Effects on Traditional Resources of the Mikisew Cree First Nation: The Joslyn Creek Project Specific and Cumulative Effects in the Oil Sands Region

Prepared for

Mikisew Cree First Nation

August 2010

Prepared by

207 Edgebrook Close NW
Calgary, Alberta
T3A 4W5 Canada

List of Contributors

Terrestrial Ecology & Conservation Biology	Dr. Petr Komers, P.Biol.
Vegetation, Soils & Reclamation	Dr. Sheri Gutsell
Land Use Planning & Coordination	Dr. Troy Whidden, P.Biol.
Forestry Engineering& Geographic Information Systems	Zoran Stanojevic, M.F.
Research Support	Shannon Gavin, M.Sc., P.Biol. Abbie Stewart, M.Sc., P.Biol. Sarah Hechtenthal, M.Sc., P.Biol.

Executive Summary

Total seeks approval from the Energy Resources Conservation Board (ERCB) to construct and operate the Joslyn North Mine Project (the Project). MSES Inc. was retained to review the likely Project impacts on Mikisew Cree First Nation's traditional resource use. Management and Solutions in Environmental Science (MSES) reviewed evidence about the availability of past, present and likely future key traditional resources and applied that evidence to the regional study area (RSA) for vegetation, wildlife, and biodiversity as defined by Total as well as the larger area of the Regional Municipality of Wood Buffalo (RMWB).

For the purpose of this report we have been asked to assume that the following traditional resources are of concern to the Mikisew Cree: remoteness, ecosystem process, bison, caribou, moose, beaver, and waterfowl.

This report consists of the following four parts:

- industrial impacts on conditions supporting traditional resources;
- industrial impacts on traditional resources;
- re-establishment of traditional resources; and
- First Nation participation in decision making.

Our main findings are that, as of 2008, about 56% of the RSA were disturbed by industrial developments. The Project's impacts, in accumulation with past, present, and future projects will remove any undisturbed land from the RSA by about 2021. Within ten years after that, the habitats for moose, beaver and waterfowl will be removed and, as a result, their populations in the RSA will likely not be viable.

To date, reclamation practices have not re-established vegetation and wildlife diversity similar to pre-disturbance conditions, and are unlikely to do so in the future. Finally, the environmental planning process does not provide the scientifically rigorous information necessary to understand and prepare the First Nations for the erosion of traditional resources.

We list the key findings of our analyses below.

Key Finding: In the past 16 years, an average of 3% of undisturbed area has been removed each year from the RSA. As of 2008, 56% of the RSA was disturbed. At this rate, there will be no undisturbed area left for the effective practice of traditional resource use in the RSA by the year 2021.

Key Finding: The landscape disturbance process in the RSA has reached an asymptote of maximum fragmentation. Further development is almost certain to push the ecosystem into a substantial and long-term reorganization which is understood as an ecosystem or regime shift.

Key Finding: Bison and caribou, two historically important subsistence species, have been removed from not only the RSA, but from most areas of the wider Oil Sands Region and are scarcely available for traditional resource use.

Key Finding: In the past 16 years, an average of 3% of moose habitat has been removed each year from the RSA. At this rate, the moose population will cease to be viable in the RSA between 2015 and 2019, depending on the probability of natural extinction events.

Key Finding: In the past 16 years, beaver habitat experienced a yearly loss of 23 km^2, or 3.2%, of the 730 km^2 of originally available in 1992. At this rate, there will be no beaver habitat left in the area by the year 2025.

Key Finding: In the past 16 years, waterfowl habitat experienced a yearly loss of 8 km^2, or 2.8%, of the 293 km^2 originally available in 1992. At this rate, there will be no waterfowl habitat left in the area by the year 2029.

Key Finding: The disturbed areas are unlikely to be reclaimed. There is very little similarity in terms of species composition between reclaimed sites and natural stands. Reclaimed sites show an unnaturally low diversity of species.

Key Finding: The environmental assessment process for Alberta Oil Sands projects does not involve any objective quantification of traditional resources. There is no evidence that the impacts on First Nations traditional resource use are rigorously measured in any part of the assessment process.

TABLE OF CONTENTS

PAGE

1.0 INTRODUCTION 1

2.0 INDUSTRY IMPACTS ON CONDITIONS SUPPORTING TRADITIONAL RESOURCES 2

2.1 Remoteness as an Ecosystem Service 2

2.1.1 Past and Current Disturbances 2

2.1.2 Projected Decrease of Natural Surface 4

2.2 Ecosystem Process 12

3.0 INDUSTRY IMPACTS ON TRADITIONAL RESOURCES 16

3.1 Bison and Caribou 16

3.2 Moose 19

3.2.1 Moose Population Decline 19

3.2.2 Moose Habitat Use in Reclaimed Areas 20

3.2.3 Moose Use Habitat Less When Fragmented and in Low Supply 20

3.2.4 Moose Habitat Decline in the RSA 21

3.2.5 Linking Moose Habitat Loss and Population Viability 23

3.3 Beaver Habitat Decline 24

3.4 Waterfowl Habitat Decline 25

4.0 RE-ESTABLISHING TRADITIONAL RESOURCES 26

4.1 Natural Forest Stands 26

4.2 Reclaimed Sites 26

4.3 Differences Between Natural Stands and Reclaimed Sites 27

5.0 FIRST NATION PARTICIPATION IN DECISION MAKING 29

5.1 Review Methods 29

5.2 Results 31

5.2.1 Scoping Phase 31

5.2.2 EIA Phase 32

5.2.3 Follow-up Phase 32

5.2.4 Aboriginal Community Participation 32

5.2.5 Approval Phase 33

5.3 Conclusions 34

6.0 REFERENCES 35

TABLE OF CONTENTS (cont)

PAGE

LIST OF TABLES

Table 2.1-1: Project Applications in the RSA 6
Table 2.1-2: Disturbances (km², Linear and Footprint Combined) in the RMWB within a 250 m Zone from Disturbance 10

LIST OF FIGURES

Figure 2.1-1: Increasing conversion of natural surfaces (green) to industrial ones (red) in RSA 4
Figure 2.1-2: The projected conversion, based on satellite image analysis of all natural land cover to industrial surface, including areas of zones of influence, in the RSA. 5
Figure 2.1-3: The projected disturbance of natural land cover in the RSA, based on the Planned Projects 7
Figure 2.1-4: Comparison of the disturbances in the RSA by 2008 showing all disturbances including linear features shown by AltaLIS data (right panel) and without the linear features (left panel). 8
Figure 2.1-5: Sample area showing new disturbances that occurred between the update by AltaLIS of 2006 and the SPOT image taken in 2007. 9
Figure 2.1-6: Increasing disturbance of natural surfaces in relation to Oil Sands Tenure (Leases) in the RMWB 11
Figure 2.2-1: The number of patches of natural land cover related to the amount of land cover conversion in townships within the Oil Sands Region. 13
Figure 2.2-2: The average size of patches of natural land cover related to the amount of land cover conversion in townships within the Oil Sands Region. 13
Figure 2.2-3: The proximity index of patches of natural land cover related to the amount of land cover conversion in townships within the Oil Sands Region. 14
Figure 3.1-1: Caribou Density Decline 17
Figure 3.1-2: Caribou Habitat intactness as presented in the Athabasca Caribou Management Options Report (Alberta Caribou Committee 2010). 18
Figure 3.2-1: Moose densities (moose per km²) observed in various aerial surveys conducted by regulatory agencies or private industry between the years 1960 and 2008 19

Figure 3.2-2: Moose pellet group density (indicating intensity of habitat use) in moose habitat increases as the amount of moose habitat increases in the landscape (up to approximately 70%, there were not landscapes with more than 70% moose habitat in them; reprinted from Stewart 2007). 21
Figure 3.2-3: Moose habitat (green areas) decline in the RSA for vegetation, wildlife, and biodiversity between 1992 and 2008 22
Figure 3.2-4: Projected moose habitat decline and moose population viability in the RSA for vegetation, wildlife, and biodiversity 23
Figure 3.3-1: Beaver habitat (green areas) decline in the RSA for vegetation, wildlife, and biodiversity between 1992 and 2008 24
Figure 3.4-1: Green winged teal habitat (green areas) decline in the RSA between 1992 and 2008 25
Figure 5.2-1: Average ranks of each of five document categories of the impact assessment process in the Oil Sands 31
Figure 5.2-2: The number of conditions explicitly listed in Decision Reports on proposed industry projects in the Canadian Oil Sands. Circles and full line indicate the number of conditions that specifically require stakeholders to be involved in monitoring. 34

LIST OF APPENDICES

Appendix A: Change of Land Cover Analysis
Appendix B: Wildlife Habitat Models
Appendix C: Population Viability Analysis: Input Parameters
Appendix D: Background on Forest Succession
Appendix E: Map of Government Issued Oil Sands Leases

ACRONYMS

BACI	Before-after and Control-impact
C&R	Conservation & Reclamation
EA	Environmental Assessment
EIA	Environmental Impact Assessment
ERCB	Energy Resources Conservation Board
IA	Impact Assessments
LFH	Litter, Fermentation and Humus
MSES	Management and Solutions in Environmental Science
NTS	National Topographic System
PVA	Population Viability Analyses
RSA	Regional Study Area
RMWB	Regional Municipality of Wood Buffalo
ToR	Terms of Reference
TR	Traditional Resources
ZOI	Zone of Influence

1.0 Introduction

Total seeks approval from the Energy Resources Conservation Board (ERCB) to construct and operate the Joslyn North Mine Project (the Project). Management and Solutions in Environmental Science (MSES) Inc. was retained to review the likely Project impacts on Mikisew Cree First Nation's traditional resource use. MSES reviewed evidence about the availability of past, present and likely future key traditional resources and applied that evidence to the regional study area (RSA) for vegetation, wildlife, and biodiversity as defined by Total as well as the larger area of the Regional Municipality of Wood Buffalo (RMWB).

For the purpose of this report, we have been asked to assume that the following traditional resources are of concern to the Mikisew Cree: remoteness, ecosystem process, bison, caribou, moose, beaver, and waterfowl.

This report consists of the following four parts:

- industrial impacts on conditions supporting traditional resources;
- industrial impacts on traditional resources;
- re-establishment of traditional resources; and
- First Nation participation in decision making.

Our main findings are that, as of 2008, about 56% of the RSA were disturbed by industrial developments. The Project's impacts, in accumulation with past, present, and future projects will remove any undisturbed land from the RSA by about 2021. Within ten years after that, the habitats for moose, beaver and waterfowl will be removed and, as a result, their populations in the RSA will likely not be viable.

To date, reclamation practices have not re-established vegetation and wildlife diversity similar to pre-disturbance conditions, and are unlikely to do so in the future. Finally, the environmental planning process does not provide the scientifically rigorous information necessary to understand and prepare the First Nations for the erosion of traditional resources.

2.0 Industry Impacts on Conditions Supporting Traditional Resources

2.1 Remoteness as an Ecosystem Service

Key Finding: In the past 16 years, an average of 3% of undisturbed area has been removed each year from the RSA. As of 2008, 56% of the RSA was disturbed. At this rate there will be no undisturbed area left for the effective practice of traditional resource use in the RSA by the year 2021.

This section focuses on the "deprivation of traditional lands". "Traditional lands" refers to the natural land surfaces including the vegetation and the wildlife required to exercise traditional resource use versus industrial surfaces which do not provide traditional resources. Here, we view the ability to use traditional resources as a service provided by the ecosystem to human society (see discussion by Schindler and Lee 2010).

2.1.1 Past and Current Disturbances

2.1.1.1 Identifying the Industrial Footprint

The rate of converting natural land surfaces to industrial ones was calculated based on satellite imagery. Using a series of satellite Landsat5 images we calculated the yearly rate of converting natural surfaces to industrial ones from 1992 to present (as captured in the satellite image of 2008). We applied a change analysis using data processing based on the image algebra method which allows one to compute the change in each pixel between two images of different dates (see Appendix A for detailed methods).

For linear disturbances that may not be detected by the resolution of satellite images we used AltaLIS 1:20,000 transportation data sets. The main reasons for the selection of the data from AltaLIS were data accuracy, availability and cost. According to AltaLIS, "The 1:20,000 Base Feature dataset is the most accurate and detailed of the Base products, and was created to populate GIS applications" (AltaLIS 2008). Base Features is a GIS-ready dataset that has been compiled internally within the Government of Alberta since 1996, and is now available to the private sector through its distributor, AltaLIS Ltd.

2.1.1.2 Identifying the Zone of Influence

In our ecological research and evaluations, we typically find that animals avoid the area near industrial activities. This area is typically called a "zone of influence" (ZOI). Based on our experience working with First Nations, we understand that local hunters and trappers also avoid the areas near industrial

activities. Consequently, in addition to analyzing the effects of direct vegetation clearing and the simple length of linear corridors, we have applied a ZOI around each footprint and each linear industrial feature.

Both the Alberta and the British Columbia provincial resource management agencies have adopted a 250 m buffer (zone of influence) when developing land use plans relating to industrial activities (ASRD 2009a, Thiessen 2009).

The distance of 250 m was chosen for several reasons, including the following:

- hunting is not permitted within 183 m of any occupied building (ASRD 2008);
- moose presence near roads is reduced within 200 m (Rolley and Keith 1980) to 500 m (Laurian *et al.* 2008);
- moose suffer higher mortality from wolf predation near trails (median distance of kills was 209 m, compared to random sites at 470 m, Kunkel and Pletscher 2000);
- caribou avoid industrial features within about 250 m (Dyer *et al.* 2001);
- the viability of caribou populations could be compromised when more than 61% of the landscape is within 250 m of industrial features (Sorensen *et al.* 2008);
- other mammals avoid industrial features within about this distance (Forman *et al.* 2003);
- birds in woodlands avoid roads, power lines and seismic lines by up to about 300 m, depending on species and ecological context (Kroodsma 1982, Bayne *et al.* 2008, Machtans 2006); and
- comprehensive reviews of edge responses show that "abiotic and plant responses are generally reported to extend up to 50 m into patches, invertebrate responses up to 100 m, and bird responses 50–200" (Ries *et al.* 2004, p. 510).

Clearly, the ZOI differs widely between the species, the type of industrial features and related activities, and the ecological context (i.e., species, 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 the abundance of wildlife and the land use by humans may be altered.

2.1.1.3 Results

Assuming that the sensory disturbance includes a ZOI of 250 m near any industrial feature, of the 4,007 km^2 in the RSA, Figure 2.1-1 shows the progression of disturbance as follows:

- as of 1992, 11% was disturbed;

- as of 2002, 37% was disturbed; and
- as of 2008, 56% was disturbed.

Combining all linear developments by the AltaLIS data with other linear developments shown by the Landsat images, there were 6,243.4 km of linear corridors in the RSA in 2008, representing a density of 1.56 km/km^2. To put this density into context, there may be density thresholds of seismic lines of as low as 0.3 to 0.8 km/km^2, depending on the ecological context, at which caribou and moose populations may be excluded from the area (Weclaw & Hudson 2004). At 1.56 km/km^2, some thresholds are likely already surpassed in the RSA. In such a case, the effectiveness of traditional resource use near linear corridors could be compromised. Consequently, in addition to the effects of vegetation clearing detectable by satellite image, the high density of linear corridors would likely remove all of the land cover in RSA from the effective use of traditional resources within just a few years.

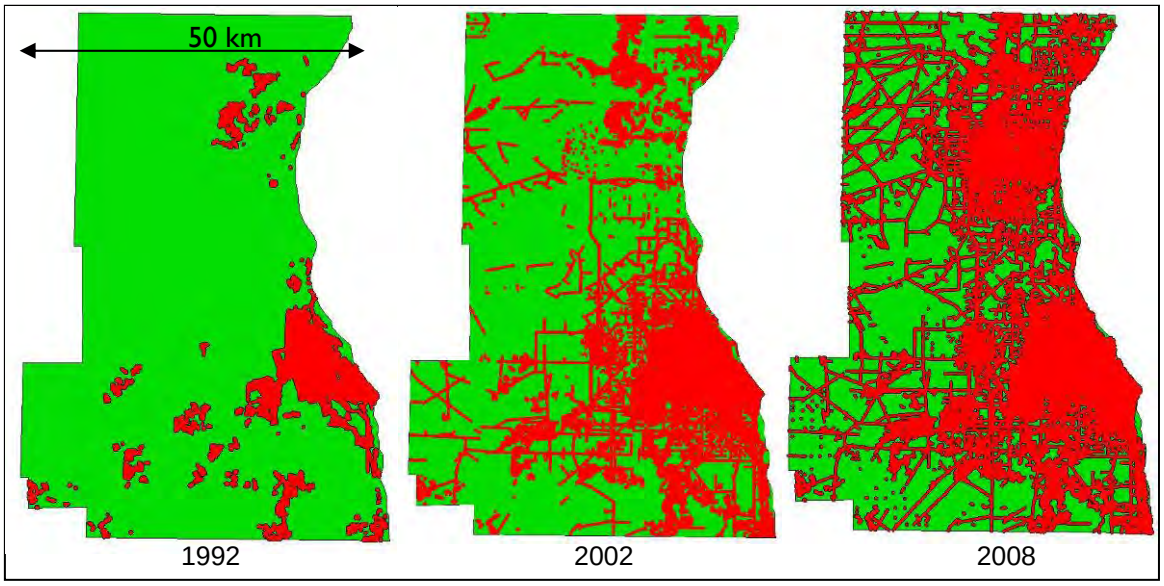


Figure 2.1-1: Increasing conversion of natural surfaces (green) to industrial ones (red) in RSA.
The conversion shown includes 250 m zones of influence around all industrial features and is based on satellite image analysis and AltaLIS data for linear developments.

2.1.2 Projected Decrease of Natural Surface

2.1.2.1 If the Rate of Disturbance Continues

Over the past 16 years, the RSA saw an annual average of 112 km^2 (3% of the RSA) of disturbance. Assuming that the rate of change remains constant, then the conversion of all natural land cover to

industrial surface will be 100% by 2021 (Figure 2.1-2). After 2021, there will be no area left where a person could go to be farther than 250 m away from an industrial feature. If the development of linear corridors continues at the current rate, then the density will increase from the present 1.56 km/km^2 to 3.35 km/km^2 by 2021.

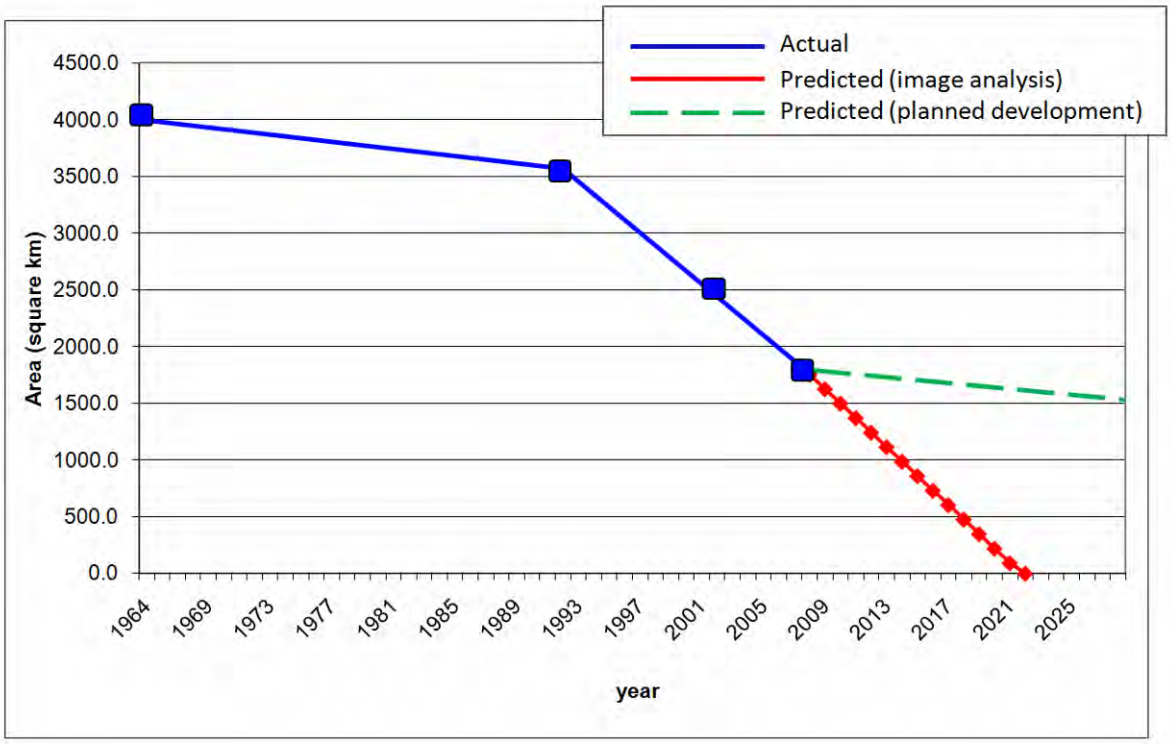


Figure 2.1-2: The projected conversion, based on satellite image analysis of all natural land cover to industrial surface, including areas of zones of influence, in the RSA. The blue squares and line represent actual measurements from the satellite image analysis. The first square, in 1964, represents the area of the RSA and is an approximation, showing that some time before Oil Sands developments this amount of land area was available for traditional resource use.

2.1.2.2 If Only the Currently Planned and Approved Projects Are Executed

We calculated the future disturbance based on the publically disclosed plans listed in Table 2.1-1 (the Planned Projects) (note: several of these Planned Projects were not considered by Total in their cumulative effects analysis). We assume that the planned disturbances will be completed within the next 20 years. This is a reasonable assumption given that, for example, since their regulatory approval in 2003, about 14% of the approved 12,960 ha in the Jackpine Mine (Shell Canada Ltd.) and about 47% of the approved 14,800 ha in the Horizon Mine (Canadian Natural Resources Ltd.) have been cleared by 2008.

Table 2.1-1: Project Applications in the RSA

Project Name	Company	Date Submitted
Horizon Mine and Upgrader*	Canadian Natural Resources Ltd.	March 2003
Pierre River Mine Project	Shell Canada Ltd.	December 2007
Voyageur South Project	Suncor Energy Inc.	July 2007
Voyageur Upgrader*	Suncor Energy Inc.	March 2005
Mildred Lake Site and Aurora Site*	Syncrude Canada Ltd.	March 2006
Equinox/Frontier	UTS / Teck	t.b.d.
Mackay River Commercial Project	AOSC	December 2009
Joslyn North Mine	Total Energy	February 2010
Terre De Grace Pilot Project	Value Creation Inc.	December 2007
STP McKay SAGD Project	Southern Pacific Resources Corp.	May 2009
Planned Harvest Areas 2001-2016	Alberta Pacific Forest Industries	n/a
Parsons Creek Project	Parson Creek Aggregates	June 2010

Note: *denotes approved projects

If only the Planned Projects are carried out in the next 20 years, then the future yearly increase in disturbance would be 37.2 km^2 (roughly the equivalent of one average moose home range) in the RSA. The areas of current and planned disturbance are shown in Figure 2.1-3. This would result in a total disturbance of 2,409 km^2 (60.1% of the RSA) by the year 2028 (Figure 2.1-2).

The Planned Projects do not include supporting activities such as exploration or infrastructure projects. Figure 2.1-4 shows how much disturbance is underestimated when linear features are omitted from the analysis (as is the case in the analysis of Planned Project disturbance). Moreover, other projects may be planned but not yet disclosed. The projection of future developments based on the Planned Projects, therefore, grossly underestimates future disturbance.

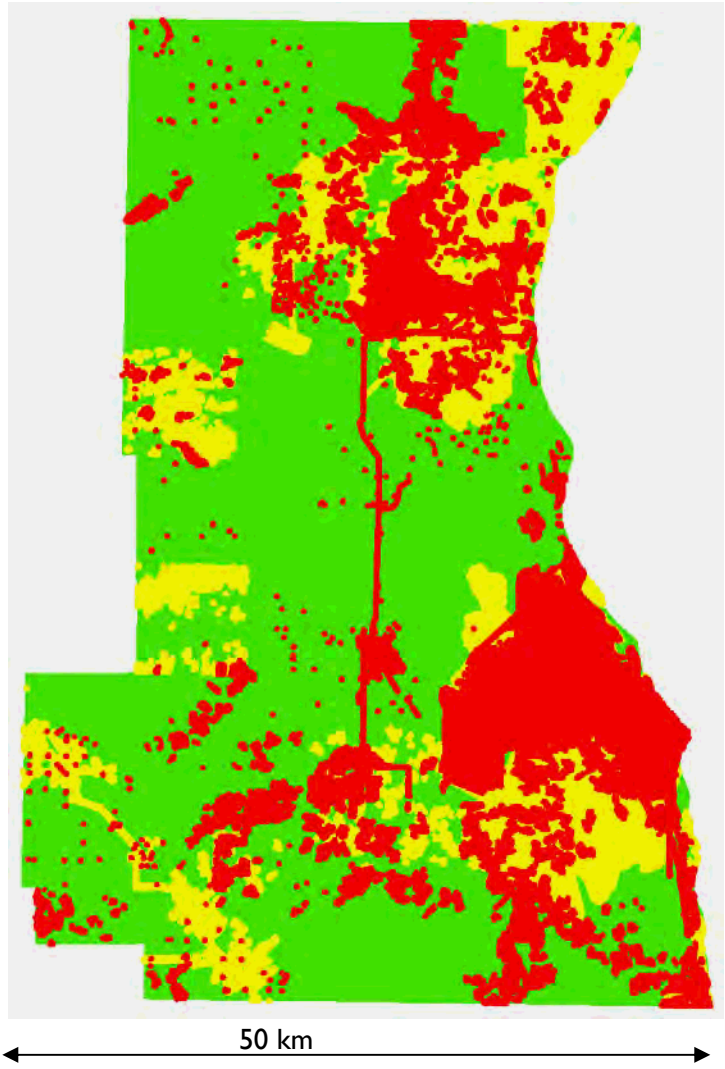


Figure 2.1-3: The projected disturbance of natural land cover in the RSA, based on the Planned Projects.
Areas in red represent disturbance existing in 2008, areas in yellow represent additional disturbance currently planned. Most linear disturbance such as exploration is not shown because planned linear disturbances are unknown.

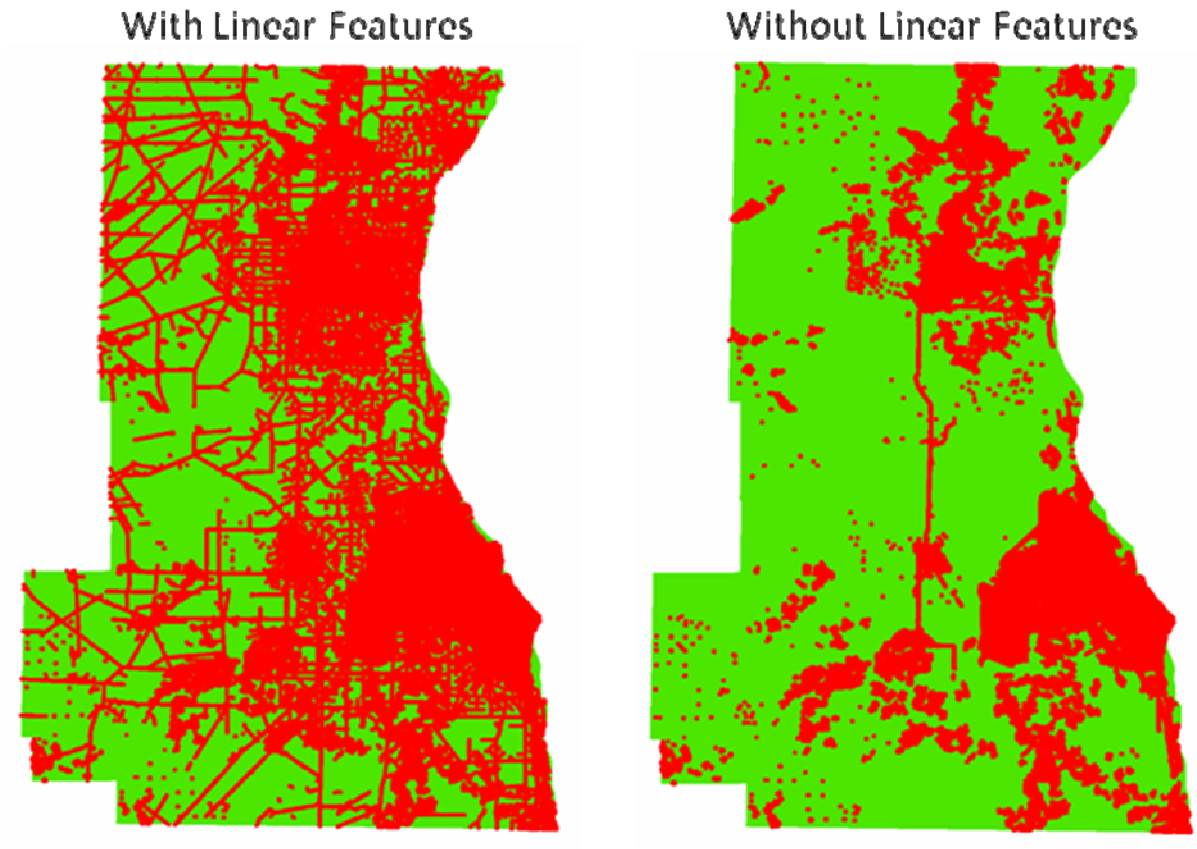


Figure 2.1-4: Comparison of the disturbances in the RSA by 2008 showing all disturbances including linear features shown by AltaLIS data (right panel) and without the linear features (left panel).

2.1.2.3 Conservative Use of Data

A major challenge in obtaining data detailed enough to capture all linear developments for every year lies in the fact that AltaLIS data is not updated for all areas in every year. We compared the most recent AltaLIS data from a sample area of the RSA in 2006 with a SPOT image of the same area in 2007. SPOT images are based on fine resolution satellite imagery with an accuracy of about ±10 m.

The comparison in Figure 2.1-5 shows there were disturbances visible in the SPOT image of 2007 which were not shown by the AltaLIS data of 2006. For the sample area shown in Figure 2.1-5, there were 150.4 km of linear developments shown by the AltaLIS data, while the SPOT image showed an additional 58.4 km of developments. This suggests that in just one year, the sample area was subject to new disturbance which was not captured in our analysis because our analysis was based on the most current data obtained from AltaLIS. Therefore, our analysis, which estimates the amount of "current" disturbance in 2008, likely underestimates the actual amount of disturbance in 2008.

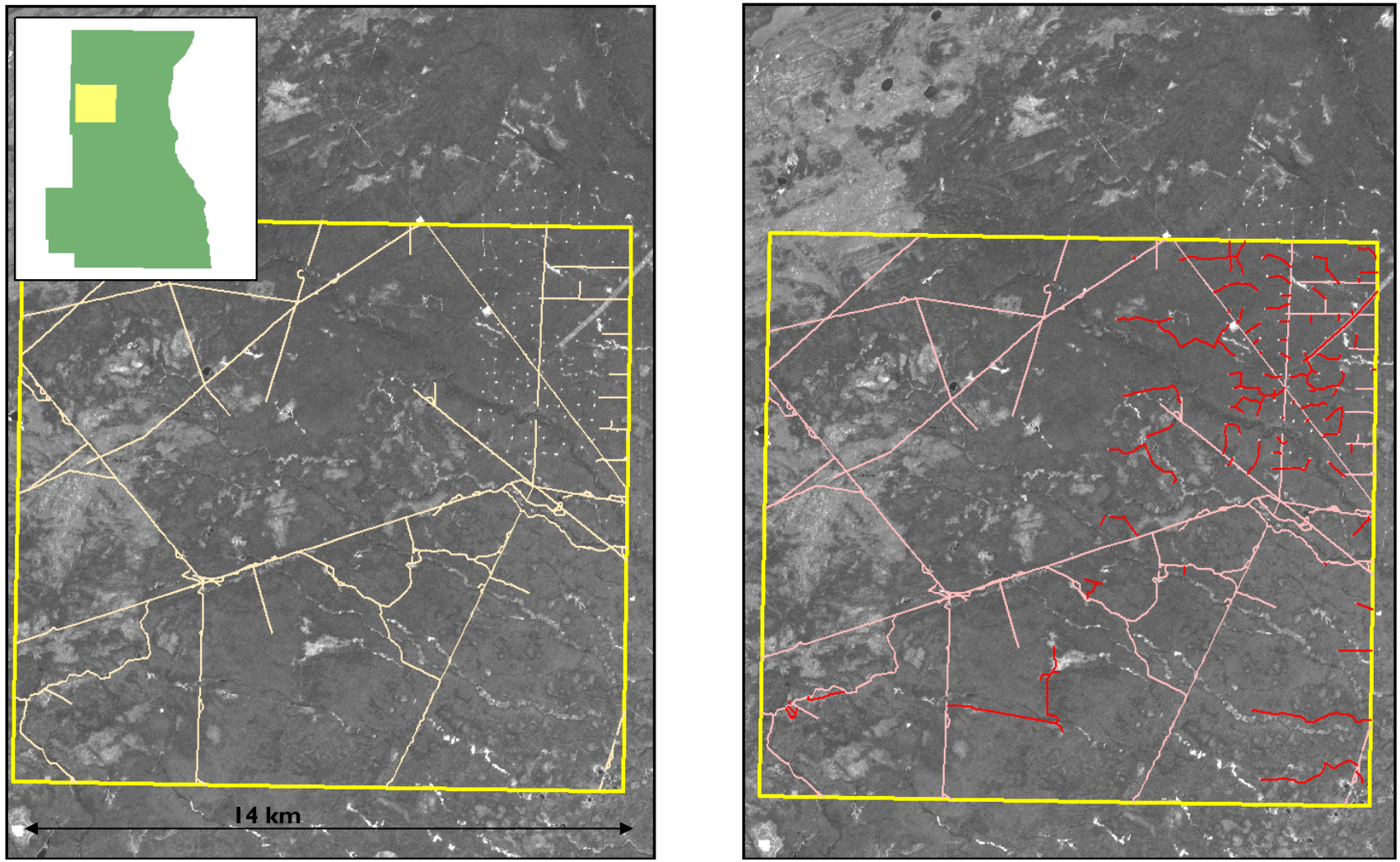


Figure 2.1-5: Sample area showing new disturbances that occurred between the update by AltaLIS of 2006 and the SPOT image taken in 2007. Left panel shows the AltaLIS data in yellow overlain on the SPOT image. The right panel highlights in red the disturbances not captured in the AltaLIS data. The yellow square represent the NTS map sheet 84H08SE at 1:20,000 scale.

2.1.2.4 Development beyond the RSA

The map of Oil Sands Leases (Appendix E) indicates that resource exploitation within the RMWB is anticipated to expand much beyond the RSA (Figure 2.1-6). It appears likely that all areas south of Wood Buffalo National Park in the RMWB will be disturbed in a similar manner as the RSA. We have conducted an analysis of disturbance in the RMWB, similar to the one we presented above which was specific to the RSA. The only difference between the analyses for the RSA and the RMWB was that we did not use the AltaLIS data for the larger scale and coarser analysis of the RMWB. Our disturbance analysis shows that disturbance has increased since 1992 in the RMWB south of Wood Buffalo National Park (Figure 2.1-6), and that it moved northwards over time.

By 2008, 15,813 km^2 or 23% of the Regional Municipality of Wood Buffalo were disturbed by land clearing and the surrounding zone of influence of 250 m. The south experienced relatively the most disturbance, followed by the central area. The north area was relatively unaffected by land clearing and the surrounding zone of influence (Table 2.1-2); this coincides with an absence of Oil Sands Leases (Figure 2.1-6). By contrast, areas outside of the RMWB are under lease (Figure 2.1-6) and likely follow a similar pattern of disturbance as the leased areas within the RMWB shown in our analysis.

Table 2.1-2: Disturbances (km^2, Linear and Footprint Combined) in the RMWB within a 250 m Zone from Disturbance The amount of disturbance is underestimated as the analysis does not include AltaLIS data.

	Up to1992	Up to 2002	Up to 2008	Area Disturbed by 2008 %
North	114	124	125	0.7
Central	3,110	5,247	7,969	24.8
South	4,162	6,346	7,719	41.6
Total RMWB	7,386	11,717	15,813	23.0

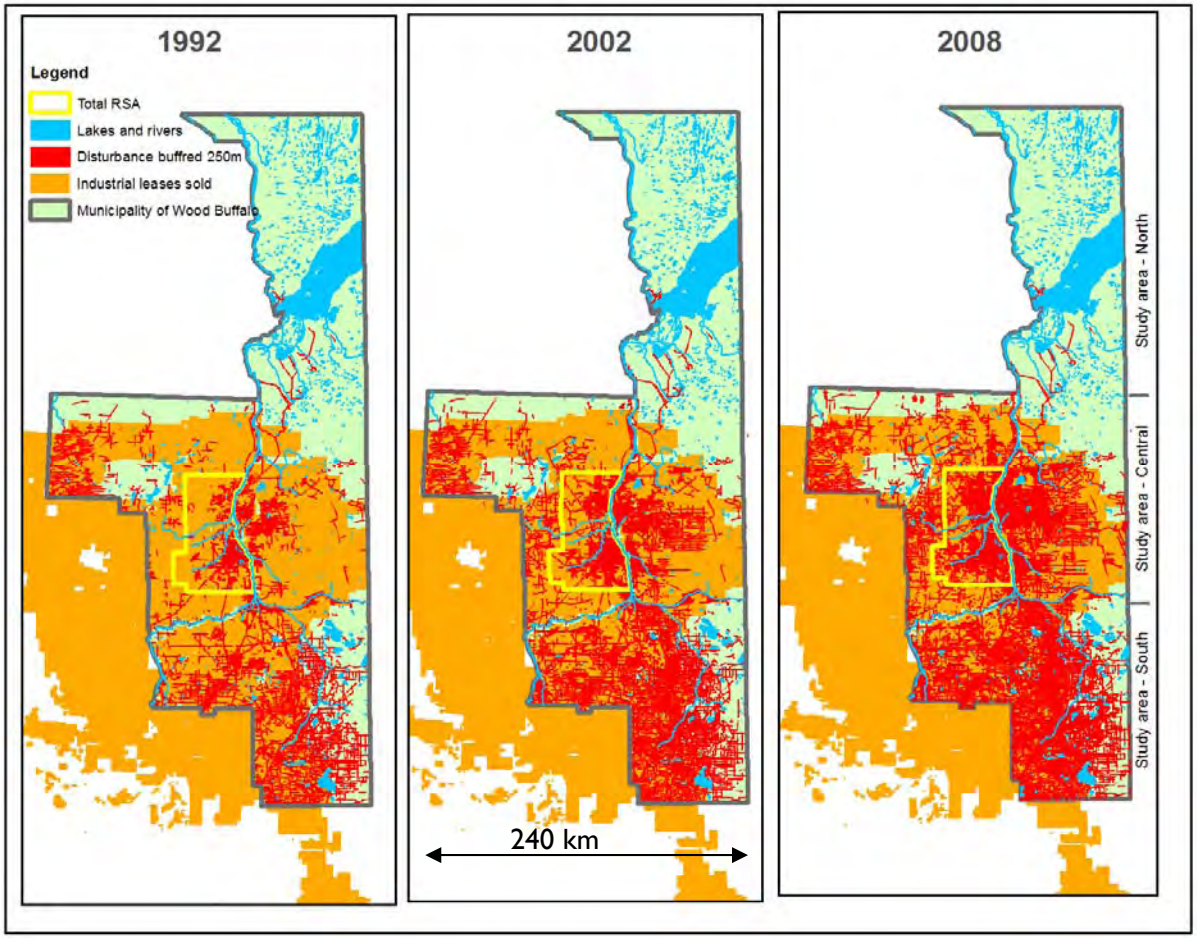


Figure 2.1-6: Increasing disturbance of natural surfaces in relation to Oil Sands Tenure (Leases) in the RMWB.
The disturbance shown here includes 250 m zones of influence around all industrial features and is based on satellite image analysis. Overlain are lease areas. Disturbances are underestimated as they do not include AltaLIS data.

2.2 Ecosystem Process

Key Finding: The landscape disturbance process in the RSA has reached an asymptote of maximum fragmentation. Further development is almost certain to push the ecosystem into a substantial and long-term reorganization which is understood as an ecosystem or regime shift.

Ecosystem shifts occur when external forces alter a system so that its organization shifts from one set of processes to another (Gordon *et al.* 2008). Folke *et al.* (2003, p.354) define ECOLOGICAL RESILIENCE as "the magnitude of disturbance that can be experienced before a system moves into a different state and different set of controls". These researchers argue that natural and human systems are combined as one social-ecological system and that ecosystems need to be managed to sustain the social systems. They define SOCIAL RESILIENCE as "the ability of human communities to withstand external shocks to their social infrastructure, such as environmental variability or social, economic, and political upheaval". If the environmental variability represents a great shock to the social infrastructure, then the social structure will break down. If the environmental variability moves the ecosystem to a different state then the First Nation traditional resource use will be unable to sustain that shock and will need to change.

The ecosystem in the RSA may have already shifted to a different state: the landscape now exists of very many, very small and isolated patches of natural surfaces. To visualize the effect of vegetation clearing on natural surfaces in the Oil Sands region, we calculated the number of patches of natural surfaces, the average patch size, and the index for the proximity of patches to each other, using the Patch Analyst of ArcGIS 9 for each of 35 townships in the mineable Oil Sands Region. The proximity index is large when any given patch is in close proximity of large patches, and decreases as patches become smaller or more sparse (Gustafson and Parker 1994). We also calculated the amount of natural surface disturbed in each township.

These calculations show that fragmentation of natural surfaces in the Oil Sands Region increases exponentially with the amount of natural surface conversion (Figures 2.2-1 to 2.2-3). This is consistent with theoretical predictions in landscape ecology (Andrén 1994, Hargis *et al.* 1998). Comparing these findings with the RSA, the number of patches is at a maximum and the size and the proximity of patches are at or near a minimum. Therefore, the required travel distance form one patch to another is at a maximum and even if any patch is reached it is small and isolated.

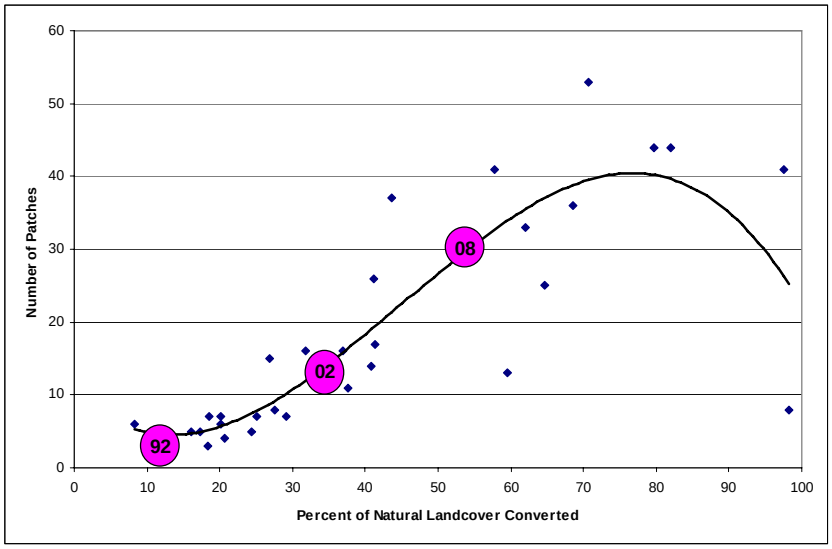


Figure 2.2-1: The number of patches of natural land cover related to the amount of land cover conversion in townships within the Oil Sands Region. The trend line is calculated as $y = -0.0003x^3 + 0.038x^2 - 0.8598x + 9.9159$. The R^2 value is 0.75, indicating that 75% of the variation in the data is represented by the trend line. The purple circles indicate the situation in the RSA in 1992, 2002, and 2008, relative to the general trend observed for townships in the Oil Sands Region.

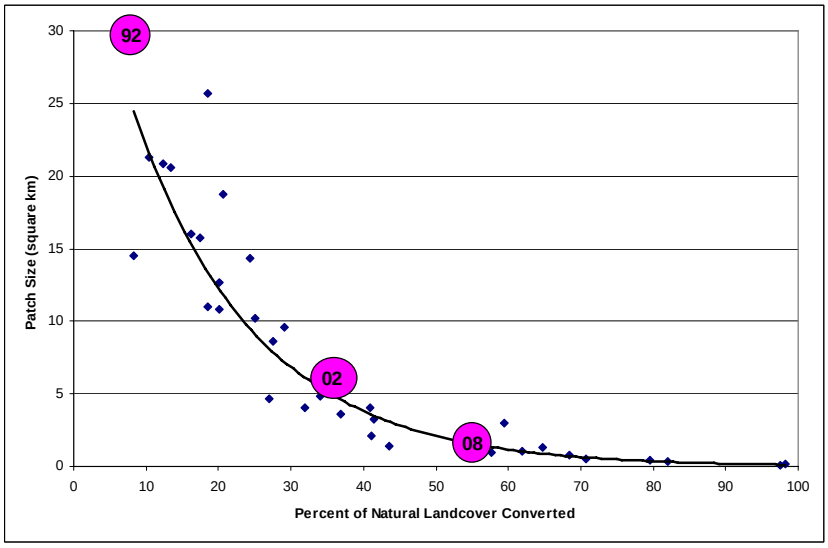


Figure 2.2-2: The average size of patches of natural land cover related to the amount of land cover conversion in townships within the Oil Sands Region. The trend line is calculated as $y = 39.716e^{-0.0586x}$. The R^2 value is 0.94, indicating that 94% of the variation in the data is represented by the trend line. The purple circles indicate the situation in the RSA in 1992, 2002, and 2008, relative to the general trend observed for townships in the Oil Sands Region.

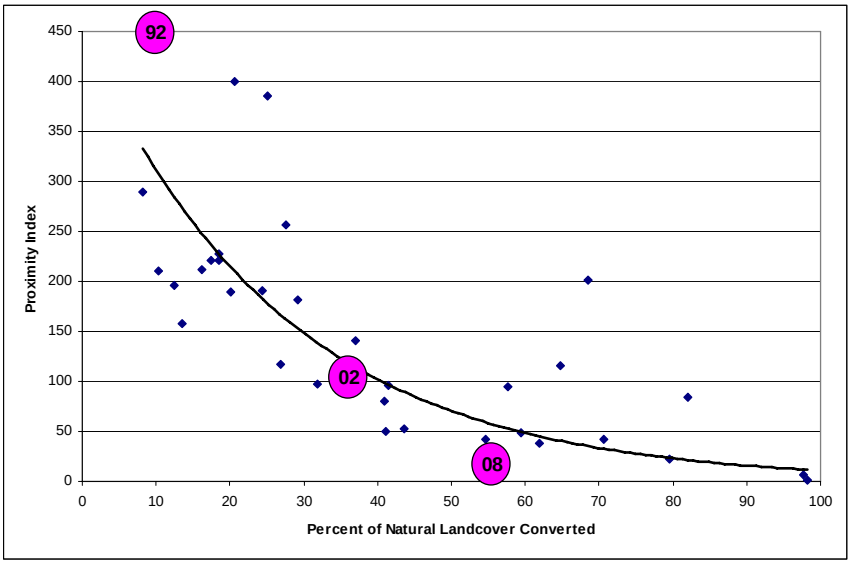


Figure 2.2-3: The proximity index of patches of natural land cover related to the amount of land cover conversion in townships within the Oil Sands Region. Higher values indicate larger patches being closer to each other. The trend line is calculated as $y = 453.81e^{-0.0373x}$. The R^2 value is 0.67, indicating that 67% of the variation in the data is represented by the trend line. The purple circles indicate the situation in the RSA in 1992, 2002, and 2008, relative to the general trend observed for townships in the Oil Sands Region.

If the original landscape is disturbed more than 50%, it breaks up into small and isolated patches. The landscape in the RSA is now dominated by disturbed surfaces and edges of the small patches with core wildlife habitat being rare. This may lead to the disappearance of wildlife species from the landscape, including moose and caribou (see Sections 3.1 and 3.2 below), and to the invasion by other species, including deer and magpies (Dawe and Boutin 2009; ASRD 2009b). The invasion of natural vegetation communities by invasive plant species is believed to be a considerable impact caused by disturbance (White *et al.* 1993, ASRD 2004).

The landscape changes bring about many radical ecological changes, not only in wildlife and vegetation populations, but also in hydrological cycles (Gordon *et al.* 2008). The changed ecosystem structure and processes may lead to changes in the ecosystem services such as water retention and filtration, carbon storage, and resource use (Schindler and Lee 2010). Large changes in the landscape structure can increase the risk of ecological regime shifts (Gordon *et al.* 2008). In the early 1990s, aside from providing a comprehensive review of biophysical conditions and trends, the Northern River Basin Study used traditional knowledge of First Nations and Aboriginal to illustrate the observations of people most familiar with the rivers. Traditional knowledge holders believed that changes in river conditions were not only caused by in-stream flow alterations, but also by activities on land such as mining, logging and

other industrial disturbances. In support of these observations, western scientists and authors of the Northern River Basin Study agreed that land clearing includes some or all of these hydrologic impacts on rivers (Northern River Basin Study 1994, p. 29):

- "changes to water tables and water retention capacity of soil;
- slow recovery of evapotranspiration processes;
- changes in the capacity of peat lands to store water;
- reduction in the size and number of wetlands;
- potential for increased flows causing degradation of rivers and streams at some locations and aggregation of rivers and stream beds at other locations;
- decreased stream gradients;
- low nutrient soil environments; and
- changes to sediment levels, water yield, water temperature, and aquatic biota. "

Aside from the projected elimination of natural surfaces, it is likely that the landscape in the RSA has already entered a new state of configuration of natural vegetation patches likely leading to a new scheme of ecological processes (Scheffer *et al.* 2001; Gordon *et al.* 2008). Open spaces and habitat edges or ecotones now dominate the landscape and areas large enough to be considered intact expanses of boreal forests no longer exist (Potapov *et al.* 2008 defined intact forests as areas of at least 500 km^2 without significant human activity). Concurrently with the advancement of disturbance, the spread of species such as deer, magpies, and invasive vegetation is observed as is the disappearance of others such as caribou. Early warning signals for ecological transition, such as increasing variance of environmental parameters (natural variability), may well be accessible and measurable (Landres *et al.* 1999; Carpenter and Brock 2006, Scheffer *et al.* 2009), but the system controls in the RSA or in the larger RMWB are not sufficiently known to quantify the change.

Oil Sands proponents often state that their disturbances (which in our view cause ecosystem shifts) can be reversed. However, as discussed below there is very little evidence of successful re-establishment of natural vegetation communities in the Oil Sands region (Section 4.0). Further, there is no example in the oil sands where pre-disturbance conditions had been restored, which would allow for traditional land use to resume.

In fact, future development is almost certain to push the ecosystem into a substantial and long-term reorganization which is understood by many as an ecosystem or regime shift (Scheffer *et al.* 2001; Carpenter and Brock 2006; Gordon *et al.* 2008; Scheffer *et al.* 2009; Gammerstani *et al.* 2009).

3.0 Industry Impacts on Traditional Resources

3.1 Bison and Caribou

Key Finding: Bison and caribou have been virtually removed from the RSA, and from most areas of the RMWB and are scarcely available for traditional resource use.

It is said that "Indians … once lived bountifully on the buffalo" but that by the end of the 19th century the last wood bison were seen in the Clearwater River and the Fort McMurray areas (Gates *et al.* 1992). Although the Wood Buffalo National Park was established with the purpose of protecting the remnant population, the bison have never re-established in the region between Lake Athabasca and the Clearwater River.

In that same region, the woodland caribou population has been declining since the 1990s (Figure 3.1-1, McLaughlin *et al.* 2003, Alberta Caribou Committee 2010). The Athabasca Caribou Management Options Report (Alberta Caribou Committee 2010) presented information on relative caribou habitat intactness, showing only few highly intact caribou habitat areas left (dark green, Figure 3.1-2). Some of the green areas are within the RSA. However, our analysis shows that even the green areas are disturbed, some heavily, and some are planned to be disturbed (Figures 2.1-3, 2.1-6 above). According to Sorensen *et al.* (2008) caribou populations can only be sustainable up to a maximum of 61% (less if the landscape is affected by fire) of the landscape being within 250 m of industrial development. Our analyses indicate that 56% of the RSA was within 250 m of industrial disturbance in 2008 (see Section 2.1 above). We conclude that given the existing and planned developments, the extirpation of woodland caribou is a near certainty, particularly the herds West Side and East Side of Athabasca River (McLaughlin *et al.* 2003; Alberta Caribou Committee 2010).

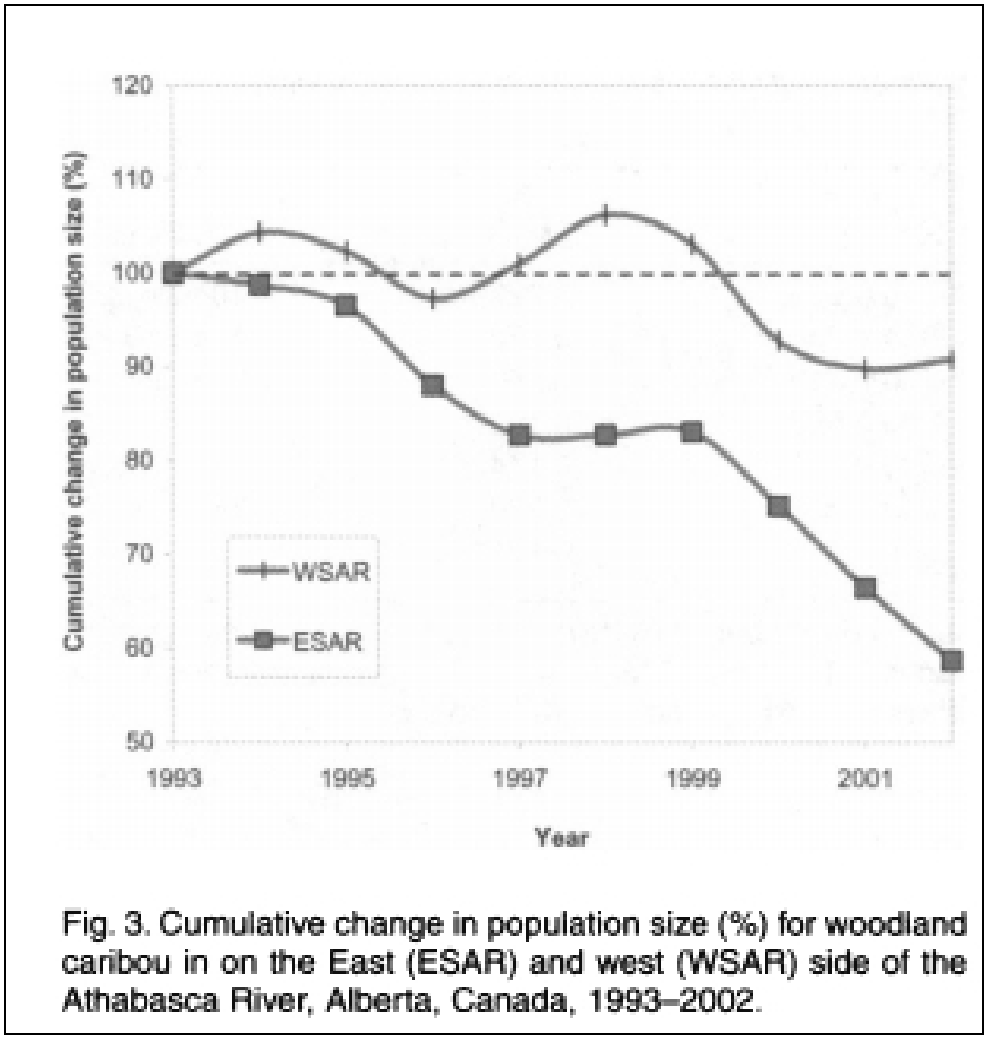


Fig. 3. Cumulative change in population size (%) for woodland caribou in on the East (ESAR) and west (WSAR) side of the Athabasca River, Alberta, Canada, 1993–2002.

Figure 3.1-1: Caribou Density Decline.
Figure reprinted from McLoughlin *et al.* (2003).

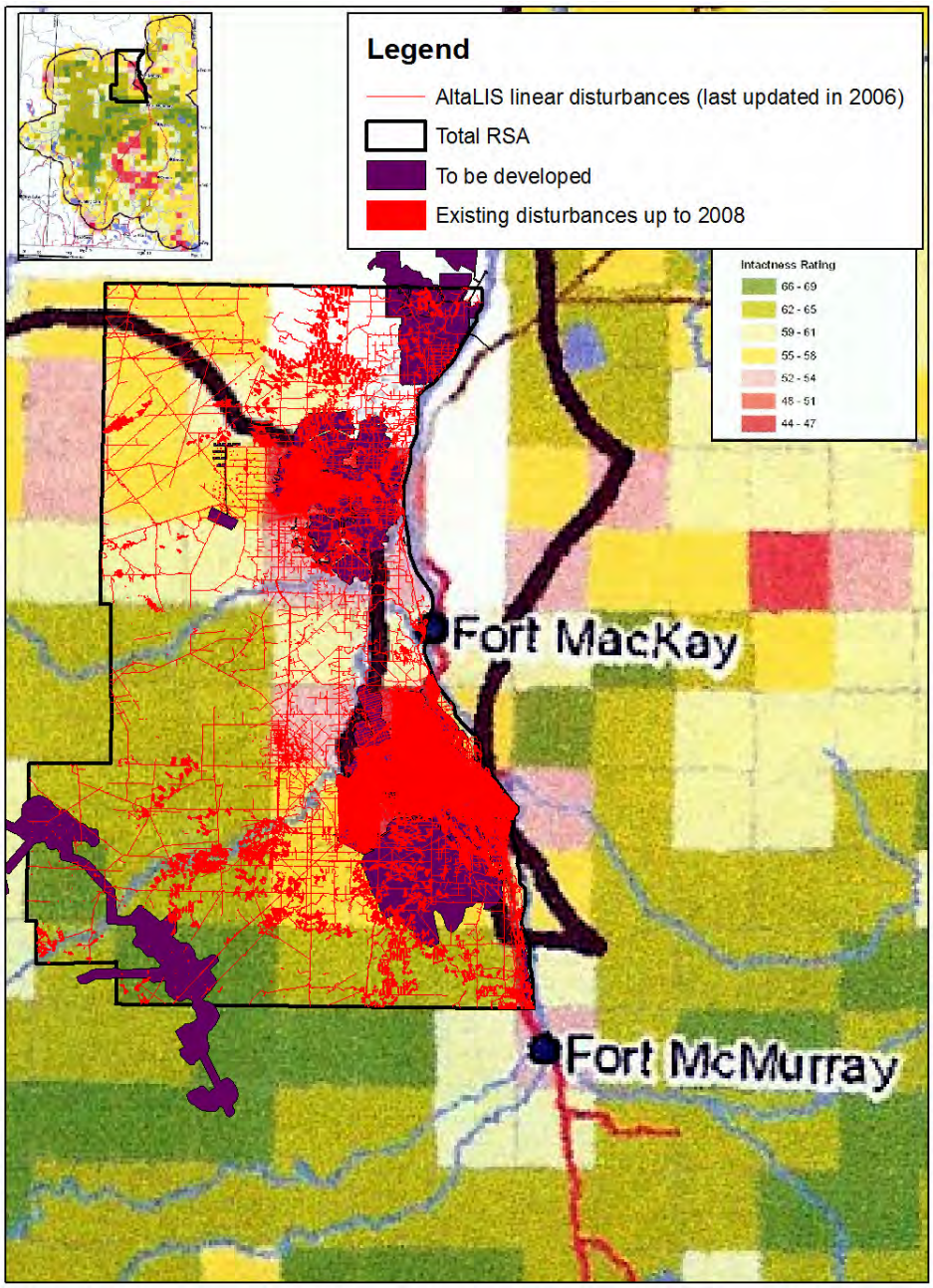


Figure 3.1-2: Caribou Habitat intactness as presented in the Athabasca Caribou Management Options Report (Alberta Caribou Committee 2010). The RSA and disturbances analyzed by MSES are overlain in red.

Both bison and caribou are therefore essentially removed from traditional resource use.

3.2 Moose

Key Finding: In the past 16 years, an average of 3% of moose habitat has been removed each year from the RSA. At this rate, the moose population will cease to be viable in the RSA between 2015 and 2019, depending on the probability of natural extinction events.

3.2.1 Moose Population Decline

Figure 3.2-1 is based on the data provided in of Suncor's Mine Dump 9 Application (Attachment 1 of the SIRs, Table 5-1, Suncor 2008). It demonstrates that moose density is declining in the region which includes the RSA. The declining trend is highly significant (Spearman rank order correlations r_s=-0.52, N=44, p<0.001) and consistent with the increasing conversion of natural land surfaces to industrial development.

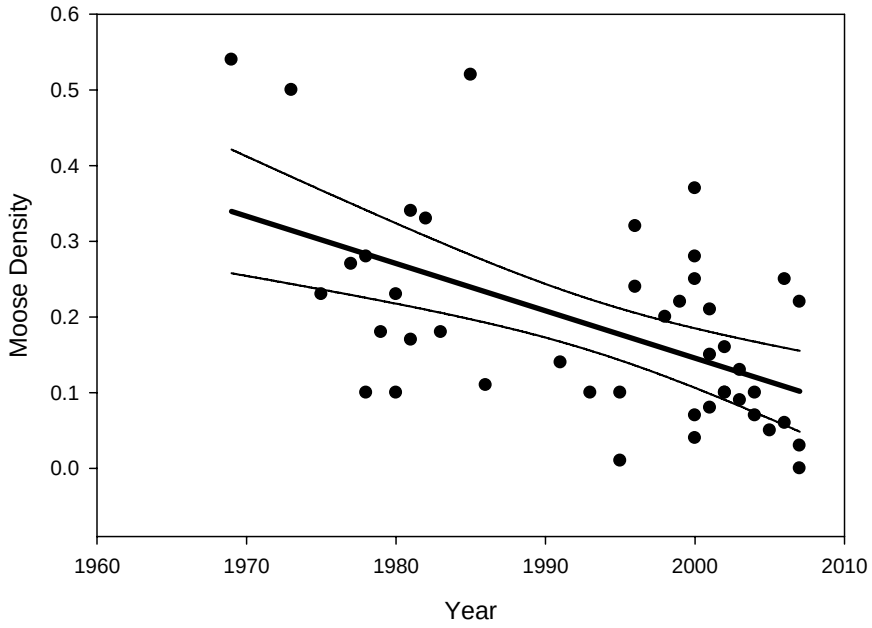


Figure 3.2-1: Moose densities (moose per km²) observed in various aerial surveys conducted by regulatory agencies or private industry between the years 1960 and 2008.
The data were obtained from Suncor (2008). Where a range of dates was given we plotted the most recent year, where a range of densities was given we plotted the highest indicated density. The trend line is y=-0.0063x + 0.7709, ± 95% confidence limits indicated by the lines above and below. The declining trend is statistically highly significant (Spearman rank order correlations r_s=-0.52, N=44, p<0.001).

3.2.2 Moose Habitat Use in Reclaimed Areas

Monitoring reports from proponents in the Alberta Oil Sands Region are required to produce evidence of wildlife re-establishment, for example Suncor's Approval No. 94-02-00:

6.1.73 The approval holder shall re-establish a diversity of wildlife and fish habitats similar to those that existed prior to disturbance, in proportions appropriate relative to the approved Life of Mine Closure Plan.

6.1.74 The approval holder shall demonstrate, through monitoring, progress in achieving a diversity of wildlife and fish habitats as outlined in subsection 6.1.73.

6.1.75 The approval holder shall document wildlife and fish habitat utilization on the reclaimed land by monitoring wildlife and fish species typically associated with and naturally occurring in the wildlife and fish habitat types present.

No moose sign on reclaimed or disturbed sites has been found by Suncor Energy Inc in either their *2007 Annual Conservation & Reclamation Report for the Millennium Mine* or their *Wildlife Monitoring Program March 2006 for the Firebag Project*. Similarly, no moose sign has been reported by either Shell (Shell Canada Energy Jackpine Mine Phase 1) or Albian Sands (Albian Sands Energy Inc Muskeg River Mine) on their reclaimed areas. Moreover, no empirical documentation of moose re-establishment has been provided by Syncrude in their 2006 Closure and Reclamation Plan.

These observations indicate that moose do not readily return to newly revegetated sites while oil sands operations are still ongoing.

3.2.3 Moose Use Habitat Less When Fragmented and in Low Supply

Increased fragmentation and decreased habitat availability result in higher isolation of moose habitat patches and smaller patch size of moose habitat. Moose are less likely to use small and isolated patches because it may not be worthwhile for moose to reach them. Evidence of moose reducing their use of habitat patches in highly fragmented areas was found in the Foothills Natural Region of Alberta (Figure 3.2-2, Stewart 2007). The implication is that the number of moose in an area declines faster than expected from the decline in habitat availability alone because moose are unlikely to use habitat patches that are small and far apart.

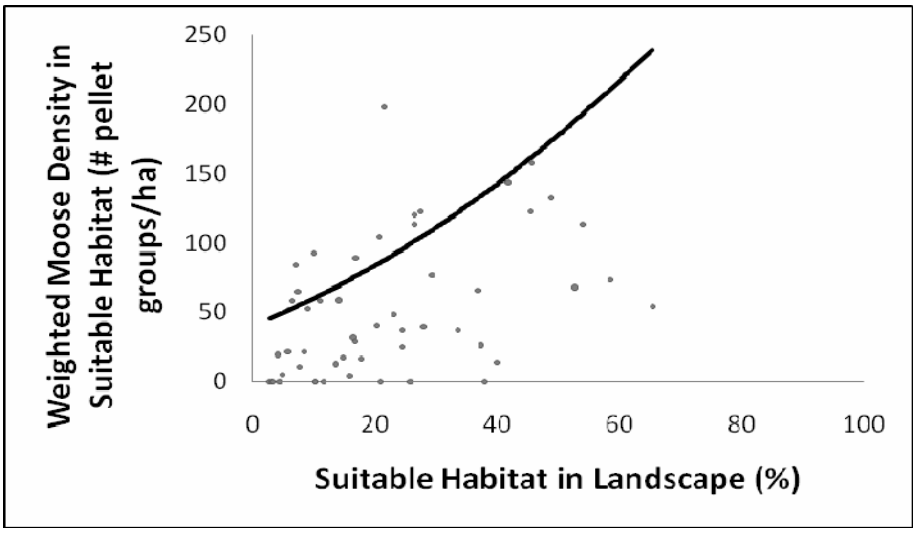


Figure 3.2-2: Moose pellet group density (indicating intensity of habitat use) in moose habitat increases as the amount of moose habitat increases in the landscape (up to approximately 70%, there were not landscapes with more than 70% moose habitat in them; reprinted from Stewart 2007).

There is a great deal of evidence from research in landscape ecology that fragmentation and isolation of habitat patches affects the ability of animals using the patches (Collingham *et al.* 2000, Laurance *et al.* 2002). Research on moose in Alberta appears to support this evidence (Stewart 2007; Stewart *et al.* 2010). We have used this information in our calculations of moose habitat availability in the RSA. Given this fragmentation effect, resulting in a decreasing probability of moose using small patches, we assumed that carrying capacity in highly fragmented landscapes is more variable than in contiguous landscapes.

3.2.4 Moose Habitat Decline in the RSA

Moose habitat in the RSA declined from 1,780 km^2 (in 2002) to 1,147 km^2 (in 2008). This represents a yearly loss 51 km^2 or 2.3% of the 2,158 km^2 of originally available (in 1992) moose habitat. Moose habitat was determined by calculating an affinity index (see Appendix B for detailed methods). Affinity indices provided a quantitative evaluation of wildlife habitat preferences. These indices were designed to remove habitat availability biases from wildlife habitat use assessment (Cairns and Telfer 1980). Unlike traditional habitat modelling, which is based on literature and expert knowledge, affinity indices are based on empirical data. Affinity indices provided a ranking of habitat preference and gave an indication of where individuals or populations of a species were likely to occur based on past observations.

We assumed that habitat normally preferred by moose that is within 250 m of industrial features is avoided by moose; therefore, we removed all habitat within 250 m of industrial features as having been disturbed. Our assumption is based on many ungulate studies in peer-reviewed literature (Rolley and Keith 1980, Dyer 2001, Forman *et al.* 2003, Gavin and Komers 2006) as well as our own measurements in wildlife surveys and field courses with our students.

The rate of decline in habitat availability was calculated based on satellite imagery. Using a series of satellite Landsat5 images, we calculated the yearly rate of converting natural surfaces to industrial developments from 1992 to present. We applied a change analysis using data processing based on the image algebra method which allows one to compute the change in each pixel between two images of different dates (see Appendix A for detailed methods).

A map depicting the declining availability of moose habitat and increasing fragmentation between 1992 and 2008 in the RSA is provided in Figure 3.2-3.

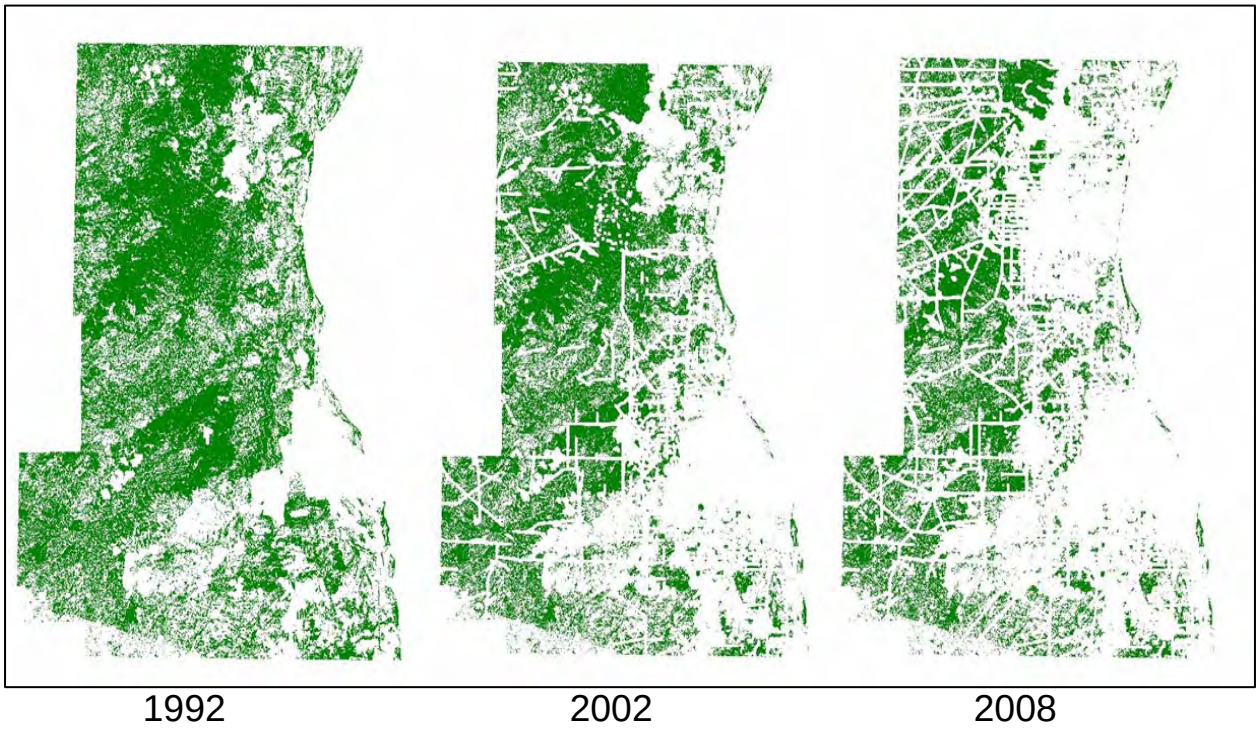


Figure 3.2-3: Moose habitat (green areas) decline in the RSA for vegetation, wildlife, and biodiversity between 1992 and 2008

Based on the rate of decline in the past 16 years, moose habitat will disappear from the RSA in about the year 2019 (Figure 3.2-4).

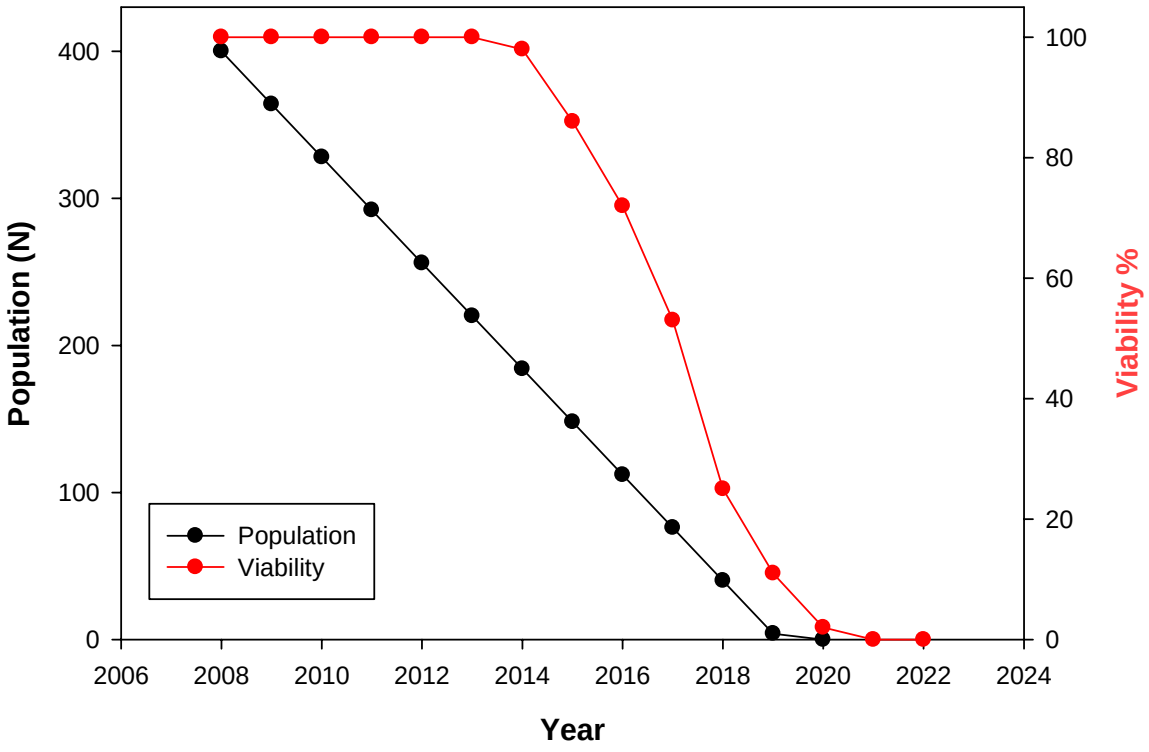


Figure 3.2-4: Projected moose habitat decline and moose population viability in the RSA for vegetation, wildlife, and biodiversity

3.2.5 Linking Moose Habitat Loss and Population Viability

Habitat loss and fragmentation is probably the most significant threat to wildlife populations (Mills 2007). The viability of a species in a landscape depends on the quantity and quality of habitat (Rutledge and Lepczyk 2002). Population viability analyses (PVA) are often used as a tool in decision making (Mills 2007). We have evaluated the viability of the moose population in the RSA using a PVA with input parameters that reflect moose population structure and dynamics as could be expected in the Alberta Oil Sands Region (see Appendix C for PVA input parameters). As a result of habitat decline and fragmentation, our PVA indicates that by about the year 2015 the viability of the population could start to decrease (Figure 3.2-4). In other words, at that time the moose population would be reduced to such low numbers that even if any further habitat reduction is halted, the population may not persist over time. Based upon our PVA, moose would disappear from the RSA between 2015 and 2019, depending on the probability of natural extinction events (Figure 3.2-4). From a wider, Alberta Oil Sands Region point of view, this means that the population in the RSA would be a sink population, only kept alive by the immigration of moose from other regions in the Canadian boreal forest.

3.3 Beaver Habitat Decline

Key Finding: In the past 16 years beaver habitat experienced a yearly loss of 23 km^2 or 3.2% of the 730 km^2 originally available in 1992. At this rate, there will be no beaver habitat left in the RSA by the year 2025.

Beaver habitat in the RSA declined from 531 km^2 in 2002 to 361 km^2 in 2008. This represents a yearly loss of 23 km^2 or 3.2% of the 730 km^2 of beaver habitat that was originally available in1922.

As for the habitat calculations for moose, we have used satellite imagery to map the distribution and availability of beaver habitat (see Appendix B for detailed methods), as well as the changes in habitat availability between 1992 and 2008. We included in our calculations the observations that beaver are disturbed from their preferred habitat within up to 50 m of human activities.

A map depicting the declining availability of beaver habitat and increasing fragmentation between 1992 and 2008 in the RSA is provided in Figure 3.3-1.

Figure 3.3-1: Beaver habitat (green areas) decline in the RSA for vegetation, wildlife, and biodiversity between 1992 and 2008

3.4 Waterfowl Habitat Decline

Key Finding: In the past 16 years, waterfowl habitat experienced a yearly loss of 8 km² or 2.8% of the 293 km² originally available in 1992. At this rate, there will be no waterfowl habitat left in the RSA by 2029.

Waterfowl habitat in the RSA declined from 215 km² in 2002 to 160 km² in 2008. This represents a yearly loss of 8 km² or 2.8% of the 293 km² of waterfowl habitat originally available in 1992.

We have used a model for the green winged teal as an indicator for waterfowl in general. As for the habitat calculations for moose, we have used satellite imagery to map the distribution and availability of waterfowl habitat (see Appendix B for detailed methods), as well as the changes in habitat availability between 1992 and 2008. There may be some variation between waterfowl species in their habitat requirements and their responses to disturbance, but the green winged teal model we used encompasses the general requirements of many waterfowl species in terms of their need for grassy or shrubby vegetation types in proximity to water. We included in our calculations the observations that waterfowl are disturbed from their preferred habitat within up to 100 m of human activities.

A map depicting the declining availability of waterfowl habitat and increasing fragmentation between 1992 and 2008 in the RSA is provided in Figure 3.4-1.

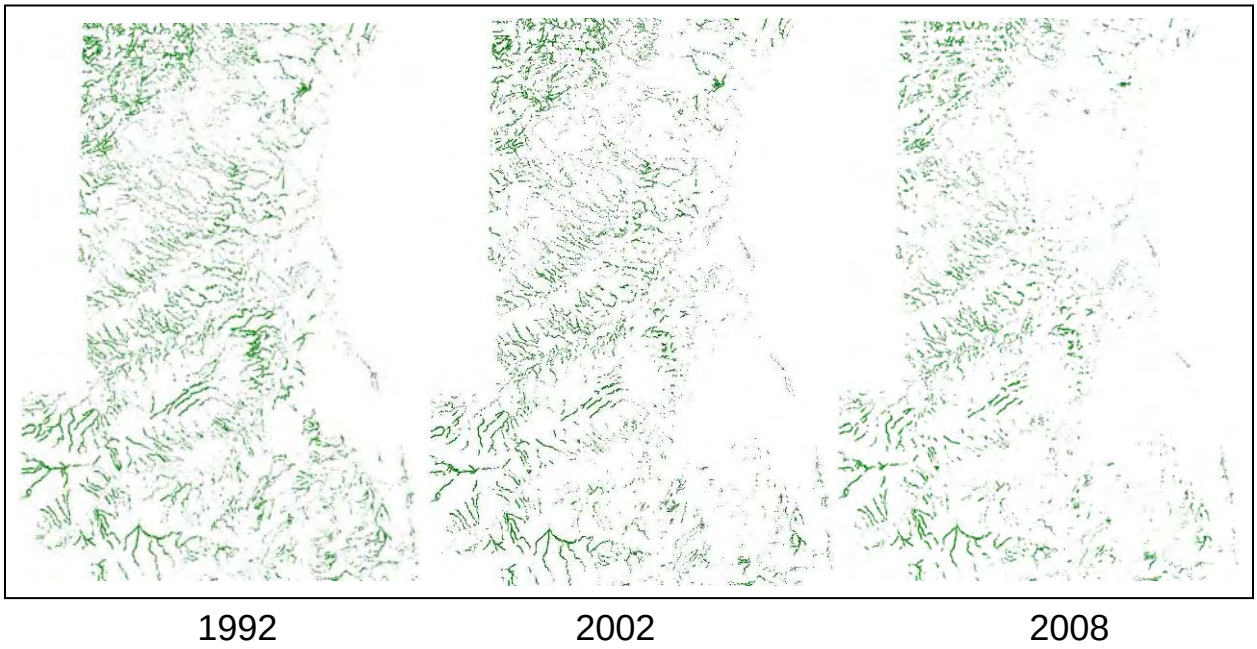


Figure 3.4-1: Green winged teal habitat (green areas) decline in the RSA between 1992 and 2008

4.0 Re-establishing Traditional Resources

Key Finding: The disturbed areas are unlikely to be reclaimed. There is very little similarity in terms of species composition between reclaimed sites and natural stands. Reclaimed sites show an unnaturally low diversity of species.

4.1 Natural Forest Stands

Under natural conditions within the boreal forest, the plant species present within each stand (i.e., ecosite phase) is determined primarily by the soil moisture and nutrient regime of a site (e.g., Bridge and Johnson 2000) and by the availability of seeds or viable asexual stems/roots soon after wildfire (e.g., Greene *et al.* 2004). Most plant species in the boreal forest appear to establish within the first few years after forest fire (Chipman and Johnson 2002). The establishment of most sexually reproducing plant species occurs where the litter, fermentation and humus (LFH) layers have been consumed by fire, leaving either a very thin layer of humus or exposed mineral soil (e.g., Charron and Greene 2002, Hesketh *et al.* 2009). Where LFH is consumed by fire, conditions for establishment and growth are ideal: there is adequate moisture, space, and light, allowing plants to thrive. Soon after fire, these sites become covered with plants and as a result there is little or no further establishment. Thus, in contrast to what is often believed, a succession of plant species does not establish over long periods of time in these stands. At least one study has shown that as boreal forest stand age increases, the number of vascular plant species actually decreases (Chipman and Johnson 2002).

4.2 Reclaimed Sites

In a reclaimed site, salvaged surface organic material (LFH) or a peat-mineral mix is put onto the site and a small number of tree and shrub species are planted. The presence of a relatively thick surface organic layer precludes most sexually reproducing species from successfully establishing. Therefore, these sites will consist of mainly planted species that survive and species that can sprout from underground stems or roots and spread from adjacent, intact forests. They may also contain species that have emerged from viable seeds or vegetative structures within the salvaged LFH layers replaced on a site. However, the emergence of species from the LFH appears to occur only if the LFH is replaced within 12 months of it being salvaged (MacKenzie and Naeth 2007). Unfortunately, such rapid replacement is rare in reclamation. Only a small number of species are planted in reclamation sites because it is believed that a succession of species will establish over time, eventually leading to high diversity sites similar to naturally occurring boreal forest stands. Unfortunately, this view is not supported by evidence in the scientific or gray literature.

Evidence for the above arguments of a lack of succession can be seen in peer-reviewed publications (e.g., Gutsell and Johnson 2002) and in Suncor and Syncrude's long-term reclamation data as seen in Appendix F of Guidelines to Reclaim Forest Vegetation in Alberta (OSVRC 1998). Notably, Syncrude and Suncor's results, after 40 or more years of reclamation, substantiate the arguments that there is a short establishment period in reclaimed sites and no succession thereafter (and contradict the Guidelines' own recommendations that revegetation of reclaimed sites will occur by natural successional processes). The relevant results from their reclaimed sites are detailed below (text in italics are quotes from page F-14, OSVRC 1998):

On the oldest reclaimed sites, where peat amendment was incorporated and a legume/grass mix applied, grass and legume cover ranged from 50-100%. These vegetation communities have *persisted for over 20 years* and have *resisted the establishment of native species either through natural invasion* or planting programs. Reclaimed sites that were not seeded or only seeded to annual barley have typically become dominated by a variety of herbaceous species that provide *close to 100% total cover within a few years after reclamation* (incidentally, none of these herbaceous species were present in natural stands). These herbaceous species *maintain their control in the following years*. Trembling aspen, balsam poplar and a variety of native shrubs *invade* the sites within *a few years* of reclamation.

4.3 Differences Between Natural Stands and Reclaimed Sites

The methods that Total proposes to reclaim disturbed areas have been shown to result in reclaimed sites that have very low or no similarity, in terms of species composition, to natural stands, with a low diversity of species unlike any post-fire boreal forest stands. The reasons for this can be seen by examining what we know about the post-fire regeneration dynamics in the boreal forest and comparing it with the methods Total proposes in its reclamation plan.

Comparisons between reclaimed sites and natural stands show that there is very little similarity in terms of species composition between any of the reclaimed areas with natural stands. The oldest reclaimed sites seeded to grasses and legumes typically had ≤10% similar species. Sites seeded to native grasses and sites not seeded had similarity values between 0.1 and 0.29. In most cases, the *species that were common between the sites were the trees and shrubs planted as part of the reclamation program*. These results clearly show that it is incorrect to assume that re-vegetation will be augmented by natural vegetation species ingress and reclaimed areas will evolve into ecosystems similar to those found naturally. Clearly, if a particular set of plant species is desired within a reclaimed site then they will need to be planted within the first few years of reclamation. Within these reclaimed sites at least some patches of thin humus or exposed mineral soil will be needed to ensure early plant survival.

There is a relatively small number of plant species in the planting mix for reclaimed sites because it is also believed that shrubs, graminoids, and forbs will establish from seeds or propagules in the LFH layers that are placed back onto reclamation sites. However, as noted above, recent studies in the oil sands (MacKenzie 2006, MacKenzie and Naeth 2007, MacKenzie 2009) have found that when soils are stockpiled for more than one year, there are no viable seeds or root stocks remaining in the LFH. Furthermore, if the LFH was a productive source of seeds then one would expect to see the emergence of plant species found in natural stands from soils salvaged from natural areas (pre-disturbance stands). Instead, Suncor and Syncrude's reclaimed sites have plants that are "virtually absent" in natural stands (OSVRC 1998). Two of the plants found to be dominant in reclaimed sites, fireweed (a native species) and sow thistle (a non-native species), which are known to be good at dispersing quickly into disturbed areas, were not found in adjacent natural stands. Trembling aspen, balsam poplar, a variety of willows and other native shrubs *invaded* the sites (likely from asexual stems) within a few years of reclamation (OSVRC 1998). Given that none of the herbaceous species that dominated reclaimed sites were present in natural stands and that tree and shrub species apparently invaded the sites from adjacent intact stands, it does not appear that there has been emergence of individuals from the LFH.

The information presented above is important to understanding how successful reclamation might be achieved. Unfortunately, the belief that the emergence of plants from the LFH and "successional processes" will supplement any early reclamation efforts (i.e., planting/seeding) means that not enough will be done in the critical early period of reclamation to ensure that a variety of plant species will establish successfully and lead to the high diversity of forested stands seen in the pre-disturbance landscape.

Total claims that a number of ecosites will be reclaimed progressively and at closure. However, to date there is no evidence that reclamation has been successful. That is, there are no reclaimed areas that are similar in species composition and contain a similar number of species as naturally occurring, boreal forest stands.

5.0 First Nation Participation in Decision Making

Key Finding: The environmental assessment process for Alberta Oil Sands projects does not involve any objective quantification of traditional resources. There is no evidence that the impacts on First Nations traditional resource use are rigorously measured in any part of the assessment process.

Impact assessments (IA) are an environmental management tool that should assure local communities that potentially significant impacts from a planned project have been identified (Wood 2003). Here, the term IA denotes the entire process, from scoping to environmental impact assessment (EIA) and follow-up. In the Oil Sands Region of Alberta, the IA process is applied to protect the environment and local communities from environmental degradation (Alberta Environment 2004). However, this process is increasingly complex and requires the integration of science into management. The application of science should assist communities to understand environmental change and to manage it. Here, we review how scientific rigor is implemented in the assessment process of oil sands development. We start with the premise that predictions made in an EIA should be testable and should lead to environmental monitoring that tests the predictions in a scientifically rigorous manner.

In the spirit of participatory management that integrates science and community concerns in decision making, we assess the role of Aboriginal communities in the IA process. Scoping should lead to the design of EIAs that alleviate potential impacts on the resources that are fundamental to the culture of Aboriginal communities. Subsequently, monitoring should include testable questions that are formulated by the communities to assure them that mitigation measures are effective. Successful mitigation is the quintessential foundation of a greener future that balances intensive industrial development with the continued use of culturally significant natural resources.

5.1 Review Methods

We reviewed 72 environmental planning documents related to wildlife and vegetation ecology that were provided to government regulators between 1999 and 2008, approximately 7,000 pages of information in total. All of the reviewed documents were prepared for bitumen extraction projects in the Canadian oil sands region.

Documents were categorized into one of the three phases of the IA process: 1) Scoping phase (ToR = terms of reference); 2) Environmental Assessment phase (EA = environmental assessment of small projects / EIA = comprehensive environmental impact assessment of larger projects); and 3) Follow-up phase (C&R = conservation and reclamation plan / Monitor = monitoring reports).

Our reviews were conducted as they would be for any peer-review of a scientific manuscript. Firstly, for each phase, we assessed how well the methods were described and whether objectives were clearly stated, we evaluated the soundness of interpretations and the conclusions, and we determined whether the information provided is adequate for environmental protection. We also analyzed the quality of the data, trends and confidence limits, and results of statistical analyses (if present). For issues related to follow-up programs we looked for the use of before-after and control-impact comparisons (BACI) (Smith 2002), the application of targets, definitions of mitigation success, and the development of testable predictions and questions (Burns & Wiersma 2004).

We then examined each document for evidence of Aboriginal community involvement in the IA process. We also looked at how science was used to address community concerns. In the ToR, we focused our questions on whether or not the description and quantification of traditional resources (TR) was required. In the EIA phase, we asked whether TRs were described in the baseline data and whether impacts on TRs were predicted. In C&R plans, we looked for detailed methods for re-establishing the TRs. In the monitoring reports, we asked whether the success of re-establishing TRs was monitored with statistical rigor and whether the benchmarks and targets were set to reflect community concerns.

For each document reviewed, we assigned a value of 1.0 if we were satisfied with the information provided and a value of zero if we were not satisfied. We assigned a value of 0.5 if some aspects of the review, but not all, were satisfactory. For example, we were satisfied (rating 1.0) when baseline data, including visible trends, the variation or confidence limits, and the statistical power of the analyses were provided. We were partly satisfied (rating 0.5) when means and measures of variation were provided, but statistical tests were either absent or incorrectly applied. We were not satisfied (rating zero) when none of the above were provided.

Regulators in Alberta influence the IA process by providing two types of documents: Decision Reports and Approvals. Decision Reports are developed by review panels to communicate recommendations to federal or provincial Environment Ministers. Approvals contain the terms and conditions under which a proposed project will be allowed to operate. We assessed both types of documents for oil sands mining applications based on how they deal with scientific rigor and the concerns of communities. The approval phase documents are qualitative and general. We therefore used simple indices such as number of recommendations and number of pages to evaluate their sophistication and detail.

5.2 Results

The overall low scores suggest that pre-disturbance conditions are not rigorously quantified, targets for mitigation are not clearly defined in C&R plans, and the success of re-establishing vegetation and wildlife communities is not objectively tested in monitoring programs. We think that the low scientific rigor of the IA process in the oil sands region is largely responsible for the absence of successful reclamation programs (Johnson and Miyanishi 2008).

Our results indicate that the ToR were given a higher rating significantly more often than EAs, EIAs and C&R plans (Kruskall-Wallis pair-wise comparisons (Siegel and Castellan 1988), $p<0.05$, Figure 5.2-1). Monitoring reports were ranked similarly to ToRs, indicating that both these types of documents were, on average, partly satisfactory (mean rating score was 0.37 for ToRs, and 0.25 for Monitoring; by comparison, the means were for: EA=0.03, EIA=0.14, C&R=0.12).

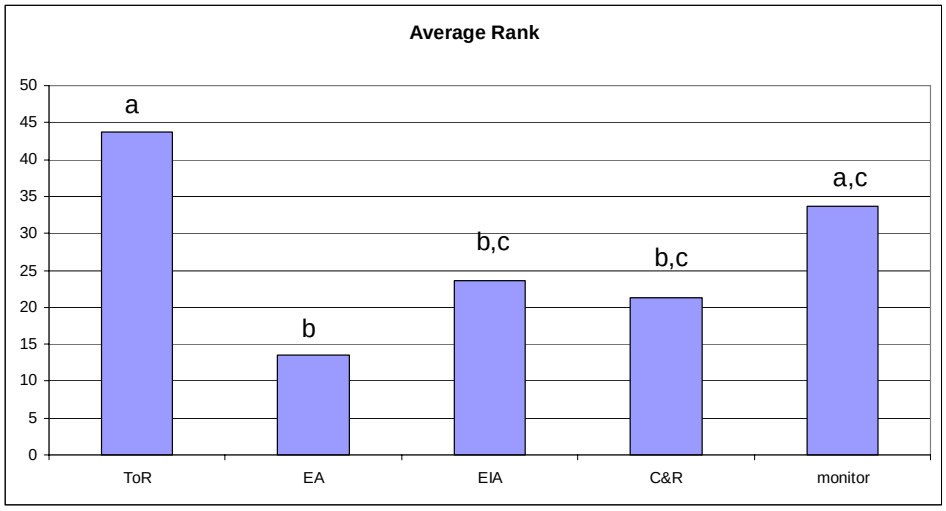


Figure 5.2-1: Average ranks of each of five document categories of the impact assessment process in the Oil Sands.
Bars not sharing same letters are significantly different from each other, indicating that, for example, reviewers were consistently more satisfied with the ToR than either with EAs, EIAs, or C&R. Sample sizes are 10 documents reviewed for each category except for EIA where 13 were reviewed.

5.2.1 Scoping Phase

The ToRs were often partly satisfactory because quantitative assessments were generally requested by Regulators. However, we could not assign a higher rating because the ToRs often fell short of requesting specific data to address specific questions for ecological parameters. Moreover, details about analytical approaches or parameter selection for traditional resources were not requested.

Some ToRs required that the reclamation progress be measured. Again, however, these requirements fell short of asking for specific methodology or requesting that testable questions and targets for reclamation be developed. Typically, ToRs only asked for a conceptual description, giving the proponent the freedom to decide how detailed the reclamation and monitoring programs should be. Consequently, by the time the details of monitoring are being developed, pre-disturbance conditions often no longer exist.

5.2.2 EIA Phase

The ToRs requested, in general, the application of quantitative analyses to be included in the assessment. For example, the term "*discuss initiatives, to enable quantitative estimates of future conditions with the highest possible degree of certainty*" was often specified in the ToRs. However, quantification in EIAs was rare. Overall we found that EAs are essentially devoid of adequate baseline data for the application of benchmarks and targets in follow-up programs. The comprehensive EIAs sometimes presented satisfactory baseline surveys; however, the methods were typically inadequate to determine how models were developed, what assumptions they were based on, or what the unit of replication might be for any of the rarely applied statistical tests.

5.2.3 Follow-up Phase

We were not satisfied with the use of baseline data in most of the C&R Plans or the Monitoring Reports we reviewed. Most C&R Plans did not refer to baseline or pre-disturbance data and did not show concrete methods for the sampling design or statistical analyses. Monitoring reports rarely demonstrated any quantitative comparison between pre- and post-disturbance conditions in vegetation, wildlife, or traditional resources. However, the Monitoring Reports were more likely to include quantitative analyses and models than did any of the documents in the earlier phases of IA (Figure 5.2-1). Where quantitative comparisons between impact and control sites were presented, statistical analyses, if applied, were rarely rigorous. Moreover, data were seldom compared against targets and benchmarks.

5.2.4 Aboriginal Community Participation

We were partly satisfied with the requirements in the ToRs for identifying and reporting community concerns. However, ToRs did not specifically ask to address these concerns in the assessment, mitigation, or follow-up phases. The focus was often on involving communities, but not on providing solutions for their concerns. A serious flaw of this process is that the collection of information about community concerns is a part of the EIA phase, as opposed to being a precursor to it. If communities had meaningful input during scoping, the proponents would develop the EA or EIA based on the concerns raised by communities. This way, communities would be part of strategic decision making.

There were several instances where an EIA presented findings from public consultation sessions leading to commitments for cooperation with communities in the future. However, a more productive, interactive and timely method for community participation would be to present concerns as a list of questions in the EIA, followed by answers attempting to resolve these concerns. This method was not used in any of the IA phases we reviewed. While wildlife species and vegetation communities were usually described, no direct link to traditional resource use, predictions of impact on that use, or mitigation of impacts were apparent in any of IA documents.

Currently, community concerns can only be fully addressed during follow-up programs, but we found no evidence in C&R Plans that questions would be developed to test whether or not the community concerns would be alleviated. Monitoring Reports occasionally presented actions that were taken towards understanding traditional resource use, but we found no evidence that the effects on traditional resources were specifically measured.

5.2.5 Approval Phase

In Decision Reports, there was a significantly increasing trend for the number of explicit recommendations to the Environment Minister between 1999 and 2007 (Figure 5.2-2). This was true for both the number of recommendations that address actions to manage ecological parameters (Spearman rank correlation r_s=0.73, $p<0.05$), and the number of recommendations that address monitoring which must involve "stakeholders" (including communities) (r_s =0.95, $p<0.02$).

Recent Approvals of oil sands mining applications list more conditions (i.e., pages) than earlier ones, clearly reflecting the increasing complexity of the issues in the decision process (r_s =0.87, $p<0.02$). It was striking, however, that even though the number of conditions increased, they did not become more specific over time. For example, more recent Approvals require the developer to "*address vegetation and traditional land use*" but they do not define what is meant by "*address*." There are no targets prescribed for reclamation of ecological constituents, let alone for traditional resources. There was also no evidence that proponents would be specifically required to quantitatively measure the success of the proposed mitigation measures.

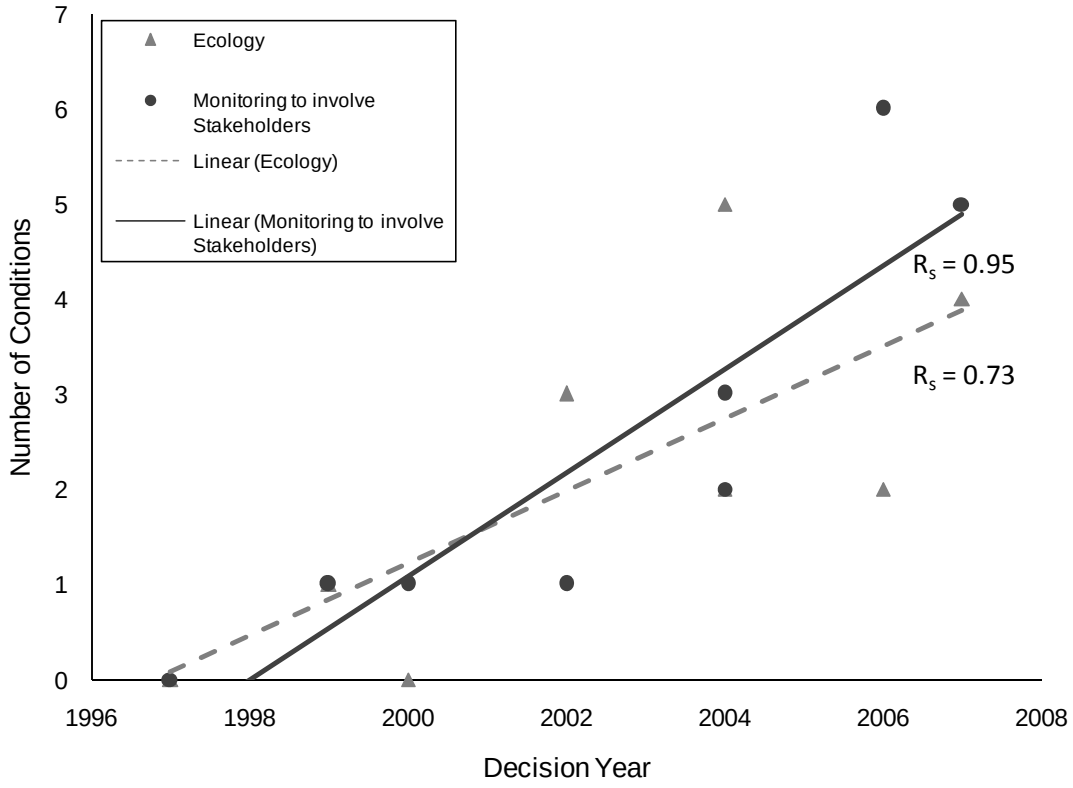


Figure 5.2-2: The number of conditions explicitly listed in Decision Reports on proposed industry projects in the Canadian Oil Sands. Circles and full line indicate the number of conditions that specifically require stakeholders to be involved in monitoring. Triangles and dashed line indicate the number of conditions that specifically mention ecological parameters that must be addressed by the projects.

5.3 Conclusions

The IA process in the oil sands is weak in two ways: not only is there a poor quantification of impacts and mitigation success, the Aboriginal communities are not explicitly involved in strategic decision making. However, in the course of the past ten years, regulators seemed to have heard concerns and have responded with increasingly complex decision and approval documents. It remains to be seen if the regulatory process will continue evolving to eventually fully integrate the concerns of Aboriginal communities.

6.0 References

Alberta Caribou Committee 2010. Website accessed July 2010. Last updated approx end of 2009: http://www.albertacariboucommittee.ca/.

Alberta Environment 2004. Alberta's environmental assessment process. Pub No. I/990; ISBN: 0-7785-3766-8 (Printed); ISBN: 0-7785-3767-6 (Online). http://environment.gov.ab.ca/info/library/6964.pdf. Retrieved on 2008-07-09.

AltaLIS. 2008. Bring data to life; base overview. Website accessed 8 October 2008: http://www.altalis.com/products_base.html).

Andrén, H. 1994. Effects of habitat fragmentation on birds and mammals in landscapes with different proportions of suitable habitat: a review. *Oikos*, **71:** 355-366.

ASRD (Alberta Sustainable Resource Development). 2004. Costs and threats of invasive species to Alberta's natural resources. Website Accessed July 2010: http://www.srd.alberta.ca/ManagingPrograms/FishWildlifeManagement/FisheriesManagement/documents/.

ASRD (Alberta Sustainable Resource Development). 2008. Hunting regulations. Website accessed September 2008: http://www.srd.alberta.ca/fishwildlife/fishinghunting/albertaregulations.aspx.

ASRD (Alberta Sustainable Resources Development). 2009a. Terrestrial ecosystem management framework for the Regional Municipality of Wood Buffalo (TEMF). Website accessed July 2010. Last updated February 2009. http://www.cemaonline.ca/index.php/cema-recommendations/terrestrial-ecosystem.

ASRD (Alberta Sustainable Resource Development). 2009b. Wild species: white-tailed deer (*Odocoileus virginianus*). Website accessed July 2010. Last updated June 2009. http://www.srd.alberta.ca/BioDiversityStewardship/WildSpecies/Mammals/Deer/WhitetailedDeer.aspx.

Bayne, E.M., L. Habib and S. Boutin. 2008. Impacts of chronic anthropogenic noise from energy-sector activity on abundance of songbirds in the boreal forest. *Conservation Biology*, **22**: 1186–1193.

Bridge, S.R.J. and E.A. Johnson. 2000. Geomorphic principles of terrain organization and vegetation gradients. *Journal of Vegetation Science,* **11**: 57-70.

Burns, D.A. and G.B. Wiersma. 2004. Conceptual basis of environmental monitoring systems: a geospatial perspective. *In:* Environmental monitoring, ed. by G. B. Wiersma, CRC Press, Boca Raton, Florida, pp. 1-35.

Cairns, A.L. and E.S. Telfer. 1980. Habitat use by 4 sympatric ungulates in boreal mixedwood forest. *J. Wildl. Manage.*, **44:** 849-857.

Carpenter, S.R. and W.A. Brock. 2006. Rising variance: a leading indicator of ecological transition. *Ecology Letters,* **9:** 311-318.

Charron, I. and D.F. Greene. 2002. Post-wildfire seedbeds and tree establishment in the southern mixedwood boreal forest. *Canadian Journal of Forest Research,* **32:** 1607-1615.

Chipman, S.J. and E.A. Johnson. 2002. Understorey vascular plant species diversity in the mixedwood boreal forest of western Canada. *Ecological Applications,* **12**: 588-601.

Collingham, Y.C. and B. Huntley. 2000. Impacts of habitat fragmentation and patch size upon migration rates. *Ecological Applications*, **10**: 131-144.

Dawe, K. and S. Boutin. 2009. Range expansion of white-tailed deer. Presented at the Resource Access and Ecological Issues Forum. Sponsored by PTAC. Calgary, Alberta, November 30, 2009.

Dyer, S.J., J.P. O'Neill, S.M. Wasel and S. Boutin. 2001. Avoidance of industrial development by woodland caribou. *J. Wildl. Manage.*, **65:** 531-542.

Folke, C., J. Colding and F. Berkes. 2003. Synthesis: building resilience and adaptive capacity in social-ecological systems. In: Navigating Social-Ecological Systems, Building Resilience for Complexity and Change, ed. by F. Berkes, C. Folke, and J. Colding, Cambridge University Press, Cambridge, pp. 352-387.

Forman, R.T., D. Sperling, J.A. Bissonette, A.P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T. Turrentine, and T.C. Winter. 2003. Road ecology: science and solutions. Island Press, Washington, D.C., USA.

Gamerstani, A.S., C.R. Allen and L. Gunderson. 2009. Panarchy: Discontinuities reveal similarities in the dynamic system structure of ecological and social systems. *Ecology and Society,* **14**: 15.

Gates, C., T. Chowns and H. Reynolds. 1992. Wood Buffalo at the crossroads. *In*: Buffalo, ed. by J. Foster, D. Harrison and I.S. MacLaren. Alberta Nature and Culture Series, the University of Alberta Press.

Gavin, S.D. and P.E. Komers. 2006. Do pronghorn (*Antilocapra americana*) perceive roads as a predation risk? *Canadian journal of Zoology,* **84**:1775-1780.

Gordon, L.J., G.D. Peterson and E.M. Bennett. 2008. Agricultural modifications of hydrological flows create ecological surprises. *Trends in Ecology and Evolution*, **23:** 211-219.

Greene, D.F., J. Noel, Y. Bergeron, M. Rousseau, and S. Gauthier. 2004. The regeneration of *Picea mariana*, *Pinus banksiana*, and *Populus tremuloides* along a fire severity gradient. *Canadian Journal of Forest Research,* **34**: 1845-1857.

Gustafson, E.J. and G.R. Parker. 1994. Using an index of habitat patch proximity for landscape design. *Landscape and Urban Planning*, **29:** 117-130.

Gutsell, S.L. and E.A. Johnson. 2002. Accurately aging trees and examining their height-growth rates: implication for interpreting forest dynamics. *Journal of Ecology,* **90**: 153-166.

Hargis, C.D., J.A. Bissonette and J.L. Davis. 1998. The behavior of landscape metrics commonly used in the study of habitat fragmentation. *Landscape Ecology*, **13:** 167-186. http://www.srd.alberta.ca/BioDiversityStewardship/WildSpecies/Mammals/Deer/WhitetailedDeer.aspx.

Hesketh, M., D.F. Greene and E. Pounden. 2009. Early establishment of conifer recruits in the northern Rocky Mountains as a function of post-fire duff depth. *Canadian Journal of Forest Research*, **39:** 2059-2064.

Johnson, E.A. and K. Miyanishi. 2008. Creating new landscapes and ecosystems; the Alberta oil sands. *Annals of the New York Academy of Sciences,* **1134:** 120-145.

Kroodsma, R.L. 1982. Edge effect on breeding forest birds along a power-line corridor. The *Journal of Applied Ecology*, **19:** 361-370.

Kunkel, K.E. and D.H. Pletscher. 2000. Habitat factors affecting vulnerability of moose to predation by wolves in southeastern British Columbia. *Canadian Journal of Zoology,* **78:** 150-157.

Landres, P.B., P. Morgan, F.J. Swanson. 1999. Overview of the use of natural variability concepts in managing ecological systems. *Ecological Applications,* **9:** 1179-1188.

Laurance, W.F., T.E. Lovejoy, H.L. Vasconcelos, E.M. Bruna, R.K. Didham, P.C. Stouffer, C. Gascon, S.G Laurance and E. Sampaio. 2002. Ecosystem decay of Amazonian fragments: a 22 year investigation. *Conservation Biology*, **16:** 605-618.

Laurian, C., C. Dussault, J.P. Ouellet, R. Courtois, M. Poulin, and L. Breton. 2008. Behaviour of moose relative to a road network. *Journal of Wildlife Management,* **72:** 1550-1557.

Machtans, C.S. 2006. Songbird response to seismic lines in the western boreal forest: A manipulative experiment. *Canadian Journal of Zoolog*., **84:** 1421-1430.

MacKenzie, D. 2006. Assisted natural recovery using a forest soil propagule bank. M.Sc. Thesis. Department of Renewable Resources, University of Alberta. Edmonton, Alberta. 140 pp.

MacKenzie, D. 2009. Reclamation using Upland Surface Soils from Boreal Forests in the Oil Sands. Ph.D. Thesis. Unpublished manuscript. University of Alberta, AB.

MacKenzie, D.D and M.A. Naeth. 2007. Assisted natural recovery using a forest soil propagule bank in the Athabasca Oil Sands. Pages 374 -382. *In:* Seeds Biology, Development and Ecology. Cromwell Press, Townbridge, United Kingdom.

McLoughlin, P.D., E. Dzus, B. Wynes, and S. Boutin. 2003. Declines of populations of woodland caribou. *J. Wildl. Manage.*, **64:** 755-761.

Mills, L.S. 2007. Conservation of wildlife populations: demography, genetics, and management. Blackwell Publishing, Oxford.

Northern River Basin Study. 1994. Executive summary of a workshop on the impacts of land clearing on the hydrologic and aquatic resources of boreal forests in Alberta, November 18 and 19, 1994. Northern River Basin Study Project Report 63.

OSVRC (Oil Sands Vegetation Reclamation Committee). 1998. Guidelines for reclamation to forest vegetation in the Athabasca Oil Sands Region. ISBN 0-7785-0411-5.

Potapov, P. *et al.* 2008. Mapping the world's forest landscapes by remote sensing. *Ecology and Society,* **13**: Art.No. 51.

Ries, L., R.J. Fletcher, J. Battin and T.D. Sisk. 2004. Ecological responses to habitat edges: mechanisms, models and variability explained. *Annual Review of Ecology, Evolution, and Systematics,* **35**: 491-522.

Rolley, R.E. and L.B. Keith. 1980. Moose population dynamics and winter habitat use at Rochester, Alberta, 1965-1979. *Canadian Field-Naturalist,* **94:** 9-18.

Rutledge, D.T. and C.A. Lepczyk. 2002. Landscape change: Patterns, effects, and implications for adaptive management of wildlife resources. *In:* J. Liu and W. Taylor, editors, *Integrating Landscape Ecology into Natural Resource Management*, Cambridge University Press, pp.312-333.

Scheffer, M., J. Bascompte, W.A. Brock, V. Brovkin, S.R. Carpenter, V. Dakos, H. Held, E.H.V Nes, M. Rietkerk, and G. Sugihara. 2009. Early-warning signals for critical transitions. *Nature,* **461**: 53-59.

Scheffer, M., S. Carpenter, J.A. Foley, C. Folkes and B. Walker. 2001. Catastrophic shifts in ecosystems. *Nature*, **413:** 591-596.

Schindler, D.W. and P.G. Lee. 2010. Comprehensive conservation planning to protect biodiversity and ecosystem services in Canadian boreal regions under a warming climate and increasing exploitation. *Biological Conservation,* **143**: 1571-1586.

Siegel, S. and N.J. Castellan. 1988. Nonparametric statistics for the behavioural sciences, 2nd Edition. McGraw-Hill. New York.

Smith, E.P. 2002. BACI design. Pages 141-148 in H. Abdel, El-Shaarawi, and W. W. Piegorsch, editors. Encyclopedia of environmetrics, Volume 1. John Wiley & Sons, Ltd, Chichester.

Sorensen, T., P.D. McLoughlin, D. Hervieux, E. Dzus, J. Nolan, B. Wynes, and S. Boutin. 2008. Determining sustainable levels of cumulative effects for boreal caribou. *J.Wildl.Manage.,* **72:** 900-905.

Stewart, A. 2007. The effects of habitat amount and fragmentation on ungulates in the Alberta Foothills: mosaic versus binary perspectives. A thesis submitted to the faculty of graduate studies in partial fulfillment of the requirements for the degree of Master of Science, Department of Biological Sciences, University of Calgary, Alberta.

Stewart, A, P.E. Komers and D.J. Bender. 2010. Assessing landscape relationships for habitat generalists. *Ecoscience*, **17:** 28-36.

Suncor. 2008. Suncor Energy Ltd., application for approval of the Suncor Energy MD9 mine waste dump; supplemental information requests, Attachment 1; submitted to the Alberta ERCB.

Thiessen, C. 2009. Peace Region; Boreal Caribou Monitoring: Annual Report 2008-09. British Columbia Ministry of Environment, Fish and Wildlife Section, Peace Region Technical Report.

Weclaw, P. and R.J. Hudson. 2004. Simulation of conservation and management of woodland caribou. *Ecological Modelling*, **177:** 75-94.

White, D., E. Haber, and C. Keddy. 1993. Invasive plants of natural habitats: An integrated review of wetland and upland species and legislation governing their control. Canadian Wildlife Service, Environment Canada. Ottawa, ON.

Wood, C. 2003. Environmental impact assessment: A comparative review, 2nd Edition. Prentice Hall, Edinburgh.

Appendix A

Change of Land Cover Analysis

A1.0 Change of Land Cover Analysis

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 based on a mathematical manipulation of the values of two input images. Methods within the image algebra method include: simple differencing, image regression, and image rationing. Rationing and regression are useful when considering more than two dates because a common relationship is established between the images in an effort to normalize areas of non-change. We have used the simple differencing method, which employs a simple equation for the differencing of a common band of imagery for two image dates as shown below:

$$D_{ijk} = BV_{ijk}(1) - BV_{ijk}(2) + c$$

where: *Dijk* = change in pixel value
BVijk(1) = brightness value at time 1
BVijk(2) = brightness value at time 2
c = constant
i = line number
j = column number
k = band number

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 2007 in the south and 2008 in the north, in order to detect changes caused by anthropogenic disturbances between these periods of time.

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 (Kroodsma 1982, Belisle *et al.* 2001, Machtans 2006).

Clearly, 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 Tucker1993, 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 include both qualitative-positional and quantitative-classification assessments.

In qualitative assessments, we determine if we correctly assigned disturbed versus undisturbed classes by comparing the class extracted from the imagery with what we see on the ground. In other words, we tried to answer the simple question: does the map correctly show what is on the ground? We visited a number of sites north and south of Fort McMurray and we travelled along major roads to verify the existence of disturbances that we detected on the Landsat images.

Quantitative assessments attempt to identify and measure remote sensing-based error such as misclassification. There are two main types of common errors including omission (underestimation) and commission (overestimation). Processes that use medium and low resolution images produce larger errors than high resolution images. In this part of assessment, we compared our data derived from Landsat images with reference data. As a reference, we used AltaLIS 1:20,000 transportation data sets. Data were obtained from four randomly selected sheets from the National Topographic System (NTS), two for the Northern and two for the Southern study area. Each NTS sheet covered 215 km^2. For the accuracy analysis, the northern and southern study areas were combined because the data of the most recent available Landsat image was not relevant here to distinguish between the two areas, as the most recent AltaLIS data available were from the year 2006, while our Landsat data were from 2007 and 2008. We were therefore compelled to make the assumption that the disturbance data between 2006 and 2008 simply represents the present time. However, we found a total of 145.2 km of linear developments in our dataset which were not present in the AltaLIS dataset and we excluded these lines from the accuracy analysis under the assumption that they occurred after the year 2006.

The main reasons for the selection of the data from AltaLIS were data accuracy, availability and cost. According to AltaLIS, "The 1:20,000 Base Feature dataset is the most accurate and detailed of the Base products, and was created to populate GIS applications" (AltaLIS 2008). Base Features is a GIS-ready dataset that has been compiled internally within the Provincial Government since 1996, and is now available to the private sector through its distributor, AltaLIS Ltd. The Base Feature Project merged, connected, updated, restructured, revised, and attributed several topographic themes covering Alberta, using various resources such as provincial 1:20 000 Provincial Digital Mapping Program (accuracy ± 5 m), crown Alberta Vegetation Inventory, and Indian Remote Sensing satellite imagery (accuracy ±25 m). Other data sources include Orthophoto imagery, Aerial photography, Spot imagery (accuracy ±10 m).

A1.5 References

AltaLIS. 2008. Bring data to life; base overview. Website accessed 8 October 2008: http://www.altalis.com/products_base.html).

ASRD (Alberta Sustainable Development). 2008. Hunting regulations. Website accessed September 2008: http://www.srd.alberta.ca/fishwildlife/fishinghunting/albertaregulations.aspx.

Belisle, M. and C.C.S. Clair. 2001. Cumulative effects of barriers on the movement of forest birds. *Conservation Ecology*, **5**.

Collins, J.B. and C.E. Woodcock. 1994. Change detection using the Gramm-Schmidt transformation applied to mapping forest mortality. *Remote Sensing of Environment,* **50**: 267-279.

Congalton, R. and K. Green. 1999. Assessing the accuracy of remotely sensed data: principles and practices. CRC/Lewis Press, Boca Raton, FL. 137 pp.

Dyer, S.J., J.P. O'Neill, S.M. Wasel and S. Boutin. 2001. Avoidance of industrial development by woodland caribou. *J. Wildl. Manage.*, **65,** 531-542.

Foody, G.M., G. Palubinska, R.M. Lucas, P.M. Curran, and M. Honzak. 1996. Identifying terrestrial carbon sinks: classification of successional stages in regenerating tropical forest from Landsat TM data. *Remote Sens. Environ.* **55**: 205-216.

Forman, R.T., D. Sperling, J.A. Bissonette, A.P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T. Turrentine, and T.C. Winter. 2003. Road ecology: science and solutions. Island Press, Washington, D.C., USA.

Kroodsma, R.L. 1982. Edge effect on breeding forest birds along a power-line corridor. *The Journal of Applied Ecology*, **19:** 361-370.

Machtans, C.S. 2006. Songbird response to seismic lines in the western boreal forest: A manipulative experiment. *Can. J. Zool.*, **84:** 1421-1430.

Rolley, R.E. and L.B. Keith. 1980. Moose population dynamics and winter habitat use at Rochester, Alberta, 1965-1979. *Canadian Field-Naturalist,* **94:** 9-18.

Singh, A. 1989. Digital change detection techniques using remotely-sensed data. *International Journal of Remote Sensing*, **10(6):** 989-1003.

Skole, D. and C. Tucker. 1993. Tropical deforestation and habitat fragmentation in the Amazon: satellite data from 1978 to 1988. *Science* **260:** 1905-1910.

Stanojevic, Z, P. Lee and D.G. Gysbers. 2006. Recent anthropogenic changes within the Northern Boreal, Southern Taiga and Hudson Plains Ecozones of Quebec. Global Forest Watch Canada. Website accessed 8 October 2008: http://www.globalforestwatch.ca/change_analysis/downloadQC.htm. Report needs more info for access.

Tucker, C.J. and P.J. Sellers. 1986. Satellite remote sensing of primary production. *International Journal of Remote Sensing,* **7:** 1395-1416.

Tucker, C.J., D.M. Grant and J.D. Dykstra. 2004. NASA's global orthorectification landsat data set. *Photogrammetric Engineering & Remote Sensing,* **70(3):** 313-322.

USGS. 2008. Landsat orthorectified TM imagery (Landsat_Ortho_TM); Product Readme. USGS Earth Resources Observation and Science Centre (EROS) Website Accessed September 2008: http://Edcsns17.Cr.Usgs.Gov/Nsdp/Tm_Readme.htm.

Wickware, G.M. and P.J. Howarth. 1981. Change detection in the Peace-Athabasca delta using digital landsat data. *Remote Sensing of Environment*, **11:** 9-25.

Appendix B

Wildlife Habitat Models

B1.0 Affinity Index for Moose Habitat

Information on differential habitat use by wildlife species can be used to develop management tools for species potentially affected by human development (Harkonen and Heikkila 1999). Many methods provide general information on species habitat use, but often habitat availability is not taken into consideration when interpreting this information. Affinity indices provided a quantitative evaluation of wildlife habitat preferences. These indices were designed to remove habitat availability biases from wildlife habitat use assessment (Cairns and Telfer 1980).

Unlike traditional habitat modelling, which is based on literature and expert knowledge, affinity indices are based on empirical data. Affinity indices provided a ranking of habitat preference and gave an indication of where individuals or populations of a species were likely to occur. It should be noted that actual use of habitat by individuals may vary depending on the local (home range) availability of alternative habitat that may provide some resource value (Dunning *et al.* 1992; Estades and Temple 1999). There could be what is termed a neighbourhood effect, whereby abundance within preferred habitat may be positively or negatively influenced by adjacent vegetation, depending on the quality of the adjacent vegetation (Dunning *et al.* 1992). These relationships are difficult to assess; however, they may account for subtle differences in habitat use between different home ranges.

Habitat preference was determined using affinity indices for moose which were calculated based on reports that provided information on relative abundance, survey effort, and habitat availability for the Oil Sands Region. This information was obtained from several EIAs listed in Table B1-1.

Table B1-1: Datasets Used for Calculation of Affinity Indices

Valued Ecosystem Component	Data Type	Number of EIAs Used	EIAs Used
Moose (*Alces alces*)	Pellet Group Data	7	Husky Oil Operations Ltd. 2005 Imperial Oil Resources 2006 OPTI-Nexen 2006 Shell Canada Ltd. 2002 Shell Canada Ltd. 2005 Suncor Energy Inc. 2005a Suncor Energy Inc. 2005b
	Winter Track Count Data	4	Birch Mountain Resources Ltd. 2006 Shell Canada Ltd. 2002 Suncor Energy Inc. 2005a Suncor Energy Inc. 2005b

Affinity indices were calculated using methods outlined in Neu *et al.* (1974), Cairns and Telfer (1980), and Harkonen and Heikkila (1999). Affinity indices were calculated as: (proportion of total counts of species sign on plots in vegetation group x (p_i)) / (proportion of study plots in vegetation group x). Species sign refers to the data type available for moose, as indicated in Table B1-1. Affinity indices are positive values with no upper limit. The calculation of affinity indices takes sampling effort into consideration. An index <1.0 indicated that the vegetation group was used less than one would expect based on availability. An index equal to 1.0 indicated that the vegetation group was used in proportion to its availability. An index >1.0 indicated that the vegetation group was used more than one would expect based on availability (preferred). Bonferroni confidence intervals were calculated to determine which vegetation groups were used significantly more or less than would be expected based vegetation availability alone (Neu *et al.* 1974; Arthur *et al.* 1996). Affinity indices give an indication of habitat preference, while Bonferroni confidence intervals determine statistical significance of vegetation use. Bonferroni confidence intervals were constructed for each observed proportion of species sign (p_i) to identify whether the expected proportion of species sign (area of habitat x out of all habitat available) fell within the magnitude of the significant effects. Bonferroni confidence intervals use an adjusted z-statistic that widens the confidence intervals (to bound the probability error rate at α=0.05) and takes into consideration that multiple simultaneous estimates are being made. The form of the confidence interval is:

$$p_i - z_{(1-\alpha/2k)}\sqrt{(p_i(1-p_i)/n)} \leq p_i \geq p_i + z_{(1-\alpha/2k)}\sqrt{(p_i(1-p_i)/n)}$$

where: α = 0.05, k = number of simultaneous estimates (i.e., the number of vegetation groups with data), and n is the sample size (e.g., number of pellet groups). This method of habitat use assessment accounted for vegetation availability biases. The ability to detect significant differences, or the power of an analysis, increases with an increase in sample size due to a corresponding reduction in the standard error of the estimate (Peers 1996). Therefore, vegetation types with affinity indices closer to 1.0 may be found to be significant if there is a large sample size, while those with indices farther from 1.0 may not be found to be significant due to a smaller sample size.

Vegetation group rank was determined using results of the Bonferroni confidence intervals and data interpretation where needed. The ranking system used consisted of four classes: High (1), Moderate (2), Low (3), and Very Low (4). Most often, vegetation used significantly more than expected based on availability (according to Bonferroni confidence intervals) were categorized as Very Low or High, respectively. In some cases, ranks were assigned based on a combination of the affinity index, professional knowledge and data interpretation. Effective wildlife habitat was considered to be vegetation groups ranked as High and Moderate, while vegetation groups ranked as Low and Very Low were considered to be non-effective habitat. Effective habitat is where species abundance is likely to be highest and where the majority of resources are found in the landscape for a species. It is essential to understand the distribution of effective habitat in order to make predictions about the impact that

changes to the landscape may have on a particular species. Habitat availability for the baseline scenario was presented using this binary classification of effective and non-effective habitat in the landscape.

A primary goal of habitat mapping was to be able to predict the distribution and abundance of species of interest by extrapolating from sampled to un-sampled areas. Vegetation group ranks were associated with a spatial vegetation component that was easily analyzed and integrated using a Geographic Information System (GIS). Ranks based on affinity indices, spatial vegetation information, and baseline zone of influence were integrated using a GIS to determine baseline habitat availability.

B2.0 Green-winged Teal Habitat Model

B2.1 Introduction

The group of waterfowl known as "dabbling" ducks are common in Alberta from March – October (Fisher and Acorn 1998). Dabbling describes the feeding behaviour whereby invertebrates, seeds, and other plant materials are filtered from or near the surface of the water. Dabbling duck nesting sites generally occur where graminoid, herbaceous, and low shrub cover (<1 m tall) occur adjacent to water (Bent 1987). The waterfowl habitat model is based on the Green-winged Teal (*Anas crecca*), a typical dabbling duck species that is representative of ducks and waterfowl occurring in the Project RSA.

B2.1.1 Status

The status of the Green-winged Teal is determined by federal and provincial agencies. As of August 2007, the Green-winged teal in Canada was not listed on any of the Schedules of the *Species At Risk Act* (SARA). The Committee on the Status of Endangered Wildlife in Canada has not classified the Green-winged teal (COSEWIC 2008). The Green-winged teal is listed as *Sensitive* in Alberta (AENV 2005).

B2.1.2 Distribution

The breeding habitat of the Green-winged Teal spans most of Canada and Alaska, and spreads south into states of North Dakota, Minnesota, Northern Michigan, and Maine. They do not winter in Alberta, but rather migrate south to the western and southern United States and Mexico (Roof 1999).

B2.1.3 Information from Field Surveys

This species-habitat model was developed using published literature and adapted from a Blue-winged Teal model developed by OPTI-Nexen (2006). Green-winged Teal, and several other species of waterfowl, were recorded during waterfowl surveys conducted in June 2007. The data collected provided presence/absence information and did not provide detailed information on habitat use.

B2.1.3.1 Habitat Preferences

The Green-winged Teal is typical of dabbling duck species occurring within Alberta. Their primary habitat requisites are aquatic habitat for rearing young and feeding with adjacent suitable nesting habitat. Green-winged Teal feed in shallow water with abundant aquatic vegetation. The Green-winged Teal will most often be found feeding in shallow waters near the shoreline, where they feed on aquatic invertebrates, seeds of aquatic vegetation, and directly on aquatic vegetation (Roof 1999). Any open waterbody, including rivers, creeks, ponds, marshes, and lakes, was considered as potentially suitable habitat for the Green-winged teal. Suitable nesting habitat consists of graminoid, herbaceous and low shrub habitat within 100 m of open water (Hickie 1985).

High quality habitat for the Green-winged Teal was determined by the close proximity (<100 m) of feeding and nesting habitat. Forage was considered to be limiting during the summer season before they migrate south. Reproductive habitat was considered to be a critical factor for green-winged teal during the spring season.

The key habitat components for this species were:

- open water (feeding; summer); and
- graminoid, herbaceous, and low shrub habitat (nesting; spring).

B2.2 Development of Ratings Table

Ratings are listed for each landcover class occurring in the study area (Table B2-1) for each of the life requisites of the Green-winged Teal.

Table B2-1: Vegetation Group Ratings for the Green-winged Teal Life Requisites in the RSA (Rating: 4= best, 1=poorest)

Vegetation Group	Nesting: ≤100 m to Water (Spring)	>100 m apart (both requisites)
Bog / fen	4	1
Coniferous	1	1
Deciduous	1	1
Disturbed	1	1
Mixed wood	1	1
Shrub	4	1
Water	n/a	n/a

B2.2.1 Development of Ratings Table

Green-winged Teal ratings tables were developed for suitability of vegetation groups for the spring and summer seasons. The following list of assumptions was applied to the model:

- any permanent water bodies such as ponds and lakes were suitable as foraging habitat (excluding tailings ponds, streams and Athabasca River); and
- suitable nesting sites were limited to graminoid, herbaceous and low shrub habitat within 100 m of foraging habitat.

The suitability of a habitat type providing resources for one life requisite depended on its proximity to another habitat type providing for another life requisite (Dunning *et al.* 1992). This attribute of Green-winged Teal habitat requirements (i.e., proximity of nesting and food resources) was incorporated into the model (Table B2-2).

Table B2-2: Adjustments for Green-winged Teal Habitat in the Wildlife RSA

Needs	Variable	Parameter	Details	Rating	Comments
Spring and Summer: Nesting and Feeding (March – October)	Vegetation and Water	Proximity	Both nesting and food habitat within 100 m	No change to rating.	Habitat requirements met.
			All area >100 m from water's edge	Rating 1-4=1	Proximity requirement not met.
		Human Activity (roads, RoW, facilities, developments)	0-50 m	Rating down by 2	≤50 m waterfowl vigorously swim or fly.
			50-100 m	Rank down by 1	>50 m waterfowl response less vigorous (Pease *et al.* 2005).

B2.3 Development of Ratings Table

The Green-winged Teal model was evaluated using Green-winged Teal observations from waterfowl surveys conducted in various surveys in the oil sands. Green-winged Teal locations were overlaid on maps showing the distribution of Green-winged Teal effective habitat.

B3.0 Beaver Habitat Model

B3.1 Introduction

Beaver (*Castor canadensis*) are specialized aquatic rodents that are active year-round and range throughout the North America (Allen 1982). Beavers inhabit permanent waterbodies, such as streams, ponds, and lakes, with forested and shrubby margins for forage and building materials. Beavers build lodges on waterbody shorelines or directly within waterbodies, and also build dams to regulate water levels (Fisher and Acorn 1998).

B3.1.1 Status

As of August 2007, the beaver was not listed on any of the Federal Schedules of the *Species At Risk Act*. The Committee on the Status of Endangered Wildlife in Canada has not classified the beaver (COSEWIC 2008). The beaver is listed as *Secure* in Alberta (AENV 2005).

B3.1.2 Distribution

Beaver range throughout Canada, though they are infrequent in the prairie regions and not present north of the treeline (Rezendes 1999). In their 2nd spring, subadult beavers will migrate to alternate waterbodies, while adult beavers are non-migratory. Migrations typically cover a distance of approximately 8 to 16 stream km (Allen 1982).

B3.1.3 Information from Field Surveys

This species-habitat model was developed using published literature and adapted from Allen (1982). Beaver presence was incidentally noted during waterfowl surveys conducted in June 2007. The data collected provided presence/absence information and did not provide detailed information on habitat use.

B3.1.3.1 Habitat Preferences

Beaver inhabit permanent freshwater environments, including lakes, ponds, and low-gradient streams, where suitable woody vegetation is in close proximity. Beavers gather food from around a pond and return it to a central location for consumption. Beaver have been known to forage at distances up to 200 m from the water's edge, but typically remain within 100 m of the shoreline (Boyle and Owens 2007). The effort associated with transportation of trees increases as distance from the pond increases. Gallant *et al.* (2004) found that as distance from water increases, tree selection became more selective with fewer, larger trees being cut. This decrease in the number of trees being cut as distance increases suggests an incremental decrease in habitat suitability and no suitability beyond a distance of 200 m. Suitable vegetation consists of tree and/or shrub cover adjacent to the waterbody. Beaver have been noted to prefer aspen and willow species, but will also utilize coniferous species if needed (Allen 1982). Suitable beaver habitat must include a permanent and stable waterbody with a gradient of less than 15%, and the presence of year-round woody food sources (Williams 1965).

High quality beaver habitat was determined by the close proximity (<200 m) of feeding and low-gradient aquatic habitat (ponds and lakes). High quality habitat occurred within 20 m of streams, as streams were likely to be used in search of forage or building materials, but not directly inhabited. Forage was considered to be limiting during the winter season when beavers rely solely on woody vegetation. Reproductive habitat was considered to be a critical factor for beaver during the spring season.

The key habitat components for this species were:

- adjacent tree and shrub habitat (forage; winter);
- permanent water (reproduction; spring); and
- low gradient of water body (reproduction; spring).

B3.2 Development of Ratings Table

Ranks are listed for each vegetation type occurring in the study area (Table B3-1) for each of the life requisites of the Beaver.

Table B3-1: Vegetation Group Ratings for the Beaver Life Requisites in the RSA (Rating: 4= best, 1=poorest)

Vegetation Group	Distance to Stream: 0-20 m (Spring)	Distance to Pond/Lake: 0-100 m (Spring)	Distance to Pond/Lake: 100-150 m (Spring)	Distance to Pond/Lake: 150-200 m (Spring)	Distance to Pond/Lake: >200 m (Spring)
Bog / fen	1	1	1	1	1
Coniferous	3	3	2	1	1
Deciduous	4	4	3	2	1
Disturbed	1	1	1	1	1
Mixed wood	4	4	3	2	1
Shrub	4	4	3	2	1
Water	n/a	n/a	n/a	n/a	n/a

B3.2.1 Assumptions and Adjustments

Beaver ratings tables were developed for suitability of habitat types for the spring and winter seasons. The following list of assumptions and limitations applied to the Project area:

- suitable foraging habitat was limited to woody tree and shrub habitat within 200 m of a permanent waterbodies such as lakes and ponds and within 20 m of streams;
- any permanent water bodies such as ponds, lakes, and streams were suitable as habitat for reproduction (excluding tailings ponds, streams and Athabasca River); and
- the most suitable waterbodies had a gradient of less than 6%. Permanent ponds, lakes, and most streams meet this criterion.

The suitability of a habitat type providing resources for one life requisite was dependent on its proximity to another habitat type providing for another life requisite (Dunning *et al.* 1992). This attribute of beaver habitat requirements was incorporated into the model (Table B3-2). The presence of either water or forage was insufficient for supporting beavers in the study area. Both habitat requirements occurred within 200 m of each other (20 m for streams) in order to be given a habitat suitability ranking, otherwise the habitat was considered unsuitable.

Table B3-2: Adjustments for Beaver Habitat in the Wildlife RSA

Needs	Variable	Parameter	Details	Rating	Comments
Winter and Spring: Food and Reproduction	Vegetation and Water	Proximity of food and residence to ponds and lakes	0-100 m	No change in rating.	Proximity requirement met.
			100-150 m	Rating down by 1.	Most trees are cut within 100 m. More selective tree cutting occurs beyond 100 m (Boyle and Owens 2007).
			150-200 m	Rating down by 2.	
			>200 m	Rating 1-4=1	Maximum distance recorded for trees cut (Allen 1982a).
		Proximity of food to streams	0-20 m	No change in rating	Proximity requirement met.
			>20 m	Rating 1-4=1	Unlikely to travel beyond 20 m of streams.
		Human Activity (roads, RoW, facilities, developments)	0-50 m	Rating down by 1	Disturbance adjacent to waterbodies may remove or adversely affect resources (Slough and Sadleir 1977)

B3.3 Model Evaluation

The beaver model was evaluated using Beaver and Beaver sign observations from field surveys conducted in the oil sands region. Beaver locations were overlaid on maps showing the distribution of Beaver effective habitat.

B4.0 References

AENV (Alberta Environment). 2005. The general status of Alberta wild species 2005. Alberta Sustainable Resource Development Publication No 1/023 Edmonton, AB.

Allen, A.W. 1982. Habitat suitability index models: beaver. U.S. Dept. Int., Fish Wildl. Serv. FWS/OBS-82/10.30. 20pp.

Arthur, S.M., B.F.J. Manly, L.L. McDonald, and G.W. Garner. 1996. Assessing habitat selection when availability changes. *Ecology,* **77:** 215-227.

Bent, A.C. 1987. Life histories of North American wild fowl; ducks, geese, teals, mergansers, eiders, swans, scoters and others. Dover Publications, New York, p. 314 + plates.

Boyle, S. and S. Owens. 2007. North American beaver *(Castor Canadensis*): a technical conservation assessment. Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project. Available: http://www.fs.fed.us/r2/projects/scp/assessments/northamericanbeaver.pdf [Accessed October 3, 2007].

Cairns, A.L. and E.S. Telfer. 1980. Habitat use by 4 sympatric ungulates in boreal mixedwood forest. *J. Wildl. Manage.*, **44:** 849-857.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2008. Canadian species at risk. Environment Canada Ottawa, ON 90 pp.

Dunning, J.B., B.J. Danielson and H.R. Pulliam. 1992. Ecological processes that affect populations in complex landscapes. *Oikos,* **65:**169-175.

Estades, C.F. and S.A. Temple. 1999. Deciduous-forest bird communities in a fragmented landscape dominated by exotic pine plantations. *Ecological Applications,* **9:** 573-585.

Fisher, C. and J. Acorn. 1998. Birds of Alberta. Lone Pine Publishing, Edmonton, Alberta, Canada.

Gallant, D., C.H. Berube, E. Tremblay, and L. Vasseur, 2004. An extensive study of the foraging ecology of beavers (*Castor Canadensis*) in relation to habitat quality. *Canadian Journal of Zoology,* **82:** 922-933.

Harkonen, S. and R. Heikkila, 1999. Use of pellet group counts in determining density and habitat of moose (*Alces alces*) in Finland. *Wildlife Biology,* **5:** 233-239.

Hickie, J. 1985. Habitat management guidelines for waterfowl in Ontario for use in timber management. Ontario Ministry of Natural Resources, Ontario.

Neu, C.W., C.R. Byers and J.M. Peek. 1974. A technique for analysis of utilization-availability data. *J. of Wildl. Manage.,* **38:** 541-545.

OPTI-Nexen. 2006. Application for approval of the Long Lake South Project. Submitted to Alberta Energy and Utilities Board and Alberta Environment.

Pease, M.L., R.K. Rose and M.J. Butler. 2005. Effects of human disturbances on the behaviour of wintering ducks. *Wildlife Society Bulletin,* **33(1):** 103-112.

Peers, I. 1996. Statistical analysis for education and psychology researchers. Routledge (Taylor and Francis Group), 1-436pp.

Rezendes, P. 1999. Tracking and the art of seeing: how to read animal tracks and sign. Firefly Books Ltd., Ontario, Canada. 336pp.

Roof, J. 1999. "*Anas crecca*" (On-line), Animal Diversity Web. Accessed August 23, 2007 at http://animaldiversity.ummz.umich.edu/site/accounts/information/Anas_crecca.html.

Slough, B.G. and R.M.F.S. Sadleir. 1977. A land capability classification for beaver (*Castor canadensis Kuhl.). Canadian Journal of Zoology,* **55(8):** 1324-1335.

Williams, R.M. 1965. Beaver habitat and management. *Idaho Wildl. Rev.,* **17(4):** 3-7.

Appendix C

Population Viability Analysis: Input Parameters

Population Viability Analysis: Input Parameters

Based on density surveys in the Alberta Oil Sands Region in recent years, we estimated that in 2008, at a density of 0.1 moose per km^2, there would be about 400 moose in the RSA. For the population simulation model we used VORTEX 9.72 with the following input parameters, based on research about moose life history parameters:

First age of reproduction for females: 2 for males: 5
Maximum breeding age (senescence): 18
Sex ratio at birth (percent males): 50

Polygynous mating;
% of adult males in the breeding pool = 20

% adult females breeding = 90
EV in % adult females breeding: SD = 20

Of those females producing progeny, ...
Mean number of progeny per breeding female per year = 1.2
SD in number of progeny = 0.5

Specific to our model for the RSA, we assumed the following:

Catastrophe type 1: ticks
Frequency (as a percent): 10
Multiplicative effect on reproduction = 50
Multiplicative effect on survival = 80

Initial size of Population 1: 400
(set to reflect stable age distribution)

Carrying capacity = 400
with a 0 percent decrease for 0 years.
EV in Carrying capacity = 80 (i.e., 20% variation)
Decrease in carrying capacity = 5-10% per year (based on our calculations of diminishing habitat)

We also accepted the following VORTEX 9.72 default settings:

> 1 population(s) simulated for 100 years, 100 iterations
> Extinction is defined as no animals of one or both sexes.
> Inbreeding depression modeled with 3.14000 lethal equivalents per individual, comprised of 1.57000 recessive lethal alleles, and 1.57000 lethal equivalents not subject to removal by selection.
> EV in reproduction and mortality will be concordant.

We completed a sensitivity analysis on the above parameters. This analysis showed that variations of up to 20% in parameter value, did generally not change the outcome of the model predictions. Only an increase in mortality rates by 20% (but not at 10% increase) reduced the viability of the modelled population by about 10%. The sensitivity analysis indicates that our model is relatively robust to changes in parameter values. The values that we applied are likely within about 20% of what could be expected in the moose population of the RSA.

Appendix D

Background on Forest Succession and Reclamation through Natural Succession

D1.0 Reclamation in Environmental Impact Assessments

Total's reclamation process is based on CEMA's guidance and the general belief described in EIAs of the Oil Sands Region:

> "Successful reclamation requires the reestablishment of ecosystem functions based on natural successional processes."

> "While specific ecosite phases will be targeted within various landscapes, natural processes will ultimately determine the progression and eventual ecosite phase. Revegetation will be augmented by natural vegetation species ingress and successional processes, providing an opportunity for reclaimed areas to evolve into ecosystems similar to those found naturally in the region under similar environmental conditions."

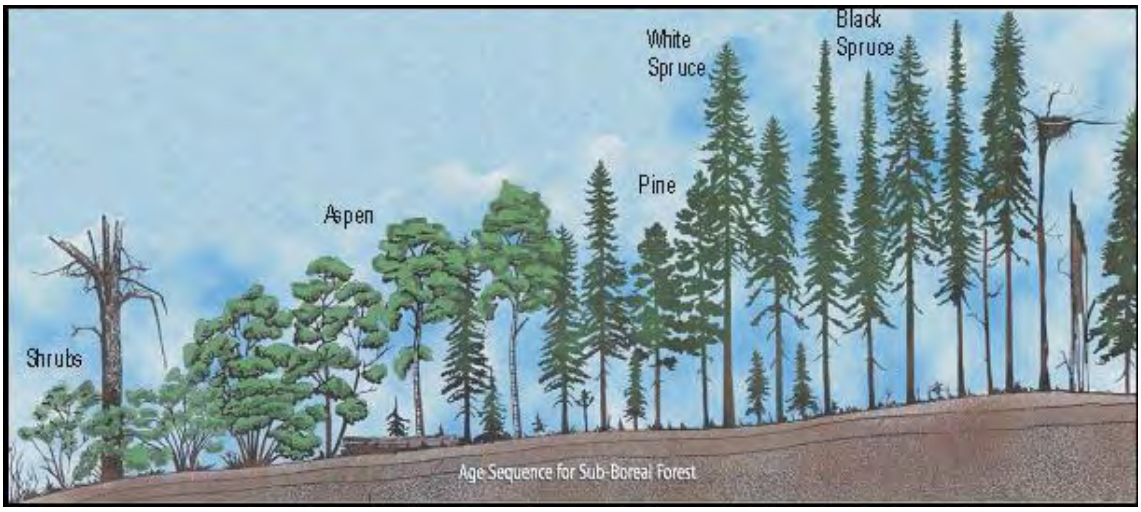
As the above and similar such statements from EIAs indicate, an important part of any reclamation plan involves believing that "a succession of species" will become established on their own within reclaimed sites. This means that only a few species may be planted/seeded initially in the reclamation site with the expectation that a series of plant species will become established on their own over time. However, *direct* evidence from both Suncor and Syncrude data and scientific studies shows that in the boreal forest most plant species become established within the first few (~five) years of reclamation or after forest fires. The only species that we are aware of that can establish after this initial period are trembling aspen (*Populus tremuloides*), which can sprout from underground stems, and white birch (*Betula papyrifera*) which can sprout asexually from the base of the tree, usually after the tree is damaged or dies. However, both species have high mortality rates.

D1.1 Background about Forest Succession

Definitions of forest succession may include only tree species or all plant species that exist in a forest. The concept of succession with only trees or all plants came about using what is called a chronosequence approach. This approach is described below for only tree species, but the same approach has been used to develop successional arguments for all plant species.

Forest succession is hypothesized to be a result of differences among tree populations in establishment time and growth and death rates. Some populations establish, mature, and decline when a community is young, while others do so when the community is middle aged, or older. Hence, there is a succession of tree species replacing each other. It is often believed that the early successional species make the environment unsuitable for recruitment of their own species such that as they die, space is made available for the next species in the successional sequence.

For example, Figure D1-1 below shows a *hypothesized* pattern of forest succession in the boreal forest, with different tree populations establishing and dominating at different times. In early succession, aspen (*Populus tremuloides*) establishes and dominates the community. In mid-succession, as aspen dies, white spruce (*Picea glauca*) and pine (*Pinus banksiana*) establish and dominate the community. Finally, in late succession, when aspen and pine have died, black spruce (*Picea mariana*) establishes and dominates the community (with some white spruce).



Aspen dominates	White Spruce/Pine dominate	Black Spruce dominates
Early Succession	→Mid-Succession →	Late-Succession (Old-growth)

Figure D1-1: Hypothesized pattern of forest succession in the boreal forest

The theory of forest succession is widely accepted as an accurate description of nature, but there is actually little *direct evidence* that tree populations succeed each other. Direct evidence is lacking because the long life span of trees (>100 years) makes it impossible to follow several generations of tree species populations long enough to see the replacement of tree species in the canopy.

Because showing forest succession directly is difficult, ecologists have tried to document succession indirectly (e.g., Cowles 1899 and Cooper 1923 are examples of two classic studies). They have attempted this by finding a series of forest sites that are believed to be similar in all respects except age. This series of sites is called a chronosequence. For example, Figure D1-2 below shows the same diagram as above but it is divided into a chronosequence of sites, separated by vertical black lines. On the left is a young site dominated by aspen, in the middle is a middle-aged site dominated by white spruce and pine, and on the right is an old site dominated by black spruce.

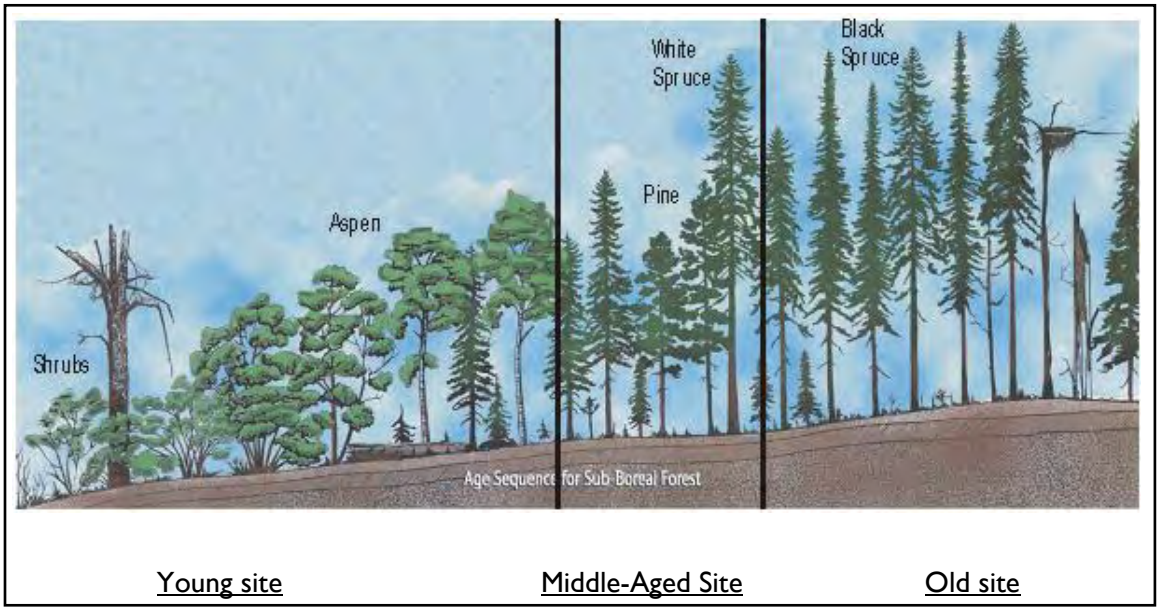


Figure D1-2: Chronosequence for sub-boreal forest

It is *assumed* that the different tree populations dominating the different-aged sites represent a sequence over time that occurred (and is occurring) at each site. Unfortunately, studies advocating succession seldom test the assumption that different aged sites experience the same developmental sequence. In fact, the few studies that have examined this assumption have found that plant populations do not succeed each other over time (e.g., Jackson *et al.* 1988; Fastie 1995).

Succession, as described above (or some form of the above) is a widely-believed concept. Therefore, it is surprising to most people that there is actually no *direct* evidence of succession in the boreal forest, or in other forests. More recent studies have shown that forest dynamics are actually much simpler than succession theory suggests. The recruitment of plant species after forest fires or during initial reclamation of oil sands sites is rapid and occurs until all available sites are occupied by plants (e.g., Gutsell and Johnson 2002, OSVRC 1998). After this initial period, the number of species within sites actually decreases such that older stands are less diverse than younger stands (Chipman and Johnson 2002).

D1.2 References

Chipman, S.J. and E.A. Johnson. 2002. Understorey vascular plant species diversity in the mixedwood boreal forest of western Canada. *Ecological Applications,* **12:** 588-601.

Cooper, W.S. 1923. The recent ecological history of Glacier Bay, Alaska. II. The present vegetation cycle. *Ecology,* **4:** 223-46.

Cowles, H.C. 1899. The ecological relations of the vegetation on the sand dunes of Lake Michigan. *Botanical Gazette,* **27:** 95-117, 167-208, 361-91.

Fastie, C.L. 1995. Causes and ecosystem consequences of multiple pathways of primary succession at Glacier Bay, Alaska. *Ecology,* **76:** 1899-1916.

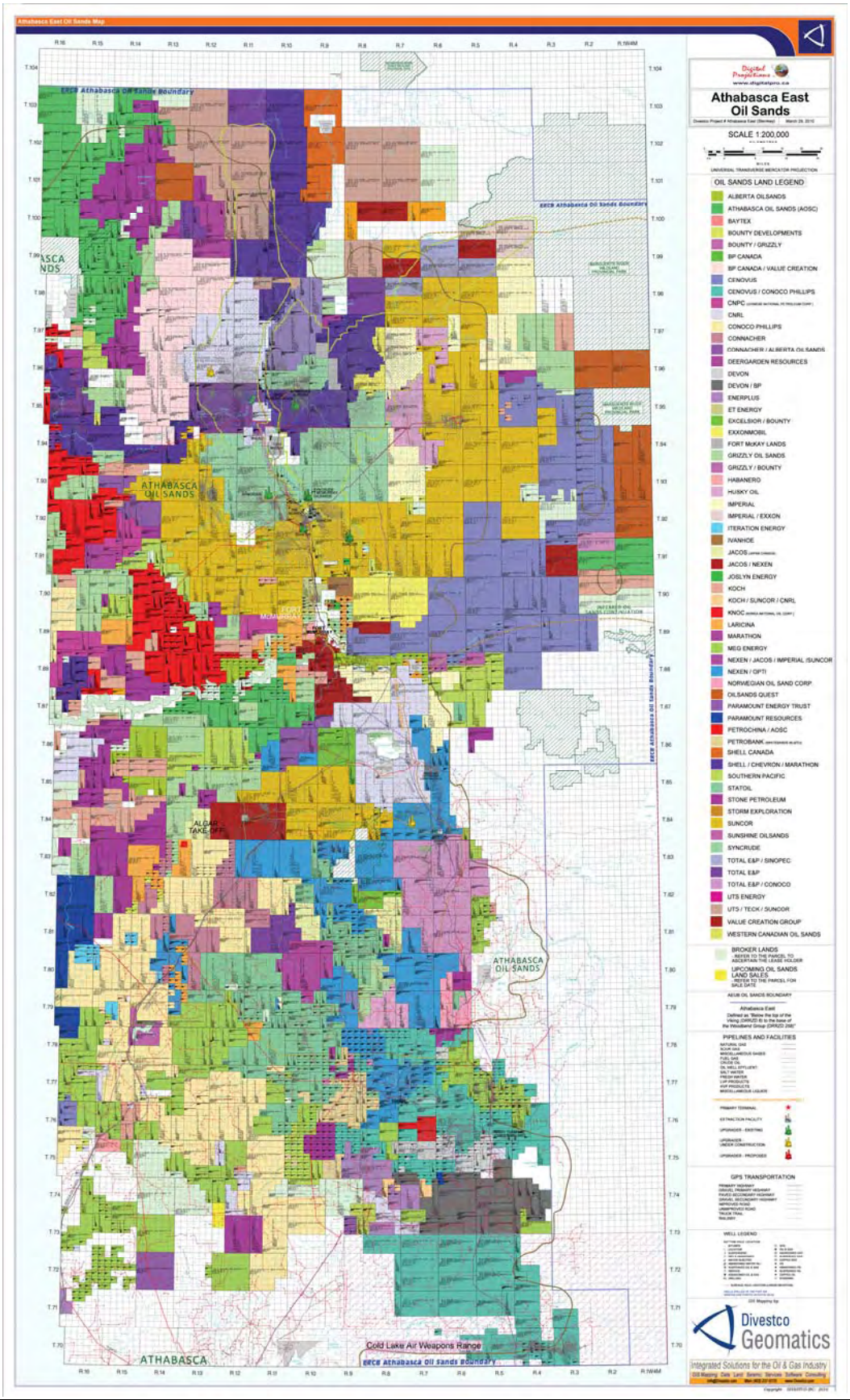
Gutsell, S.L. and E.A. Johnson. 2002. Accurately aging trees and examining their height-growth rates: implication for interpreting forest dynamics. *Journal of Ecology,* **90:** 153-166.

Jackson, S.L., R.P. Futyma, and D.A. Wilcox. 1988. A paleoecological test of a classical hydrosere in the Lake Michigan dunes. *Ecology,* **69:** 928-36.

OSVRC (Oil Sands Vegetation Reclamation Committee). 1998. Guidelines for reclamation to forest vegetation in the Athabasca Oil Sands Region. ISBN 0-7785-0411-5.

Appendix E

Map of Government Issued Oil Sands Leases


Athabasca East Oil Sands
SCALE 1:200,000
OIL SANDS LAND LEGEND
ALBERTA OILSANDS
ATHABASCA OIL SANDS (AOSC)
BAYTEX
BOUNTY DEVELOPMENTS
BOUNTY / GRIZZLY
BP CANADA
BP CANADA / VALUE CREATION
CENOVUS
CENOVUS / CONOCO PHILLIPS
CNRL
CONOCO PHILLIPS
CONNACHER
DEERGARDEN RESOURCES
DEVON
DEVON / BP
ENERPLUS
ET ENERGY
EXCELSIOR / BOUNTY
EXXONMOBIL
FORT McKAY LANDS
GRIZZLY OIL SANDS
GRIZZLY / BOUNTY
HABANERO
HUSKY OIL
IMPERIAL
IMPERIAL / EXXON
ITERATION ENERGY
IVANHOE
JACOS
JACOS / NEXEN
JOSLYN ENERGY
KOCH
KOCH / SUNCOR / CNRL
KNOC
LARICINA
MARATHON
MEG ENERGY
NEXEN / JACOS / IMPERIAL /SUNCOR
NEXEN / OPTI
NORWEGIAN OIL SAND CORP.
OILSANDS QUEST
PARAMOUNT ENERGY TRUST
PARAMOUNT RESOURCES
PETROCHINA / AOSC
PETROBANK
SHELL CANADA
SHELL / CHEVRON / MARATHON
SOUTHERN PACIFIC
STATOIL
STONE PETROLEUM
STORM EXPLORATION
SUNCOR
SUNSHINE OILSANDS
SYNCRUDE
TOTAL E&P / SINOPEC
TOTAL E&P
TOTAL E&P / CONOCO
UTS ENERGY
UTS / TECK / SUNCOR
VALUE CREATION GROUP
WESTERN CANADIAN OIL SANDS
BROKER LANDS
UPCOMING OIL SANDS LAND SALES
AEUB OIL SANDS BOUNDARY
PIPELINES AND FACILITIES
GPS TRANSPORTATION
WELL LEGEND
ERCB Athabasca Oil Sands Boundary
ATHABASCA OILSANDS
ALGAR TAKE-OFF
Cold Lake Air Weapons Range
ATHABASCA
Divestco Geomatics
Integrated Solutions for the Oil & Gas Industry

Review of Total's Joslyn North Mine Project Additional Information July 2010

Prepared for

Mikisew Cree First Nation GIR

August 2010

Prepared by

207 Edgebrook Close NW
Calgary, Alberta
T3A 4W5 Canada
Phone 403-241-8668
Fax 403-241-8679
Email: petr.komers@mses.ca

List of Contributors

Project Management, Senior Review & Follow Up & Monitoring Review	Dr. Petr Komers, P.Biol.
Hydrology	Mr. Mike Thompson, M.A.Sc., P.Eng.
Water Quality	Dr. Mike Vandermuelen
Air Quality	Mr. Kris Sirunas, P.Eng.
Wildlife	Dr. Troy Whidden, P.Biol.
Vegetation & Reclamation	Dr. Sheri Gutsell
Traditional Land Use	Dr. Peter Doug Elias
Integration of Comments & Project Management	Ms. Shannon Gavin, M.Sc.

Executive Summary

The Mikisew Cree First Nation GIR (Mikisew Cree) has requested that Management and Solutions in Environmental Science (MSES) review Total E&P Joslyn Ltd.'s, (formerly Deer Creek Energy Limited and hereafter referred to as Total), Joslyn North Mine Project Additional Information July 2010. The Total submission was in response to the Joint Review Panel (JRP) Additional Information Requests (JRP AIRs).

While examining the Additional Information we are mindful that a great concern of the Mikisew Cree is the impact of the Project upon their traditional resource use. We are advised by the Mikisew Cree that traditional resource uses include hunting, fishing, trapping and gathering within their traditional territory of which the local study area (LSA) and regional study area (RSA) are a part. MSES evaluated the information to determine how and to what extent Total has addressed the concerns of the Mikisew Cree surrounding environmental stewardship and considered the ramifications of such a project to the Mikisew Cree in terms of proponent liabilities and potential residual effects to the environment.

The evidence that Total produced concurs with our evaluations as it indicates that the changes caused by oil sands development are permanent from the view point of one or more human generations. This information is critical because it points to the need to improve the understanding of and the technology for re-establishing disturbed ecosystems. Furthermore, it is critical in assisting the Mikisew Cree to understand that traditional resources will not be returned to their pre-disturbance condition in the foreseeable future.

Furthermore, Total's recognition that effects are not reversible in the foreseeable future puts the determination of significance into question. This is because reversibility of an effect is a key ingredient in Total's determination of insignificance. Numerous effects on traditional resources were deemed by Total to be high in magnitude. If these effects cannot be reversed or mitigated, within one or more human generations, then all such effects are significant.

Several overarching concerns with the Total's responses in the Additional Information were noted by discipline reviewers:

1) Total's responses regarding uncertainty surrounding end pit lakes repeats the position heard so often that research is ongoing, that best available current knowledge is used, and conservative assumptions are used. However, there are as yet no end pit lakes on the landscape in the area, and it is not logical to state with such certainty that a viable, sustainable aquatic ecosystem will develop. Data is needed from experimental pit lakes at a relatively large scale to test model predictions (Water Quality).

2) It is not clear whether AENV will require pre-industrial conditions (estimates) for wildlife to be used as benchmarks in reclamation approval conditions (Wildlife).

3) Total should include details regarding wildlife monitoring programs which at present, are not discussed in the document (Wildlife).

4) Total has provided a brief outline of wildlife habitat re-establishment, without specific targets, management goals and objectives; the Mikisew Cree cannot determine how long it will take for wildlife to recolonize any disturbed lands that are undergoing reclamation (Wildlife).

5) Although Total has begun to gather information to meet the JRP's request for more specific information to species at risk, it will not be submitted until the end of August 2010. Given that the hearing is currently scheduled to begin on 21 September 2010, the Mikisew Cree may not have the time and capacity to appropriately respond to the promissed submissions (Wildlife).

6) While it is commendable that Total plans to direct-place a large proportion of salvaged soils, the benefit gained from direct placement will only be realized in a relatively small proportion of the soils that are going to be salvaged for development (Vegetation & Reclamation).

7) Literature shows that it is incorrect to assume that there will be an ingress of plant species into reclaimed sites, similar to what occurs in native forest stands. Total should consider increasing the direct placement of upland soils and associated LFH and planting a wide variety of species within the first few years of reclamation (Vegetation & Reclamation).

8) The potential effects from the project on all air quality indicators are considered insignificant because they are considered reversible. This is a very misleading approach to determine the significance that is not justified based on scientific or technical evidence but appears to be based on an arbitrary definition (Air Quality).

9) Mitigation of impacts to traditional land use remains an outstanding issue (Traditional Land Use).

10) The information provided by Total, questions 14, 15 and 17 notwithstanding, does not provide any new and concrete insights into just how Total will conduct follow-up programs. Commitments to learning from past research and monitoring aside, we have no evidence that Total will define and measure the success of mitigation measures, including reclamation, in a quantifiable and objective manner that would be relevant for the Mikisew Cree.

TABLE OF CONTENTS

PAGE

1.0 INTRODUCTION 1
1.1 Project Description 1
2.0 TECHNICAL REVIEW 3
2.1 Hydrology 3
2.2 Water Quality 3
2.3 Wildlife 4
2.4 Vegetation & Reclamation 9
2.5 Air Quality 11
2.6 Traditional Land Use 12
2.7 Follow Up & Monitoring 12
3.0 RECOMMENDATIONS 14
4.0 LITERATURE CITED 16

1.0 Introduction

The Mikisew Cree First Nation GIR (Mikisew Cree) has requested that Management and Solutions in Environmental Science (MSES) review Total E&P Joslyn Ltd.'s, (formerly Deer Creek Energy Limited and hereafter referred to as Total), Joslyn North Mine Project Additional Information July 2010. The Total submission was in response to the Joint Review Panel (JRP) Additional Information Requests (JRP AIRs).

While examining the Additional Information we are mindful that a great concern of the Mikisew Cree is the impact of the Project upon their traditional resource use. We are advised by the Mikisew Cree that traditional resource uses include hunting, fishing, trapping and gathering within their traditional territory of which the local study area (LSA) and regional study area (RSA) are a part. MSES evaluated the information to determine how and to what extent Total has addressed the concerns of the Mikisew Cree surrounding environmental stewardship and considered the ramifications of such a project to the Mikisew Cree in terms of proponent liabilities and potential residual effects to the environment.

1.1 Project Description

Total is applying to Alberta Environment (AENV) and the Energy Resources Conservation Board (ERCB) to construct, operate and reclaim the proposed Joslyn North Mine Project located within Townships 94-96, Ranges 11-13, W4M, approximately 70 km north of Fort McMurray. The Project is located on a plateau between the Birch Mountains to the west and the Athabasca River to the east. The Project area is located immediately south of the CNRL Horizon oil sands project, and is bisected by the Ells River, running roughly east-west through the Project lease area. The southern boundary of the Project area intersects the Athabasca River at its confluence with the Muskeg River, draining from the east.

Total proposes to develop the bitumen resources using staged implementation of mining operations and steam-assisted gravity drainage (SAGD). The Project has a target bitumen production rate of 100,000 bbl/d by 2013, and will include a Central Processing Facility (CPF), along with related project infrastructure, including roads, power lines, work camps, an open pit, tailings ponds, external (tailings filter cake) disposal areas, wastewater disposal wells, a landfill and equipment and materials storage areas. The Project has a 25 year operational timeline, with mine start-up scheduled for 2013, completion of mining in 2037, followed by closure and site reclamation.

1.2 Overarching Findings

The evidence that Total produced concurs with our evaluations as it indicates that the changes caused by oil sands development are permanent from the view point of one or more human generations. This information is critical because it points to the need to improve the understanding of and the technology for re-establishing disturbed ecosystems. Furthermore, it is critical in assisting the Mikisew Cree to understand that traditional resources will not be returned to their pre-disturbance condition in the foreseeable future.

Furthermore, Total's recognition that effects are not reversible in the foreseeable future puts the determination of significance into question. This is because reversibility of an effect is a key ingredient in Total's determination of insignificance. Numerous effects on traditional resources were deemed by Total to be high in magnitude. If these effects cannot be reversed or mitigated, within one or more human generations, then all such effects are significant.

2.0 Technical Review

2.1 Hydrology

Reference: JRP Question 11
Comment: In previous documents, the water balance of the lake was presented to show that direct rainfall and inflow would exceed evaporation and seepage in an extreme dry year. **We recommend that this information be part of the response to Question 11 to discuss how Total is "*demonstrating the efficacy of Total's proposed MFT free end-pit lake*".**

2.2 Water Quality

Total provides clarification that mature fine tailings will not be transferred to the single end pit lake planned for the closure landscape. This fact is reassuring because of the complications such tailings might impose on the aquatic ecosystem that must develop in the lake. However, the additional statements included do not necessarily provide reassurance that the end pit lake will be effective and sustainable, and may even be unscientific. This is an important challenge as end pit lakes, even those not containing tailings, may represent an appreciable environmental liability on the closure landscape.

It is claimed that "*fundamental, sound and proven principles of hydrology, limnology and water treatment*" have been applied. This may well be, and attempts to understand how end pit lakes and their respective aquatic ecosystems function will have to start with current knowledge. **However, there are as yet no end pit lakes on the landscape in the area, and it is not logical to state with such certainty that a viable, sustainable aquatic ecosystem will develop. It is not tenable to make such a universal statement which does not acknowledge that unforeseen developments may occur, and that complete understanding does not exist.**

Similarly, predicted water quality was modelled "*using accepted and peer-reviewed models*" and this is a good starting point, but appeal to the use of conservative assumptions does not provide reassurance. It should not be assumed that all mechanisms relevant to the establishment and functioning of the aquatic ecosystems (physical, chemical, and biological) are understood fully, that is, the structure of the model may need to be different. Even if the model is entirely correct in its structure (*i.e.*, the processes it incorporates), use of conservative assumptions does not guarantee that the model is run in a realistic parameter space for an area where end pit lakes do not yet exist. **Please provide quantitative justification that conservative assumptions mitigate uncertainty.**

It is helpful that "*key findings from CONRAD and CEMA research on pit lakes, experimental ponds and wetlands*" were incorporated in the analysis. It would be good to know what such key findings are and whether ongoing research involves simple fine-tuning of parameters in existing models, whether alternative conceptions of the operation of the aquatic ecosystem are evaluated (*i.e.*, different model structures incorporating processes at various trophic levels), and what progress in being made on testing such models and predictions at scales approaching that of the end pit lakes themselves.

Total's apparent commitment to being involved in research and development associated with pit lakes via CEMA and CONRAD is positive, but other stakeholders must ensure that Total (and all proponents) participation is meaningfully and that progress is documented. Research programs aimed at understanding the creation and functioning of end pit lakes must acknowledge the current uncertainties. Even if water quality is acceptable (and this is the focus of much of the modelling), effort must be made to understand how biological processes will operate against the particular water quality background. **There needs to be an understanding of how water quality and biological processes interact as predictions may be complicated by non-linear or mediated effects.** Biological processes include establishment of primary producers in pelagic and littoral zones (phytoplankton and macrophytes, respectively) and successive trophic levels with dynamic couplings among them. These mechanisms must be understood at appropriate temporal and spatial scales. The complex, interconnected nature of the aquatic ecosystem is recognized by other stakeholders, as well. For example, in the Fort MacKay First Nation Traditional Knowledge Report prepared by FMA heritage Resources Consultants Inc. (page 16) one member commented that a lake 'is not like a fish tank' and 'how do they expect to re-make the ecosystem?'

In summary, Total's response regarding end pit lakes is relatively glib and repeats the position heard so often that research is ongoing, that best available current knowledge is used, and conservative assumptions are used. **We recommend that the Mikisew Cree continue to request proponents to provide results from experimental pit lakes at a relatively large scale so that it becomes clear whether current model structures are adequate and, if they fail, at what level or interaction of physical, chemical, and biological components this breakdowns occurs.**

2.3 Wildlife

Aspects of the Total submission pertaining to wildlife and wildlife habitat were reviewed on behalf of the Mikisew Cree. This included:

- Section 3.0 – Cumulative Effects - Wildlife
- Section 7.0 – Reclamation - Terrestrial
- Section 9.0 – Species At Risk

Although all of the JRP questions and Total responses were reviewed, below we provide a summary of those questions and responses that are believed to be the most relevant to the Mikisew Cree.

2.3.1.1 Cumulative Effects - Wildlife

1) **Reference:** JRP Question 5

Comment: For each of the wildlife species that were identified as valued environmental components (VECs), Total was asked to provide regional wildlife population estimates for the following time periods: predisturbance (1965), project start up and 2037.

Population estimates were provided for the delineated RSA rather than populations defined by ecological or genetic boundaries because these areas are difficult to define due to the paucity of relevant information. In addition, three of the VECs were guilds of animals or groups of associated species and no population estimates were provided by Total; this included waterfowl, old-growth bird communities, and mixedwood bird communities. Given that these three VECs are generally standard constituents in EIAs and wildlife assessments for oil sands projects, it would have been valuable for Total to at least provide estimates surrounding their historic, current and future numbers in the RSA so as to provide a rough idea of any trends in numbers.

Although Total claims that *"... traditional knowledge does not provide the quantitative information necessary for such calculations"* (page 16), it is not apparent if Total took the population estimates to the local First Nation communities for general validation purposes.

The analysis by Total can be summarized as such:
"The analysis concludes that wildlife populations in the RSA have already declined an average of 19% relative to pre-industrial conditions (ranging from a loss of 9% for beaver to 37% for moose). These declines are based solely on estimated changes in wildlife habitat of VECs, including direct losses from industrial footprints and indirect losses in adjacent zones of influence from sensory disturbance. In other words, at baseline wildlife populations in the RSA average 81% of their pre-industrial levels (ranging from 63% to 91%)." (page 20)
The Mikisew Cree should request whether or not AENV will require pre-industrial conditions (estimates) for wildlife in reclamation approval conditions. These pre-industrial wildlife population estimates would be the basis for comparing the results of any future wildlife monitoring programs, as long as the monitoring programs are well thought-out in terms of their design. Baseline scenarios are not indicative of pre-industrial conditions for wildlife and wildlife habitat.

2) **Reference:** JRP Question 6

Comment: Question 6 reads as such:
In its response to the September 2008 Questions 2, 3 and 4 from the Panel, Total has assessed separately the significance of the effects of past projects, of recently proposed projects and of ongoing and future

activities on VECs, without combining all of these sources of effects together to provide an overall assessment of how valued wildlife have been cumulatively affected:

a. *Provide an overall assessment of the likely cumulative effects for each wildlife VEC identified. This assessment should include the combined effects of past, current, future activities and projects that have affected and may affect wildlife. In its assessment, Total is requested to consider:*
    - *habitat loss caused by the project, by forest harvesting, and by other past, existing exploration and development such as oil and gas, in-situ and oil sands mining;*
    - *direct mortality (hunting, poaching, road collision); and*
    - *reduction in habitat suitability (noise, edge effect and fragmentation).*
b. *Provide a determination of the significance of these combined effects on each valued wildlife species and clearly indicate what threshold or definition were used to determine the significance of the cumulative effects.*
c. *Provide a determination of the significance of these combined effects on each valued wildlife species and clearly indicate what threshold or definition were used to determine the significance of the cumulative effects.*

(page 29)

Total claims that their assessment considered cumulative effects on wildlife for three distinct assessment scenarios (periods), where the combined effects from all known, relevant human-related disturbances on the landscape were considered and the effects of habitat loss and reduced habitat suitability have already been combined. Total purports that combining the effects of reduced habitat availability with direct mortalities to estimate overall effects is problematic, as the two effects represent very different cumulative issues pertaining to wildlife. As such, they did not combine these parameters in their effects assessment as requested.

Total also claimed that most of the JRP Question 6 had been answered previously; the issue of the significance of these combined effects on each VEC was not re-assessed. It is important for the Mikisew Cree to see how the JRP considers these responses by Total in the sense of gaining a better understanding of the true cumulative effects on wildlife.

2.3.1.2 Reclamation – Terrestrial

1) **Reference:** JRP Question 14

Comment: Total was asked to provide any relevant studies of monitoring and research regarding reclamation conducted by CEMA and to include a summary of the studies' conclusions. Total complied by providing Table 14-1 (page 47), which lists recent reclamation work relevant to the Alberta Oil Sands Region. Interestingly, only 10 studies could be pointed to under the wildlife studies section, with 5 of these pertaining to tree swallows. Like all oil sands development proponents, Total cannot point to any tangibles that are being used to shape the EIA process. There continue to be no targets or benchmarks for wildlife recolonization of disturbed lands. There

are no thresholds associated with "acceptable" levels of habitat loss for, at minimum, the period of time that oil sands projects will be undergoing construction, operation and reclamation. Wildlife monitoring of lands undergoing reclamation is being done in a piece-meal fashion with little to no direction from Alberta Sustainable Resource Development (ASRD) or AENV and with little to no apparent thought for monitoring plan goals and objectives other than to supposedly meet approval conditions. The Mikisew Cree have made repeated requests that this issue be addressed, but to date their requests have either not been accommodated or ignored. **The JRP needs to take into account this apparent lack of direction when considering the potential project and cumulative impacts to wildlife and wildlife habitat.**

2) **Reference:** JRP Question 15

Comment: Total was asked to:

Provide relevant studies conducted by CEMA, and the Canadian Oil Sands Network for Research and Development (CONRAD), which would influence Total's reclamation and monitoring protocols, including a discussion of the recommendations contained in these studies.

Total defers to Table 14-1 for their answer, but does provide a few specific examples in a short discussion section. Of the examples provided, none deal with wildlife recolonization of disturbed lands or the associated issues of concern the Mikisew Cree have with wildlife disturbance and displacement. **Total should include details regarding wildlife monitoring programs which at present, are not discussed in the document.** The JRP need to take into account this apparent lack of direction when considering the potential project and cumulative impacts to wildlife, wildlife habitat targets, and monitoring programs.

3) **Reference:** JRP Question 16

Comment: When asked to provide information with respect to how long it might take for areas undergoing reclamation to evolve into habitat appropriate for the wildlife VECs chosen, Total does acknowledge that in some instances (i.e., old growth forests) that it could well take 100 years or more for habitat to become re-established. In some instances (i.e., certain types of wetlands), habitat will not be restored to accommodate the life history parameters of wildlife VECs. Although **Total has provided a brief outline of wildlife habitat re-establishment, without specific targets, management goals and objectives, the Mikisew Cree cannot determine how long it will take for wildlife to recolonize any disturbed lands that are undergoing reclamation.**

4) **Reference:** JRP Question 18

Comment: Total was requested to:

Discuss whether or not Total has used the information included in studies identified in questions 12 to 17 above to determine cumulative effects based on the probable success of reclamation to mitigate the impact

to vegetation communities, rare species, and wildlife habitat of the local study area (LSA), and regionally for other built, approved or disclosed oil sands mine development. (emphasis added)

Given that Total cannot point to an estimate of the probability of success of reclamation to mitigate, in part, impacts to wildlife habitat in the LSA the question appears to go unanswered.

2.3.1.3 Species At Risk

1) **Reference:** JRP Questions 20 to 23

Comment: The JRP requested that Total provide information specific to species at risk (including wildlife) that can be found in the RSA. To summarize, this included:

- population estimates in the LSA (for preindustrial conditions and the baseline case), using existing data; quantify how the project is likely to affect the populations of these species at full build out;
- provide the available habitat (relevant ecosite phases) in the LSA. Include maps of where this habitat occurs against any species at risk detections; quantify the expected area of occupancy for each ecosite phase used by each species; identify how much of this habitat will be affected by the project for each species;
- indicate if reclamation will result in the same type of ecosite phases affected by the project and the approximate time it will take to reclaim these ecosite phases., and
- supply updated information on potential habitat in the RSA for those species that did not have any Habitat Suitability Index (HSI) models applied.

Although Total has begun to gather or develop the information requested, it will not be submitted until the end of August, 2010. This was apparently noted in correspondence to the JRP on 24 June 2010. It is not clear if the Mikisew Cree were informed of these alternative submissions with dates that are approaching the beginning of the Total hearing. Given that the hearing is currently scheduled to begin on 21 September 2010, the Mikisew Cree may not have the time and capacity to appropriately respond to eleventh-hour submissions. **We recommend that the Mikisew Cree request that additional time be granted, or the date of the hearing start be extended so as to be able to appropriately respond to any additional hearing-related submissions by Total.** Regardless, it will require additional time and capacity to synthesize the additional information that is to be provided by Total.

2) **Reference:** JRP Questions 24

Comment: If any additional filed survey work was required to answer questions 20-23 above, Total was asked to summarize the survey methods, assumptions, sample sizes, and any other considerations that Total used to conduct the surveys. Breeding bird point count surveys and common nighthawk nocturnal surveys were completed in the LSA in June and July 2010, and a brief

summary of how the surveys were conducted has been provided. The detailed survey methods should be scrutinized in conjunction with any review of the additional SARA-related materials provided under Questions 20-23, above.

3) **Reference:** JRP Questions 25

Comment: The JRP requested that Total explain cases where certain wildlife VECs were used as "surrogates" for species at risk when assessing potential project impacts. With the additional work being done by Total under JRP Questions 20-23 above, no surrogate species will be used to estimate project effects on SARA-listed species. This too should be scrutinized in conjunction with any review of the additional SARA-related materials provided under Questions 20-23, above.

4) **Reference:** JRP Questions 26

Comment: With respect to species at risk that may occur in the RSA, the JRP requested that Total:

- include an assessment of the combined effects of habitat loss, direct mortality and reduction in habitat suitability (i.e. noise, edge effect and fragmentation of the habitat), and
- provide any measures, other than habitat reclamation, that may be used specifically to mitigate effects on species at risk.
- In response, Total states that an assessment of the combined effects of habitat loss, direct mortality and reduced habitat suitability will be undertaken for SARA-listed species for the RSA and will be filed at the end of August 2010. Again, the Mikisew Cree will have to wait until this information is submitted to see how Total addresses these JRP requests.

However, Total further states that, as indicated in the 24 June2010 letter sent to the JRP, additional information on species listed as Sensitive, At Risk, or May Be At Risk in the *General Status of Alberta Wildlife Species 2005* will be developed in consultation with ASRD subsequent to project approval. This post-approval due diligence for wildlife is not be acceptable to the Mikisew Cree bcause experience shows that post-approval work does not accommodate Mikisew Cree requests for issues of concern to be addressed. Unless a plan with clear goals and objectives to involve the Mikisew Cree in a meaningful way is prepared before any approval is granted, the practice of committing to post-approval actions should not take place. **Should post-approval consultation with ASRD proceed as stated above, ASRD expectations should be made clear to the Mikisew Cree prior to any consultation activity.**

2.4 Vegetation & Reclamation

1) **Reference**: JRP Questions 12 - 13, pg 41-46

Comments: Total has provided and discussed some relevant research papers on strategies and results for ecosystem development. One of these papers deals with the direct placement of salvaged upland mineral soils and the top LFH layers. Total states that the direct placement of salvaged LFH onto reclamation sites "*assists in creating diverse ecosystems on reclaimed upland landscapes by providing a source of propagules for re-vegetating forest communities*." In their C&R plan, they list direct placement of soil material as one mechanism of enhancing the biodiversity of the reclaimed landscape. Total states that "*it has provided reclamation plans that indicate direct-placement of 44% of salvaged reclamation materials (by volume).*" The use of direct placement of salvaged LFH is based largely on research by MacKenzie (2006, 2009) and Mackenzie and Naeth (2007, 2010). These studies showed that when LFH material is direct-placed or placed within one year of salvage onto areas that are similar in moisture and nutrient regime, a significant number of plant species will emerge from the propagule bank within the LFH. Total states that there will be direct placement of 44% of salvaged reclamation materials, which is a very high proportion compared to other oil sands developments. However, it is important to point out that a much smaller percentage (11%) of the direct-placed soils will contain the important LFH layers from upland soils. Of the 6.8 Mm^3 to be direct-placed, only 1.7 Mm^3 is mineral soil + LFH from upland areas; 5.1 Mm^3 is peat-mineral mix and a further 8.2 Mm3 of soil will be stockpiled. Unfortunately, the other material to be direct-placed (5.1 Mm^3 of peat mineral mix) has been shown to result in reclaimed sites with a much lower diversity of species. Using both growth chambers and field plots, MacKenzie and Naeth (2010) showed that about twice as many plant species emerged from the propagule bank in the LFH treatments than the peat treatments. In addition, LFH treatments had double the species richness, as well as higher plant abundance, soil nutrients and similarity indices (i.e. more similar in species composition to native reference sites) compared to peat treatments. Soils that were stockpiled and stored for longer than a year resulted in no species emerging from the LFH (MacKenzie 2009). **While it is commendable that Total plans to direct-place a large proportion of salvaged soils, the benefit gained from direct placement will only be realized in a relatively small proportion of the soils that are going to be salvaged for development.**

With respect to ecosystem development and the time required for ingress of native species, Total indicates that "*higher forest site indices...suggest that reclamation efforts have been successful in providing equivalent capability for forest production*." However, achieving equivalent capability for forest production through higher forest site indices does not mean that forest ecosystems with the diversity of plant species found in native forests will be developed. Instead, it simply means that on the reclaimed site capability has not been diminished, where capability is assessed by comparing soil properties, hydrology, etc. with the surrounding lands. If these properties are consistent with surrounding lands, then capability is assumed to be restored on site. The vegetation component of the criteria is intended to give some assurance that the site is on the right vegetation trajectory. In other words, as long as some boreal species are present on site initially, it is believed that

successional processes will result in a boreal forest with a higher diversity of species on the site at some point in the future. Unfortunately, however, in reclaimed oil sands sites and natural sites in the boreal forest, studies have shown there is no succession of plant species over time. For example, a review of the results of monitoring within reclaimed oil sands sites (Appendix F in OSVRC 1998) shows that there is a short establishment period in the first few years of reclamation, with no further plant establishment thereafter. Furthermore, comparisons between reclaimed sites of varying ages and natural stands show that there is very little similarity in terms of species composition between any of the reclaimed areas with natural stands. The species that were similar between reclaimed and natural stands were the trees and shrubs planted as part of the reclamation program (Appendix F in OSVRC 1998). In a study of naturally occurring boreal forest stands, Rees and Juday (2004) found a very high diversity of plant species (80 species) on recently burned stands in Alaska, whereas the oldest stands had the fewest species. Similarly, Chipman and Johnson (2002) found that understorey plant diversity was highest in the youngest stands and decreased with increasing stand age. These results show that it is incorrect to assume that there will be ingress of plant species into reclaimed sites, similar to what occurs in native forested stands. **In addition to the other strategies to reclaim development sites to particular ecosite types, such as the addition of coarse woody debris, Total should consider increasing the direct placement of upland soils and associated LFH and planting a wide variety of species within the first few years of reclamation.** This will ensure that the ecosites targeted for reclamation will bear some resemblance to naturally occurring boreal forest stands.

2.5 Air Quality

1) **Reference:** JRP Question 3

Comment: As part of the definition of the significance of the cumulative effects, Total has considered that if the effect is reversible then the air quality indicator is insignificant. All the project air quality effects are considered reversible after project operations cease (when there will be no air emissions). Therefore, no matter the magnitude and duration of the impacts from the project air emissions while the project is operating, the potential effects from the project on all air quality indicators are considered insignificant because they are considered reversible. This is a very misleading approach to determine the significance that is not justified based on scientific or technical evidence but appears to be based on an arbitrary definition. While the project is in operation, it appears that the potential air quality indicators would be significant but as soon as emissions cease then the effects would be insignificant which Total concludes in their assessment. However, there is no weight given to the fact that the project will be operating for up to 40 years in that conclusion. **We recommend that Total also discuss what, if any, air quality cumulative effects could occur during the operation phase.**

2.6 Traditional Land Use

1) **Reference:** JRP Question 27

Comment: The proponent has supplied copies of TEK-TLU studies completed in the past decade. These are the studies the proponent cites in their development plans, but were not included in their original submissions to the JRP.

2) **Reference:** JRP Question 28a

Comment: The proponent acknowledges that the Total Joslyn North Mine Project will impact traditional land users, but Total still cannot indicate how those impacts will be mitigated. The proponent funded the Mikisew Cree to undertake TEK/TLU studies, but these are not yet complete and, therefore, the proponent cannot take this information into account in their plans. **Mitigation of impacts to traditional land use remains an outstanding issue.**

3) **Reference:** JRP Question 28b

Comment: The proponent again states it has reached an Environmental Agreement with the Fort McMurray First Nation, but the details of the agreement are completely lacking.

2.7 Follow Up & Monitoring

Total provided several pieces of information that represent a step forward and are useful in the environmental planning process. Most notably, responses to question 14, 15 and 17 and the information provided in Table 14-1, indicate that:

- Populations of wildlife on reclaimed sites are less productive, animals exhibit a decreased vigor and populations may not be viable;
- Plant diversity is lower than in natural stands;
- Soil and vegetation structure differs from natural stands;
- Re-establishment of some vegetation communities may not be possible;
- Natural landscape heterogeneity may take centuries to recover.

The evidence that Total produced concurs with our evaluations as it indicates that the changes caused by oil sands development are permanent from the view point of one or more human generations.

This information is critical because it points to the need to improve the understanding and the technology for re-establishing disturbed ecosystems. Furthermore, it is critical in assisting the Mikisew Cree to understand that traditional resources will not be returned to their pre-disturbance condition in the foreseeable future.

The information provided by Total, questions 14, 15 and 17 notwithstanding, does not provide any new and concrete insights into just how Total will conduct follow-up programs. Commitments to learning from past research and monitoring aside, we have no evidence that Total will define and measure the success of mitigation measures, including reclamation, in a quantifiable and objective manner that would be relevant for the Mikisew Cree.

3.0 Recommendations

Recommended actions are listed by discipline and should be addressed in a dialogue between the Mikisew Cree and Total. Although the recommendations below highlight the overarching issues, they do not replace comments and questions raised throughout the report and are not, necessarily, mutually exclusive. The Mikisew Cree may wish to engage the discipline experts retained by either party in a technical dialogue to discuss the specifics of the main body of the reviews above.

1) We recommend that the Mikisew Cree continue to request proponents to provide results from experimental pit lakes at a relatively large scale so that it becomes clear whether current model structures are adequate and, if they fail, at what level or interaction of physical, chemical, and biological components this breakdowns occurs (Water Quality).

2) The Mikisew Cree should request whether or not AENV will require pre-industrial conditions (estimates) for wildlife in reclamation approval conditions (Wildlife).

3) Request Total provide details regarding wildlife monitoring programs which at present, are not discussed in the document (Wildlife).

4) The JRP requested that Total provide information specific to species at risk (including wildlife) that can be found in the RSA. Although Total has begun to gather or develop the information requested, it will not be submitted until the end of August, 2010. We recommend that the Mikisew Cree request that additional time be granted, or the date of the hearing start be extended so as to be able to appropriately respond to any additional hearing-related submissions by Total (Wildlife).

5) Should post-approval consultation with ASRD proceed as stated above, ASRD expectations should be made clear to the Mikisew Cree prior to any consultation activity (Wildlife).

6) In addition to the other strategies to reclaim development sites to particular ecosite types, such as the addition of coarse woody debris, Total should consider increasing the direct placement of upland soils and associated LFH and planting a wide variety of species within the first few years of reclamation (Vegetation & Reclamation).

7) We recommend that Total also discuss what, if any, air quality cumulative effects could occur during the operation phase (Air Quality).

8) Further discussions are need regarding mitigation of impacts to traditional land use (TLU).

9) Concrete plans on how to measure the success of mitigation, including reclamation, are still required (Follow-up programs).

4.0 Literature Cited

Chipman, S.L. and E.A. Johnson. 2002. Understorey vascular plant species diversity in the mixedwood boreal forest of western Canada. Ecological Applications 12: 588-601.

MacKenzie, D. 2006. Assisted natural recovery using a forest soil propagule bank. MSc Thesis. Department of Renewable Resources, University of Alberta. Edmonton, Alberta. 140 pp.

MacKenzie, D.D and M.A. Naeth. 2007. Assisted natural recovery using a forest soil propagule bank in the Athabasca Oil Sands. Pages 374 -382. In: Seeds Biology, Development and Ecology. Cromwell Press, Townbridge United Kingdom.

MacKenzie, D. 2009. Reclamation using Upland Surface Soils from Boreal Forests in the Oil Sands. PhD Thesis. Unpublished manuscript. University of Alberta, AB.

MacKenzie, D.D. and M.A. Naeth. 2010. The role of the forest soil propagule bank in assisted natural recovery after oil sands mining. Restoration Ecology 18(4): 418-427.

Oil Sands Vegetation Reclamation Committee (OSVRC). 1998. Guidelines for reclamation to forest vegetation in the Athabasca Oil Sands Region. Fort McMurray, Alberta. 212 pp.

Rees, D.C. and G.P. Juday. 2002. Plant species diversity on logged versus burned sites in central Alaska. Forest Ecology and Management 155: 291-302.

Effects on Traditional Resources of the Mikisew Cree First Nation:

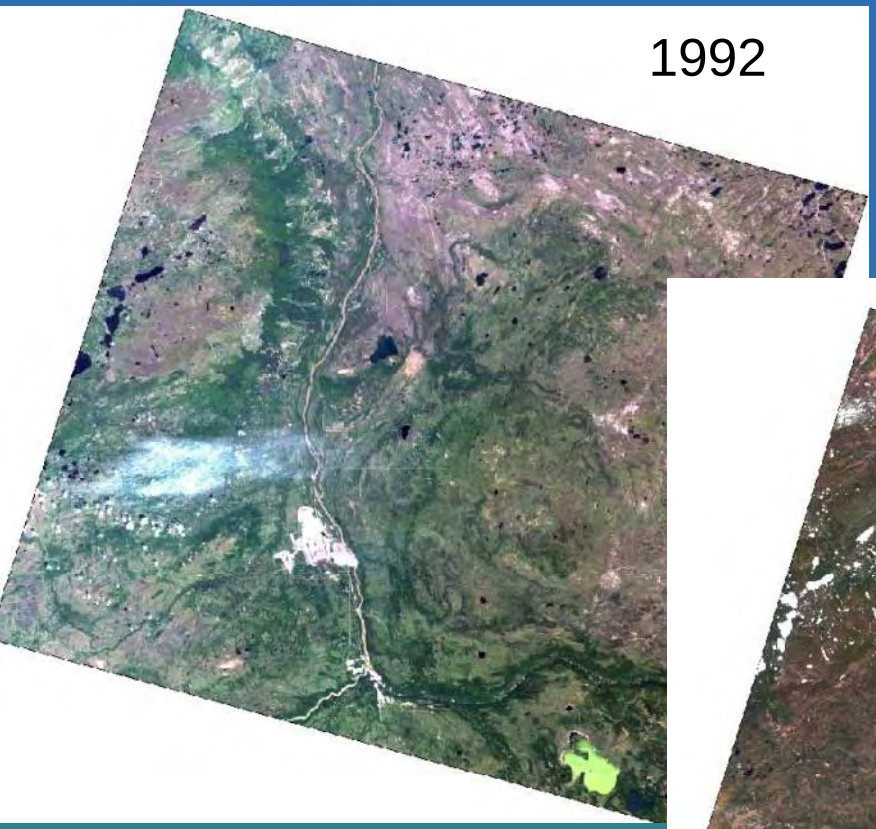
Joslyn Creek Project Specific and Cumulative Effects in the Oil Sands Region

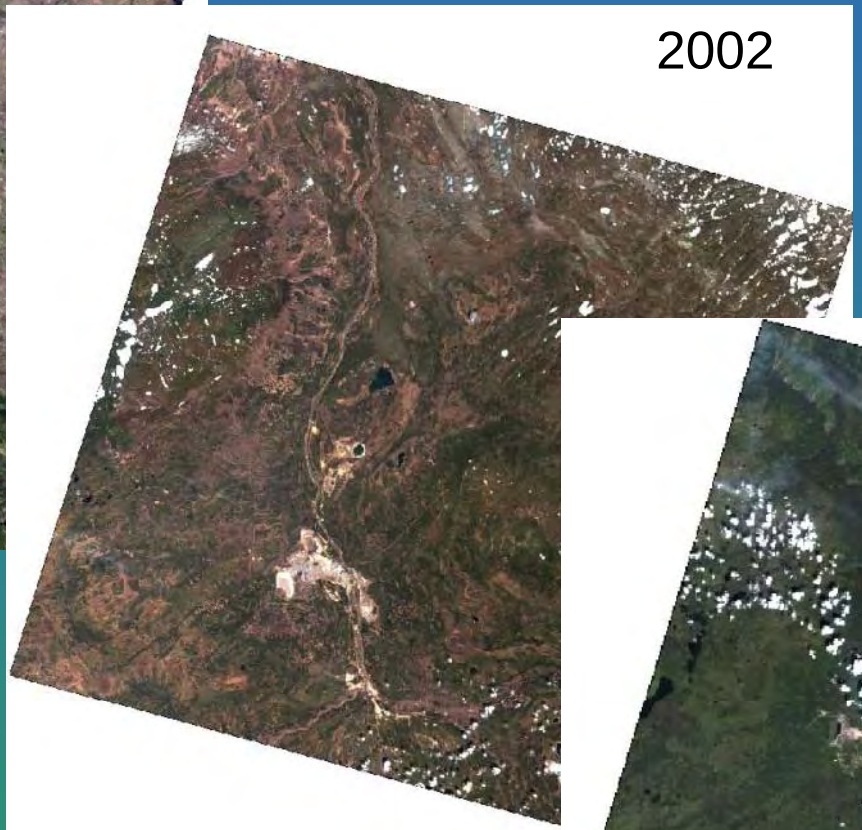
Presentation
September 2010

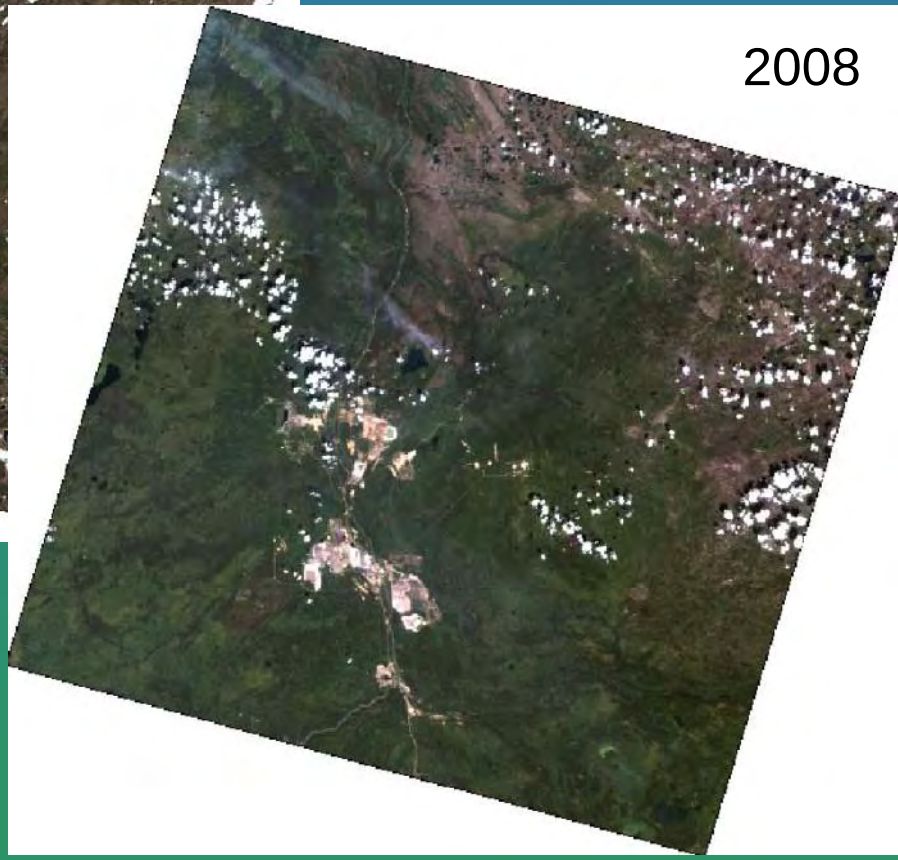
Prepared by

MSES

The Rate of Change





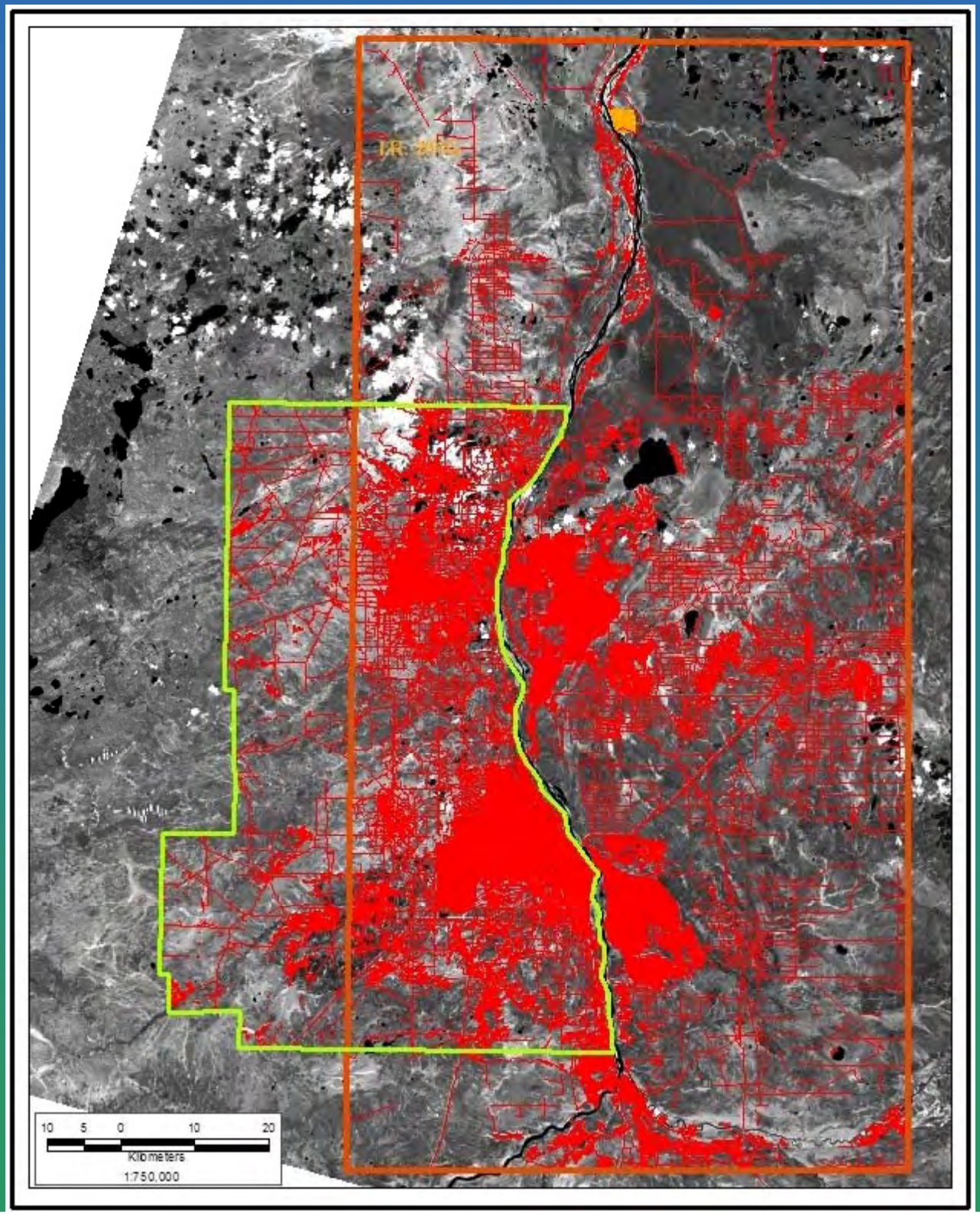


Using a series of satellite images, the rate of disturbance in the landscape can be measured.

Total's Regional Study Area

Human disturbance visible on the satellite images is highlighted in red.

We focus our analysis in more detail on Total's RSA (green outline)



Key Finding: Remoteness

Total Joslyn Mine Hearing

Since 1992, an average of 3% of undisturbed area has been removed each year from the RSA.

As of 2008, 56 % of the RSA was disturbed.

At this rate there will be no undisturbed area left by the year 2021.

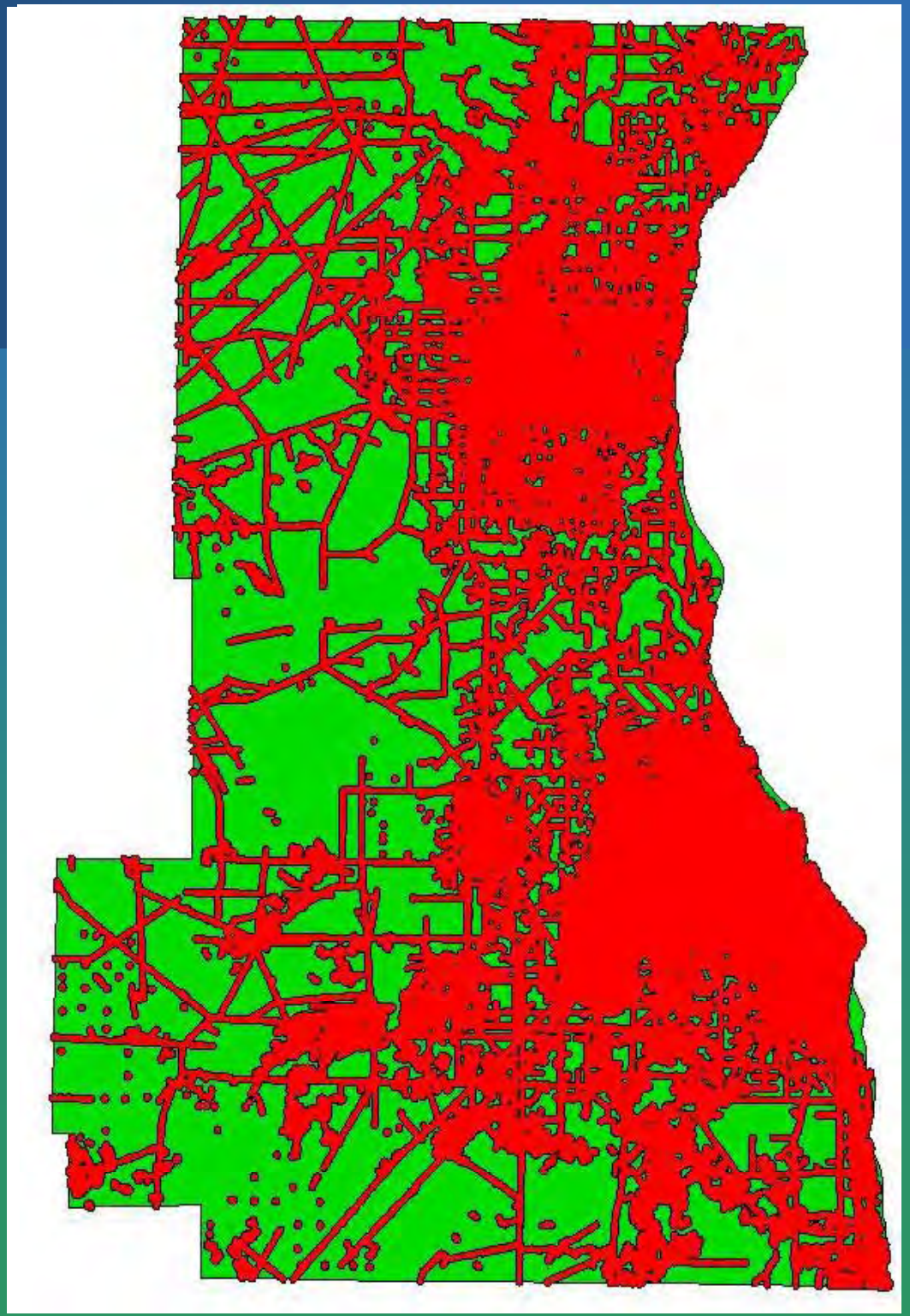
Natural Land-cover (green)

Total Joslyn Mine Hearing

Disturbed from 1992 to 2008

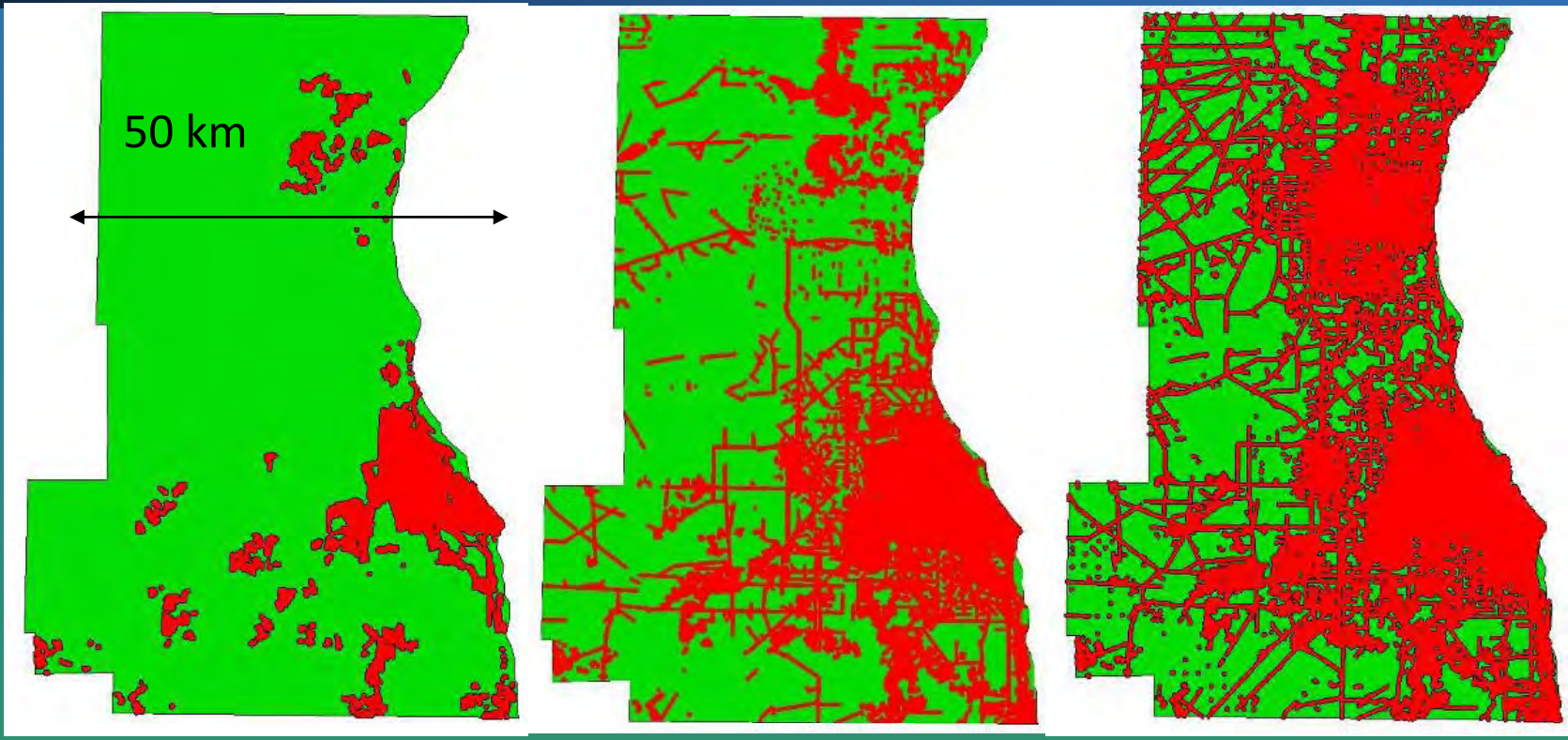
250 m zone of disturbance around each Footprint

(eg. Laurian et al. 2008, Ries et al. 2004, Sorensen et al. 2008)



Increasing Disturbance from 1992 to 2008

Total Joslyn Mine Hearing



- *3% of undisturbed areas removed each year*
- *In 2008, 56% of area disturbed*
- *There will be no undisturbed area left in 2021*

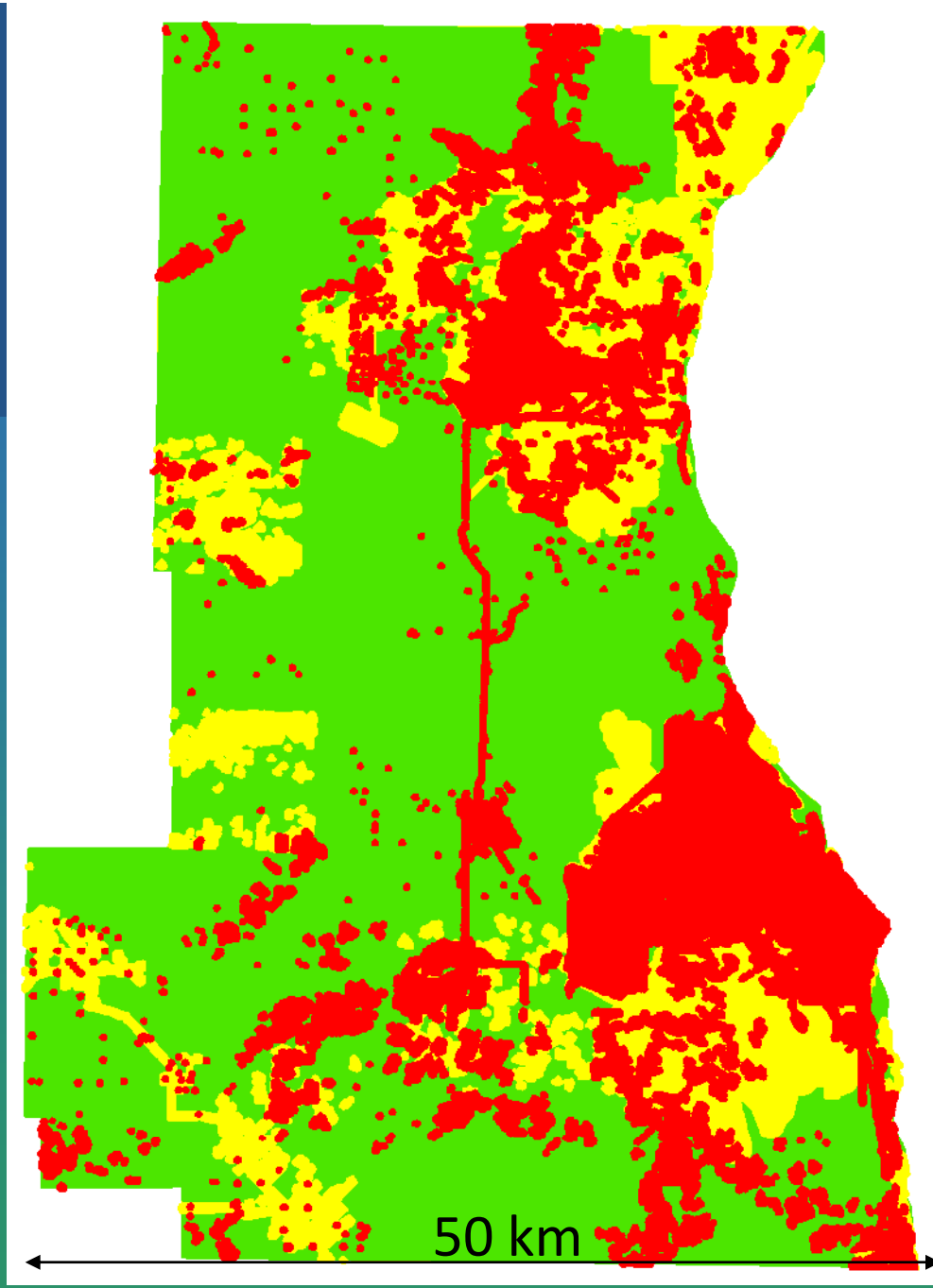
Planned Development

Total Joslyn Mine Hearing

***Yellow** = planned disturbance*

***Red** = disturbance existing in 2008*

Does NOT include most linear features

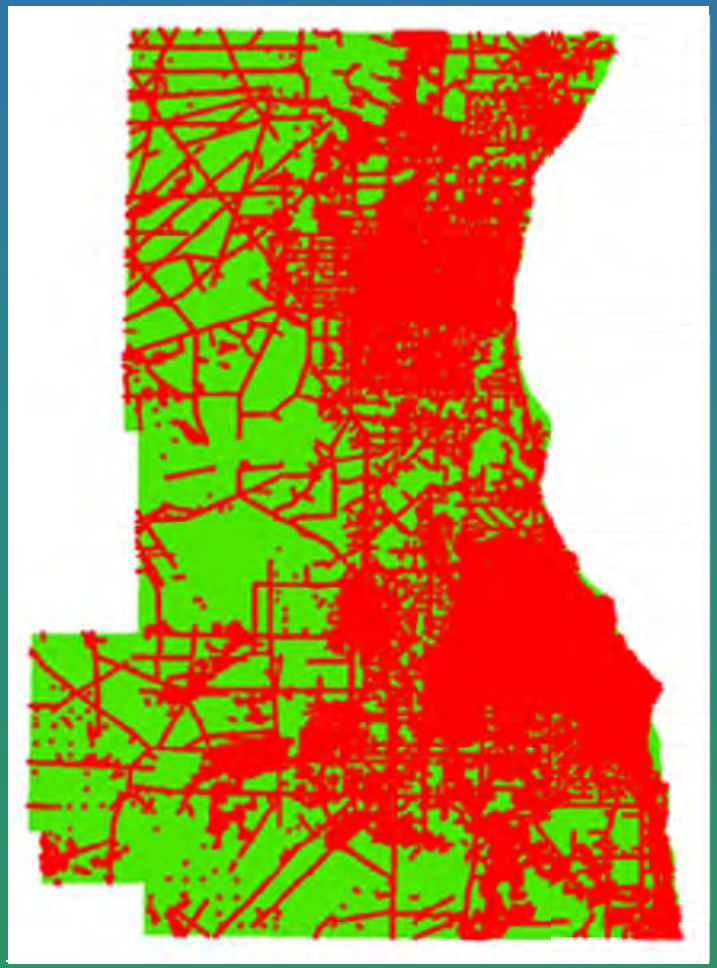


- *Future yearly increase 37.2 km²*
- *By 2028, 60% of RSA will be disturbed*

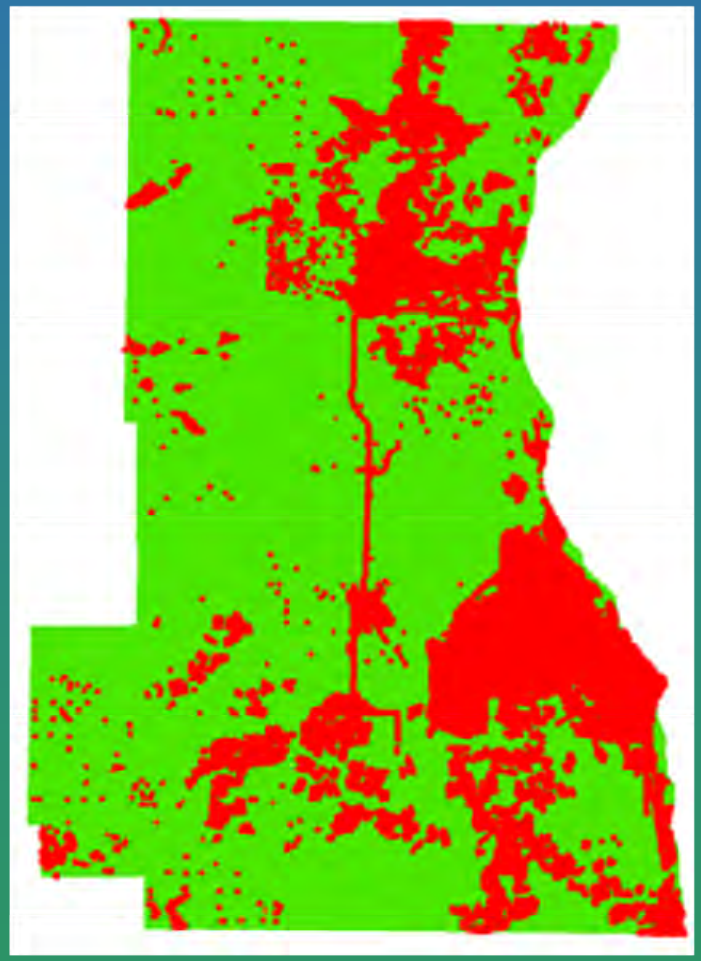
Future Disturbances Underestimated

Total Joslyn Mine Hearing

With Linear Features



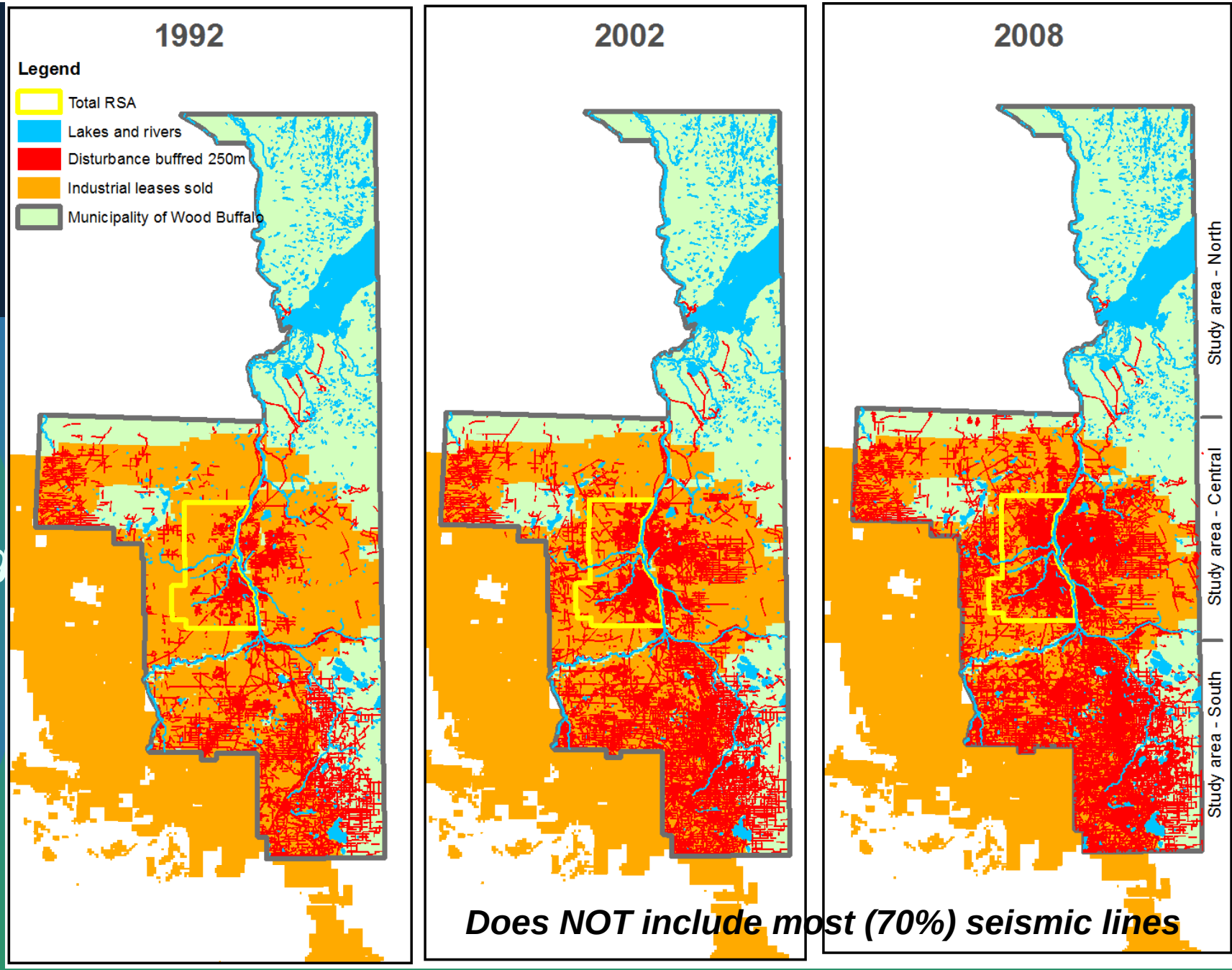
Without Linear Features



Comparison of disturbances in RSA by 2008 with and without linear features.

The RMWB

Total Joslyn Mine Hearing



Does NOT include most (70%) seismic lines

By 2008, the disturbance was 41% in the south, 25% in the center, 1% in the north.

Disturbance concentrated on Oil Sands Leases (brown)

Key Finding:
Ecosystem Process

Total Joslyn Mine Hearing

The disturbance progress in the RSA is approaching maximum fragmentation.

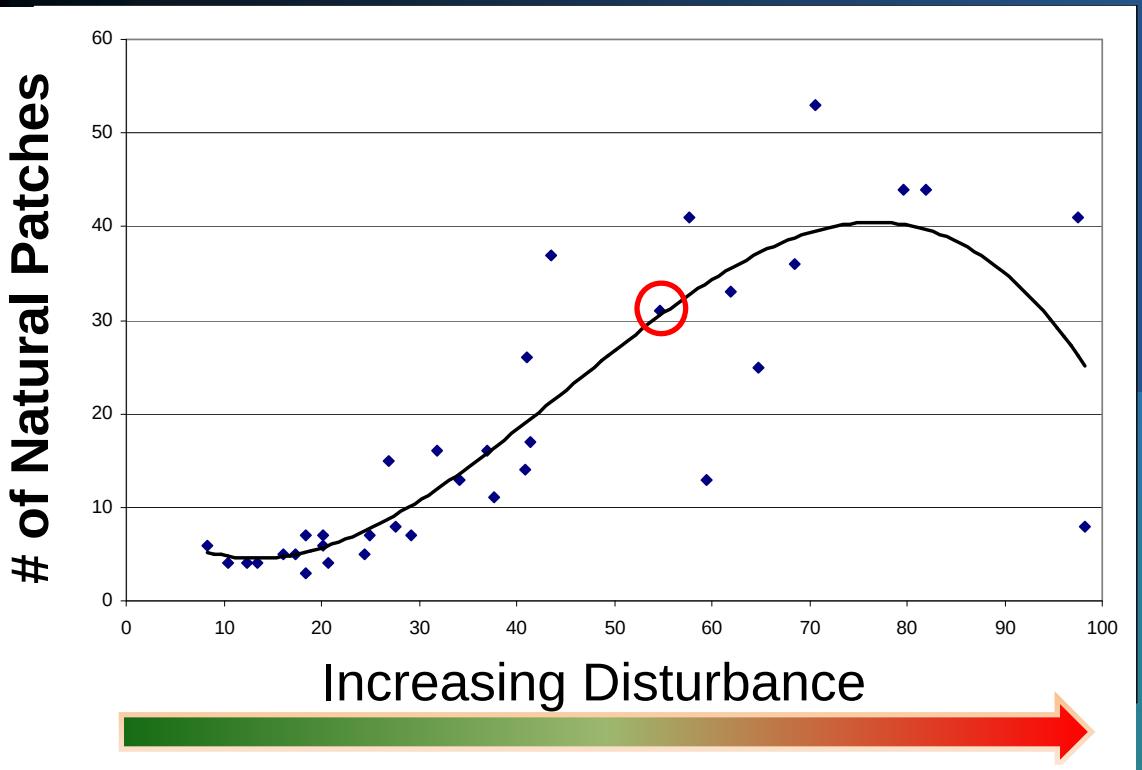
Further development is almost certain to push the ecosystem into a substantial and long-term reorganization.

Ecosystem Shifts

occur when external forces alter a system so that its organization shifts from one set of processes to another.

(Scheffer et al. 2001; Gordon et al. 2008)

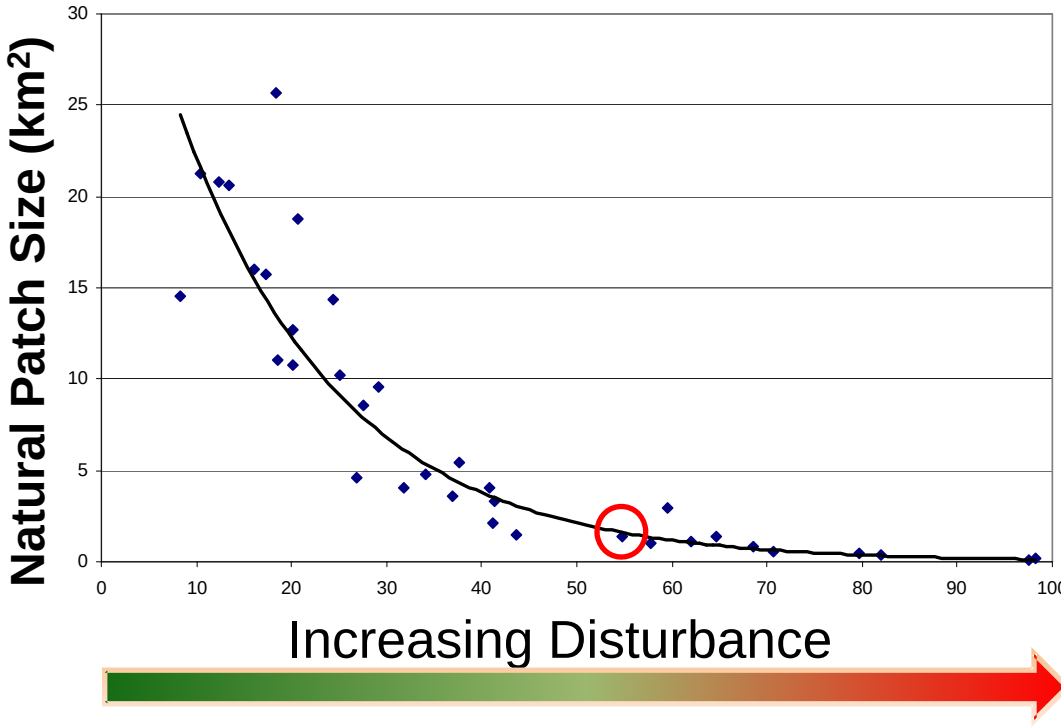
Total Joslyn Mine Hearing

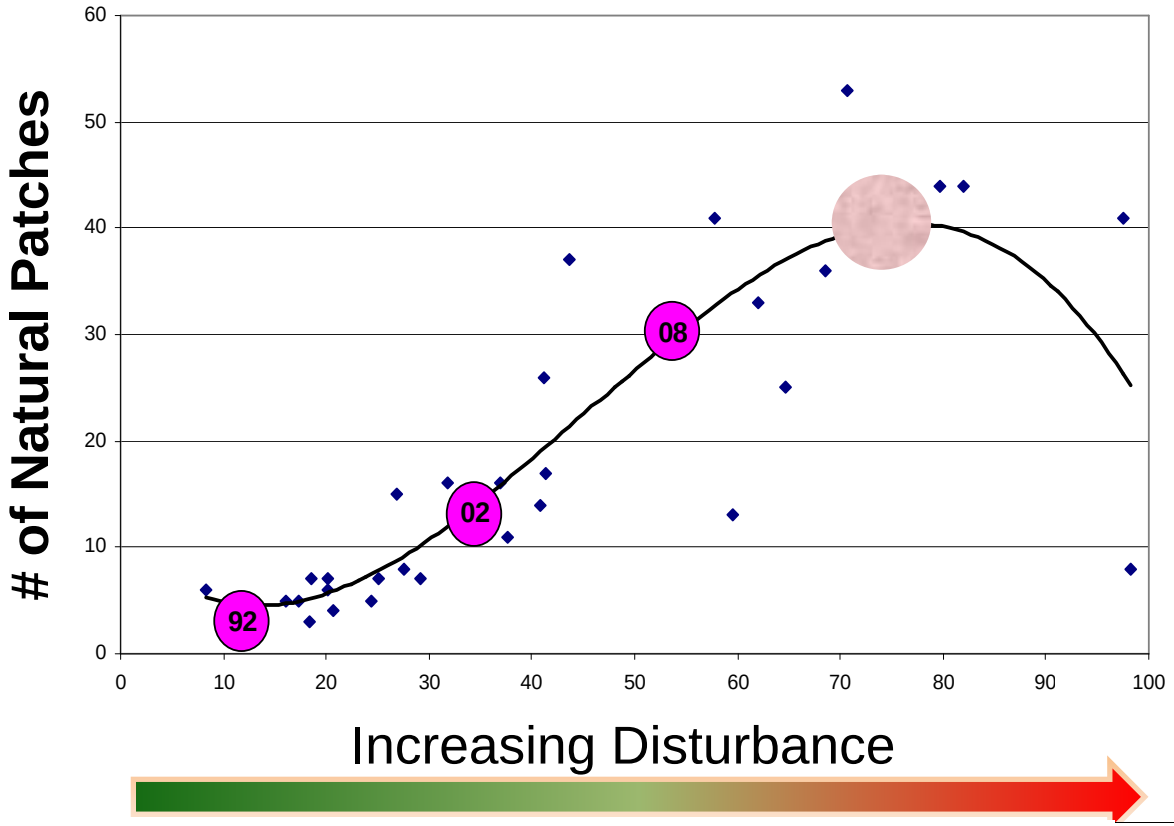


More Disturbance = More Fragmentation

Each Dot = one township in the Oil Sands

Townships with low disturbance have a few large patches of natural vegetation

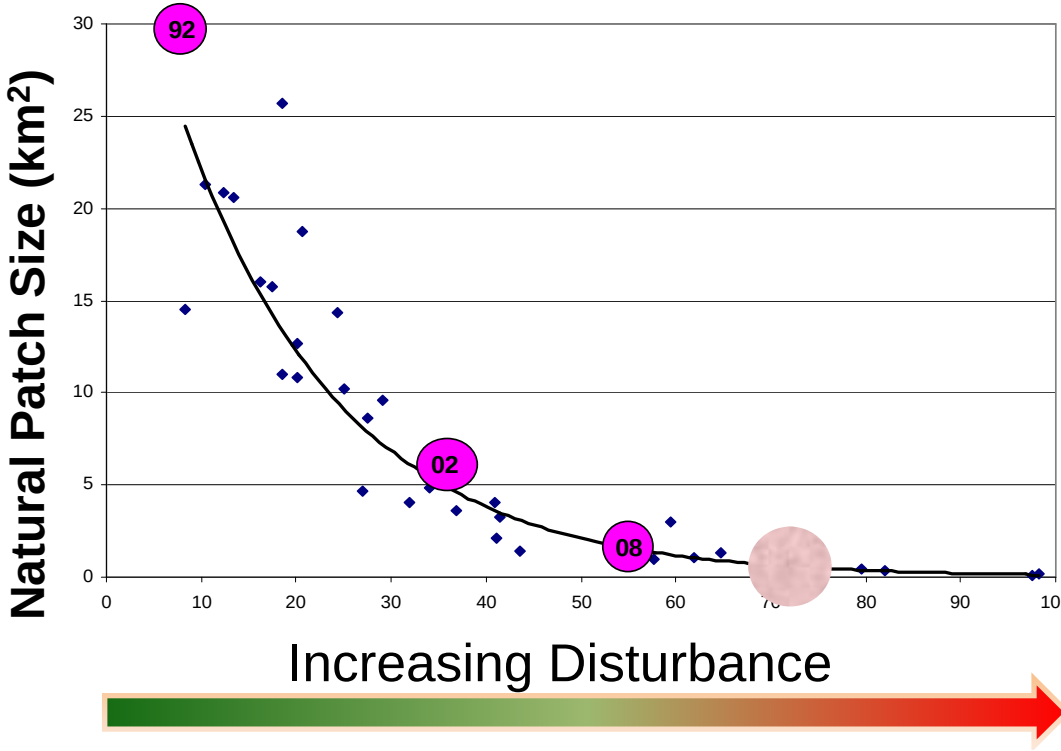




Where Total's Area is Now

= *Condition of RSA in 1992, 2002, 2008*

= *projected condition in 2014*



Consequences of Ecosystem Shift

Total Joslyn Mine Hearing

A new set of ecological processes

Less core wildlife habitat =

fewer moose & caribou,

more deer & magpies

Increase of invasive plant species

(ASRD 2004)

Changes to hydrological cycles

(Northern River Basin Study 1994, Schindler and Lee 2010)

Key Finding:
Bison & Caribou

Total Joslyn Mine Hearing

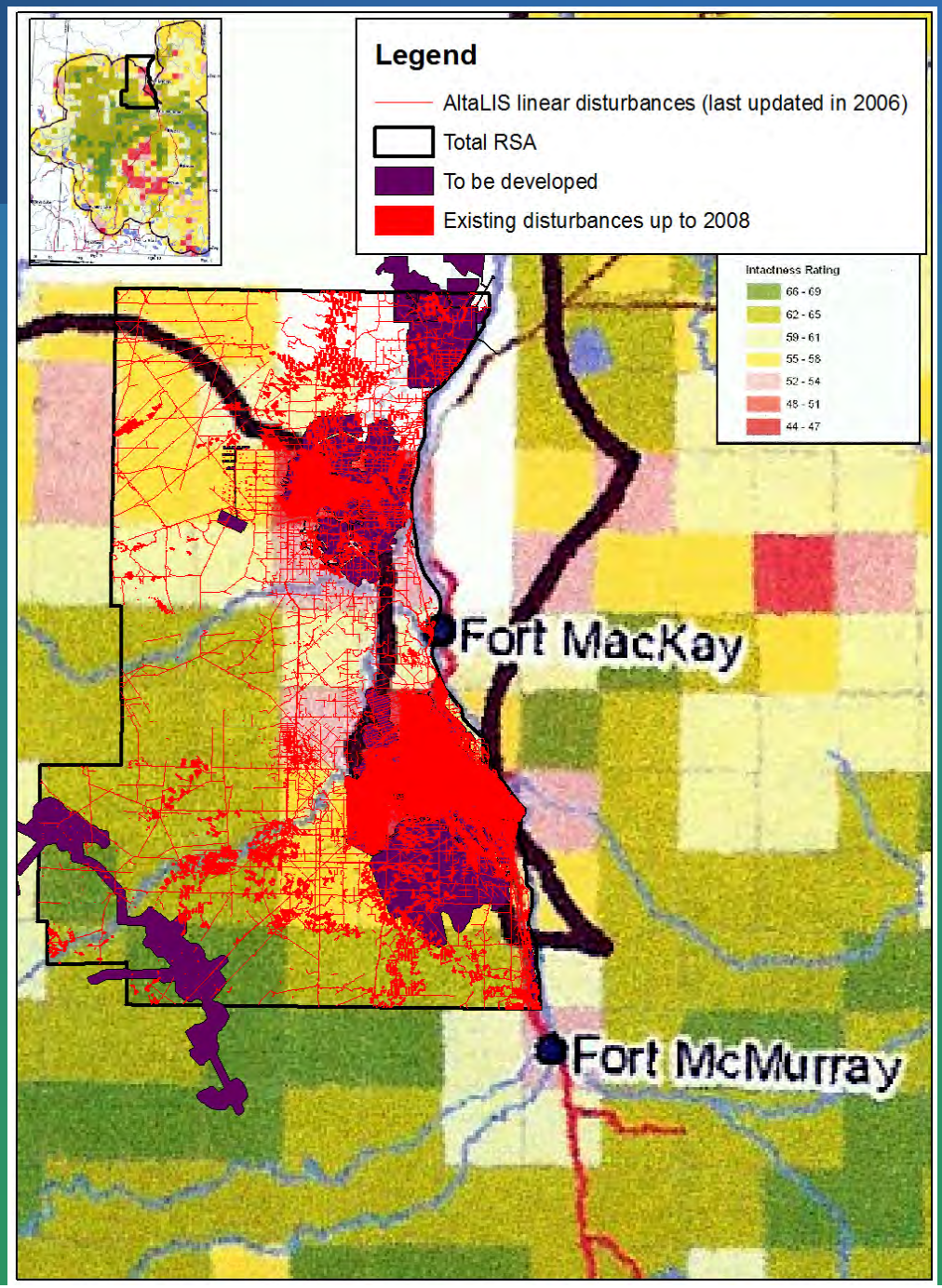
Bison and caribou have been virtually removed from the RSA, and from most areas of the RMWB.

Caribou Habitat Intactness

Total Joslyn Mine Hearing

Base map by Alberta Caribou Committee:
green = intact

The RSA & disturbances analyzed by MSES are overlain in red and purple.



Caribou Population Sustainability

Total Joslyn Mine Hearing

- ***Caribou populations sustainable up to 61% of landscape within 250m of development (Sorensen et al. 2008)***
- ***56% of RSA within 250m of development in 2008 – extirpation is likely***

Key Finding: Moose

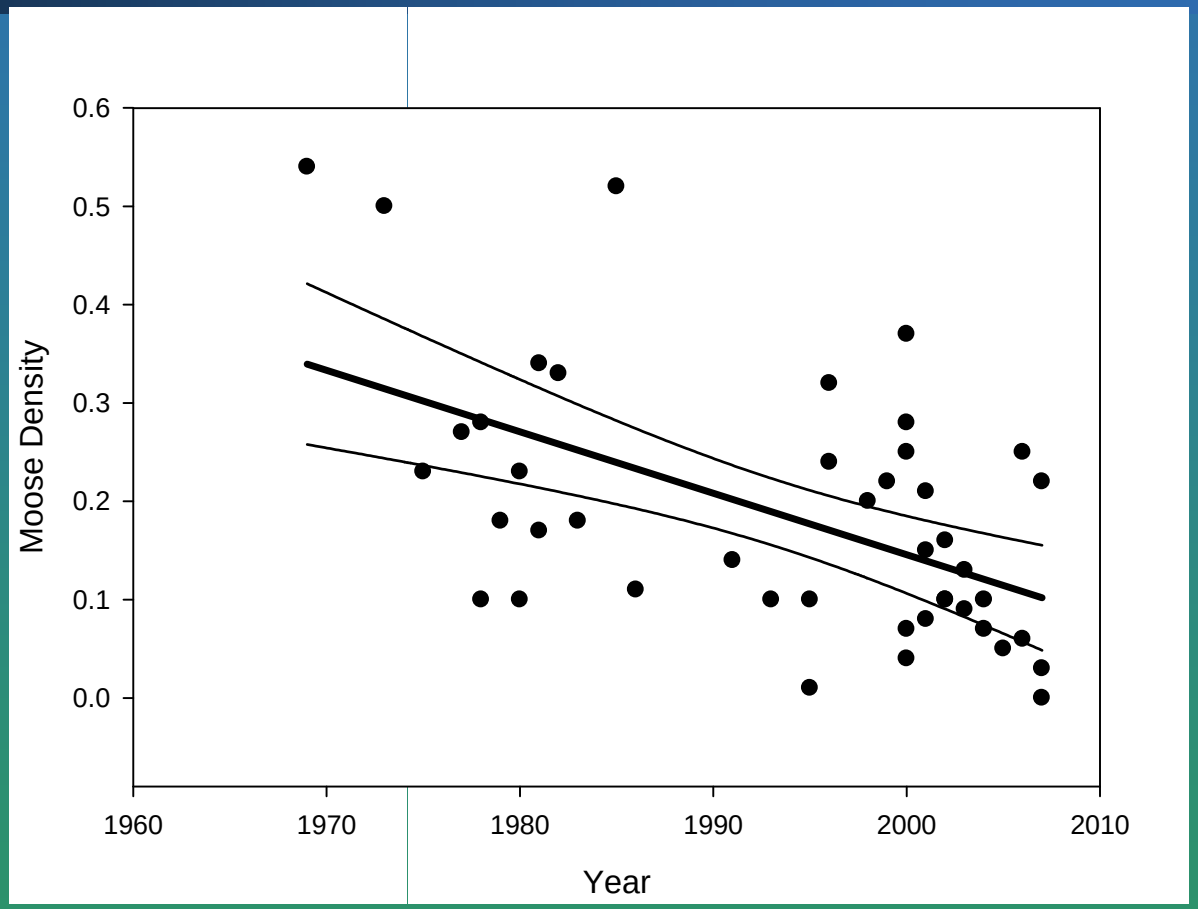
Total Joslyn Mine Hearing

An average of 2.3% of moose habitat has been removed each year from the RSA.

At this rate, the moose population will cease to be viable in the RSA between 2015 and 2019.

Moose Density Declining in the Oil Sands Region

Total Joslyn Mine Hearing



Moose densities (moose per km^2) observed in aerial surveys between the years 1960 and 2008 (Suncor data).

Moose Habitat Decline in RSA

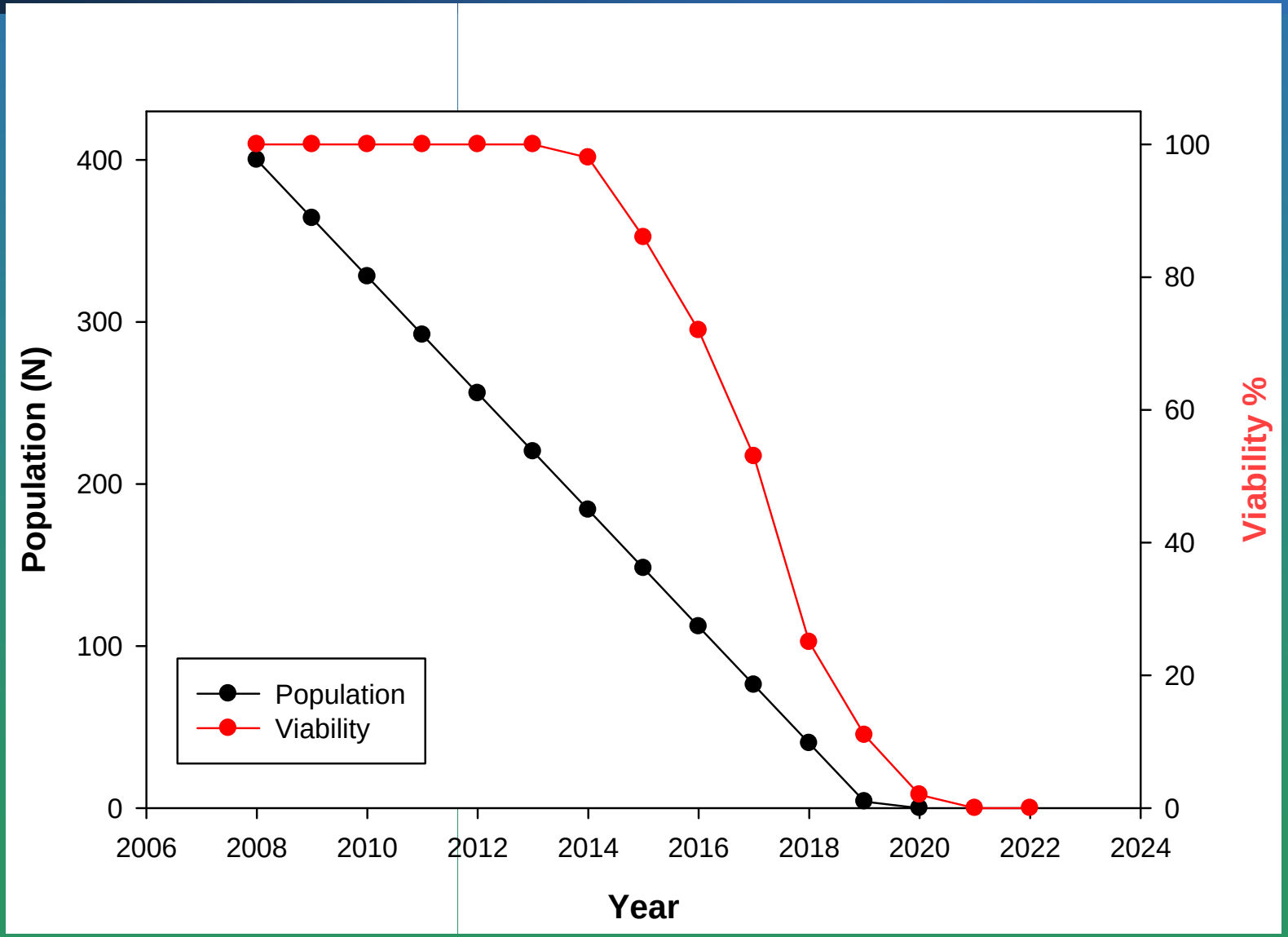
Green = preferred moose habitat

Total Joslyn Mine Hearing

- *Disappears from 1992 to 2008*
- *Yearly loss of 51 km^2 or 2.3%*

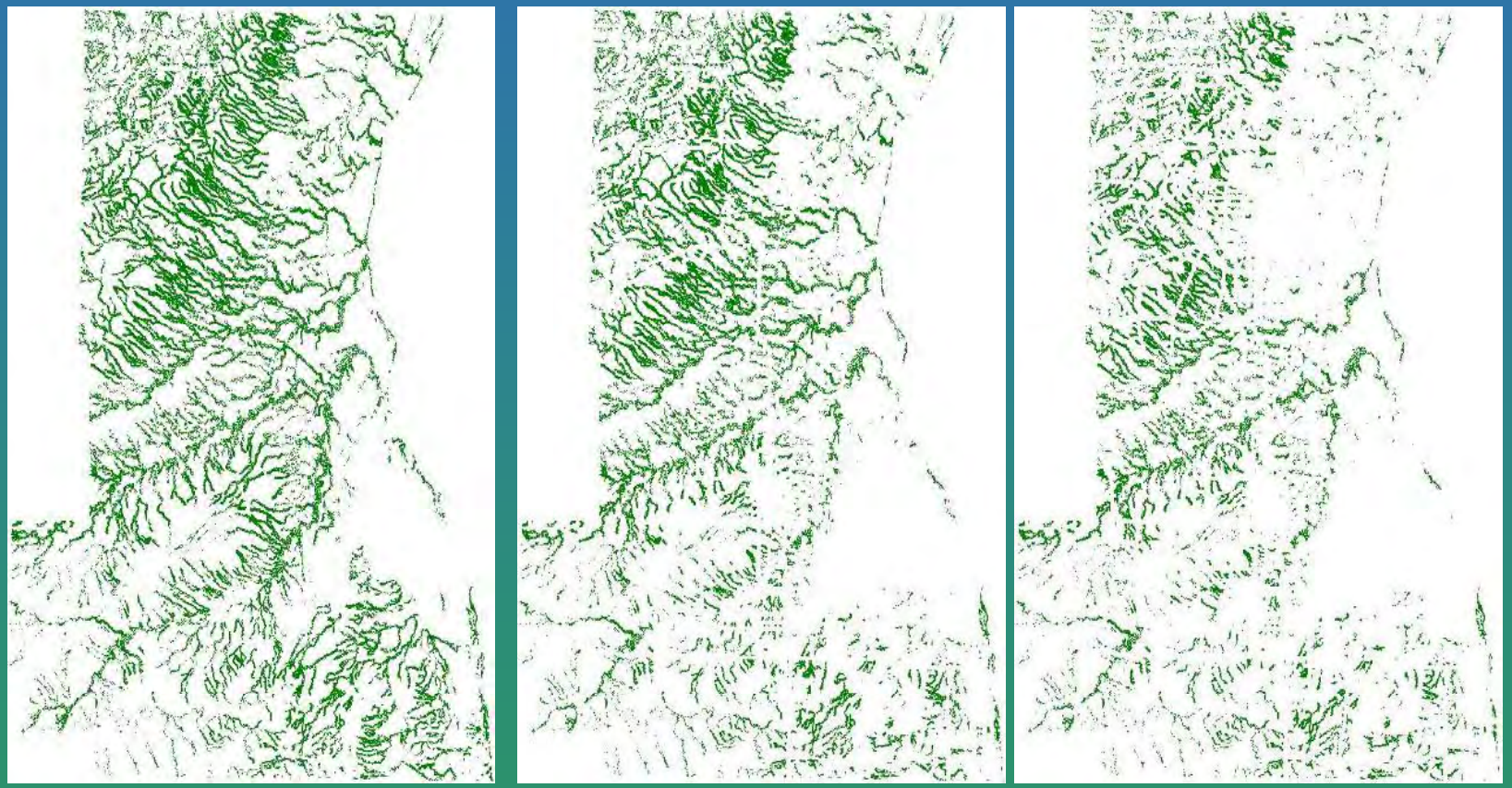
Moose Population Viability

Total Joslyn Mine Hearing



Key Finding: Beaver

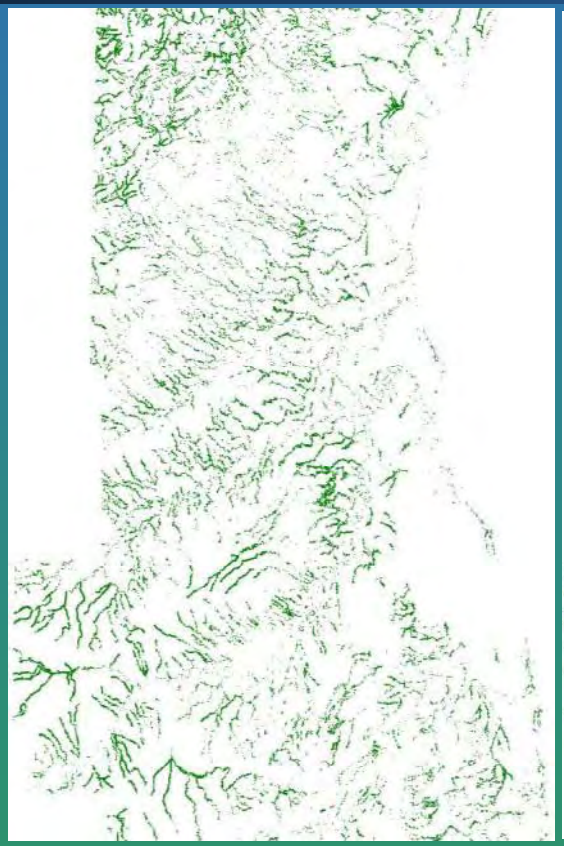
Total Joslyn Mine Hearing

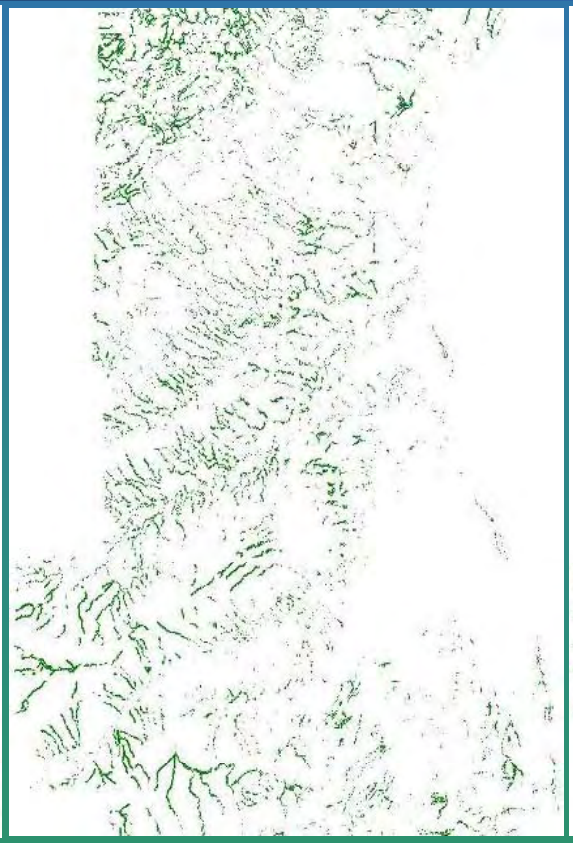


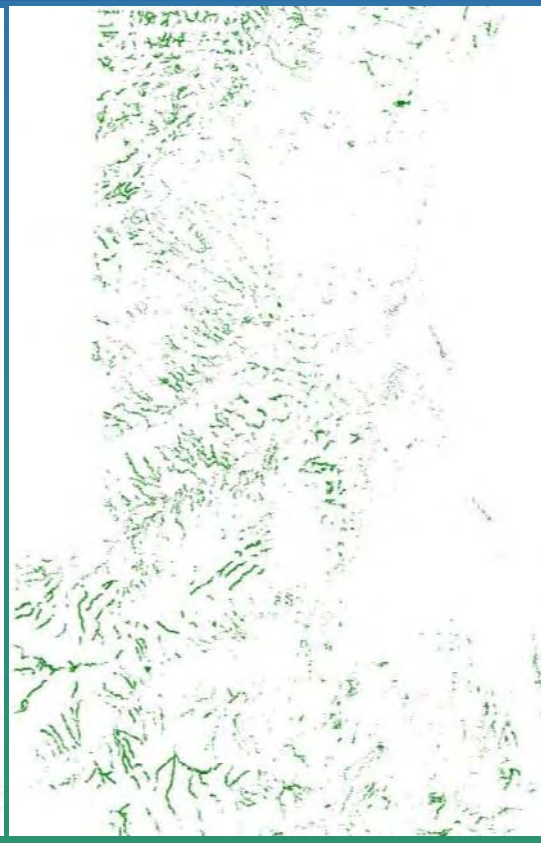
- *3.2 % of beaver habitat is lost per year*
- *There will be no habitat left by 2025*

Key Finding: Waterfowl

Total Joslyn Mine Hearing







- *2.8 % of waterfowl habitat is lost per year*
- *There will be no habitat left by 2029*

Key Finding: Re-establishing Traditional Resources

Total Joslyn Mine Hearing

Disturbed areas will not be reclaimed to pre-disturbance forest.

Reclamation to date has not been successful, despite claims of proponents (Johnson and Myinashi 2008).

Natural Forest Stands

Total Joslyn Mine Hearing

Most plant species establish within a few years after fire (Greene et al. 1999).

As stands age, # of plant species decreases (Chipman and Johnson 2002).

Thus, there is not a succession of plant species over time (Johnson and Miyanishi 2008).

Data on Reclamation in the Oil Sands

Total Joslyn Mine Hearing

- *Plant species that establish in first few years of reclamation dominate sites indefinitely.*
- *Reclaimed sites show no to very low similarity to natural sites.*
- *Reclaimed sites have very low diversity of species.*
- *Species present are often non-native invasive species.*

Data on Reclamation in the Oil Sands

Total Joslyn Mine Hearing

***Moose**: No sign recorded on reclaimed sites*

***Birds**: High parasite loads and poor body condition on wetlands with OSPW*

***Fish**: OSPW- impacts to health, i.e. hormone disruptions, organ abnormalities, disease*

***Amphibians**: OSPW- impacted wetlands will not support viable populations*

(OSPW: Oil Sands Project-affected Water)

Key Finding:
First Nation Participation in Decision Making

Total Joslyn Mine Hearing

The environmental assessment process does not involve any objective quantification of traditional resources.

The impacts on First Nations traditional resource use are not rigorously measured in any part of the assessment process.

Needed Role of First Nations in the IA Process

Total Joslyn Mine Hearing

***Scoping**: EIA design that alleviates potential impacts on traditional resources*

***EIA Phase:** targets and benchmarks for mitigation*

***Monitoring**: testable questions to assess effectiveness of mitigation measures (Burns and Wiersma 2004)*

First Nation Participation in Decision Making

Total Joslyn Mine Hearing

First Nations not explicitly involved in strategic decision making:

<u>Scoping</u>: EIA design does not include concerns and requirements by FNs

<u>EIA Phase:</u> targets and benchmarks for mitigation not developed for FN concerns

<u>Monitoring</u>: does not test effectiveness of mitigating impacts to FNs

Sample Approval Conditions:

Total Joslyn Mine Hearing

- *The approval holder shall re-establish a diversity of wildlife and fish habitats similar to those that existed prior to disturbance...*
- *The approval holder shall demonstrate, through monitoring, progress in achieving a diversity of wildlife and fish habitats…*
- *The approval holder shall document wildlife and fish habitat utilization on the reclaimed land by monitoring wildlife and fish species…*

Monitoring Reports

Total Joslyn Mine Hearing

To date, no monitoring report produced in the Oil Sands tests:

- ***Existing Approval conditions (sample above)***
- ***Re-establishment of traditional resources***
- ***Re-establishment of the use of traditional resources***

Total Joslyn Mine Hearing

MSES

MCFN TEK: Summary Report

Prepared for the Total Hearing

August 20, 2010

Mikisew Cree First Nation
Traditional Environmental Knowledge

Summary Report for the
Total Joslyn North Project Regulatory Hearing

Prepared for:

Mikisew Cree First Nation
Government & Industry Relations
208-9715 Main Street
Fort McMurray, AB
T9H 1T5

Prepared by:

Sherri Labour, MA
PO Box 325, 160 Mackenzie Avenue
Fort Chipewyan, AB
T0P 1B0

Table of Contents

Abbreviations.....ii

Introduction.....**Error! Bookmark not defined.**

TEK and Environmental Assessment..... 1

TEK and Resource Management..... 2

MCFN TEK Research Summary..... 4

Synenco Northern Lights Project..... 4

Total Hearing Informant Interviews..... 6

Analysis of Aboriginal Perspectives and the Significance of Environmental Effects..... 9

Treaty and/or Aboriginal Rights..... 10

Harvested Animals and Plant Species..... 11

Ecosystem..... 15

Water/Ice for Travel and Consumption..... 17

Economy..... 18

Social/Cultural..... 18

Other Community Health and Safety..... 20

Resources Consulted..... 22

Abbreviations

CEAA ..... Canadian Environmental Assessment Agency
EA..... environmental assessment
GIR ..... Government & Industry Relations
IRC.....Industry Relations Corporation
Joslyn Project.....Joslyn North Mine Project
MCFN.....Mikisew Cree First Nation
NLP.....Northern Lights Project
Synenco ..... Synenco Energy Inc.
TEK..... traditional environmental knowledge
Total.....Total E&P Joslyn Ltd.

Introduction

This report constitutes a summary of Mikisew Cree First Nation (MCFN) traditional environmental knowledge (TEK) prepared for the Total E&P Joslyn Ltd.'s (Total) Joslyn North Mine Project (Joslyn Project) hearing. TEK gathered during Synenco Energy Inc.'s (Synenco's) Northern Lights Project (NLP) study, as well as from a small number of focused informant interviews, is included (second section).

At the current time, the author is not aware of any models or social science research that meaningfully and thoroughly addresses the assessment of cumulative effects from an Aboriginal perspective. And yet, this is at the very heart of many Aboriginal communities' issues with development projects. MCFN Elders and harvesters *know* that their traditional lifeways and culture have been, and are continuing to be, *significantly* affected by the cumulative effects of development in and around their traditional lands. Their TEK tells them this. The challenge then, is, how can this reality be effectively communicated to decision-makers, resource managers and scientists?

The third section of this report provides a preliminary analysis of MCFN TEK using significance indicators developed for the Canadian Environmental Assessment Agency's (CEAA's) Research and Development Monograph series (Winds and Voices 2000). The main goal of this research was to explore ways of improving how significance could be better determined in "cases where Aboriginal interests and rights are involved" (Winds and Voices 2000: page 6). Research design was based on a literature review, case studies and interviews with "Aboriginal persons with direct experience and knowledge of federal EA [environmental assessment] processes" (Winds and Voices 2000: page 10). (Interviews had a very low response rate, which was attributed to lack of capacity.) The report includes sections on the importance of EA significance determinations to Aboriginal peoples, an interpretation and analysis of Aboriginal involvement in EAs, a suggested framework of "Aboriginal-based criteria" for determining impact significance, as well as a list of better practices (Winds and Voices 2000).

TEK and Environmental Assessment

The values and perspectives of Aboriginal peoples are frequently not reflected in current assessment, regulatory and project planning practices (Paci et al. 2002; Labour 2005a, 2005b; Plate et al. 2009). In previous intervention submissions and technical reviews, MCFN has stated their perspective on existing and ongoing impacts in their traditional lands, and the inadequacy of current scientific research, resource management and decision-making processes with regard to the protection of their traditional lifeways and lands (Carver 2010; Chandler 2010; MCFN 2006a, 2006b).

TEK evaluates effects from a holistic perspective in the sense that it not only considers individual species, but also the role and value of that species in the social and cultural aspects of the community. While an effect may not be significant to an ecological community, or a 'valued ecosystem component' from western science's perspective, it may ultimately have important implications for community use and organization. TEK views on risk and environmental sustainability may also disagree with western science's predictions (British Columbia First Nations Environmental Assessment Working Group 2000, Paci et al. 2002). As such, TEK and western science assessments of significance often differ.

In this context, a 'significant' impact would be indicated by a loss of the ability to practice traditional activities, or to access certain portions of traditional lands. This level of impact suggests that there will be a significant loss of individual well-being (as part of a viable cultural entity), as well as community well-being (cultural continuance). A 'significant' impact may also result from the loss of a particularly important or sensitive environmental component, traditional use pattern or community social interaction (e.g., traditional food harvesting for Elders).

A 'moderate' impact could be defined as project effects hindering the capacity for cultural continuation by the loss of basic traditional elements, making it difficult to maintain holism in complete cultural and traditional continuity. A 'low' impact might be defined as a project effect that results in a minor loss of a harvested species, or short-term effects to a small portion of a harvest area (Labour et al. 2005b).

All of these terms need to be defined from the Aboriginal community's perspective for any assessment to be accurate or appropriate. Even commonly accepted terms used in EAs, such as 'long-term' or 'moderate' (either in magnitude or confidence) (Hegmann et al. 1999), may not have the same meaning from a TEK point-of-view. For example, during one environmental assessment in the Athabasca oil sands, discipline leads for vegetation found that less than two percent of the study area would be affected. This disturbance was determined to be not significant in the EA. Aboriginal participants in the traditional land use work disagreed with this conclusion, stating that this disturbance was indeed significant (D. Bush, pers. comm., 2002).

TEK and Resource Management

While the cultural paradigms of TEK and western science differ, many researchers have 'discovered' how valuable TEK can be in understanding complex environmental processes and in assessing environmental change (Berkes 1988, 1999; Menzies 2006; Usher 2000, 2001). This has resulted in a relatively new (~30 years) field of research in which the potential uses and applications of TEK to resource management are being explored, developed and applied.

Traditional knowledge is different from western science, not only in its content, but also in the way that it is gained. The main difference is the inseparability of culture and the natural world in traditional knowledge. In modern resource management, these differences are starting to be mediated by approaches that stress the precautionary principle, or that adopt adaptive, integrative or co-management strategies. In the context of EAs, this implies a shift from the consideration or prediction of impacts to an examination of the "kind of assessment and management research that can be undertaken" (Berkes 1988: page 201, Labour et al. 2005b).

Transmitted through oral history and stories, TEK is knowledge that is both "lived" and alive (Berkes 1999: page 27). Elders preserve the "corporate memory" of a community (Berkes 1999: page 95), and pass on TEK and other types of traditional knowledge through their teachings. Holders of TEK are trained scientists; the observational techniques passed down to them through the generations enable them to take 'measure' of environmental conditions and changes in their traditional use areas. As explained by one MCFN Elder, "I used to travel with my grandfather who had advised me to observe and take notice of changes in nature. Since then I have noticed some changes. I am truly convinced that he was right, and since then I have noticed many things (MC02*)."[1] Thus, the "management authority" of Aboriginal Peoples is "to a significant degree, based on reliable intergenerational knowledge of the environment" (Paci et al. 2002: page 117).

Resource management and sustainability have literal and immediate implications for survival in a TEK context. A former MCFN Chief and Elder explains one aspect of this approach to environmental management in the following way, "We don't just demolish everything. We always make sure we get seeds for the following year. You don't try to exterminate everything that's out there that moves." Research dating back to the late 1990s reveals that Aboriginal Peoples in the Athabasca oil sands were already recommending that project development be slowed down so that cumulative effects could be adequately addressed (TP Management Services 1998). MCFN is continuing to seek protection of their traditional lands and lifeways from cumulative effects, as the "water of that Athabasca River and delta plays a central role in defining the way of life, livelihood, and cultural identity of the … Mikisew Cree peoples" (Chandler 2010: page 6).

[1] Participant codes have been used to protect the identity of individual MCFN informants. An asterisk after a code denotes that the interview was conducted in Cree.

MCFN TEK Research Summary

The following section provides a summary of MCFN TEK collected for Synenco's NLP application for approval (Turuk and Labour 2007), as well as from four informant interviews conducted with MCFN Elders and harvesters regarding Total's Joslyn Project. The information provided focuses on the cumulative effects and environmental change that MCFN TEK links to oil and gas development.

Synenco Northern Lights Project

In 2006, MCFN Elders and community members were involved in TEK research regarding Synenco's proposed development in their traditional territory. MCFN Industry Relations Corporation (IRC, now GIR) representatives were approached by study facilitators to determine how best to proceed with the work. Facilitators were introduced to MCFN's TEK Committee, and meetings were held with them to review and discuss study approach and goals. A workplan and budget was then drafted and submitted to the proponent and the IRC Director for approval.

The study itself involved interviews with 24 MCFN members in Fort McMurray and Fort Chipewyan. Most participants were male Elders, though several females and a couple of younger, active harvesters were also interviewed. Two community members were hired to lead and interpret the interviews – Ms. Rita Marten and Ms. Stella Marten. MCFN members who shared their TEK for the Synenco project, in alphabetical order, are:

- Elder Harvey Antoine
- Elder John James Antoine
- Elder Andrew Castor
- Elder Alec Courtorielle
- Elder Ernie Courtorielle
- Elder Johnny Courtorielle
- Mr. Steve Courtorielle
- Elder Madeline Gladue
- Elder Majorie Glanfield
- Elder Joe Kaskamin
- Elder Jack Marten
- Ms. Jocelyn Martin
- Elder Reggie McKay
- Elder Sidney McKay
- Elder John Tuccaro
- Elder Fred Vermillion
- Elder Lawrence Vermillion
- Elder George Wanderingspirit
- Elder Francis Waquan
- Elder Archie Waquan
- Elder George Waquan
- Elder Mary Rose Waquan

- Elder George Martin
- Elder Alec Whiteknife

In 2006, MCFN work on their use and occupancy was ongoing. Thus, it was not possible to make use of this information for the NLP application. Interviews were therefore designed solely to collect participants' TEK, with a focus on their knowledge of past and ongoing environmental changes taking place in their traditionally used areas. Questions specifically addressed MCFN TEK regarding potential effects to and changes in the various environmental components comprising a typical EA, such as:

- Water quality and quantity
- Air emissions
- Wildlife, vegetation, fish (or aquatic ecology)
- Soils and reclamation
- Socio-economic conditions and opportunities
- Noise
- Land and resource use (e.g., access management)
- Human health

Participants drew a picture of environmental conditions in their traditional lands, comparing them to the changes that they have experienced in their lifetimes. They described how development has introduced widespread effects; effects that have been long-term and synergistic. How impacts to water and air quality are affecting not only the air and water, but also the animals that live there, and the humans that survive on them. "The overarching theme that emerged from Elders is that industry use of their traditional lands is affecting not only the environment, but also the lifeways, culture, health and future of Mikisew members (Turuk and Labour 2007: page 7).

Changes to water quality and quantity surfaced as the single largest environmental effect in Mikisew traditional lands. Almost every participant spoke of low water levels, with half of respondents describing impacts to travel along traditionally used waterways. The Bennett Dam was recognized as having the single largest impact on water levels to date. Water withdrawals from and pollution in the Athabasca River in the last 35 years have added to these impacts on water quality and quantity.

Seventy per cent of MCFN members interviewed provided details on impacts to water quality; 58 per cent of participants link these changes to upstream oil and gas developments. Water in Lake Athabasca not affected by the outflow of the Athabasca River, at Sandy Point for example,

is clear and clean, unlike water from the river or lake water that is affected by the river outflow, which is described as 'brown' and 'muddy looking'. Participants reported the following types of problems regarding water quality:

- Polluted (46%)
- No longer safe to drink (41%) - have to carry drinking water
- Discoloured and brown water (29%)
- Cause of health issues in Fort Chipewyan (20%)

All participants involved in the study linked effects to air quality in the region with oil and gas development to the south. The following effects to air quality were described:

- Changes to water and/or snow quality
- Impacts to people's health
- Effects to plant and animal health (20%)
- Bad odours; sulfur or oil-like (37%)

Participants link observed health problems in harvested animals with oil and gas development (20%). A decline in fish populations (33%), changes in spawning (20%) and diseased and/or deformed fish have also been observed since the 1960s and 1970s. The taste of wild foods has also changed; fish (20%), animals (20%) and plants (12%) were all described as not being as enjoyable as they had been 30 to 40 years prior. A number of participants explained that they no longer eat certain foods due to pollution (MC13, MC18), and many have had to change where they harvest them (MC14). Participants shared that the effectiveness of traditional medicines has declined. A third of interview participants (33%) report that the observed changes in medicines is due to air and water pollution.

The community of Fort Chipewyan has experienced increasing incidences of disease and death in the last 30 to 40 years. Diseases such as cancer and diabetes were previously unheard of in the community; people died of oil age or tuberculosis. Oil and gas development upstream is seen as a major contributor (41%) to the air and water pollution that participants link to increased cancer rates and deaths (58%).

Total Hearing Informant Interviews

A number of focused informant interviews were carried out in preparation for the Total hearing for the Joslyn Project. One of the selection criteria for informants was their knowledge and experience of the area around the Joslyn Project lease, and included both historic and recent

(within 10 years) use and occupancy experience. Informants were asked to discuss the effects that they are experiencing to their traditional way of life, and the environmental changes they observe as being specifically related to oil and gas development upstream. Questions drew upon previous research for Synenco's NLP, where MCFN TEK revealed major impacts to water quality and quantity; air quality; human, plant and animal health; as well as to travel and access. Interviews were limited to four informants, due to the limitations of time and interviewee availability. Ms. Jocelyn Marten organized the interviews and helped facilitate discussions. In alphabetical order, informants who participated in TEK interviews for the Total Hearing include:

- Elder Willie Courtorielle
- Elder Mary Rose McKay
- Mr. Stanley Shortman
- Mr. Billy Whiteknife

Interview notes compiled from informant interviews conducted in preparation for the Total Hearing affirm the TEK findings provided by participants of the Synenco study.[2] Informants reiterated that MCFN members are experiencing significant impacts to their traditional lifeways and practices. Existing cumulative effects were described as preventing the meaningful use of traditional areas, and of conducting traditional practices. In the past, people could simply 'dip a cup in the water' if they needed a drink. Now they must calculate how much water they need for the amount of time they wish to spend in the bush, or plan extra travel to visit a creek that is known to be 'clean' (all informants). Elders wonder how their grandchildren "will survive" (MC25*). Parents wanting to take their adult children out on the land cannot, in some cases, access the areas where these same children 'grew up' (MC28).

The small sample size of interviews does not permit adequate appraisal, but some of the TEK provided appears to report that environmental change is accelerating and/or becoming more apparent in recent years. MC26 travels the Athabasca River regularly and describes how the movement of sandbars in the river has become more dynamic, making it even more difficult to predict where the river channel will be. A mud flat of the mouth of the Embarras River has also made an appearance in the last few years; people are getting stuck at the mouth of this river 'for hours' (MC26). MC28 used to make dry fish and sell it as part of his annual income. This year he was not able, in three months, to catch enough fish 'make a living' (MC28). It was explained that another MCFN member, who also net fishes the Quatre Fourches to feed his six dogs, has had to 'come to town to buy dog food' (MC28, J. Marten). In the last couple of years, MCFN members have also seen eagles and pelicans, who feed on fish, dying from no apparent cause (MC28, J. Marten). Some species, such as garter snakes, seem to be disappearing, whereas

[2] Information presented in this section was prepared from interview notes taken by the researcher. Timelines for this report did not permit the preparation of full interview transcripts. Results must therefore be considered 'preliminary'.

species not present in the region before are appearing (MC28). Some animals, like muskrat, are much smaller than formerly (MC26). Bear are behaving strangely and are becoming more aggressive (MC28).

Animals are being scared away by all the industrial activity. At one time, a traveler on the Athabasca River could expect to see at least two dozen animals, of several different species. Now, it is rare to even see one moose when traveling from Fort McKay to Fort Chipewyan (MC26). Some people will not take moose south of the Firebag, as the meat from animals upstream does not taste 'right' (MC26). River travelers have to 'scrub' the dirt off their boats from a single trip up the Athabasca. MC26 reports that his father's cabin, which was formerly located on the riverbank near the 27th baseline, is now some two kilometers from shore.

Exclusion from smaller creeks and sloughs (in addition to barriers to smaller tributaries to major river channels (Chandler 2010)) is leading to concentrated hunting effort in the larger channels of the river (MC28). It is expected that this will further contribute to the difficulty in obtaining traditional foods. Harvested species might be present, but hunters cannot access their traditional hunting areas (MC27). In addition, habitat is changing so much, animals and fish are no longer located in expected areas. They are moving around, making it much more difficult to ensure hunting success (MC26, MC27, MC28).

Like many of the participants from the Synenco study, all informants described how former water sources are no longer 'safe to drink'. When asked to describe the cumulative effects of development to his traditional use, MC28 stated, '[They've] done too much damage already. It's kaput.' In response to the same question, MC25* said, 'There is nothing left. No animals. No fish,' adding later in the interview, 'How will my grandchildren survive (MC25*)?'

Analysis of Aboriginal Perspectives and the Significance of Environmental Effects

A report prepared for CEAA's Research and Development Program has suggested "significance impact indicators" that may be used to consider the significance of environmental effects to Aboriginal peoples (Winds and Voices 2000). In applying this framework to MCFN TEK, it quickly became apparent that there are concerns raised by MCFN TEK that are not covered in the framework, cumulative effects being just one of these. In order to adequately assess cumulative effects and their significance to MCFN's use and practices, it would be necessary to develop a community-defined framework that includes indicators and significance criteria that culturally-appropriate to MCFN.

The report outlines three factors contributing to Aboriginal communities concerns regarding environmental effects (Winds and Voices 2000: page 22):

- lower tolerance to environmental effects due close ties to and reliance on land-based activities
- social, economic and cultural identity derived from relationship with the land
- constitutionally protected Treaty and Aboriginal rights

The report also concludes that "any impact to the land and environment that threatens or endangers future generations of people or other species is significant" from an Aboriginal perspective (Winds and Voices 2000: page 19). It identifies seven criteria categories relevant to evaluating the significance of impacts to Aboriginal Peoples:

- Treaty and/or Aboriginal Rights
- Harvested Animals and Plant Species
- Ecosystem
- Water/Ice for Travel and Consumption
- Economy
- Social/Cultural
- Other Community Health and Safety

Tables containing MCFN TEK relevant to these seven categories, along with the related significance impact indicator, are presented below. Direct quotes from MCFN members are provided where available. In the case where information was taken from an informant interview (as opposed to a Synenco NLP transcript), a summary note has been added. All information is referenced with a participant code (e.g., MC01, MC02, etc.). Where Cree was used in an interview, and interpretation and/or translation was required, an asterisk has been added to the participant code.

An effort was made to limit quotes to two or three per impact indicator. This was not always possible, especially in the case of the Harvested Animals and Plant Species category for descriptions of declining food quality, where MCFN TEK covered impacts to numerous species. An additional indicator was added to the final category of Other Community Health and Safety, as MCFN TEK regarding morbidity and mortality in their community did not seem to be covered elsewhere. It is hoped that the TEK shared by MCFN members is self-explanatory and stands on its own merit.

Treaty and/or Aboriginal Rights

Significance Impact Indicators	MCFN IK
Limitations or restrictions on access	• MC14* – "People have difficulty traveling to Fort McMurray. The oil companies draw too much water today. Long ago the big boats traveled and traveling was good. Today now, they cannot go anywhere. People never had problem boating long ago." • MC17 – "A lot of people used to travel along the river and the creeks. You could go on these creeks traveling inland a lot of places, but now these creeks, the water is so low you can't use them creeks anymore for getting to where the Elders used to go trapping in the spring." • MC20 – "...go back let's say 15 years…about 1991…we can go on a boat…and we can go to pretty well any shore in the Delta. … Now forget it, you couldn't do it."
Limitations or restrictions on harvesting rights	• MC11 – 'Where can you go and trap?'' … "Not only that, you can't hunt no more. You can't get out of Fort Chip. No water. You can't fish, there's no water."
Exclusion or prevention of MCFN from managing or protecting lands and/or resources within traditional territories	• MC11 – "Nothing will ever change. They'll go ahead and do that. Doesn't matter how many people talk."

	• MC11 – "That's why people…they don't know what to say, what to think. They see all the world is getting ruined and wrecked, but nothing's happening. Government will never help people." • MC12* – "The Alberta government is responsible for selling off our water. If they rationed it…just let small portions of it go, or monitor it proper, we wouldn't have had this problem today." • MC16 – "One lesson that I would want to send to whoever is going to listen to this tape in the future generations to come – we all have a responsibility to this land. Nobody owns the land…we're just keepers of this land. … I think industry needs to really seriously look at how they can work with First Nations…to try to better manage the lands, along with the province and Canada."
Infringement to the Aboriginal right where activities impose undue hardship on holder of the right, denies the holder the right of their preferred means of exercising the right, and unreasonably limits Aboriginal or Treaty rights	• MC03 – "…the young generation will be faced with hardship because of our land being polluted. It is going to be very hard for the people of the future." • MC07 – "….what they say progress, we pay. One way or another, we pay for it." • MC16 – "You know, first of all, we were forced out of our land, our way of life, basically that was taken away from us. Nothing in return has given us an equal opportunity to be able to survive. It's a good thing that the Mikisew people, the Dene people, the Métis people in this community are survivors." • MC20 – "…they say that when you take away land from somebody, then that person's nothing. That's true. And I think that's what they're doing to us."

Harvested Animals and Plant Species

Significance Impact Indicators	MCFN IK
Decline in diversity of species and/or decline in relative numbers of individual species	• MC05* –"I see the pipes, the stacks, the smoke never quits coming out. It goes out all the time. You always see it in the air and wherever the wind blows, that's where that smoke goes to,

	wherever. And then it drops and it affects the animals. We used to see a lot of animals. There used to be a lot of foxes, there was a lot of martens, there was a lot of lynx. Today, you don't see them. To me, the way I see it, I think the air has killed off those animals, has polluted the animals." • MC07 – "It's already done…. Closing the door after the horse is gone." [Statement in reference to monitoring of animals.] • MC10* – "Before the oil companies started, long ago, we used to see all kinds of living things. There were many ducks on the rivers all summer long. Since the oil companies started mining, these animals and birds started leaving the area." • MC15 – "…a lot of this stuff that flies around with the wind you now, the burned stuff and all that stuff, if it lands into a lake or a river that's got fish, it will eventually kill a lot of the fish there. The other part is, a lot of stuff like rabbits or even moose…, all these animals that eats willows and stuff like that food, they get affected by that too." • MC19 – "…you could see Birch Mountain from where we would stay. … When the geese used to fly up, the waveys and stuff, you weren't able to see Birch Mountain. All you could see was white and black. And that's all these waveys…coming in springtime, they were landing there to feed, and I haven't seen that since I was about seven [early 1970s]."
Adverse change in the availability and/or access to species due to change in migration patterns; change in species behavior; change in water and land travel routes	• MC07 – "I think they're [fish] also moving wherever they can spawn. I think their spawning areas are moving or they're moving their spawning areas." • MC14 – "Today now the only place for people to hunt is in the two main rivers, Athabasca and Quatre Fourches, which runs into the Peace. It is pretty sad we cannot go to hunt in our traditional hunting areas. Sometimes we have to walk and push our boats because it is too shallow." • MC16 – "…in the springtime we looked forward to ducks because there were a lot of birds coming through the Delta…the flyway has changed. It's more to the west. I can only guess

	it's because of the air quality, the smoke that comes out from the stacks that kind of forces them to fly different directions, different directions, away from the smell."
Decline in opportunities for harvesters to pursue activities – restricted access	• MC16 – "Maybe you'd be lucky to find it [rat root] somewhere in a slough where it's floating, where it's constantly in the water…it's hard to get to those areas." • MC15 – "I remember one year they were fishing inside Richardson Lake and they were catching [fish]…a thousand pounds. Now, on account of the low water, now you can't even go with a boat and motor into the lake now. …when the water is high, Athabasca [river] fills this lake up." • MC26 – Can no longer access fall hunting areas in Birch River
Decline in food qualities and/or safety due to contaminants or changes in texture, colour, taste, appearance	***Fish*** • MC03 – "Like we used to boil whitefish or cook them in the fire. Now you boil whitefish it turns to like, flour like. …jackfish too, a lot of difference." • MC06* - "I noticed the fish does not taste the same. I prefer fish from the inland lakes…are fat too, but the fish from the lake [Athabasca] does not taste the same. … I think pollution has a lot to do with the taste of fish." • MC16 – "I went ice fishing in March along the Athabasca River…where the Richardson River…runs into the Athabasca. … I caught 30 fish, 30 pickerel…. And there was two fish there that I noticed that were different from all the others. One of them was a pretty big, adult pickerel, but it was kind of orangey-yellow all over; its scales on the back and also on the stomach, all around. It looked weird. But because he was big I thought he was okay, so I kept it. Then the other weird-looking fish that I caught…the other one was a young pickerel, maybe three pounds. It had warts along the side…on the ribs, and it had a bunch of warts there, probably at least six warts altogether. So I knew there was something wrong with that one for sure. … I thought I'd clean that big one, the orange one…. But as soon as I got it open it was all bloody inside, the guts were bloody. So I closed it up right away and I threw it away…. And I sterilized my knife again too, before I

	kept on going with the others." • MC19 – "The fish are…more watery. … When you gut fish, sometimes you see that there's some yellow in the livers, where you've never seen that before. Or maybe there's pus in the gut or something, it's not proper. …sometimes we get fish that, something's growing out around that…I didn't see before."
	Moose • MC01 – "…there's little white spots, it's like jelly you know, inside the moose, all around the intestine. … Rabbit, same thing. …since the plant started. … The birds, same thing. The liver, that's the one in the birds... We used to take the liver and put it on an open fire and cook it, you know. It was nice. And now it doesn't look good, you don't want to eat it." • MC04 – "…I don't know if it's sickness or what, but I killed a moose in Birch River…year before…it's a cow moose that I killed and I skinned that cow moose and it's full of pus inside. The lungs were just full of pus…. I never seen that before…. We didn't eat that." • MC07 – "I notice in the moose, the last couple of years the moose that were killed, the meat has little spots like…not exactly like pus, but jelly-like you know, inside, in the meat itself. I never noticed that before." • MC11 – "You can't even eat moose meat now…that's part of [the] oil companies' pollution."
	Furbearers • MC03 – "…even the muskrat tastes different too. …they kind of taste like oil eh." • MC23 – Before, when the water was not polluted, beaver and muskrat had "good and white fat"; now it is "yellowish"
	Birds • MC02* - "…whenever you kill chickens [grouse], ptarmigans and take them home and thaw them out, you see little bugs crawling…. It was never like that in the past."
	Plants/Berries • MC02* - "The pollution goes whichever way the wind blows, and when it rains it brings the pollution to the ground. If you were to pick

	ground berries today and eat them, they taste different and funny and almost like burning your lips." • MC02* - "…the Saskatoon berries are already damaged and another type of herb that grows along the shore. They were white little berries that tasted good. Those have not grown in the past three years." • MC13 – Wild mint "doesn't taste as good as it used to and it doesn't smell as good as it used to. … almost like oil, motor oil." • MC13 – "I notice one thing different nowadays, you pick cranberries, especially this fall [2006], the berries were falling off very easily, off the plants. They don't hang on very long and they get soft and they kind of dry up. They also have…the red cranberry has black spots on it." • MC17 – "There's been a lot of changes, even for berries. There must be some kind of pollution." • MC18 – "I noticed the bulrushes do not grow anymore. I used to eat them before, long ago and now I cannot because the water is polluted."

Ecosystem

Significance Impact Indicators	MCFN IK
Habitat loss, damage	• MC20 – "…low water…one thing I can blame is the oil sands, cause they're taking so much water out. I don't think the Alberta government even knows how much water is actually taken out of that river system. The whole watershed." • MC23 – "…bulrushes…those things, they grow in the lake, and in the sloughs, but now you see them all over in the river….straw, like grass,…and there in the river, and it never happened before. Never. And those things, they grow in the lake."
Encroachment or disturbance of high biodiversity areas (e.g., wetlands, marshes)	• MC15 – "Muskeg is just like a foam, you see. It holds water in there, it's always damp. So if you take muskeg out, you're drying that whole piece of land and there's nothing – even if it

	rains or things like that – there's no foam there to hold that water. You take that foam out and there's dirt in there and sand and even when it rains, the rain will go right through and it'll just get lost. You don't get nothing out of it." • MC20 – "…once you start removing some of those fens and bog lands, you damage the amount of water that's actually going into the river system. And that's being done as we speak. There's more, every time you have an open pit… … See, one thing is about the muskeg and fens, that takes a thousand years for that to be there."
Disturbance of critical habitat (e.g., calving grounds, spawning areas)	• MC17 – "…the water is the main for the fish. They gotta have a lot of water where they're going to spawn, where they go to. And most of these places are drying up, where they used to spawn." [In response to question regarding water levels on Lake Athabasca.] • MC20 – "…one thing that Alberta Environment hasn't done…it's the studies underneath the ice. … You don't know what sort of habitat that you're destroying."
Disruption of food webs	• MC15 – "A lot of these plants grow in the water, you see, like rat root and pineapple and that, they grow along the water. They take all that out, then they destroy the whole thing. They'll never put that back again. It's the same with plants, wildlife and everything, muskrats, beavers, they live on the water. I guess a lot of places keep rabbits, chickens, all that stuff, now they eat roots too. Well, once they destroy all that, they're all gone."
Obstruction of travel routes or unsafe travel conditions	• MC14* - "Water is very low because the oil companies use all the water from the Athabasca River. The silt settles in the mouth of every [little] delta. That is what causes it to become shallow and people have difficult time to travel." • MC18 – "High water, you take short cuts, long ago. Now you gotta follow the river [Athabasca], and you hit sand bars." • MC20 – [Commenting that it would nice to have a river marking system on the Athabasca River] "…so that people can drive comfortably, without hitting the sandbars, and wrecking their motors. …but that's our highway, and

	people use it all the time."

Water/Ice for Travel and Consumption

Significance Impact Indicators	MCFN IK
Reduced or increased water flow impacts on ice formation or degradation, timing; travel; access to shorelines; wildlife and fish; water quality	• MC02* – "Two years ago I set conibear traps at Ryan Lake for beavers. I caught two beavers and when I lifted the traps the steel was all black. The water must be strong and affected the traps." • MC03 – "When winter comes, the ice used to be thick. Nowadays…even the ice changed a lot, from the water and the pollution that's coming down from the oil sands there." • MC03 – "If there's no water, there's no life." • MC14* – "Water is boss!" • MC28 – Father's cabin formerly on shoreline - now two kilometers away
Reduced water quality for potable purposes	• MC04 – "Now I have to carry water whenever I go out you know…. Ever since the oil companies started." • MC16 – "The quality of water, the differences in the last few years I think was probably already there in the 70s. I remember [we] were living in Embarras and taking water from the Athabasca River…and making tea or something, you'd notice there would be a light film of dark…it looked almost like oil in the water and the tea would be black and it would always leave a stain on your cup. … That was when it was just Suncor [known as GCOS back then]…and then slowly it got worse when Syncrude opened and started operating." • MC18 – "And the water, it's no good now. It's all polluted…."
Reduced water quality due to introduction of contaminants, sediment or debris	• MC04 – "About 1949 when I started trapping, it was a really good life, lots of animals, lots of everything…. Then the people that lived out there, boy, they had good lives. The water was clean, you could drink Athabasca River water, it was so clean. Then…ever since the plant started…that's when it started, that water

	pollution." • MC11 – "You drink water in Fort Chip, you might as well drink sewer water right from Fort McMurray there. Because that Lake Athabasca is just like a basin. All the pollution goes into there…." • MC15 – "With all this garbage coming down the Athabasca, and the Bennett Dam on the Peace River, the water's not as clear as it used to be. It's muddy looking." • MC22* – "Long ago there was no oil activity and the water was clean, but since the oil plants started, they are polluting the river."

Economy

Significance Impact Indicators	MCFN IK
Present or future loss of income and/or income-in-kind from wildlife harvesting	• MC28 – Can no longer make a living from fishing and selling dry fish • MC28 – Children have to take wage employment now; no other choice
Removal of adults and especially harvesters to work in remote project sites	• MC20 – [Commenting on proposed Synenco fly-in, fly-out program] "…we can have the best of both worlds. Staying here, and working out there."

Social/Cultural

Significance Impact Indicators	MCFN IK
Reduction and/or quality of recreational opportunities or amenities *MCFN TEK regarding significance and importance of traditional way of life and culture also presented here*	• MC04 – "…out there…was a really, really good life. People were not rich with money, but rich with food, and everything was there." • MC14* - "…his biggest… concern is, 'I don't want to lose my way of life, my land. I don't want to not be able to go out there and enjoy my life.' The serenity, the beautiful way of life that he is so connected to. Because everybody is connected to the land and our cultural traditional way of life is very, very important. And if he doesn't talk about it now, who else is.

	And that is what he really wants. …. 'My father had instilled our traditional way of life, so that is number one in our family.' And he being the oldest, is the one who is kind of speaking for that and I thank him [as his younger sister] for that." • MC24 – "…they took our heritage away from us. My family's."
Negative impact on language, spiritual teachings, knowledge transfer	• MC16 – "The government has to…look at the state we're in right now. We're at the point of no return where we can't get it back to where it was or is there an opportunity to do something about it. Having a joint effort with the community by way of using the community's knowledge, how we can best achieve that. …there's far too much damage been done already. But for the purpose of people to get out on the land, for our future generations to get out on the land to somewhat enjoy what we have…." • MC17 – "…mostly Elders now. The young people, no. They try and teach them…but there's a lot of them don't bother. And it's so hard for everything now, that's the reason for it." • MC28 – Cannot access areas where children grew up, or visit these areas with them
Decreased quality and quantity of herbs and medicines	• MC03 – "Like our roots and stuff from the ground [medicines]. … They're hard to find now. They're hard to find. … That Syncrude smoke there, that's what's polluting everything. And the water too." • MC04 – "I'll tell you a story about my grandfather. He used to have a medicine bag yeah, traditional medicine. He used to go out there and pick up the root and you know…and he cured lots of people with the traditional medicine. But today now, I don't want to trust to pick anything up from the ground anymore. I'm not a medicine man or anything, but then if my grandfather was alive he would tell you more." • MC16 – "…we haven't had the quality of rat root that we used to. … It's the same with the willows we use…. Last few years I notice the fungus isn't like it was…."

Other Community Health and Safety

Significance Impact Indicators	MCFN IK
Decline in air quality	• MC16 – "I call it acid rain, whatever it is, that settles into sloughs and plants. Our animals eat those plants…. Even when I mention the [changes in the] fish…definitely it has to do with whatever comes out of those stacks. … We get a lot of times the south winds that blow for two or three days at a time." • MC21 – "Like when it rains heavily, there's a yellow scum on the water that, I don't know if that has something to do with acid rain or whatever…. Around the edges of the puddles you see it, after a rain."
Community health issues not listed in Winds and Voices (2000) significance criteria, but brought forward by MCFN participants as significant to them	• MC03 – "My grandfather prophesied that the people would some die of sickness and I see that happening today." • MC07 – "There's something coming through that's not being caught. Because all the cancer rates in Chip. We've said that before and we'll keep saying it you know. There's got to be something wrong somewhere. There's lots of monitoring being done, but they're still… missing something. Whether it's in the air, the water, or the food that we eat." • MC08 – "Long ago people were healthy and lived off the land and lived to a ripe old age. … I think it has to do with the pollution and the air emissions that is causing people getting sick and dying." • MC09 – "You never seen no people…people weren't dying off in Fort Chip as fast as they're dying off now. The death rate has gone pretty wild here in Chip. So like I said, I blame too much crap in the water nowadays." • MC12* - "And when he was younger, 75 years ago…he never heard of people being diabetic or [having] cancer. Now, he says, cancer seems so prominent here in Fort Chip, so many people have cancer and people are diabetics…. So that's what's happening today, most people in the community have illness, not like long ago." • MC15 – "Nowadays, especially the last ten

years now, people are just going steady. And most of them died of cancer, you know, some sickness that we never heard of before. … The only thing I could think of about it is that these deaths was the water and air."

Resources Consulted

Berkes, F. 1988. "The Intrinsic Difficulty of Predicting Impacts: Lessons from the James Bay Hydro Project." Environmental Impact Assessment Review: Vol. 8, 201-220.

Berkes, F. 1999. Sacred Ecology: Traditional Ecological Knowledge and Resource Management. Taylor & Francis. Philadelphia, PA.

British Columbia First Nation Environmental Assessment Working Group. 2000. Workshop Report for the CEAA Five-Year Review. March 7th, 2000. Prepared by Praxis Pacific and submitted to the Canadian Environmental Assessment Agency. March 28th, 2000. Vancouver, BC. (Available at: http://www.acee.gc.ca.)

Bush, D. 2002. Personal Communication. Senior Vegetation Ecologist, AXYS Environmental Consulting Ltd. Calgary, AB.

Carver, M. 2010. Review of the Phase Two Framework Committee Non-Consensus Recommendation for the Lower Athabasca River. Draft Report prepared for Athabasca Chipewyan First Nation Industry Relations Corporation and Mikisew Cree First Nation Government and Industry Relations by Aqua Environmental Associates. July 2010. Nelson, BC.

Chandler, C. 2010. Review of the Athabasca River Phase II Framework Committee Report, January 2010 – Aboriginal knowledge, use, interests and rights. Technical memorandum prepared for Mikisew Cree First Nation Government and Industry Relations, and Athabasca Chipewyan First Nation Industry Relations Corporation by The Firelight Group. July 2010.

Hegmann, G., C.Cocklin, R.Creasey, S.Dupuis, A.Kennedy, L.Kingsley, W.Ross, H.Spaling and D.Stalker. 1999. Cumulative Effects Assessment Practitioners Guide. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for Canadian Environmental Assessment Agency. Hull, QC.

Labour, S. 2005a. Traditional Knowledge Strategy. Prepared for Tsawwassen First Nation as part of review of proposed Deltaport Third Berth project. Consultants' report prepared by FMA Heritage Resources. April 2005. Calgary, AB.

Labour, S., G.Fedirchuk and N.Nicholls. 2005b. Traditional Knowledge Manual. (Volume 1: Literature Review and Evaluation, Volume 2: Using Traditional Knowledge in Impact Assessments.) Prepared by Kavik-AXYS and FMA Heritage for the Environmental Studies Research Fund. Consultant's report. August 2005. Calgary, AB.

Menzies, C.R. (ed.) 2006. Traditional Ecological Knowledge and Natural Resource Management. University of Nebraska Press. Lincoln, NE.

Mikisew Cree First Nation (MCFN). 2006a. Submission for Intervention, Re: Kearl Oil Sands Project. Application No. 1408771 and 1414891 by Imperial Oil Resources Ventures Limited. Submitted by Prowse Chowne LLP. October 10, 2006. Edmonton, AB.

Mikisew Cree First Nation (MCFN). 2006b. Submission for Intervention, Re: Kearl Oil Sands Project, Supplemental Materials. Application No. 1408771 and 1414891 by Imperial Oil Resources Ventures Limited. Submitted by Prowse Chowne LLP. October 24, 2006. Edmonton, AB.

Paci, C., A.Tobin and P.Robb. 2002. "Reconsidering the Canadian Environmental Impact Assessment Act – A Place for Traditional Environmental Knowledge". Environmental Impact Assessment Review: Vol. 22, 111-127.

Plate, E., M.Foy and R.Krehbiel. 2009. Best Practices for First Nation Involvement in Environmental Assessment Reviews of Development Projects in British Columbia. Consultant's report prepared for New Relationship Trust. July 2009. West Vancouver, BC.

TP Management Services Ltd., in association with Cathy Goulet Consulting. 1998. An Aboriginal Perspective on Environmental and Socio-economic Cumulative Effects on Aboriginal Communities within the Regional Municipality of Wood Buffalo. Workshop Summary.

Turuk, J. and S. Labour. 2007. Mikisew Cree First Nation Traditional Ecological Knowledge report for the Northern Lights Project. Consultant's report prepared by FMA Heritage Resources for Synenco Energy Inc. May 2007. Calgary, AB.

Usher, P.J. 2000. "Traditional Ecological Knowledge in Environmental Assessment and Management." Arctic: Vol. 53 (June 2000), 183 -193.

Usher, P.J. 2001. Traditional Ecological Knowledge in Environmental Assessment. Presentation given at the Northern Impact Assessment Seminar. 30 October 2001. Yellowknife, NWT.

Winds and Voices Environmental Services Inc. 2000. Determining Significance of Environmental Effects: An Aboriginal Perspective. Prepared for the Research and Development Monograph Series, Canadian Environmental Assessment Agency, Research and Development Program. Ottawa, ON.

MIKISEW CREE FIRST NATION TRADITIONAL ECOLOGICAL KNOWLEDGE REPORT

SYNENCO ENERGY INC.
NORTHERN LIGHTS OIL SANDS DEVELOPMENT

Prepared for

Mikisew Cree First Nation
Fort Chipewyan, Alberta

On Behalf of

Synenco Energy Inc.
Suite 1000, 715 – 5th Avenue SW
Calgary, Alberta

Prepared By

FMA Heritage Resources Consultants Inc.
200, 1719 10TH Avenue SW
Calgary, Alberta

May 2007

1.0 MIKISEW CREE FIRST NATION 1
1.1 Introduction 1
1.1.1 Terms of Reference 1
1.1.2 Objectives 1
1.1.3 Intellectual Property 1
1.2 Methods 2
1.2.1 Assessment Approach 2
1.2.1.1 Framework 2
1.2.1.2 Study Facilitation 4
1.2.1.3 Nature of the Information 4
1.2.1.4 Effects Assessment 6
1.2.2 Participant Involvement 9
1.2.2.1 Initial Scoping Meetings 10
1.2.2.2 Participant Interviews 10
1.2.2.3 TEK Committee Progress Meeting 13
1.2.2.4 Follow Up Meeting 14
1.2.2.5 TEK Committee EIA Review 14
1.2.2.6 Site Visits 15
1.3 Baseline Information 15
1.3.1 Literature Review 15
1.3.1.1 Project-Specific Environmental Impact Assessments 15
1.3.1.2 Traditional Land Use, Historical or Cultural Studies 17
1.3.1.3 Other Reports and Analyses 17
1.3.2 Mikisew Traditional Ecological Knowledge 17
1.3.2.1 Water Quantity and Quality 17
1.3.2.2 Air Quality 26
1.3.2.3 Animals 29
1.3.2.4 Fish 31
1.3.2.5 Vegetation 32
1.3.2.6 Reclamation 33
1.3.2.7 Access Management 35
1.3.2.8 Socio-Economics 36
1.3.2.9 Health and Well-Being 42
1.3.2.10 Cumulative Effects 47
1.3.2.11 Project-Specific Effects 49
1.3.2.12 Consultation and Regulatory Process 50
1.4 Application Case Assessment 53
1.4.1 Environmental Management and Protection 53
1.4.1.1 Water Quality 53
1.4.1.2 Water Quantity 54
1.4.1.3 Town Drinking Water 54
1.4.1.4 Bennett Dam 54
1.4.1.5 Air Emissions 55
1.4.1.6 Wildlife Protection 55
1.4.1.7 Reclamation 55
1.4.1.8 Access Management 56

1.4.1.9 Monitoring and Testing 56
1.4.1.10 Industry Environmental Management 57
1.4.1.11 Project-Specific Effects 57
1.4.1.12 Cumulative Effects 57
1.4.2 Employment and Education 58
1.4.2.1 Employment 58
1.4.2.2 Education and Grade 12 59
1.4.2.3 Training 59
1.4.2.4 Fly-In/Fly-Out 60
1.4.3 Socio-Economics and Consultation 60
1.4.3.1 Consultation 60
1.4.3.2 Compensation 61
1.4.3.3 Community Programs 61
1.4.3.4 Health and Well-Being 62
1.4.3.5 Traditional Lifeways 62
1.4.3.6 Traditional Foods 63
1.4.3.7 Cost of Living 63
1.5 Cumulative Effects Assessment 63
1.6 References Cited 65
1.6.1 Literature Cited 65
1.6.2 Internet Sites 66

List of Figures

Figure 1 Community Wellness and Identity 3
Figure 2 Industrial Effects and Identity 5
Figure 3 Traditional Knowledge and Environmental-Socioeconomic Assessment Process 7
Figure 4 Local Study Area – Mikisew Cree First Nation 11
Figure 5 Mikisew Reserve Lands 12

List of Tables

Table 1 Traditional Ecological Knowledge Information Categories 6

1.0 MIKISEW CREE FIRST NATION

1.1 Introduction

This section contains information gathered during meetings and discussions with members of Mikisew Cree First Nation (Mikisew) regarding Synenco Energy Inc.'s (Synenco's) proposed Northern Lights Oil Sands Development Project ('the Project'). The collection of Mikisew traditional ecological knowledge (TEK) was facilitated by FMA Heritage Resources Consultants Inc. (FMA).

During the scoping stage of the project, FMA and Synenco were instructed that Mikisew would not be sharing any traditional land use (TLU) information. An assessment of potential Project impacts to Mikisew TLU is therefore not included.

1.1.1 Terms of Reference

As per Section 8 of the Project Terms of Reference, this study must consider the following:

"Provide details on the consultation undertaking with Aboriginal communities with respect to traditional ecological knowledge and traditional land use:

- a) provide results of consultation with Aboriginal stakeholders to determine the extent of traditional land use of the Local Study Area (LSA). Discuss the vegetation and wildlife used for nutritional and medicinal purposes, and any potential effects the Project may have;
- b) identify the traditional land uses including fishing, hunting, plant harvesting (nutritional or medicinal), and cultural use with specific regard given to local Aboriginal peoples; and
- c) identify cabin sites, spiritual sites and graves. Determine the project and cumulative effects of development on these uses and identify possible mitigation strategies" (Alberta Environment 2006).

1.1.2 Objectives

The objectives of this study are to present:

- a summary of TEK collected;
- a summary of Mikisew perspectives on potential effects from both previous developments and the Project; and
- recommendations for the mitigation of potential effects on Mikisew.

1.1.3 Intellectual Property

Since the information discussed during participant interviews constitutes the intellectual property of participants, and, collectively, of Mikisew Cree First Nation, the study was designed in consultation

with, and is subject to the approval of, Mikisew participants and Mikisew representative organizations. Any interview information, including notes, GPS readings and/or photographs taken, be it in tape, transcribed or electronic form, is considered the property of Mikisew and will be returned to the Mikisew Industry Relations Corporation (IRC) and the Mikisew TEK Committee for archival upon completion of the study. Information has been provided with the understanding that, apart from the submission of reports for the regulatory process, no copies of, or distribution of any documents produced, will take place without the express permission of the Mikisew IRC.

Information provided during work for the Project is intended for the one-time use of the assessment application, and the Project described therein, only.

1.2 Methods

The methods section outlines the assessment approach, participant involvement and baseline information collected during work with Mikisew members.

1.2.1 Assessment Approach

This section describes how information is collected and used in the environmental assessment context, and how participants were involved in the study.

1.2.1.1 Framework

The Aboriginal concept of 'the land' is integral to the assessment process as it "encompasses their personal and cultural identities, their histories, and their religions embedded within complex oral traditions" (Oakes et al. 1998). The 'land' is the matrix containing communities of plants, animals, and humans created by spiritual beings. Humans are integral parts of those communities, not set apart from them. The cosmologic view is holistic. No one place in a landscape is more significant than any other. All are significant to the individual and collective psyche and worldview (Oakes et al. 1998). "Many of Canada's Indigenous people define themselves in terms of the homelands that sustained their ancestors. These are the places where their spiritual roots lie. Drawing from their natural surroundings, Aboriginal groups have developed powerful metaphors, symbols and narrative traditions to express their religious and philosophical views. Some groups named the features of the landscape to recall important events in their individual and collective lives. In effect, the land was their history book" (Ray 1996).

The emerging future with its rapidly changing technologies and demand for resources is resulting in irreversible changes to people around the world. Nowhere is this change more evident than in Aboriginal cultures. The assessment of effects of a proposed resource extraction project on traditional land use is of cultural, environmental and, ultimately, socio-economic relevance because it pertains to the social and physical well-being of not only a community, but of the individuals within that community (Figure 1, McCullough & McCullough 2005).

Figure 1 Community Wellness and Identity

Cultures, past and present, are dynamic works in progress; they are shaped from within as well as by outside influences. Irreversible changes are inevitable but ultimately each culture's goal is to maintain its identity and well-being by adapting to the forces of change rather than being subsumed (Figure 2, McCullough & McCullough 2005). Mitigation measures serve to support this process of adaptation.

1.2.1.2 Study Facilitation

This assessment approach takes into account the perceived effects of a proposed development on traditional lands as well as the direct effects these changes may have on the culture, practices and lifestyles of Aboriginal peoples whose homeland is being affected. The Aboriginal community's perceptions of the proposed development's interactions in combination with past and existing projects are also documented. Recommendations for mitigation of any perceived adverse project effects are reported as provided by study participants.

Project personnel serve as facilitators, working collaboratively with Aboriginal community members to collect information about a project's perceived effects on occupancy and use, and cultural practices and traditions from the participants' perspective. This includes information that Elders consider to be relevant for providing a cultural and environmental context. Observations and concerns are fully documented and reported to the project's proponent. Although a proponent may add responses in the report, original recommendations and comments are not changed. Upon completion of the draft assessment report, Aboriginal participants are provided with the opportunity to review study results to ensure their observations and concerns have been accurately reported. Follow up processes ensure that the communities and participants know how their input has contributed to a proposed project and allows them to review, correct, and potentially add to the information collected. It can also provide an opportunity for community members to review proposed mitigation, follow-up and monitoring activities.

1.2.1.3 Nature of the Information

Aboriginal peoples who have 'lived on the land' have memories and sensory perceptions that are vivid and detailed. This is related to cultural conditioning in which accurate perception and memory of environmental features and changes is essential for survival. Traditional knowledge is passed on orally and current observations can often have a multi-generational time perspective. Information collected from Aboriginal participants is primarily qualitative and is based on sensory data, oral traditions and cultural norms and values. Traditional knowledge "is generally grounded in specific uses of particular ecosystems. It is inseparable from landforms, environmental quality, survival of particular species, and subsistence activities. Knowledge is taught, learned, tested and expanded through traveling and using a specific territory. Modifying the landscape, biodiversity or human ecology jeopardizes knowledge" (Battiste and Youngblood 2000).

Two types of information are collected during environmental assessment – occupancy and use information, and ecological knowledge. Occupancy and use information focuses on locations and sites of cultural significance that may be impacted by a proposed development. Aboriginal ecological knowledge is the wisdom and understanding of a particular natural environment that has accumulated over countless generations and can serve to aid Western scientific disciplines in analyzing project effects. It can be relevant to a proposed project (e.g., design, safety, noise, visual

Figure 2 Industrial Effects and Identity

aesthetic, mitigation, reclamation and abandonment), to the environment (e.g., wildlife, vegetation, fisheries and aquatic resources, hydrogeology, geology and terrain, climate, soils, palaeontology and air quality), and to Aboriginal culture (health, socio-economics, traditional land use, archaeology and heritage). It also relates to the cumulative effects of past and existing activities to both culture and the environment (see Table 1 and Figure 3).

Table 1 Traditional Ecological Knowledge Information Categories

Project	Environment	Culture	Cumulative Effects
• project design • safety • reclamation • abandonment	• fisheries and aquatic resources (inland and marine) • wildlife • vegetation • hydrogeology (groundwater) • hydrology (surface water) • geology and terrain • climate • soils • air quality • noise • paleontology • visual aspects	• traditional land use • socio-economic factors • archaeology • heritage • community well-being	• effects on culture • effects on environment

1.2.1.4 Effects Assessment

The effects assessment addresses the primary and secondary effects the Project may have during construction, operations and abandonment phases. The perceived cumulative effects of past and existing activities within the Regional Study Area (RSA) are also considered, as are potential positive effects.

Primary Effects

Construction

Potential effects to occupancy and use during the construction phase are directly related to the Project footprint and typically include primary impacts to Aboriginal dwellings, spiritual sites, gravesites, trails, resource harvesting locales, or specific resource (e.g., wildlife, vegetation) habitats or features (e.g., bear dens).

Operations

At the operations phase the potential primary effects that are considered relate to the environment, health and well-being of the resources, and the health and well-being of the Aboriginal peoples whose traditional territories may fall within the RSA. Included are all aspects of life that the

Figure 3 Traditional Knowledge and Environmental-Socioeconomic Assessment Process

Aboriginal group feels may be affected by the facilities and/or by its by-products over the project's lifespan. They are not usually site-specific.

Abandonment

Effects considered for this phase are related to decommissioning activities and overall reclamation or restoration as it pertains to Aboriginal use and well-being. Perceived effects typically address both site-specific and cumulative effects.

Secondary Effects

Secondary effects include perceived changes in land use that arise from changing social and economic conditions related to Project construction, operations and abandonment. These effects can include demographic shifts, land use restrictions, increased outsider access and changes to the local and regional economy.

Cumulative Effects

Cumulative environmental effects include the Aboriginal group's perceptions of the proposed Project's interaction with past and existing projects and activities over a period of time within a designated region. An Aboriginal community's sense of cumulative effects is likely broader than the standard project inclusion list used in environmental impact assessments (EIAs), and may include activities such as sport hunting, forestry, dams and/or pulp and paper mills, for example.

Potential Positive Effects

Assessment work carried out using the approach outlined above offers potential for creating positive effects, one of which is the opportunity to better understand Aboriginal history, traditional practices and cultural perspectives. There is also much to be learned from knowledgeable Elders about a region's biodiversity (passed on through generations) which can lead to innovative models of sustainability.

Mitigation

Project-specific mitigation measures may include site avoidance, buffering, enhancement, further studies, monitoring or co-management programs, restoration or conservation measures, or compensatory action. Irreversible changes to cultural traditions necessitated by changing economic and environmental circumstances over time (cumulative effects) may require long-term mitigation strategies to assist in developing alternate livelihoods (economic systems) congruent with the values and worldview of the Aboriginal group (Figure 1). Mitigation of cumulative effects can sustain the cultural identity, heritage and well-being of the group. Determining appropriate mitigation measures requires the participation of the community, governments and industries operating within the traditional territory.

Spatial Considerations

The following describes the local study area (LSA) and RSA parameters for the study.

Local Study Area

The local study area (LSA) for the assessment is defined as the Project lease area. Figure 4 shows the LSA used during discussions with Mikisew participants.

Regional Study Area

The RSA used for the assessment of potential effects to traditional use normally encompasses the full range of a particular Aboriginal group's use over time, or traditional territory. As a Mikisew TLU study is currently still underway, facilitators were instructed that it would not be possible to illustrate the boundaries of Mikisew's traditional territory.

Figure 5 illustrates Mikisew Cree First Nation's reserve lands.

Temporal Considerations

This study considers both current and past traditional use, as well as future use. Future use pertains to the opportunities for descendants ('our children's children') of Mikisew members to practice a way of life and maintain traditional cultural and spiritual values. Based on the perspectives of Mikisew participants, the temporal boundary against which incremental changes in time are being compared in this study is 1960.

1.2.2 Participant Involvement

Discussions for the traditional ecological knowledge (TEK) study were semi-directed and focused on the following:

- Historical perspective for current traditional uses of the land, particularly changes over time;
- Mikisew TEK with regard to various EIA components (e.g. air and water quality, fisheries, wildlife, vegetation; etc.);
- Understanding participant concerns with respect to the proposed development;
- Community perspectives on potential impacts from both previous developments and the proposed Project; and
- Soliciting participant concerns and recommended mitigation measures relative to the proposed Project or overall development in the region.

Participants were encouraged to lead the discussions into topics they deemed to be of importance, and to make recommendations regarding the concerns that they had raised.

Discussions with participants were aided with the use of plotter-sized (approximately 2x3') maps of the region. As traditional land use information was not recorded, the maps were used to guide discussions only, and no traditional sites or areas were recorded on them. The interview map was left with the participant.

Throughout the report, except in the case of specific statements by elected representatives, participant names and comments have been coded to protect their identity and privacy (e.g., MC01, MC02, etc.). All of the Mikisew community members who participated in the study are listed in the relevant sections below.

1.2.2.1 Initial Scoping Meetings

Two initial meetings were held between Synenco, FMA facilitators and the Mikisew Elders' TEK Committee. One was an introductory meeting held on February 13th, 2006 to discuss TLU–TEK information needs, and the second was a meeting on March 2nd, 2006 to respond to a request by the TEK Committee from the initial meeting. The intent of the second meeting was to provide additional information on oil and gas licensing, and the overall regulatory process for environmental assessments, particularly with regard to the collection and application of TLU–TEK information in that context. Synenco and FMA were instructed to not record any minutes from these meetings.

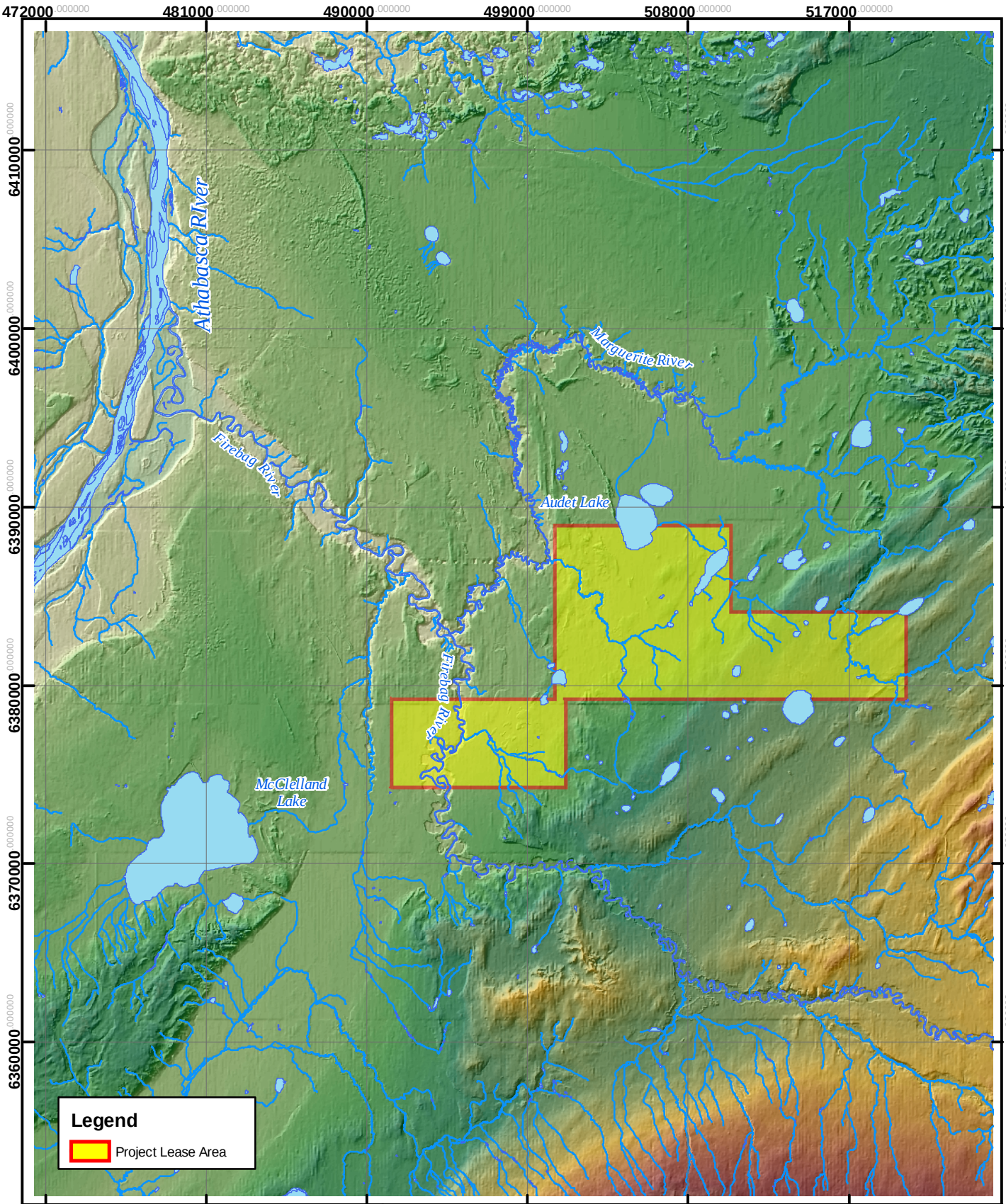
It was determined through these meetings that Mikisew did not wish to share specific TLU information, but that they would provide information to the Project application in the form of TEK-focused interviews to be led by a Mikisew community member. Study facilitators would participate in the interviews as observers and assistants.

Further discussions with the Mikisew TEK Coordinator and Councillor Alice Martin, and the head of the Elders ' TEK Committee, Lawrence Vermillion, in September 2006, revealed that there was a desire to educate community workers about EIAs, and the use of TEK in EIAs. The proposed TEK study workplan was then redrafted with input from Mikisew representatives as to how to address these requests. Personal interviews were to be conducted with 25 Mikisew members, some of who reside in Fort McMurray either full or part-time.

1.2.2.2 Participant Interviews

A kick off meeting with the Mikisew TEK Committee was held on October 10th to select a list of interview participants and to discuss interview approach and content. The FMA facilitator prepared an interview reference binder containing information on Project design, impact assessment process and interview approach. Copies of this binder were shared and discussed with TEK Committee members.

Interviews with Mikisew members residing in Fort Chipewyan took place from October 10th – 20th. Rita and Stella Marten conducted the interviews. Rita Marten led and interpreted the Cree interviews and transcribed the Cree tapes. Stella Marten led the Fort McMurray interviews.



TITLE

Local Study Area- Mikisew Cree First Nation

Area of Detail

NORTH

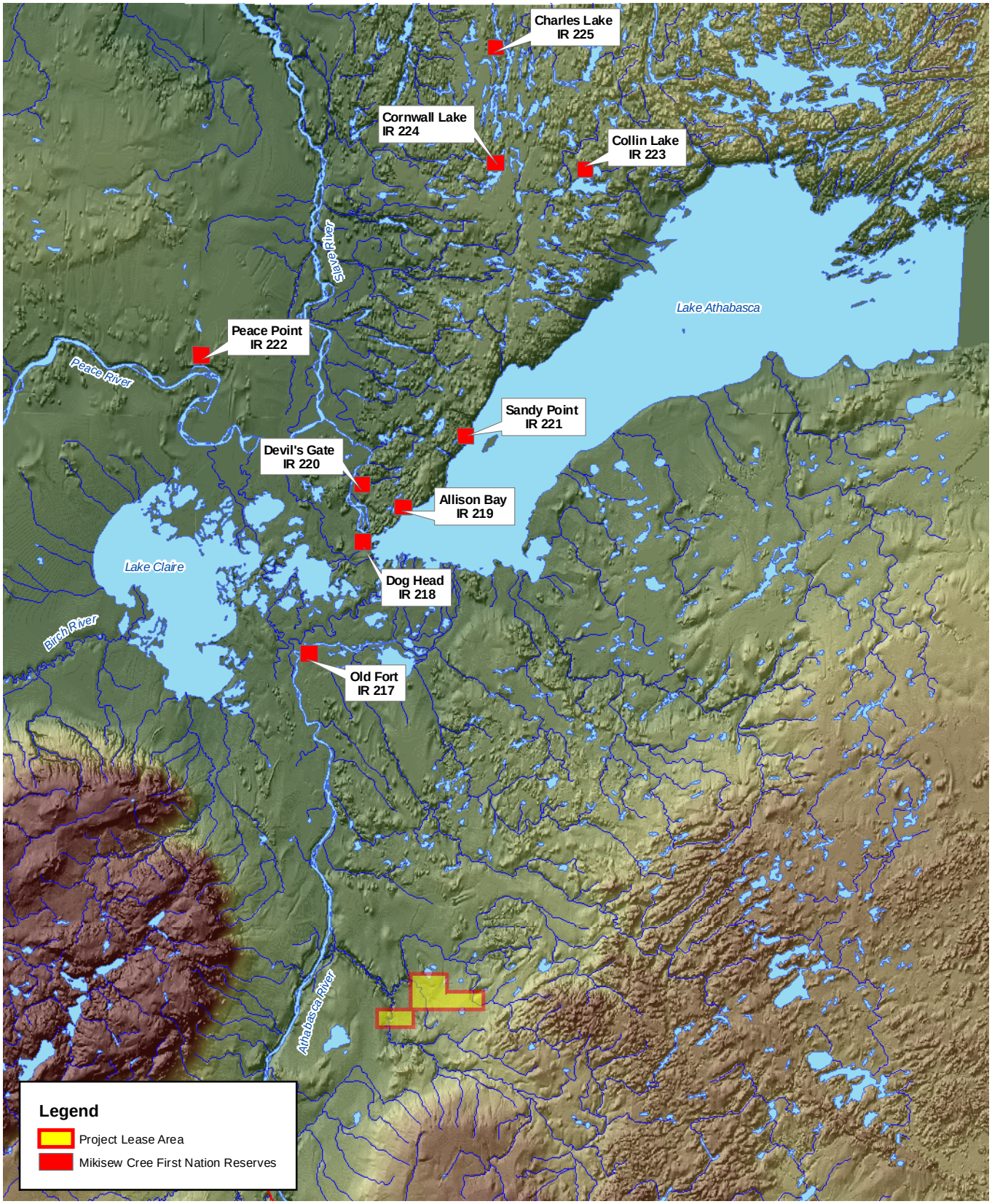
2 0 2 4

Kilometres

Acknowledgements:
Original Drawing by FMA Heritage Resources Consultants Inc.

Northern Lights

PREPARED BY				
DRAFT DATE 22/Jan/2007			SCALE 1:300,000	
REVISION DATE 22/Jan/2007			PROJECT 1692	FIGURE NO. 4
DRAWN MR/KJ	CHECKED	APPROVED SL	VOL	



TITLE

Mikisew Cree First Nation Reserve Lands

NORTH

5 0 5 10 15

Kilometres

Acknowledgements:
Original Drawing by FMA Heritage Resources Consultants Inc.

Northern Lights

PREPARED BY				
DRAFT DATE 22/Jan/2007			SCALE 1:1,500,000	
REVISION DATE 22/Jan/2007			PROJECT 1692	FIGURE NO. 5
DRAWN MR/KJ	CHECKED	APPROVED SL	VOL	

Participants interviewed in Fort Chipewyan included:

- Joe Kaskamin;
- George Wanderingspirit;
- Jack Marten;
- Johnny Courtorielle;
- Alec Whiteknife;
- Madeline Gladue;
- Alec Courtorielle;
- Francis Waquan;
- Reggie McKay;
- Andrew Castor;
- Ernie Courtorielle;
- Lawrence Vermillion;
- George Martin;
- Fred Vermillion;
- Steve Courtorielle;
- John Tuccaro;
- Joslyn Marten;
- Archie Waquan;
- Marjorie Glanfield;
- Mary Rose Waquan; and
- Harvey Antoine.

Mikisew Elders residing or staying in Fort McMurray were interviewed in October and November. At his request, the interview with John James Antoine took place in two parts, the first comprising of an hour-long discussion of the Project and information needs, and a second session in which Mr. Antoine discussed his traditional knowledge and concerns regarding the proposed Project. These two meetings took place on October 22nd and November 19th, 2006 respectively. George Waquan was also interviewed in Fort McMurray on October 22nd; Sidney McKay was interviewed on November 19th.

1.2.2.3 TEK Committee Progress Meeting

A progress meeting was held with the Mikisew TEK Committee on December 8th. Councillor Alice Martin also attended the meeting. Items on the agenda included an update on the draft report, next steps and upcoming schedule. Committee members discussed some of their recommendations for appropriate consultation as well. These have been added to the recommendations provided in the Application Case Assessment (Section 1.4).

TEK Committee members present at the meeting included:

- Joe Kaskamin;
- George Wanderingspirit;
- Fred Vermillion;
- John Tuccaro;

- Alec Courtorielle;
- Reggie McKay;
- Lawrence Vermillion;
- Marjorie Glanfield; and
- George Waquan.

1.2.2.4 Follow Up Meeting

A follow up meeting was held on January 29th, 2007 in Fort Chipewyan to review the draft report with study participants. Follow up processes are critical as they help ensure that communities and participants know how their input has contributed to the proposed Project and allows them to review, correct, and potentially add to the information collected. It also provides an opportunity for community members to review proposed mitigation, follow-up and monitoring activities. All participants, including Fort McMurray residents, were invited to attend this meeting. It was a day-long meeting with a catered lunch. Comments and recommendations received from participants during the meeting have been added to this report.

Copies of the draft report will be distributed to participants. The Application Case Assessment section, which contains a summary of predicted adverse Project effects as reported by participants, along with their recommendations for addressing them, was reviewed in detail. Once feedback from this meeting was incorporated into the report, the report was submitted to the IRC for final approval.

Participants attending the follow up meeting included:

- Joe Kaskamin;
- George Wanderingspirit;
- Alec Whiteknife;
- Madeline Gladue;
- Reggie McKay;
- Ernie Courtorielle;
- John James Antoine;
- Fred Vermillion;
- John Tuccaro;
- Joslyn Marten;
- George Waquan;
- Sidney McKay;
- Mary Rose Waquan; and
- Harvey Antoine.

John Steward provided transportation for the Elders. Steve Courtorielle interpreted for the morning session, with Rita Marten working as interpreter for the afternoon portion of the meeting.

1.2.2.5 TEK Committee EIA Review

During the drafting of the workplan, the Mikisew IRC Director, Melody Lepine, instructed the FMA facilitator to plan for TEK Committee members to attend an EIA review meeting with Mikisew IRC

members and Synenco's EIA team. The intent of this workshop would be for the TEK Committee members to have exposure to an EIA review and have input on how Mikisew TEK is being used in the EIA supplemental information. This meeting is expected to take place in early June 2007.

1.2.2.6 Site Visits

Mikisew TEK Committee members visited the Project site February 01, 2007, via the ice road.

1.3 Baseline Information

Baseline information collected for the study includes a summary of background literature reviewed for the Project, as well as a discussion of the Mikisew traditional ecological knowledge collected during participant interviews.

1.3.1 Literature Review

The review of background literature includes project-specific environmental assessments, TLU and cultural or historical studies as available and other types of reports and analyses relevant to the assessment of the Project and potential effects to Mikisew activities or traditional territory.

Research included:

- historical and ethnographic literature;
- TLU work conducted for impact assessments; and
- academic texts on resource development and Aboriginal peoples, with a focus on northern Alberta.

1.3.1.1 Project-Specific Environmental Impact Assessments

The following is a summary of some of the major issues and concerns that have been raised in the oil sands region, both by Mikisew and other Aboriginal groups, in the project-specific EIAs reviewed:

- Access to and conduct of traditional activities remains a vital part of Aboriginal culture and daily life; traditional use is of vital cultural importance to the region's people (Golder Associates 2002a, 2002c, 2002d; AXYS 2004; FMA 2005a, 2005b, 2005c);
- Cumulative effects related to resource development in the area are having a major impact on the availability of traditional lands and traditional use (Golder Associates 2002c, 2002d, AXYS 2004);
- Mikisew feels strongly that access management issues need to be addressed in their traditional territories (FMES and AGRA 1997, AXYS 2004, FMA 2005a, 2005c);
- Aboriginal communities in the region maintain a strong connection to the land and highly value the integrity of the environment (Golder Associates 1997, FMA 2005a);

- Traditional users feel that their participation and input into regional projects is not being considered, and thus not respected (FMA 2005a);

- Respectful, sustained and meaningful consultation and communication is required (AXYS 2004; FMA 2005a, 2005b);

- Water quantity and quality is very important to the traditional lifeways of Aboriginal communities; cumulative effects to water quality and quantity are already felt to be significant (AXYS 2004, FMA 2005a, 2005b, 2005c);

- Air quality has degraded with the development of industry; they perceive this as having an effect on their health, as witnessed by the development of cancers in the community (Golder Associates 2002c, AYXS 2004, FMA 2005a, 2005b);

- Concern regarding disturbance, health and disrespectful treatment of animals (e.g., meat quality, sport hunting, removal of beavers); increased incidences of disrespectful treatment of traditional resources by non-Aboriginal harvesters (AXYS 2004, FMA 2005a, 2005b, 2005c);

- Concern that forestry, oil sands development and recreational activities are disturbing, damaging and restricting access to the land and its resources to such an extent that it is limiting Aboriginal peoples' ability to maintain their traditional culture and lifeways (FMA 2005a, 2005c);

- Increased incidences of trapline theft and intrusion are being documented; this is linked to the growth in regional populations (AXYS 2004, FMA 2005a);

- Concern that development is damaging local ecosystems, and that once the damage is done, things will not return to pre-development conditions (AXYS 2004; FMA 2005b, 2005c);

- Current reclamation practices and strategies that are inadequate or piecemeal; profound doubt that land can be 'put back' or restored; the "sacredness of the land" has been destroyed (Golder 2002b, AXYS 2004, FMA 2005b);

- Concern about the amount of water used by regional industry (FMA 2005a, 2005b);

- TEK views increased water contamination as seriously affecting the health of humans, animals and vegetation in the area (AXYS 2004; FMA 2005a, 2005b, 2005c);

- Dissatisfaction with accepted environmental regulatory standards governing development as related to air and water pollution (Golder Associates 2002c, 2002d);

- An environment of distrust from communities towards industry (FMA 2005a); and

- Union employment and training are issues; companies make lots of promises about jobs with little result; Aboriginal people experience a lot of discrimination when it comes to hiring (AXYS 2004; FMA 2005b).

1.3.1.2 Traditional Land Use, Historical or Cultural Studies

Mikisew is currently working on a detailed traditional land use study. It is not yet ready for release to the public.

1.3.1.3 Other Reports and Analyses

Various studies conducted outside the context of project development indicate that Aboriginal peoples in the region have a high level of interest in maintaining ties to the land, consuming traditional foods and in being able to practice traditional land use activities, notwithstanding the effects of resource development that are occurring around them (Bill et al. 1996, NRBS 1996a, 1996b, FMA 2005b).

Other reports (Ross 2003, McKillop 2002) discuss the value and importance of appropriate consultation with Aboriginal peoples, and its legal context with respect to resource development in Alberta. The need for TEK to have an "effective role" in environmental studies and management is recommended in several studies (Bill et al. 1996, NRBS Board 1996a, 1996b, Farr et al. website 2004).

1.3.2 Mikisew Traditional Ecological Knowledge

TEK information shared by Mikisew participants and that may have relevance to other impact assessment components is presented in this section. TEK was collected during meetings and personal interviews. The overarching theme that emerged from Elders is that industry use of their traditional lands is affecting not only the environment, but also the lifeways, culture, health and future of Mikisew members. Mikisew TEK is presented from the perspective of participants' interviewed.

1.3.2.1 Water Quantity and Quality

Participants' single greatest concern is local water quality and quantity. Declining water quality and quantity has ramifications that are felt at a number of different levels. Low water levels have depleted local waterways to the point that they are no longer traversable. Few waterways can be traveled; those that are still useable for transportation are so low that community members frequently encounter travel delays as a result of impediments such as sandbars. Furthermore, local vegetation and wildlife are suffering the consequences of the water shortage. A decrease in the frequency and intensity of annual flooding only compounds the problem. Industry and damming projects are singled out as major contributors to low water levels. Polluted waters generate an equal amount of concern. Again, local wildlife and vegetation are feeling the effects of the pollutants that industry is discharging into local waterways. Community health is also adversely impacted. Participants report that water is discoloured, is covered in scum, and tastes bad. In fact, local water is considered unfit to drink. Ice roads and bridges are becoming increasingly difficult to set up and maintain due to the poor quality of winter ice that forms. Poor ice is attributed to a lack of water coupled with polluted water. A number of recommendations were offered by community members.

Water Quantity

Mikisew participants report an alarming decrease in local water levels (MC01, MC02, MC03, MC04, MC06, MC07, MC09, MC11, MC14, MC15, MC17, MC18, MC19, MC20, MC22, MC23, MC24). Water

levels have been decreasing ever since the oil and gas industry commenced production to the south (MC20, MC24). From 1955 to 2003 the water in Lake Athabasca has dropped 17 feet (MC24). From 2003 to 2006 the water level in the lake has dropped an additional two to three feet (MC24). Fifteen years ago there were only two plants in operation; ever since then there has been a steady decrease in water levels in the Delta (MC20). Scientists attribute decreasing water levels to global warming, evaporation during the summer months and low rainfall to the south, however, one participant points out that industry water withdrawals are only increasing (MC20). Another community member adds that one company requires three barrels of water to produce one barrel of oil (MC15). If industry launches future operations, they will have difficulty getting water (MC24). There is fear that eventually the Athabasca River will be drained (MC15, MC18). Pumping water from Lake Athabasca, as an alternative to taking water from the Athabasca River, is becoming an increasingly impractical option as the lake is going dry as well (MC24).

A number of community members have and continue to experience difficulties travelling local waterways due to the substantial decrease in water levels (MC02, MC05, MC07, MC15, MC19, MC20, MC22). There was a time when water levels were so high that travelling by water when it was windy was dangerous (MC22). The waters of the Athabasca River (MC07, MC15, MC19) and Lake Athabasca (MC15) are very low; this fall (2006) the waters were reported to be at an all-time low (MC07, MC14, MC20). The Athabasca River is no longer the 'big river' (MC18). The Athabasca River is now full of sandbars (MC15, MC18). When the waters of the Athabasca River are high, Jackfish Lake should be full. Currently, however, mudflats make up the majority of the mouth of this lake (MC15). Water levels are so low in the Delta that boats often have to be pulled to shore (MC02). Fifteen years ago, community members could travel to any shore in the Delta without having to pull in their boats (MC20). Another participant reports that he has difficulty getting out to Potato Island; an east wind is required as there is no water with a west wind (MC15).

Low water levels are not only reported in Lake Athabasca and the Athabasca River. Smaller rivers, creeks and inland lakes are experiencing similar conditions. These smaller waterways can no longer be used as short cuts (MC17, MC18, MC19, MC23), which results in prolonged trips (MC18). Sandbars are frequently encountered (MC10, MC16, MC23) making water travel difficult. One community member remarks that the situation has worsened considerably in the last three years (MC10). A number of participants are observing critically low water levels in Lake Claire, Lake Mamawi, Galoot Lake, Baril Lake and Jackfish (Richardson) Lake. Lake Mamawi, for example, used to be full of water; now the lake is no longer traversable in summer (MC11). This was also true of Lake Claire, however, one community member reports getting stuck in the middle of this lake in the spring of 2006 while duck hunting - there was only eight to nine inches of water in the lake (MC15). From the air, it can be seen that Galoot Lake is now half gone (MC09). One participant recalls fishing in Hay River and Baril Lake in the 1950s; these waters are now mostly mudflats too (MC15). Another community member reports that he can now see mudflats where there used to be water past his dock (MC17).

Rivers and creeks such as Baril Creek, Hay River, Embarras River and the Peace River are also at critically low levels. One participant reports that she used to be able to travel a long distance along Baril Creek (a tributary of the Peace River); now the creek is entirely dried up (MC06). One participant can no longer get to his cabin via the Peace River in the fall to hunt because of low water levels (MC15). Low waters on the Embarras River prevent this river from being used as a shortcut in the way that it used to be. The river is now too low and riddled with sandbars (MC19). This waterway can no longer be used, even with a small boat (MC19). The Peace River used to be three and a half times the flow of the

Athabasca River – now it no longer empties those quantities into Lake Athabasca, which further contributes to decreasing water levels (MC20). One participant recalls that there used to be so much water that that his grandfather could transport his grandmother, who was a midwife, via 'shortcuts' across backcountry waterways, instead of on the main river (Peace River). This would not be possible today (MC17).

Community members have observed fluctuations in the local water levels. Historically, water levels normally fluctuate on a 50 to 60 year cycle (MC13). One participant reported that in the period between 1942 and 1944 the water was so low in Lake Mamawi that dog teams were used to cross it for fall hunting (MC12). [This Elder also described drastic changes in the flood cycle. Please see Floods section below.] Water levels also fluctuate with the seasons. Water levels on the Peace River used to rise in the spring, but drop substantially by July and August (MC23). Wind is a factor in water levels on Lake Athabasca; when there is an east wind, water levels will rise, but a west wind does not change water levels (MC17). When water levels are low, community members experience considerable difficulties in traveling local waterways. It is feared that future oil and gas production will entirely eliminate the possibility of traveling the local waterways (MC24).

A number of participants expressed worry over the amount of water that is being taken from the Athabasca River (MC01, MC15, MC19, MC20, MC22). A substantial amount of water has already been taken from the river and more will be taken in the future (MC01, MC20). One participant who has worked for industry reports that large amounts of water is also being taken out of creeks running into the Athabasca River (MC11). There are only two rivers left – the Firebag and Richardson Rivers. If industry begins to take water from these rivers they will also be depleted (MC11). One participant commented that industry should, "Stop taking our water. Make your own." (MC19). Too much water is being removed from local waterways (MC20). One day there will be hard times due to a lack of water, and at the current pace, there will be no water in the future (MC22). One participant speaks of the adverse effects resulting from the removal of local wetlands (MC20). Wetlands are very important as they act like a sponge, soaking up rain water and slowly releasing it into the river system (MC20). Removing those wetlands is damaging this natural process and affecting the amount of water that is going into the river system (MC15, MC20).

Low water levels and polluted waters have adverse effects on local wildlife and vegetation. In terms of vegetation, changing water levels have led to the appearance of new growth where previously there were none (MC04). Little inland lakes are drying out and willows and grasses are growing up in place (MC15). Once these lakes dry out, replenishment via flooding will not properly restore them as they will no longer be able to contain water properly (MC15). Big lakes are now filling up with willows and grasses (MC17). Water levels have decreased at both Lake Mamawi (from 10 feet deep to 1 foot deep) and Lake Claire. As a result, there is now an island in Lake Claire with vegetation growing on it. Furthermore, vegetation is growing up around Lake Mamawi (MC04). Lake Claire and Lake Mamawi used to be deep all the time. If the oil companies do not slow down their rate of water consumption, one participant predicts that it will only take 10 years before Lake Mamawi will dry out and emerge as one expansive mudflat (MC15). The Delta too is experiencing new growth, in the form of willows and grass, as a direct result of decreased water levels (MC09).

Adverse effects are also felt by local wildlife. The substantially lowered waters of the Athabasca River results in the build up of silt that prevents fish from entering Lake Claire and Jackfish Lake to spawn (MC14). The Quatre Fourches River is now 'dry'; there are no more fish around (MC17). The effects

that low water levels have on fish are of concern as fish are very important to local wildlife (MC17). Everything is drying up because of lowered waters (MC14). One community member points out that a lot of muskrat houses are dried up and filled with willows (MC11). A long time ago, everything grew well and everyone was out fishing this time of year (October) (MC14). There are no longer any medicines or berries; the bears appear very skinny (MC14). The weeds that are growing now are killing off feed for buffalo (MC16). Furthermore, the migratory birds are changing their habits and moving to the west (MC16).

Water Quality

Community members also report that local waters have been polluted (MC01, MC03, MC04, MC06, MC09, MC11, MC16, MC18, MC20, MC22, MC23). A number of community members recall that 40 to 50 years ago, water was pristine and clear (MC16, MC20). Elders used to call it “living water” (MC07). People didn’t have to worry about going anywhere (MC16). A drop in the quality of water has been noticed since the 1970s (MC16). If “you drink water in Fort Chip, you might as well drink sewer water from Fort McMurray,” one participant commented (MC11). Since the oil and gas industry commenced operations in the 1980s local water quality has worsened (MC16). It was reported that some companies do not properly dispose of contaminants (MC24). A dyke at one mine site is leaking and leading to polluted water entering the Athabasca River. Furthermore, the water outflow at this site is also contributing to the problem; one participant has witnessed “big black chunks” coming out of it (MC24). One participant points to the “poisons” deposited in tailings ponds and questions how well the water is contained (MC07). Proper containment is important as polluted water can seep through and contaminate underground streams and rivers. He questions how deep industry monitoring of underground water goes (MC07).

Water from local water bodies is no longer safe to drink (MC01, MC03, MC04, MC06, MC07, MC09, MC16, MC18, MC21, MC23). Years ago, people drank water from local rivers, lakes, and creeks without hesitation. Even sloughs contained fresh drinking water (MC07, MC09). Now participants will not drink water from the Athabasca River (MC04, MC07), and local sloughs contain dead water that is undrinkable because there are no floods (MC09, MC16). Water quality has been declining over the past 30 years (MC03, MC04, MC07, MC16) – approximately since the time during which the oil and gas industry started production (MC07).

People travelling into the bush must now carry potable water with them (MC07, MC16, MC20, MC23) unless they will be near water sources that are not fed by the Athabasca River (e.g., Whitefish Lake) (MC20). One community member reports that it is necessary to bring two or three five-gallon jugs of water on weekend trips into the bush (MC16). Potable water must be carried along at all times, even on very short trips (MC07). Another participant remarks that he has had to take drinking water with him into the bush since the early to mid-1980s as he could no longer drink bush water (MC16). Local people have noted that industry representatives bring bottled water when they come for meetings in the community (MC18).

The polluted state of local waters is evident by its appearance (MC07, MC16, MC18, MC19, MC21, MC23, MC24). A number of community members describe local water as having a brown discoloration (MC18, MC22). One participant recalls working at a treatment plant and seeing brown foam and water being discharged into the Athabasca River (MC18). Water from the west end of Lake Athabasca is brown and leaves a stain in your cup (MC18). About 35 miles out into Lake Athabasca towards Sandy

Point, however, the water is clear (MC18). Even when lake water is boiled, it still retains a brown discoloration (MC03). Water in the Athabasca River from Fort Chipewyan to Fort McMurray is also brown in color (MC18). A 'yellowish' scum and foam are also observed on local waterways (MC07, MC19). One participant describes a 'yellowish' scum on his cups (MC07), while another participant has witnessed 'yellow foam' down a creek near Embarras Portage (MC19). A yellow scum is also noticed around the edges of puddles after it rains heavily (MC21). McKay River now runs red in the spring because of pollutants running out of oil and gas leases (MC24). The Embarras River used to run clear, however, since the 1970s there is a foamy scum sitting on the river (MC24).

Oil in local water is also reported by participants. In the 1960s one trapper used to put his rusty traps in water overnight to clean them, however, when he attempted this recently, his traps came out covered in a black 'gummy' substance (MC23). Even though tap water is treated, a styrofoam cup will retain an oil film when dipped in it – an indicator of the degree to which Lake Athabasca is already polluted (MC23). One participant reports that when water from the confluence of the Embarras River and Athabasca River is used for tea, a black stain is left in the cup (MC16). Even when water is boiled there is a rim of oil left (MC01). The water also leaves an oil stain on cooking and other drinking utensils (MC16). A visible film can be seen on these waters (MC16).

The differences in the appearance of local waters coincides with a change in the taste of these waters (MC07, MC16, MC21, MC22) One community member recalls that water used to taste very good and that potable water could be found anywhere (MC22). Today, however, water does not taste good (MC16).

Illnesses that the community is experiencing are blamed on water quality (MC07, MC09, MC18, MC20, MC22). People started getting sick around the time that Fort McMurray began growing (MC07). Furthermore, as production continues to the south, heath problems are appearing in increasing frequencies (MC20). People are getting sick and dying because of the pollution (MC22).

Treated town water is also viewed with suspicion as the chlorine that is added leaves a green scum in containers (MC09). The health effects of chlorinated water are of concern (MC09). One participant remarks that he has been boiling water at his house for two years (MC09). Fort Chipewyan used to have three water holes with fresh, clean water. In the 1950s he used to haul his own water with a dog team – this water was clean and could be drunk immediately without treatment (MC09).

Polluted waters have changed the way that wildlife tastes (MC22). Long ago, food tasted very good (MC22). Today, animals are getting sick and no longer taste good (MC22). Another community member is worried that there will no longer be any animals 10 years from now due to the polluted state of local waters (MC18). If the waters are polluted, then everything is polluted (MC18). A drop in water levels, coupled with water pollution, is of concern to a number of participants because everything depends on water (MC01, MC03, MC18, MC20). "There's no water, there's no life" (MC03). Water is the community's livelihood (MC20).

Floods

A number of participants are concerned with the lack of floods witnessed since the construction of the Bennett Dam. Many community members point out that floods are no longer seen (MC01, MC11, MC16, MC17, MC18, MC19). Floods are very important as they clean out the environment – it is

Mother Nature's way of replenishing itself (MC01, MC04, MC15, MC16). The inland lakes fill up when flooding occurs and then slowly drain again (MC15, MC17). Regular flooding ensures that inland lakes and creeks are continually replenished with water (MC01, MC03, MC15, MC17, MC18). Vegetation grows better after a flood (MC01). Today the smaller creeks are all dried out (MC03).

A number of complications stem from a lack of floods in recent years. Vegetation and wildlife, for example, are adversely affected. Willows and grasses are growing up in places where they never used to be (MC15, MC04). As one participant explained, "So now, since we don't have floods anymore - all these little inland lakes, they dry out. And then once they dry out there's willows, grass, everything grows and then it doesn't hold water anymore. Once it dries out, it's useless. Even if it does flood, it's not going to hold" (MC15). Furthermore, there is a decline in the numbers of wildlife such as muskrat (MC03, MC04, MC09) and beaver (MC03). A lack of flooding affects local trappers – trappers are "not as rich as [they] used to be" (MC04). It is becoming increasingly difficult to justify trapping due to decreasing wildlife populations (MC04). One community member recalls that every spring the Embarras River used to flood, and fresh water lakes and sloughs would appear. This was good for trapping as there were plenty of beaver, muskrats and plenty of fine fur (MC18).

Community members report that there have not been floods for a number of years (MC07, MC16, MC17, MC19). The last big flood occurred in the 1970s (MC15, MC16, MC17). One participant reports that this flood's waters flowed over the banks of the Embarras River, however, the "water wasn't as strong as it would be in earlier years" (MC16). This flood was not 'big'; "not like it used to be. Just certain places. Like over the banks of the Peace River. But it was not a big one like where six feet over the bank, flooded Lake Claire, Lake Mamawi and all that place. It was not that kind of flood" (MC15). Floods since the 1950s have become smaller, bringing just enough water to clear out small creeks and sloughs (MC16). Historically, floods would have occurred about every four years (MC04). The last three floods were all 'small' and occurred once a decade (in 1950s, 1960s and 1970s) (MC03, MC04, MC09, MC15, MC16).

BC Hydro's impact on local water levels was discussed by a number of participants (MC01, MC02, MC05, MC06, MC10, MC11, MC13, MC14, MC16, MC17, MC19, MC22). Although industry activities contribute to low water levels, BC Hydro's Bennett Dam on the Peace River is a major cause – water levels have dropped substantially as a result (MC02, MC11, MC19, MC22). One community member reports that industry activities and the Bennett Dam are the reason he is unable to get to his trapline at Lake Claire – sometimes he is forced to walk through water (MC14). Water levels have dropped substantially since the construction of the Bennett Dam (MC16, MC17). Community members recognize that waters fluctuate naturally; however, the low water levels have been exacerbated by developments such as the Bennett Dam (MC13). Furthermore, the dam is blamed for a lack of flooding and poor ice conditions (MC15).

Many participants described the impact of various developments on local waterways that they have witnessed in the Delta during their lifetime. One Elder stated that:

> .... since the dam was built it killed the regular water system. Water is alive and not dead – just like a person breathing. When you watch the ice break up, you can almost see the river breathing. The Elders used to say that whatever God created comes alive. The oil companies take a lot of water, but I really believe that BC Hydro destroyed the river system and I am convinced that if the dam was not built we would still have high water

(MC02).

Another explained how the combination of developments along the Peace and the Athabasca has changed spring break up and flooding in the Delta:

> …BC Hydro is responsible for the water level being so low. Long ago…when the both rivers, both the Athabasca River and the Peace River, when they used to both break up at the same time, in the springtime, the water would flow very swiftly and then if there was a flood all the water would go all over inland…. Fresh water would go into the creeks and Delta, you know, and it made it very good. But since the BC Hydro now, built a dam, the water doesn't flow as good anymore…. [In addition] it's all those oil companies, they're all using rivers that flow into the river…they reroute the creeks, the rivers and they use that water for their oil. So the water then becomes weak, the Athabasca River (MC12).

Ice Formation

Pollution and low water levels have led to changes in winter ice (MC04, MC09, MC11, MC18, MC19, MC24). Years ago, ice was solid. Today, ice no longer freezes in the winter as it is polluted (MC09, MC11). During the winter months, four to five feet of ice used to sit on the Athabasca and Peace Rivers (MC09). Today, winter ice will only reach two and half feet in thickness. Toward oil and gas plants, winter ice will no longer thicken more than one foot (MC09). Today, ice will break up in only two weeks (MC09). One participant recalls staying at her grandparents' place from late summer until early spring and witnessed break up and freeze up – the ice used to be very thick then (MC19). In fact, the ice used to be as high as her grandparents' house (MC19). Ice used to be thick and strong – it came right up to the shore of the lake (MC18). It no longer freezes well, it is oily, and it jams (MC18). One community member recalls that in the 1970s, ice was four to five feet thick and blue in color – it used to take two days to cut through it to set nets. Now the ice is 'yellowish' and only two to three feet thick (MC04).

Pollution and low waters have reduced the number and quality of ice bridges (MC01, MC03, MC04, MC07, MC09, MC16). Oil in the water results in soft ice that melts easily – it cannot accumulate as it did historically (MC01). Ice on the ice bridges used to be strong, hard and 'blue' (MC03, MC04, MC07). Today, because it no longer gets as cold as it used to, coupled with the fact that there is grease in the water, the number of ice bridges has decreased (MC03). Ice on the winter roads is not like it used to be (MC16). One community member remarks that he can no longer use the ice bridge to get to Lake Mamawi (MC01). Ice roads would only have to be flooded when heavy equipment was brought in. Now, it is necessary to monitor the ice constantly as it is not solid. No matter how much it is flooded, the ice is soft (described as slushy, bubbly and crumbly) and greyish or yellowish in colour (MC04, MC07, MC16).

The release of water in November from the Bennett Dam leads to complications to ice bridges as only approximately one foot of ice has formed by this time (MC15). When water is released, muddy and sandy water covers the existing ice and freezes. As soon as temperatures rise, the ice melts easily as it is not solid (MC15, MC17). The poor quality of ice (due to the muddy water comprising it) leads to difficulties with ice roads. If water was released in September, the quality of ice roads would be much improved; winter roads would freeze better and faster (MC15). If the ice is good then a change in temperature during the winter months will not cause it to melt (MC15).

Industrial Activities and Government Management

Community members attribute a decrease in local water quantity and quality to oil and gas activities to the south (MC01, MC02, MC03, MC04, MC06, MC11, MC13, MC14, MC15, MC16, MC19, MC20, MC21, MC22). Long ago, when industry was non-existent, the water was good (MC22). Oil and gas companies are "put[ting] everything in the water, they put in all the pollution, they pollute our water … the main river coming" into Lake Athabasca (MC22). Another community member expresses the same concern over the pollution and low water levels of the Athabasca River, pointing a finger to industrial activity (MC01). Pollution is traveling down the Athabasca River and emptying into Lake Athabasca (MC01). The community has to drink this water (MC22). One participant who grew up in Embarras Portage reports that there used to be a lot of water. Now, the ice has changed considerably because of pollution stemming from oil sands operations; "the pollution that's coming down" (MC03).

In addition to oil and gas activities and the Bennett Dam, sawmills and diamond drilling were mentioned by community members as partly responsible for current water conditions. Pollution in the Peace River is attributed to discharges from sawmills in operation in the area (MC13), and diamond drilling activities near Gunnar mine are responsible for depositing dust into the lake (MC17).

There is a sense that the community and the government is being deceived by industry regarding the severity of water levels and the amount of pollution that is being discharged (MC20, MC24). It is felt that the provincial government is unaware of the amount of water that industry is taking despite the fact that the community has brought this issue to the government's attention a number of times (MC20). One participant points to the appearance of scum on the river and asserts that someone is covering up (MC24). Another participant remarks that when the instream flow needs number was derived and Environment Canada came out with very low recommended intakes, the provincial government wrangled a higher number (MC20).

It is felt that the damage that is occurring to the local water system is only getting worse (MC01, MC17). One community member remarks that each year the water levels are dropping (MC17). One participant asserts that industry needs to stop taking water and "poisoning us" (MC19). If oil and gas companies continue to take water the situation will only deteriorate (MC17). Community members are concerned that the damage that has already been done is at a point of no return (MC16). There is a fear that too much damage has been done and that future generations will be left to suffer the consequences (MC16). One participant remarks that going out onto the land is like going home – his ancestors have inhabited the land for generations (MC16). Another participant is saddened by the fact that her children will not be able to travel the waterways as she has done (MC19). Even if a clean up program is put in place, it will take a very long time to undo the damage that has been done (MC16).

Participant Recommendations

A number of recommendations were put forth by Mikisew Cree members. It is felt that mitigation for water levels is difficult (MC02, MC10). For example, an attempt was made to facilitate flooding – water was held back so as to cause a jam on the Peace and Quatre Fourches Rivers. However, it did not work very well (MC20). The Athabasca River's water levels are particularly low. The only way to get the Athabasca River back is if oil companies were to halt production (MC15). Industry is urged to use caution and slow down development (MC20). A few participants would like to see industry explore alternative ways to extract oil – methods that use less water (MC07, MC19).

A number of community members would like to see restrictions on the times during which industry can take water and where water can be taken from. Oil and gas companies should only be permitted to take water when levels are high (MC03). Water should no longer be taken from the Athabasca River, rather, it should be drawn from Lake Athabasca (MC20, MC21), inland lakes (MC22), or other waterways such as the Firebag River (MC21). The amount of water that industry needs would amount to only a one inch decrease in the lake's level (MC20). That way, the Athabasca River's water levels are not affected and water can come north (MC20). One participant suggests that water should no longer be taken during the winter until wintertime water and fish studies have been conducted (MC20).

More stringent monitoring is called for (MC10, MC20). Both the community and the IRC should be more involved in monitoring (MC20). As things stand now, industry gives a report card to the government detailing how much water is taken and when it is taken. They carry out their own monitoring without community consultation (MC20). Water intake needs to be regulated and water should only be taken at certain times (MC20). A strict monitoring of industry's patterns of water consumption and the immediate effects will enable sound decisions to be made about water intake (MC20).

On top of a strict monitoring of intake and water levels, there should be tighter reigns on discharges into the river and stricter monitoring of the amount of discharge (MC13). Both sawmills and oil and gas companies are responsible for dumping copious amounts of pollutants into local waterways (MC13, MC22). Thus, it is important to monitor sawmill as well as oil and gas discharges (MC13). Pollutants do not need to be disposed of in the Athabasca River. For example, one community member points out that while one company is releasing their pollutants into the river, another has a lake in which to put contaminants (MC22). Another participant believes that water contamination could be prevented by installing clay dykes around the edges of leases. This way nothing leaks through (MC24).

One way to begin improving water levels is to release more of the water retained behind the Bennett Dam. Water levels would improve substantially if the Bennett Dam was removed completely (MC13). Two community members recommend building a control dam on the Quatre Fourches River at Dog Camp (MC15). This would immediately raise water levels in the Delta (MC16), and greatly improve water levels in both Lake Claire and Lake Mamawi (MC15). Furthermore, such a dam would increase the numbers of muskrat and birds in the area (MC15). Another participant points out that both BC Hydro and industry attribute low water levels to global warming. If global warming is the cause, then it is time to release the water (MC14).

Community members point out that releases are occur at the wrong times (MC13). BC Hydro lets water out in late fall, which results in a number of complications (MC01). Releases at this time are drowning the beaver that are living under the ice (MC01). It would be preferable to release water in September rather than November (MC15). One participant recalls in 2005 that the ice road was just about ready to go when BC Hydro released water. This delayed the road five to six weeks (MC09). Given the fact that ice roads are no longer forming properly, it is recommended that an all-weather road be constructed (MC09). One participant suggests a road from Fort McMurray to Fort Chipewyan (MC09), while another recommends a road from Fort Smith to Fort Chipewyan (MC24). BC Hydro should provide the financial backing for such a road as they are primarily responsible for these complications (MC24). In terms of sources of power, it is suggested that power could be brought from Talson River into Fort Chipewyan (MC24). Or, if a road from Fort Smith was in place, power could be brought via that route (MC24).

Community members are calling for more water quality studies (MC18, MC23, MC24). Alison Bay, for example, is full of lead (MC21). One participant remarks that he is well aware of the poisons in local waters (MC23). Oil companies need to take samples from rivers, creeks, inland lakes, and Lake Athabasca and have this water examined (MC23). These studies should come back to the community so both the study methods and results can be examined (MC23). Furthermore, these studies should be continuous and designed with the community (MC23). Another community member suggests that people, rather than electronics, test water before it is disposed of in the river so as to ensure its cleanliness (MC13). Wells in town should be tested as well, specifically, those wells located at Bishop Piché school and across from the old folks home (MC09). By extension, studies on community health should be carried out (MC21) – studies that examine the effects that polluted water is having on human health (MC23).

Given the polluted state of local waters, the community of Fort Chipewyan should be supplied with bottled drinking water (MC18, MC24). Industry should work toward finding ways to get the community drinkable water (MC18). Water needs to be supplied to protect the community's health (MC18). Alternatively, water could be pumped from the lake (MC18), specifically, from a point well away from the mouth of the Athabasca River (e.g., Sandy Point) (MC09).

It is important that the community be consulted on a regular basis. The improvement of water quantity and quality should be a joint effort between community, government, and industry (MC16). Cleaning and replenishing local waterways is a substantial undertaking and will take many years (MC16). It is critical that community knowledge be used (MC16). The government needs to be brought to the table as both provincial and federal governments are responsible for the changes in water quality and quantity (MC20). One community member points out that the World Bank conducted studies on dams and all of them received a failing grade – they all had downstream effects (MC20). There has been a lack of consultation (MC05, MC20) and both industry and government need to start talking to the community to figure out what needs to be done to correct the situation (MC20). One community member remarks that Mikisew may need to resort to enforcing land claim agreements in order to bring water levels back up (MC16). At this point, the restoration of water quality and quantity is more important than compensation. For example, the last time that the community was at the table with BC Hydro it was recommended that water was restored to the Delta before compensation be discussed (MC20). Both BC Hydro and industry need to meet with communities to discuss the problems and find solutions (MC22). Furthermore, BC Hydro and industry should work collaboratively to increase water levels (MC19).

1.3.2.2 Air Quality

Mikisew participants all report that there is a noticeable decrease in air quality around Fort Chipewyan as a direct result of oil and gas activities to the south (MC01-MC24). They have each voiced unique concerns regarding declining air quality. Generally speaking, participants are concerned that air pollution is having adverse impacts on the local ecosystem and people. Air quality impacts have been observed by Mikisew members to have an effect on the health of their community members and on local plants and animals, and to have caused a noticeable difference in standing water and snow purity.

Of great concern to Mikisew Elders are health problems that have accompanied the observed decline in air quality (MC02, MC06, MC09, MC14, MC18). Participants have experienced a decrease in physical endurance over the years (MC02). Increased cancer rates are believed to be directly related to local air

quality by some participants (MC02, MC18). Kids used to rarely get sick, but now, children are falling ill with things like colds more often (MC09). Sickness generally occurs soon after snow falls, which brings down the air pollution (MC09). One community member reported that when there is 'stuff in the air' his throat becomes sore (MC14).

Animal health has also been reported to be declining as a result of poor air quality (MC02, MC05, MC06, MC15, MC16). Animals too are experiencing a decrease in endurance; deer can no longer outrun wolves (MC02). Participants have even noticed that some animals, such as martens and foxes, are no longer seen. It is believed that air pollution has killed off a number of these animals (MC05). As he explained:

> I wanted to talk about air emissions. I know that and see that. I see the pipes, the stacks, the smoke never quits coming out. It goes out all the time. You always see it in the air and wherever the wind blows, that's where the smoke goes to, wherever. And then it drops and it affects the animals. We used to see a lot of animals. There used to be a lot of foxes, there was a lot of martens, there was a lot of lynx. Today you don't see them. To me, the way I see it, I think that air has killed off those animals, has polluted the animals. That's a really bad thing. I don't like it. It's not a very good thing (MC05).

Another participant reported a decrease in the number of fish and attributes this decline to pollution that falls from the sky into the water (MC15). "I know that a lot of this stuff that flies around with the wind you know, the burned stuff and all that stuff, if it lands into a lake or a river that's got fish it will eventually kill a lot of the fish there. The other part is, a lot of stuff like rabbits or even moose eats willows or eat, all these animals that eats willows and stuff like that, food, they get affected by that too" (MC15). Participants are concerned about animals eating polluted food and breathing polluted air (MC06, MC15).

Along with declining animal health, participants report a noticeable change in local vegetation as a result of decreasing air quality (MC13, MC14, MC16, MC18, MC22, MC23, MC24). One participant reports that the color of plants is a lighter green, or 'yellowish green' (MC23). The tops of big trees are drying out and it is believed that this drying is due to acid rain (MC14). This drying trend is linked to an increase in forest fires (MC17). Another participant describes seeing trees with leaves that are dark green and hang down like they are going to die (MC24). Also berries are not as plentiful anymore (MC13, MC18). Furthermore, ceremonial and medicinal plants like rat root, diamond willow and mint are being damaged by air pollution (MC16, MC22).

Changing weather patterns have been observed by a number of participants (MC07, MC09, MC17). In the 1960s and 1970s storms were strong; now storms are much shorter and less intense (MC07). Snowfalls in the past left much more snow than they do today. Also, there is much less moisture in the snow. As a result, water volumes are not what they used to be (MC09).

A number of participants describe a very unpleasant odour in the air, which is attributed to oil and gas production to the south (MC02, MC03, MC04, MC07, MC09, MC17, MC19, MC21, MC24). This odour is especially noticeable when there is a south wind (MC03, MC04, MC07, MC09, MC17) and can be detected in both the community of Fort Chipewyan and in traditionally used areas like the Embarras River. The smell is described as gas-like (MC17), oil-like (MC19, MC21), diesel fuel-like (MC04), tar-like (MC07), or like rotten eggs (MC03, MC18).

Along with unpleasant odours in the air, one participant has noticed a haze in the sky (MC09). Many community members are very concerned about the pollution that is falling from the sky and feel that air pollution is contributing to declining water quality (MC12, MC17, MC19, MC24). Soot has been observed on snow in the winter and on the ground in the summer (MC12). Trappers no longer take snow for water from the top; they must take from underneath (MC12). In the past, people could take water from anywhere, including muskeg, as this water was clean because it was underground. From the mid-1970s onwards, one had to be pickier about where to take water. Now, standing water is avoided; water is only taken where there is flow (MC17). Others report black residue in canisters left out to gather rain water (MC17, MC19). This residue persists even after boiling the water (MC17).

Acid rain and the appearance of standing water is also a concern for many community members (MC01, MC04, MC07, MC09, MC16, MC24). One participant is concerned that the sulphur in the air creates acid rain that pollutes lakes in the area and falls on plants and soil (MC07). This acid rain has adverse affects for those animals that subsist on the plants of the forest (MC16). Some community members have noticed an odd discoloration in standing water (MC01, MC04, MC09, MC24). A yellow scum is reported in the puddles left after rain; this scum is attributed to polluted rain (MC09, MC24). As one participant explained, "…when it rains heavily there's a yellow scum on the water…" (MC21). There is now a rusty film around the edges of tiny lakes and creeks (MC01). Another participant tells of green stuff around lakes (MC04) or of particles falling 'like snow' on the land (MC03). One participant mentioned that Aboriginal groups from northern Saskatchewan and Manitoba should be involved in the regulatory hearing process in Alberta's oil sands as air emissions are travelling there as well (MC20).

Some community members sense that they have been deceived by the oil and gas companies carrying out activities to the south (MC07, MC24). One participant questions whether or not the community is being told the truth about what is emitted from the plants (MC07). Another participant talks about complaining of the black smoke coming out of the plants at later hours in the evening (around 8 to 10pm). Although he was repeatedly told by the government environment department that he called that it will be fixed, the problem is never resolved. He feels that somebody is covering up (MC24).

Some community members are calling for oil and gas companies to search for less polluting means of extracting oil, or ways to reduce air emissions (MC07, MC14). One participant would like to see more air monitoring stations along the boundary of Wood Buffalo National Park (the 27th Baseline) so as to monitor the amount of emissions passing into the Park (MC13). Another participant would like to see more studies carried out on the adverse affects of air emissions and ways in which these emissions could be reduced or eliminated (MC15). One participant suggests that the black residue left in water collection canisters be tested (MC19). Finally, it was recommended that oil and gas companies invest money into finding ways to reduce pollution from their plants. Exhaust from plants could perhaps be transferred into a tailings pond where it could be dissolved (MC24).

One participant discussed the impacts of the diesel exhaust from the ATCO power generation plant near town. In the spring, when east winds are frequent, the fumes from the plant blow "right through Fort Chip (MC09)." He feels that the power plant needs to be moved to protect the health of people, particularly children, in the community.

To summarize, interviews carried out with participants identified a number of concerns related to local air quality and the ways in which poor air quality impacts community members as well as the local

ecosystem. Community members have noticed new health problems, specifically respiratory-related issues such as decreased endurance. These health problems extend to the local wildlife and vegetation. Some animals are reported as having alarmingly low numbers and are generally unhealthy. Local vegetation and traditionally used plants have been adversely impacted by poor air quality. Weather patterns have changed and standing water and snow are no longer considered safe to drink. Decreasing air quality not only affects one facet of the local ecosystem, but has ramifications that are felt along all parts of the lifecycle.

1.3.2.3 Animals

Mikisew participants report alarming decreases in the region's wildlife populations (MC01, MC03, MC05, MC09, MC10, MC11, MC12, MC14, MC15, MC16, MC17, MC18, MC19, MC20, MC23, MC24). Overall trends witnessed with certain animals, and the causes underlying these trends, were discussed by participants. The general consensus was that oil and gas activities to the south have direct and indirect adverse impacts on wildlife populations.

Animal Behaviour

The effects of pollution, specifically, decreasing amounts of good-quality food and water, have led to changes in wildlife behaviour (MC15, MC16, MC17, MC18, MC20, MC24). This is especially noticeable in the bird population where flyways have changed (MC12, MC16). One participant comments that the spring flyway has moved to the west, likely as a result of pollution from smoke stacks to the south (MC16). Furthermore, birds are not landing because of a lack of food and water (MC12, MC14, MC15, MC16, MC17, MC18, MC20). One participant reports that some of those birds who have changed flyways are seen feeding in farmers fields (e.g., around Grouard) (MC17).

The behaviour patterns of other animals have also changed (MC16, MC17, MC23). For example, muskrat have changed their habits; they rarely build large houses anymore. Now the houses are small 'push ups' in the river banks (MC16). This is the result of dropping water levels; muskrats are now moving from lakes to creeks and rivers (MC16, MC20). Rivers, however, have now become unsuitable habitats for the muskrat. For example, when BC Hydro releases water in November, the homes of those muskrat along the banks of the Peace River are flooded and destroyed (MC16). A number of community members singled out the muskrat as having a particularly difficult time surviving; their numbers have dropped substantially (MC09, MC16, MC19, MC20). This same trend is witnessed in the beaver population. Dried up lakes and sloughs are forcing beaver to move to rivers (MC17, MC23).

Human activity in the area is also believed to play a part in local wildlife fleeing. Noise pollution was pinpointed as a dominant factor in wildlife dispersal (MC01, MC03, MC04, MC05, MC07, MC12, MC13, MC15, MC17, MC21, MC22). Animals are leaving because of noises and smells associated with the oil and gas industry (MC20). One participant points out that an animal's ears are very sensitive. Once they are driven away by noise, it is unlikely that they will return. Animals do not get used to noises and smells (MC01). Once activities commence in an area, the animals will move away. This is especially true of bear and moose (MC13). Noise from traffic on local rivers was also discussed as contributing to the problem of decreasing wildlife populations.

Not all participants agreed that noise has an adverse impact on wildlife (MC02, MC19, MC23). One participant points out that bears, wolves, and coyotes are getting habituated to human activity and are

frequently spotted wandering around town (MC19). Another participant discusses the fact that cars and planes are part of everyday life now and that animals are used to these types of noises (MC23). One community member states that moose will tend to move just out of range of where activity is occurring because the noise keeps wolves away (MC09). It was suggested that flares and fencing be used to keep animals away from the roadways and protect them from being hit by traffic (MC19).

Animal Health

A number of participants reported disturbing maladies in the animals they hunt (MC01, MC04, MC07, MC19, MC23). Since the 1970s, hunters have noticed little white jelly spots – half a fingernail in size – on moose and rabbit intestines (MC01). One participant has seen moose and bird livers that are yellowish and whitish. Also, moose lungs are lighter in color than they should be, and the lungs of wolves are unusual as well, being pale yellow or white (MC01). Another participant reports that moose north of Fort McKay have bumpy and brownish livers (MC19). A third participant tells of a cow moose, killed in 2005, that had puss-filled lungs (MC04). During the past couple of years moose meat appears to have little spots and there is 'jelly' inside the flesh. Furthermore, puss has been observed in the joints of two moose (MC07). In regards beaver and muskrat, fat that used to be white in color is now yellowish (MC23). Certain parts of animals that are traditionally consumed are no longer consumed because of those maladies affecting specific organs (i.e., moose and bird livers) (MC01). Community members note these maladies were non-existent prior to the commencement of industrial activity (MC07).

Along with visible differences in game, certain animal meat tastes different (MC03, MC04, MC07, MC08, MC12). Muskrat meat is reported to now have an oily texture (MC03). Moose meat is said to have a different taste (MC04). Birds also have a different taste – a taste that participants are not used to (MC04, MC07). One participant comments that both moose and fish are no longer good and attributes this bad taste to polluted water (MC08). Another participant singles out duck as tasting different (MC12).

A couple of participants remarked upon the unusual appearance and disappearance of different insects. One Elder discussed how the 'water boatman' have disappeared, and how, as they are one of the main foods for ducks, this is having a negative impact on ducks (MC07). Another participant, an active hunter, noted that tiny black bugs that used to appear on the snow in March in the thousands have not appeared at all for the last four years (MC19). The appearance of these bugs is an indicator that spring has arrived and summer is coming soon (MC19). The presence of never before seen "little black bugs crawling around the ptarmigans" and chickens, and "all over the buds" of the pussy willows was also discussed (MC02).

Generally, community members have noticed a drastic decrease in local wildlife populations. A number of different reasons for this decrease were identified, including pollution coming from oil and gas activities to the south. A decrease in the amount of good-quality food and water, coupled with human disturbances such as noise, have driven local wildlife away. Also, a number of maladies have been observed in those animals that have been hunted since the inception of oil and gas operations to the south. The frequency of these maladies is increasing as industry activity increases. One community member calls for extensive studies to be carried out so as to better understand the impact of industry activities on local wildlife populations (MC20).

1.3.2.4 Fish

Low water levels, coupled with pollutants entering the waterways, have led to a sharp decline in the number of fish available for catch (MC05, MC07, MC20). The overall health of local fish populations has also been negatively affected (MC03, MC04, MC10, MC13, MC15, MC16, MC19, MC23).

A decrease in water levels, in both rivers and lakes, was reported by a number of participants (MC01, MC07, MC10, MC13, MC14, MC17). Low water levels are having an adverse effect on local fish populations. For example, the Athabasca River is very slow now and, as a result, very silty. Fish can no longer reach Lake Claire and Jackfish (Richardson) Lake to spawn (MC14). “And the fish spawning was Richardson Lake, same with Lake Claire, all those places, that’s where the fish used to spawn. Now they can’t spawn anymore and the fish is so much different now too, it’s getting worse. Yeah, because of the water” (MC14). Participants agreed that low water levels result in lower numbers of fish (MC01, MC07, MC10, MC14, MC17).

The decrease in water levels has also changed fish behaviour – specifically spawning habits (MC04, MC07, MC14, MC16, MC17). For example, migration has changed at Quatre Fourches River; a participant reports that goldeye were not present in this river in the past. Goldeye used to spawn directly in front of his cabin; now the area is all mudflats (MC07). The never-seen-before low water levels in the Athabasca River also accounts for the lack of fish and change in spawning behaviour (MC07). “And most of these places are drying up, where they used to spawn.” (MC17). Another participant remarks, “And areas where our people would gather fish for winter months, because of the shallow water, the fish are no longer there. They’ve moved on to elsewhere, they’re probably spawning somewhere else” (MC16). Concern is also expressed over the ways in which low water levels impacts fish numbers; “This is their spawning area, they go up the river, eh. And now, if they dry up that river, where are they going to go? Will they all die off below that or what?” (MC04).

Water pollution caused by oil and gas activity to the south also has negative repercussions for local fish populations (MC02, MC04, MC07). One participant pointed out that pulp mills along the rivers are also contributing to the problem (MC04). Fish are ingesting all of the pollutants in rivers and lakes (MC07). As a result, fish numbers are substantially lower now than they have been in the past (MC05, MC07, MC20). Long ago, nets could be set anywhere – fish were abundant. Today there are ‘no fish’. Just like all other forms of life, fish depend on water; polluted water decreases fish numbers (MC05).

Water pollution has resulted in ailments not previously seen in local fish populations (MC03, MC04, MC10, MC13, MC15, MC16, MC19, MC23). One participant relays a story of ice fishing in March of 2006. Of the 30 pickerel he caught, two were visibly different; one was ‘orangey-yellow’ all over, while the other, younger fish had at least six warts along its side. The larger fish was “all blood inside; the guts were all bloody” (MC13). A number of other physical deformities have been noticed. Community members have witnessed whitefish with boils or sores on their back scales (MC03), fish with unusual spots and a red color (MC04), fish with scales missing (MC10), and one fish with yellow film on the liver and pus in its gut (MC19). One Elder used to work as a commercial fisherman on Lake Athabasca and he shares that “sometimes when they catch fish they would look slightly different, like some maybe the head would be really big and the body skinny, smaller and sometimes some of them would have scales and some on one side it’s just like there’s not much, like the scales are gone” (MC10). One participant reports that while fish used to be firm and hard, they are now more ‘crumbly’ – like water-logged flesh (MC23). These deformities have been observed since the 1960s and 1970s (MC03, MC04).

Along with these noticeable changes in appearance, fish tastes different (MC03, MC06, MC07, MC10, MC22). Fish are reported to taste 'oily' (MC03) and 'watery' (MC06, MC10, MC16). These changes to fish taste and texture are attributed to water pollution (MC07, MC22). Low water levels are also linked to changes in the taste of fish, specifically whitefish (MC07). In fact, one participant claims that local fish are no longer edible (MC03). Low water levels force fish to move. As a result, fish are ingesting different, often polluted, food. The things that fish eat affect the way that they taste (MC07).

1.3.2.5 Vegetation

Elders have seen a variety of changes in local vegetation. These changes include a decrease in the overall abundance of some plants, a change in the habitat of specific types of vegetation, deformed plants and berries, a change in taste of certain plants (specifically mint and berries), and a decrease in the effectiveness of medicinal or ceremonial plants. The general consensus is that polluted air and water, from oil and gas activities to the south, account for the majority of these trends.

A number of participants describe a decrease in the abundance of a variety of local plant species (MC03, MC04, MC06, MC07, MC10, MC14, MC17, MC19, MC20, MC23). Participants discussed a lack of peppermint or wild mint (MC03, MC10, MC20, MC23), berry species (MC04, MC06, MC07, MC10, MC14, MC17, MC19, MC20), medicinal plants (MC07, MC14, MC17), specifically rat root (MC10, MC19, MC20). The frequency of these plants has been declining over the past 10 to 15 years (MC13, MC20). This decline is attributed to pollution (MC04, MC17, MC23) as well as lower water levels. As explained by a number of participants, everything needs water to grow (MC02, MC03, MC07, MC10, MC14, MC19).

Low water levels have led to habitat changes for some local vegetation (MC01, MC07, MC12, MC19, MC23). Wild mint for example, a plant that once grew in relative abundance along local rivers, is now often only found growing around inland lakes and sloughs (MC01). Conversely, bulrushes, which typically grew around inland lakes and sloughs, are now growing alongside rivers (MC23). Also, willows are now growing in areas where berries and traditional medicinal plants were once gathered (MC07, MC12, MC19).

Along with a decrease in abundance and habitat changes, plants themselves are changing (MC05, MC19, MC23). This is particularly true of medicines and herbs such as rat root, which do not grow as large as they used to historically (MC05, MC19). Changes in size are not the only differences observed; some plants have a deformed appearance (MC13, MC16, MC23, MC24). Plants and grasses in close proximity to oil and gas activities are discoloured, taking on a lighter green, or 'yellowish green' appearance (MC23). A 'brownish' discoloration is reported on local red willows and some medicinal plants (MC16). Many berries, and specifically saskatoons, have been seen with yellow growths on them (MC13). This same participant has observed a number of changes in red cranberries as well. Whereas cranberries used to be firm and juicy, they are now soft, dried up, and fall off the bush easier. Local cranberries with black spots have been observed (MC13). "There's something causing some of those berries in some areas to get this disease. I've never seen that one before" (MC13). Local trees also appear to be affected by changing conditions. One community member reports that, all the way to Poplar Point, the leaves on trees are dark green and hanging down as if they are going to die (MC24).

Along with these visual differences in local vegetation, some edible vegetation has taken on a different,

often foul, taste (MC02, MC04, MC13). Water turns black, for example, when making wild mint tea (MC02). One participant reports that he will no longer drink fresh mint tea as it tastes like oil (MC13). “I couldn’t drink it because it had a different taste. It wasn’t a good tasting mint tea. It tasted more like …almost like oil, motor oil” (MC13). Berries also taste different than they have in the past and are reported to be less juicy (MC02, MC04). This is especially true of those berries picked from areas considered polluted (MC13). In fact, a few participants remarked that they cannot or will not eat certain plants (e.g., bulrush roots) and berries because of pollution (MC01, MC04, MC13).

Ceremonial and medicinal plants are also no longer as effective (MC13, MC16, MC17). Rat root, traditionally used to relieve cold symptoms, such as sore throats and headaches, no longer offers the same degree of relief as it once did (MC13, MC16). This is attributed to the fact that these, and other plants, have been ‘drying out’ (MC16, MC17). One traditional Elder described what this meant for some of herbs he collects:

> “I’m starting to notice the quality of rat root isn’t what you are going to expect. It’s the same with the willows we use…in some of these areas, they have a different colour to them. It’s not really red any more; it’s kind of brownish. Even that … when you scrape the bark off and boil it for medicine … it doesn’t help you and it should. Other stuff I notice, the fungus that you gather from the diamond willow. Last few years I’ve noticed the fungus isn’t like it was. It’s more rubbery” (M16).

When the areas that these plants are growing in become dried out or are affected by pollution, their medicinal and ceremonial properties are altered and they lose their effectiveness (MC16). One community member remarks that he will no longer pick medicinal plants as he can no longer trust them (MC04). “We used to have medicine guys…. Today now, I don’t even hardly pick anything up from the ground anymore” (MC04).

The general consensus among participants interviewed was that polluted air and water were responsible for the vast majority of changes in local vegetation (MC01, MC02, MC04, MC13, MC17, MC22, MC23, MC24). Pollution ejected into the air by industry activities to the south falls on local vegetation causing the aforementioned problems (MC02, MC22). In regards water pollution, one participant remarks that the waters of the Athabasca are no longer clear and sandy beaches no longer exist affecting riverine vegetation (MC23).

1.3.2.6 Reclamation

The majority of Mikisew Cree First Nation community members interviewed agreed that reclamation cannot put the land ‘back the way it was’ (MC01, MC02, MC03, MC04, MC06, MC07, MC08, MC09, MC10, MC11, MC12, MC15, MC17, MC22, MC23). The land, once disturbed, has been forever changed (MC01, MC03, MC04, MC06, MC07, MC08, MC09, MC11, MC12, MC15, MC17, MC22, MC23). Reclamation is difficult because of a lack of available water once the land is disturbed (MC15, MC23), coupled with the fact that the soil is no longer ‘clean’ (MC01, MC09). As one Elder explained, “No human being will ever put that land back to what it used to be where Mother Nature controlled it or put it out there. They’ll never put that, ever put back. Because when they’re taking these tar sands out of there to process through the plants and come out with their crude oil, how many different chemicals has been used for that process” (MC09). The land itself is living; tearing the land up and attempting to put it back will ‘kill it’ (MC03). “They’re not gods. They’re playing with nature” (MC03).

Of concern to participants is the fact that some plants will not thrive in newly reclaimed environments (MC01, MC03, MC15). The lack of growth of certain plants is attributed to sub-surface disturbances and a decrease in the ability of the disturbed area to retain moisture (MC15, MC23). One community member comments “no muskeg anymore” in reference to this concern (MC23). Specific trees, such as spruce, will only grow in areas high in moisture (MC15). This is also true of many medicinal plants such as rat root, which grow in water (MC15). “Because there’s no water underneath there, there’s just all that stuff they backfill in. Well, the backfill, the water will seep right through. It’s not going to hold no water so a lot of these trees and that won’t grow in a place like that” (MC15).

One participant voiced concern over the fact that some companies will only attempt to replant certain trees or plants. For example, only trees such as jackpine have been replanted in one reclamation site; plants such as willows, wild shrubs and medicines have not been replanted (MC17). This is attributed to a lack of knowledge regarding the significance of some types of local vegetation (MC17). One participant expressed a desire to see berry bushes reclaimed (MC21).

Related concerns revolve around the types of species that grow in newly reclaimed environments (MC08, MC12) as well as growth rates (MC04). Specifically, some participants point out that because of the unavoidable change in the environment of a reclaimed area, species of plants that were not previously part of the local ecosystem will begin to appear and thrive (MC08, MC12). Growth rates were discussed as one participant reports that after 30 years of reclamation by one company, the poplar trees that have been planted have not yet reached the height of the poplar trees in his own yard that were planted at about the same time (MC04).

Another concern voiced by participants is the fact that once that environment has been altered, some animals have difficulties surviving due to a lack of vegetation that previously comprised their diet (MC03, MC15). “A lot of these plants grow in the water you see, like rat root and pineapple and that, they grow along the water. They take all that out then they destroy the whole thing, they’ll never put that back again. It’s the same with plants, wildlife and everything, muskrats, beavers, they live on the water. I guess a lot of places keep rabbits, chickens, all that stuff, now they eat roots too. Well, once they destroy all that they’re all gone” (MC15).

Participants are concerned that wildlife will leave and not return (MC09, MC15). The chemicals used to separate the oil from the sand may deter wildlife from returning (MC09). One participant points out that the animals, even the little animals such as birds, will smell the oil (MC01). Another community member is uneasy about soil contamination - specifically as it relates to human health. People are eating animals that are consuming contaminated food (MC19). Another participant expressed concern over the digging up of contaminated soils, remarking that this may be at the root of local sicknesses (MC04).

Although many participants firmly believe that reclamation does not and will not work, a few community members interviewed were more optimistic (MC05, MC13, MC14, MC22). For example, one participant, upon visiting a reclaimed area, was “impressed with what had been done” (MC21). Another community member asserts that reclamation is always a good idea so long as industry is not simply covering up polluted areas, which would eventually leach out (MC13). A third participant was not so sure reclamation would work, however, believed that the effort should be made (MC22).

The issue of long-term financial commitments to reclamation projects was also discussed (MC13,

MC20) There is a concern that once projects have run their course and profits decline, that reclamation projects will be abandoned (MC20). Discourse centred on formulating recommendations (MC13, MC17, MC19, MC20, MC24). A couple of participants called for long-term financial commitment to reclamation projects (MC13, MC20). One participant points to the current lack of funds devoted to such projects and calls for industry to ensure that there are enough funds to sustain reclamation programs (MC20). Some community members suggest that Elders or Mikisew Cree First Nations should be involved in the reclamation process in the sense of checking to ensure that correct measures are taken to restore local habitats (MC17, MC24). Others state that Mikisew contractors are well placed, and should have priority in conducting reclamation activities (MC24).

1.3.2.7 Access Management

Mikisew Cree First Nation community members were asked about increased access and access management on local traditional lands. The vast majority of participants voiced a number of concerns related to access management and offered a variety of recommendations.

One area of great concern is the fact that local wildlife will abandon areas that are opened up to increased public access (MC05, MC09, MC12). Increased access disturbs local wildlife and causes them to move around more (MC09). One participant reports that the meat from those animals that are forced to move a lot is different. It is tougher because the animal is running more than is typical (MC09). Furthermore, new access results in a more noise disturbances (MC08, MC09). All-terrain vehicles, snowmobiles, and power saws in particular, pose a threat to a peaceful wilderness due to their loud noise (MC08, MC09). “Too much travelling, using the area, like with quads and skidoos, especially. I think a lot of your little animals, some of them move off on account of that” (MC09).

Some participants expressed concern over increased volumes of people (MC16, MC22). By opening up roads into some of the more isolated areas, access is easily gained, which will lead to more non-locals accessing these areas by road, boat and all-terrain vehicles (MC16). One participant remarks that the current situation (without an all-weather road) is pleasant (MC22). If a road is built, there will be increased encroachment on Mikisew traditional territory (MC22). This situation is difficult as access is difficult to monitor; too many people travel on all-terrain vehicles, making it difficult to monitor or manage their hunting activities (MC08). Community members have noticed that many people who venture into traditional lands are unaware of the fact that they are intruding on people’s traditional territories and traplines (MC16). One participant reports that some of these people have even gone so far as to build cabins on Aboriginal traplines (MC16). Generally speaking, the Aboriginal community feels a sense of frustration with non-local people’s lack of respect for their land (MC16).

Participants are worried that the creation of new access in their traditional areas will result in increased competition for wildlife (MC17, MC20). Some fear that they will no longer be able to trap (MC10, MC12, MC20). The arrival of increasing numbers of non-local hunters, coupled with the fact that wildlife will be abandoning the area (due to increased disturbances), will make trapping a difficult pursuit (MC10, MC12). If activities are not monitored and controlled, soon there will be nothing to hunt (MC16).

A number of participants relay disturbing stories of poor hunting practices (MC07, MC15, MC16, MC18). Some people just shoot for the sake of shooting, never taking what they shoot (MC07). Furthermore, many white hunters will shoot at noise without first verifying their target (MC15). One community member tells of a time when two hunters opened fire on a hide he had hanging (MC18).

This same participant has also witnessed hunters shooting at willows and recalls an incident, four or five years ago, when a person was shot and killed in this very same fashion (MC18).

Although the majority of those community members interviewed identified problems with increased access and access management, a few did not believe that increased access posed significant risks (MC02, MC21). One participant claimed that he did not see any problems with access management (MC02). Another did not see any problems with more people entering the region (MC21).

A variety of recommendations were put forth by those community members interviewed (MC08, MC09, MC11, MC15, MC16, MC17, MC19). Input from local communities is suggested (MC11). Specifically, as development moves closer to Wood Buffalo National Park, a joint effort needs to be made between the Park's officers and Mikisew Cree First Nation so as to better monitor activities (MC16). One participant suggests erecting gates to which only trappers have keys; this will aid in deterring unauthorized hunting activity (MC16). Trappers should be notified and consulted with regularly regarding access (MC17). Sacred areas, such as burial grounds, that have deep significance for local Aboriginal communities may be at risk of suffering adverse impacts due to increased access. Regular consultation may help in the prevention of desecration of sacred sites and areas (MC17). One participant cites Wood Buffalo National Park as a good example of well-controlled access. No all-terrain vehicles are permitted and Park borders are patrolled regularly (MC08).

In additional to increased Aboriginal consultation, wildlife crews should be expanded and more officers should be put on patrol so as to better control access (MC09, MC19). 'No hunting' rules should be enforced, especially around leases (MC15). Furthermore, oil and gas companies should be participating in the protection of local wilderness (MC19). They should be working with government authorities to ensure access is monitored and safe hunting is practiced (MC15).

Other recommendations stem from the losses that trappers experience as access is increased. One community member believes that trappers should be compensated for the losses they experience as a result of encroaching industry-related activities and increased access (MC17). Trappers are not allowed to trap in lease areas and should be compensated for this as well (MC17).

In summary, the majority of Mikisew Cree First Nation participants interviewed identified problems with increased and uncontrolled access to their traditional lands. Of primary concern to many participants is the increase in noise pollution that will accompany increased numbers of people. An increase in noise will drive a large number of local wildlife away. This increase in noise, coupled with the larger numbers of people, will create substantial competition for Aboriginal trappers. Participants also discussed the number of unsafe and/or disrespectful hunting practices they have witnessed and worry about the safety their own community members. A number of recommendations were put forth, ranging from increased monitoring to trapper compensation.

1.3.2.8 Socio-Economics

Participants discussed a variety of issues pertaining to socio-economics. Education, training and employment opportunities were discussed, as were specific aspects of the proponent's plans for engaging community members. The high cost of living in Fort Chipewyan and was also brought forward by participants, as was compensation for development on traditional lands.

Grade 12

Some participants felt that obtaining a Grade 12 education was critical for youth (MC06, MC13, MC18, MC22). Completing high school is an important step in obtaining a job (MC06). The fact that oil and gas companies will not hire those who have not completed Grade 12, according to some participants, is good incentive for young people to see their studies through (MC13). Obtaining a Grade 12 education opens up the doors for graduates to pursue careers or carry on with post-secondary studies (MC22).

Other community members, however, feel that oil and gas companies should hire any Aboriginal person who is ready and willing to work even if that person lacks a Grade 12 education (MC08, MC10, MC17, MC19, MC22). A Grade 12 education is not always needed as on-site job training is provided (MC17). One participant even remarked that some of those with Grade 12 educations do not seem to want to work, probably because they are too young (MC10). He states that, "I'm inclined to think that the people who have not completed Grade 12, you know, but are capable of working, they want a job so badly, they want to work, they want to be trained, that's the kind of people they should hire. The people who have Grade 12 or students, they're not really...it seems like working is not that important to them so to speak" (MC10). Another participant drew attention to the fact that he never received an education, but that he was able to teach himself everything he needed to know for every job he was hired to do (MC08). This is also true of a second community member who has a Grade 9 education; he has always received on-the-job training (MC17). "There's a lot of places that I went to work saying that you gotta have Grade 12. But they show you, they show you around, what to do, for safety and stuff like that, to all that, they show you the site, where there's danger, stuff like that…as long as you can read and write and understand signs" (MC17). This Elder feels that "it's good to have Grade 12", but that it is really not needed for many oil and gas jobs (MC17).

A few community members discussed the need for incentives in school programs (MC13, MC21). They point out the difficulties that children are experiencing in school. Some children have lost interest in learning (MC13). It is recommended that schools hold career days more regularly, and invite oil companies to come talk to students (MC13). Also, parent – teacher meetings should be held regularly (MC13). Teachers are experiencing discipline problems in their classrooms. Although funds are limited, schools should find ways to bring in more staff such as guidance councillors or classroom assistants to remedy the situation (MC21). Children need incentives as well as support to see their education through to Grade 12 (MC21).

Employment and Training

A number of community members discussed the lack of employment in Fort Chipewyan as well as the lack of initiative, on behalf of oil and gas companies, to provide employment and/or training to young First Nations members. Generally speaking, there was a sense that more could be done to improve the current situation in Fort Chipewyan. Participants provided a variety of recommendations for how this could be addressed.

Participants point out that the unemployment rate in Fort Chipewyan is high, and is not getting any better. This is particularly true for younger generations (MC10, MC18, MC23). It is felt that part of the problem lies in the fact that many employment opportunities are not offered to young Aboriginal men and women (MC10, MC23, MC24). Oil and gas companies should be hiring more people from Fort Chipewyan, especially those with families (MC02). Of those Aboriginal people who have steady

employment with oil and gas companies, the majority have labour jobs (MC23). Aboriginal youth are discriminated against just for the “colour of their skin” (MC11). Aboriginal workers are not found in management positions (MC23), and are often only “doing simple jobs” (MC04). Many young community members are ready and willing to work, however, they lack the means or the opportunity to do so (MC23).

Some Elders discussed how they would like to see more training opportunities provided to the community’s youth – training that would take place in Fort Chipewyan (MC13, MC15, MC18). Participants suggest that a training center be brought to the community, perhaps through Keyano College (MC07, MC09, MC15, MC18). Hands-on training (including equipment operation) in apprenticeships such as welding would benefit the community immensely (MC09). The implementation of local training programs would better equip the community’s youth to enter the work force and succeed (MC13). A training center would also be an excellent way to encourage Aboriginal youth to prepare and become motivated for a career (MC07, MC15, MC18). Apprenticeship programs (MC15) as well as cross-cultural job training for Fort Chipewyan people that could prepare them for the culture of oil and gas industry (MC20), could lead to considerable progress in improving the local employment situation.

The majority of discussion about employment and training centered on exploring solutions (MC07, MC10, MC13, MC15, MC16, MC17, MC21, MC23). Training was discussed by a number of participants (MC07, MC15, MC17, MC18, MC21, MC23). Specifically, it was felt that industry needs to make a commitment to provide on-site training to all Aboriginal new-hires (MC15, MC21, MC23). If young Aboriginal persons who have not completed Grade 12 are hired, they should be offered the opportunity to commence apprenticeship training (MC15). Efforts need to be made to provide job shadowing, training or trade preparation to youth prior to graduating so that they are better prepared to secure steady employment when they graduate (MC16). One participant suggests that summer students be trained both in how to live in the bush as well as how to succeed in the workforce (MC17).

There was a call for industry to become more involved in the effort to improve the community’s employment situation. Oil and gas companies should be sending representatives to meet with youth, either in school or in training centers (MC07). Careers should be introduced to and discussed with youth who are entering high school so as to motivate children to see their studies through (MC07). In terms of those already employed, or those seeking employment, a job rotation or sharing (six months on, six months off) program was suggested (MC10, MC17). This would provide more jobs for people in the community (MC17). One participant believes that more effort needs to be made to set up trade shops within the community as it seems that youth tend to do better at home; they tend to quit jobs when they go to Fort McMurray to work (MC17). Furthermore, more local contractors from Fort Chipewyan should be hired (MC20).

Improved communication is needed between Fort Chipewyan community members and oil and gas companies (MC21, MC23). One participant recommends that industry representatives come and meet with and interview youth as well as Elders to discuss employment opportunities and ways in which the local employment situation could be improved (MC23). It is recommended that those who come to meet with community members be the ones who are the decision-makers – those who make things happen (MC23). In the past, representatives have been sent out who are not knowledgeable and who cannot answer questions (MC23). These meetings should happen yearly or bi-annually (MC23).

Fly-in/Fly-out

All those participants who spoke of the fly-in/fly-out program were in agreement that it was a great idea (MC08, MC09, MC13, MC15, MC16, MC18, MC20, MC21, MC22). This service would be particularly beneficial as housing is difficult to come by and expensive in Fort McMurray (MC15, MC21, MC22). The housing situation is a deterrent for those people in Fort Chipewyan that are interested in working in the oil and gas industry (MC15, MC22). It is especially difficult for young people to move to Fort McMurray as they cannot save enough money to get going (MC15). A fly-in/fly-out program would allow local workers to reside in Fort Chipewyan and keep their home there (MC02, MC16). Furthermore, this service would be particularly beneficial for those with young families as it is important for parents to be around (MC21); workers would never be away from home for too long (MC15).

A fly-in/fly-out program, therefore, would be a welcomed service to the residents of Fort Chipewyan. Recommendations centered on the length of shifts (MC13, MC15). One participant suggests a rotation with 7 to 10 day shifts, or, a two week on/two week off shift (MC13). Longer shift periods would be less expensive for companies, and the worker would spend less time traveling (MC13). Another participant suggested a two week on/five day off shift so that workers were not away from home for prolonged periods of time (MC15).

Cost of Living

Generally speaking, all community members who spoke on the cost of living agree that it is too high (MC01, MC02, MC09, MC11, MC17). This is particularly true of food (MC01, MC02, MC09, MC11) and gas (MC11). Food in Fort Smith is much cheaper (MC01, MC09). In fact, one participant purchases groceries from the IGA in Fort Smith and has the groceries delivered by McMurray Aviation (MC09). The price of local food is approximately twice the price of food elsewhere (MC01) due to the price associated with bringing food in (MC02). Oil costs $180/barrel (MC11).

Small families with only one income and old age pensioners are especially feeling the pinch of the high cost of living (MC09, MC11). One Elder asks, with Christmas approaching, “What kind of presents can [we] buy our grandchildren? When you have just barely enough to live with your old age pension?” (MC11). One participant noted that there are at least 150 families in Fort Chipewyan who are surviving on very low incomes (MC09).

The general consensus among participants is that an all-season road is desperately needed (MC01, MC09, MC10, MC16, MC17). An all-season road would substantially decrease the price of local items as the cost of transporting goods would be greatly reduced. One participant, however, is not so optimistic that an all-weather road would or could be constructed (MC16). This participant recalls the difficulties the community experienced when asking for a winter road. If the community had not come together to push the winter road through, it would not exist. The government had insisted that a winter road was not possible. Now the government must maintain this road. A proposal for an all-weather road will not be welcomed by government officials (MC16). It is felt that if there were plants close to Fort Chipewyan, then the road would already be paved. “If they had a plant in Fort Chip…you’d have a road already. … They’re going to pave the road to the last lease area that they’re hoping that they’re going to start mining in a few years down the road. And that’s how far that road is going to go, they’re going to maintain it and make sure that everything is covered; they’re going to have a paved road. Beyond that, I mean, we’re on our own” (MC16).

One Elder commented that with an all-weather road “all kinds of people will be coming in here. They’ll be bringing in all kinds of stuff here. Right now we’re happy. It’s quiet. And we like it the way it is” (MC22).

Compensation

Many participants think that community members should receive some form of compensation for all the development that is taking place in their traditional areas (MC07, MC09, MC11, MC16, MC17). The majority of participants expressed forward-looking concerns such as the long-term nature of the oil and gas industry in the region (MC07), in conjunction with the livelihood of future generations (MC07, MC09, MC11, MC16, MC17).

The permanency of the oil and gas industry (MC07) and the impact that industry activities have had on traditional lands (MC11) was considered. Many participants share the sentiment that, “we were forced out of our land, our way of life, basically that was taken way from us. Nothing in return has given us an equal opportunity to be able to survive” (MC16). Although no amount of money can change what has been done to traditional land, compensation may improve quality of life for today’s community members as well as for future generations (MC11). “Give us something in return…. No money will ever cover what they have done to our land, but give us something at least to enjoy life” (MC11). Currently, industry is utilizing traditional lands for profit (MC17). It is felt that some form of compensation for a loss of traditional lifeways is warranted (MC17). “We don’t get compensated. We don’t get nothing. And they’re making money off our land.” They should “give us a share of what they’re going to make” (MC17). Compensation is not considered a handout or a favour, it something that is owed to Aboriginal peoples (MC16). “The government has a legal responsibility to our people, the First Nations people on our Treaty Rights. They have a legal responsibility and they’ve neglected their responsibilities” (MC16).

Many community members expressed concern over the livelihood of future generations (MC07, MC09, MC11, MC16, MC17). One day industry will be gone (MC07). The community’s children and grandchildren will be the ones that will be using the land in the future, and therefore, deserve a share of the profit that industry is reaping from extracting oil from the land (MC17). There is a sense that today’s youth need to be taking advantage of the opportunities that the oil and gas industry brings; if they can benefit right now, perhaps the benefits will last (MC07). Money talks – if you don’t have money, you cannot talk. “Can’t beat ‘em, join ‘em” (MC07).

Some community members expressed resentment over a lack of adequate compensation (MC11, MC16). Aboriginal peoples have been forced out of their land and their way of life and have received nothing in return (MC16). A variety of forms of compensation were discussed. One participant suggests that a portion of revenue that the government makes off of local projects be re-directed to the people of Fort Chipewyan (MC09). Generally speaking, it is recognized that industry activities will not be terminated, however, support should be provided to those Aboriginal communities that will feel the impact of oil and gas activities (MC04).

A variety of suggestions stemmed from discussions regarding compensation. A socio-economic study was recommended as the cost of fuel and electricity are very high (MC09, MC11). “Now we’re paying $180 dollars a barrel, and if it’s cold, one barrel of fuel won’t last a month…. Some houses are really cold” (MC11). “Right now a $2,000 cheque, like a $1,000 every two weeks going to a family, you’ve

barely got enough to survive for the cost of living in Fort Chipewyan, Alberta" (MC09). Subsidized living for Elders (MC11) and money for education (MC16) were also suggested. One participant would like to see industry initiating communications with community members. Meetings should be set up with Chief and Council to discuss community needs (MC11).

Community Programs

A few participants spoke to community programs. Areas of suggested improvement include medical care, community recreation and senior's homes and services (MC11, MC16, MC21).

A hospital or more fully staffed clinic is needed in Fort Chipewyan (MC11) and another is required in Fort McMurray (MC19). Another doctor is also needed to work in Fort Chipewyan so that there can be one in the community full-time (MC03, MC19). Right now, it takes approximately one month to see the local doctor (MC11, MC19). Many sick people cannot get in or out of the community at certain times of the year because there is no all-weather road, and often times you cannot fly in the spring and fall (MC11). One participant described what happens if someone in Fort Chipewyan requires critical care:

> Well, they send you to Fort McMurray. But then you have to wait for the doctor. The doctor's in a different place. You're just given pills and sent home. So what is that? Doesn't fix anything. They don't send you to Edmonton. I don't know why. There's specialists out there, that's where they should send you. But they don't. Here, they just give you pills, and send you home. And if they do medi-vac you to McMurray, then you have to wait for a doctor. But if the doctor's not there, it's the same thing. They'll give you a pill, keep you in the hospital until you can see somebody. And that takes a long time (MC19).

Community recreation is nearly non-existent in Fort Chipewyan due to lack of funds to support recreational programs (MC16). Very little money is given to the municipality to support local recreation. Furthermore, the municipality is doing nothing to improve the situation (MC16). The arena roof collapsed years ago and has not been repaired yet (MC16). There are many talented and athletic youth in the community; industry could be providing support for community programs that cultivate this talent (MC16). Instead of industry getting together and providing something of benefit for the youth, "they've brought a lot of drugs and things into this region by all the money that's going around. People making all the big money and they're bringing the drugs, the gangs into our region. And our people, our young people are dying from that because they're getting killed, not only from the drugs, but from owing money to people that sell drugs" (MC16).

The old age home in Fort Chipewyan needs to be updated so that Elders do not have to leave the community (MC21). Those that are sick and go to Fort McMurray are dying of loneliness; they should at least be given the dignity to die at home (MC11). One Elder explains the situation for Elders who are ill and have to be sent to Fort McMurray for medical care:

> Not only that, for seniors people, that are here … in Fort McMurray [people] from Fort Chip, they just die of loneliness right there. They want to go home. But no, they can't go home. Finally, they just lost their mind, they just die right here. But if they had a place in Fort Chip, a better Senior's Home, at least they'd be happy. [Then] whatever's gonna happen, at least they'll be home. Because everything else is taken away from them, like trapping and all their livelihood is taken. Their food is taken away (MC11).

Medical services require improvement so that seniors can be cared for. There are only two tenants in the old folk's home. This facility is very nice, and one participant wonders why this facility cannot also serve as a senior's home, or if required, a new one could be built on the lakefront (MC21). A *Meals on Wheels* program is another suggested addition to the community. This service would ensure that all seniors receive at least one meal per day (MC21).

1.3.2.9 Health and Well-Being

Mikisew participants report an alarming increase in the frequencies of death and disease, particularly cancer and diabetes. Generally speaking, participants blame air and water pollution, coupled with a drop in quality of food, for the community's poor health. It was observed that the community's decline in health commenced a few decades ago and corresponds with start of industrial activities to the south. Participants expressed frustration with industry's unwillingness to take responsibility for the decline in community health and have put forth a number of recommendations.

An over-whelming majority of Mikisew participants agreed that both air and water pollution are the root of the plethora of sicknesses afflicting community members today (MC01, MC02, MC03, MC07, MC08, MC09, MC12, MC14, MC15, MC17, MC19, MC20, MC22, MC23). (See also sections on Water Quality and Quantity and Air Quality.) Food quality is also cited as a contributor to today's illnesses (MC02, MC07, MC09, MC12, MC19), including contaminated animal meat (MC03, MC19). Fort Chipewyan is likely the most affected by pollutants from industry activities as a large number of rivers empty into Lake Athabasca (MC23). Generally speaking, oil companies are singled out as a major contributor of the pollution that is causing the variety and frequency of illnesses in the community of Fort Chipewyan (MC01, MC03, MC08, MC09, MC14, MC15, MC17, MC20, MC22, MC23).

People used to be much healthier when they were living off the land (MC05, MC12, MC19). Now, polluted vegetation, animals and water are being attributed to increasing rates of illness (MC17, MC19, MC20); "These plants got lots to do with it" (MC17). One participant believes that pollution is collecting in minute amounts in people until it triggers cancer (MC07). Things such as diabetes did not exist when people were living off the land as sugary foods were not consumed. Instead, a lot of wild meats were eaten (MC07). Junk food (MC09), store-bought food (MC12, MC19), and force-fed animals (MC12) were also cited as possible contributors to today's health problems. Sickness used to be cured with traditional medicines. Now, traditional medicines no longer work as well as they used to and are not trusted by many people (MC04, MC16). One community member recalls that his grandfather's medicine bag contained roots that used to cure many people (MC04).

People used to live long lives (MC04, MC07) and typically died of old age (MC01, MC03, MC14) or tuberculosis (MC04, MC12, MC15, MC17). One participant recalls that people used to be 80 years old and still trapping (MC04). Another participant recalls that people used to die at age 70 or 75. People who have worked at the oil and gas plants are now dying around age 60 (MC09). A third participant points out that people in their 50s are dying of heart attacks (MC11). Furthermore, people used to be very healthy (MC05, MC11). Many years ago, cancer and diabetes were rare afflictions (MC04, MC12, MC23, MC24). One participant only recalls one case of Lou Gehrig's disease years ago (MC04). A number of community members are very concerned about the exceptionally high rates of cancer and diabetes today (MC03, MC07, MC11, MC12, MC15, MC17, MC20, MC24). Rare cancers, such as a "textbook" type of "oil-related or oil-water driven cancer of the bile ducts" have begun to appear in the

local population (MC20). Community members have also noticed the appearance of afflictions such as lupus (MC20), kidney disease (MC20), breathing problems (MC15), heart disease (MC03), high blood pressure (MC05, MC23), arthritis (MC05), tonsil problems (MC17) and appendicitis (MC17). One participant discussed increasing vision problems. Years ago, old people did not need glasses. Now, many young people are wearing glasses (MC11).

In particular, incidents of disease have been increasing over the past few decades (MC03, MC05, MC14, MC15, MC17), and have especially sped up in the last 10 years (MC15). Nowadays many people are dying of disease (MC01, MC03, MC07), including increasing numbers of young people (MC11, MC23), and death has become a frequent occurrence (MC09, MC14, MC15, MC17, MC20). The average age of death is decreasing (MC09, MC11). “All [the] Elders [are] just slowly going down” (MC17).

Death rates have increased substantially when compared to historic rates. In the 1940s, 1950s, and 1960s, three deaths a year in the community was ‘lots’ (MC17). One participant recalls that around 1950 the community would be lucky to have one death per year (MC09). Now, the community loses two to four people per month (MC09, MC17, MC22), and this death rate is not slowing down (MC09). One participant points out that while typical cancer rates are 7 in 400,000, Fort Chipewyan experiences a rate of 5 in 1,200 (MC20). The numbers, in fact, may be higher as a person’s death is registered at the place of death and many community members pass away in Fort McMurray. For example, of the three cases that died when the cancer board came to visit, only one was registered in Fort Chipewyan (as this person died in Fort Chipewyan) despite the fact that all three were from Fort Chipewyan (MC20). This type of record keeping is used by heath authorities to say that “nothing’s really happening” (MC20).

There is a sense of frustration with industry. Community members are growing tired of industry’s unwillingness to shoulder the blame for local environmental degradation (MC01, MC07, MC08, MC15). Participants feel as though they frequently get the run-around as industry repeatedly claims that they do not contribute to, or create air and water pollution (MC01, MC15). “Are we to believe because it’s written? And yet we’re suffering” (MC07). One participant remarks that he has no faith that bringing health issues to the attention of industry will result in change (MC08). It is felt that although community members know the causes of increasing illness, industry does not listen (MC01). “Yeah, because industries want to get in there and they don’t care about us. So that’s what they’re saying. That’s what we’re thinking,” he explained (MC01). There is a sense that it is too late to address the health effects of pollution as people have already been exposed, and the damage is done (MC08). Given the sense of not being heard, one community member remarks that someone needs to begin speaking on their behalf (MC01).

A number of recommendations were put forth. Some participants recommend compensation in the form of food (MC03) and/or bottled water (MC08, MC17, MC22). “Supply us water, what we eat” (MC03). One participant suggests supplying the community with groceries, meat, and buffalo, which should be given to every household (MC03). Some participants call for studies to be carried out – studies that focus on the impact that industry activities have on human health (MC03), as well as the effects of industry activities on wildlife health (MC03). Science must be missing something (MC07). Studies of air in the direct vicinity of oil plants should be carried out and compared with air quality in Fort Chipewyan (MC09). One participant calls for more studies on water (MC17).

In terms of community health, in-depth check ups should be given to oil and gas workers several times a year so as to monitor things such as breathing, hearing, heart health, and vision (MC23). “Life [is] more important than money” (MC23). One participant suggests that cancer rates in Fort Chipewyan be monitored (MC07). Another community member remarks that medical supplies should be provided to the community (MC03). Elder care was also discussed. Elders need to be well taken care of and have a decent place to stay (MC17). There are good long-term care homes in Fort McMurray, however, a home with accompanying care should be provided in Fort Chipewyan (MC17).

In sum, community members are very concerned with the health of their people. Pollution (both air and water) and a decrease in food quality are cited as major contributors. Rates of cancer and diabetes have increased exponentially. Furthermore, a number of previously unheard of afflictions have been plaguing the community. Participants are discouraged by industry’s unwillingness to shoulder blame for the health problems they are experiencing. Furthermore, there seems to be a lack of initiative, on behalf of both government and industry, to explore and develop ways to address or correct the problem.

Traditional Foods

A number of Mikisew members report a change in traditional foods. This change is primarily in the way that traditional food tastes, however, abnormalities in local wildlife have also been observed. A shift from traditional foods to store-bought food is cited as a contributor to the variety of health problems currently experienced by community members. Pollution, from oil and gas activities to the south, is linked to changes in traditional foods.

The vast majority of those participants that discussed traditional foods agreed that a variety of vegetation and wildlife has taken on a different taste (MC03, MC04, MC11, MC12, MC17, MC18, MC20). One participant reports that local moose still tastes okay, however, moose from the Fort McKay area tastes different (MC03). A number of community members have noticed a difference the taste of duck (MC11, MC12, MC17, MC18, MC20). Ducks feed in the south, which may account for the different taste (MC12). Fish is also singled out as tasting different (MC03, MC17, MC18). One participant has heard that the fish have lead in them (MC18). Another participant will no longer eat cattail roots because the surrounding water is polluted (MC18). Traditional foods, in general, taste different (MC03, MC11). Changes in the taste of traditional foods is attributed to industry-related pollution (MC18). One Elder stated, “Alberta has so much fuel, so much oil, they’re going to keep mining, they’re going to keep taking oil, and it’s going to destroy our land. Eventually even all our food will be wiped out. Traditional food” (MC22).

A couple of community members, however, have not noticed any difference in the taste of local wildlife (MC09, MC12). One participant remarks that he does not find a difference in moose or fish; he’s eaten all kinds of fish his whole life, and has not found a change in taste (MC09). Another participant adds that moose, bear, beaver, rabbit, and muskrat do not taste different (MC12).

Visible changes in wild meat, fish and edible plants have been witnessed. Fish are “different colours” with some having a “yellowish” appearance or little white spots (MC17). Fish texture has changed so that now their flesh is “watery” and soft (MC10, MC12, MC16, MC19). Fish deformities have also been observed (MC13, MC19). Fish and bird livers are also not normal; some fish livers have little white spots, and some bird livers are discoloured (MC01). Moose have been seen with little white spots on their intestines about the size of a small fingernail (MC01); others have seen jelly-like spots in the flesh

of some moose and pus in their joints (MC97). Another participant has observed moose with livers that are bumpy and brownish (MC19). Rabbits also have the white spots on their guts, and the lungs of wolves have turned an abnormal yellowish or white colour (MC01). The “good and white fat” of muskrat and beaver has now turned yellowish (MC23). As for plants, wild mint now makes the tea water black or smell like motor oil (MC02, MC13). Ground berries taste differently, “almost like burning your lips” (MC02), and many berries have black spots (MC13).

The shift from traditional foods to modern foods is attributed to the variety of health problems that plague community members today (MC10, MC13). People are no longer hunting and living off the land; they are staying in town. Health problems such as weight gain, diabetes, heart issues, and arthritis are the result (MC13). Previous generations did not experience these types of health problems (MC13).

Participants called for studies to be carried out to explore the effects of industry activities on local wildlife and vegetation (MC03, MC09). More money needs to be allocated to such studies (MC09). Specifically, one participant recommends that regional wildlife studies be carried out in the communities of Fort McKay, Fort McMurray, and Fort Chipewyan. The results of these studies should then be compared so as to assess similarities and differences in local impacts of industry activities (MC09).

Change in Traditional Lifeways

Mikisew Cree First Nation community members were questioned about the pursuit of traditional lifeways. All community members that spoke on traditional life felt as though there has been a progressive loss of traditional lifeways and accompanying values. Historically, people lived in the bush year round. A number of changes in the past few decades, some of which are attributed to industry activities and government policies, have led to a loss in traditional lifeways.

There has been a shift, over the past few decades, from traditional lifeways to town life. A number of participants report growing up and/or living in the bush (MC07, MC09, MC13, MC14, MC17). People in the bush “had everything out there” (MC04); they used to trap and hunt all year long (MC09). Life in the bush was good (MC06). People lived on the land (MC11) and in harmony with nature (MC04) – they were happy there (MC11). One Elder told of how “long ago I used to hear laughter. People would be laughing in tents all over. They were happy” (MC05). It is “so hard for everything now” (MC17) that it is sometimes impossible for hunters and trappers to access their traditional areas (MC14), and Elders find it difficult to get the youth out on the land (MC17).

A number of changes over the past few decades have forced people to abandon traditional lifeways. Low water levels and polluted water have played a large part in restricting traditional lifeways (MC09, MC14, MC15, MC17). The construction of dams has dried out the Delta (MC09). In the 1950s, 250,000 to 300,000 rats were trapped per year (over two seasons – spring and fall). There were 350 active trappers then. Now, there are only about 25 trappers. Last spring not one person trapped (MC09). Today, it is difficult to get to those places where families used to trap and reside as it is all dried up (MC04, MC14, MC17). Pollution has made it difficult to enjoy the land the way that people used to. In the 1950s you could drink water from any place. Now, in August especially, the Athabasca River’s waters change color and garbage accumulates in the river. Nice, clear, good drinking water is no longer found (MC15). One Elder, through the interpreter, described how his big concern was to be to “go out in the springtime, to be able to go out in the fall, in the winter, any time of the year…. It’s not compensation that he’s talking about; you can’t compensate for this.” He says, “I don’t want to lose my

way of life, my land. I don't want to not be able to go out there and enjoy my life, the serenity, the beautiful way of life that he is so connected to. Because everybody is connected to the land and our cultural, traditional way of life is very, very important. And if he doesn't talk about it now, who else is. And that is what he really wants" (MC14).

The introduction of store-bought food has deterred people, especially young people, from following traditional ways of life (MC03, MC09, MC12). Today, people can no longer make a living off the land and food is expensive in the community (MC03). In the 1950s there was no such thing as junk food. In those days, people drank coffee and ate pie, duck soup, fish, and dried meat; people lived off the land and dried meat. Now, people consume junk food and pop (MC09). People no longer consume much dried meat. Younger people, especially, do not like dried meat (MC12).

The switch from traditional foods to store-bought food is cited as one reason why the community is experiencing health problems (MC13). People are becoming lazier and gaining weight. A number of health problems associated with a lack of exercise and a switch in diet, such as diabetes, heart problems, arthritis, and brittle bones are now plaguing the community (MC13). People were healthy and independent when they lived in the bush (MC13). One participant recalls that his grandmother used to live in the bush in a tent all winter. She walked with snowshoes, and trapped and hunted rabbits, chickens and squirrels. She used to cut all her own firewood, dry meat and make her own moccasins and dresses (MC13).

Traditional values are still very important to the older generation (MC14). Attitudes and ways of life, however, have changed. Of concern for many Elders is the fact that young people today do not seem interested in going out on the land (MC07, MC09, MC17). People now have to have money to live (MC07, MC09, MC17). The older people did not think that way (MC07). Younger people are living a different kind of lifestyle (MC07). Town life is very different from traditional life; today's entertainment is television and video games (MC07). According to one community member, town life has nothing compared to the bush (MC04). Currency is considered an obstacle to traditional lifeways. "Money is God nowadays" (MC11). People are forced to move from Fort Chipewyan to Fort McMurray to make money. There are difficulties, such as housing, that people are experiencing when they are forced to move from the community (MC09).

The introduction of mandatory education has also had a drastic impact on traditional ways of life (MC04, MC07, MC16, MC17). People began coming to town in the 1960s when children were forced to attend school (MC04, MC17). Education took people out of the bush (MC17). Before, people lived in harmony with nature. Mandatory education made the pursuit of a bush livelihood difficult because trappers had to find places for children to stay in town while attending school (MC04). Residential schools, in particular, had a negative impact on traditional lifeways (MC07). One participant recalls that he was made to feel ashamed of who he was (MC16). It is felt that although education is important, children must not forget where they come from and be proud of their heritage (MC16). Traditional values are still very important for today's youth, and pride in their heritage is critical to their success in the modern world:

> While it's almost like a balancing act to try to guarantee an even keel it's so important that our people don't get left behind. Having changed our way of life you need to keep up to speed with how things are changing in this world. Our way of life, our trapping are a thing of the past, but they can't be forgotten. They've got to be always somehow practiced to keep

> our people balanced, to have the best of both worlds. Education is so important for young people that they need to finish, at least get their high school diploma, do something that they're going to be able to survive and that they need a trade, but not forgetting where they came from, who we are as people. When I was brought up in the residential school I was ashamed to be an Indian person, I was ashamed to be Indian, I was ashamed to be brown, I was ashamed of my language, speaking my language. My grandfather Courtorielle, I didn't spend very much time with him, he passed away when I was about eight years old, but what he has taught me has stayed with me till today - be proud of who I am. And he used to tell me you know, speak your language. … It's so important that young people understand their language, whether it's Cree or Dene. … It's so important, the reason why I say you learn how to speak your language, once you've learned how to speak your language you understand and recognize what's being said, how it [inaudible] to the Elders, people in general that love to speak their language, experience that pride. There's pride in it, you're proud of who you are, you're no longer ashamed of who you are. And don't stop learning, every day [inaudible] you learn every day. And be respectful; be respectful to yourself and to everybody else, especially to what kept our people alive and going over all these years before Europeans came to our country was the land, the animals. And be respectful to all living things and speak for those that can't speak for themselves (MC16).

A number of recommendations stemmed from discussions of traditional lifeways. A year-round road would help those families that are having difficulties making ends meet (MC03). Given the shift from traditional life to modern life, Elders maintain that education is important (MC09). Some community members, however, would like to see traditional values and culture incorporated into school curriculum (MC07, MC16, MC19). Courses such as survival, for example, would be beneficial (MC07). Children should be brought out onto the land and taught traditional values (MC19). Industry should support such school programs (MC19). Community members would also like to see improvements in water levels. It is suggested that the government of Alberta explore ways to release water in the spring and summer seasons (MC14), or to construct a control dam to bring the water up in the Delta (MC16). An increase in water levels would facilitate the pursuit of traditional lifeways (MC14). One community member points out that the river is their highway and would like to see industry provide red and green buoy markers so that people can travel safely (MC20).

In sum, community members are very concerned with the progressive loss of traditional values. Industry activities that cause environmental changes and pollution, government policies in the form of residential/mandatory schooling, and lower water levels due to the construction of dams or water withdrawals, are considered to be responsible for the loss of traditional lifeways. One participant remarks that he does not want to lose his way of life, his land and his serenity (MC14). Community members, especially Elders, feel a profound connection to their culture and way of life (MC14). Unfortunately, participants feel as though their way of life is gone (MC09); "They took our heritage away from us" (MC24). Everything has a spirit – even a little blade of grass (MC16). Too much is being done to the land; "enough already" (MC16).

1.3.2.10 Cumulative Effects

A number of cumulative effects were identified by Mikisew participants. Industry activities have impacted the local ecosystem to the point that community members can no longer subsist off the land as they once used to. Water levels have dropped substantially and local wildlife and vegetation have

been irreversibly damaged. There is a sense of disempowerment and difficulty in raising concerns as industry has the finances and government support to proceed uninhibited. Aboriginal groups lack the resources to be able to effectively assert their right to participate in industry decisions.

Participants point out that they are no longer able to live on the land as they once used to (MC01, MC04). There are no longer any places to trap (MC04, MC11, MC18). Years ago, everything was plentiful – fish, moose, ducks – everything was good (MC01). One participant recalls living in the bush when there were plenty of rats, beaver and moose; life was good then, and the water was clean (MC04). Changes in the environment have prevented people from going out onto the land. For example, people have to carry good water with them and haul more gear (MC01).

Low water levels are of concern to a number of community members (MC04, MC14, MC18). Water is 'the boss' (MC14). If there is no water, community members cannot go out onto the land to pursue their traditional ways of life (MC14). One participant reports that in some places there is only a foot of water (MC18). Another participant fears that in 10 to 15 years Lake Athabasca will be dry (MC18). There is concern that water levels have reached a point of no return (MC16).

Of great concern to community members is the environmental damage that has been and is being done. Impacts to the local ecosystem have been observed since the 1960s – around the time that industry commenced activities in the region (MC04). Specifically, air and water pollution, stemming from industry activities, is detrimental to local wildlife and vegetation. Everything depends on air and water; if those two things suffer, the entire life cycle will be affected (MC16). A number of community members are worried about water pollution (MC01, MC02, MC03, MC04, MC11, MC12, MC16). People can no longer go out onto the land with just a tea kettle – clean water must be transported everywhere (MC01). One participant reports that the water is brown and needs to be boiled (MC03). Another community member recalls a man who tested the water at Embarras Portage and found the water unfit to drink (MC04). Generally speaking, participants find the water unclean and need to drink bottled water (MC11). Polluted water is a primary concern as everything depends on water (MC12, MC16).

Local vegetation and wildlife are also feeling the effects of industry activities to the south. Water, ice, animals and fish have all changed – they are no longer edible (MC03). Industry activities are changing the lives of animals, plants and trees – damage is being done to all living things (MC03). People can no longer go out on the land and collect what they need because things are polluted (MC01). The fish are polluted and moose and duck have a different taste (MC04). One community member points out that family lifestyles have changed as traditional ways of life can no longer be pursued (MC01). There is concern that the younger generation will never see the land as it was (MC02).

Generally speaking, community members feel that industry has affected everything and is taking over (MC03, MC04, MC11, MC22, MC23). Everything is suffering the consequences of the oil and gas industry and nothing is coming out of it (MC11). The effects of industry are getting worse and there are no signs of improvement as oil and gas is moving further north (MC03, MC16). One Elder feels that "they shouldn't take any more, they shouldn't destroy any more of our land" and that "they should not bother this river" (MC22). Another participant tells of how he was raised by an Elder who told him of how white men are taking over the land and was instructed to not accept money (MC03). "We don't give up the land," he explained (MC03). "I believe that it's going to take many years to bring everything back to a state of where it's at least half of what it was once," one Elder explained (MC16). Industry is "going too fast. Absolutely. They're not thinking about the future. We're the worse ones that's hit, here.

We get everything here. See all the river come into Lake Athabasca. All the rivers run into this lake, here, and we're the ones that drink the stuff" (MC23). One Elder observed that, "Progress – one way or another we pay for it" (MC07).

There is a sense that the community is being deceived, but that they lack the resources to effectively voice their concerns (MC16). Industry smoke stacks are open more at night, leading one participant to believe that there is something that industry is hiding (MC16, MC24). Industry asserts that there is nothing going on, yet, rare cancers are being diagnosed in the community (MC16, MC20). Furthermore, the government is contributing to a decline in the Aboriginal socio-economic situation as Treaty rights are being infringed upon. For example, people are forced to pay for things like glasses, dental and health care (MC11). "The only thing the government understands, and industry, is lawsuits" (MC16). The government was wrong to allow industry to monitor itself (MC16, MC20). If Mikisew Cree First Nation had challenged this policy and raised the bar on monitoring, perhaps these effects could have been prevented (MC16). There is a sense of despair that First Nations are being "bought out" because they cannot afford to fight industry (MC16). One community member remarks that he is glad to see Mikisew Cree First Nation taking a stand; if the community can continue to voice their concerns loudly enough, perhaps industry will listen (MC16). He states that:

> First of all, I don't think we're a bunch of radicals … we believe in something that's dear to our hearts; that's our way of life, our environment. It's there for the benefit of all. And if we take care of it, it will take care of us, for many years to come. If we do make a stand I think that in time, I'm hoping that we can be heard loud enough that they'll really pay attention to what we're saying. It's not that the Elders are crazy or that they want, you know, just stop for the sake of not wanting people encroaching on our traditional lands. But the only thing they're concerned about is the environment itself, you know, … water that's at the point where, almost of no return. How do we correct that? We have to find ways to do that (MC16).

A number of recommendations were made that are relevant to cumulative effects (MC11, MC18, MC22). While money is a good form of compensation, the provisioning of health care and seniors care would be beneficial as well (MC11). Thorough studies on the adverse effects of industry activities on local wildlife and vegetation are called for (MC18). These studies should be carried out before any more oil and gas operations proceed. Furthermore, the results should be made available to Mikisew Cree First Nation (MC18). Generally speaking, there is great concern for younger generations (MC11, MC16, MC23). Children in the community will not experience the land as the Elders have (MC16). Younger generations will be feeling the effects of industry activities and should be provided with compensation (MC03). One community member does not want to see anymore land taken for industry activities (MC22). Another stated that the Elders feel that new projects should not go ahead (MC01).

1.3.2.11 Project-Specific Effects

One of the primary concerns expressed by participants was the potential impact that Synenco's project will have on local air and water quality (MC02, MC07, MC10, MC20). One participant was leery of tailings ponds – water sits in these ponds and evaporates (MC07). This polluted evaporation remains in the air and may be carried to the community via south winds (MC07). Seepage from tailings ponds is also a concern as it can end up anywhere (MC07, MC24). Thus, both air and water quality can be adversely impacted (MC07). Furthermore, one community member is concerned about the kinds of

chemicals that industry must use to clean the water (MC17). Water sources are also a concern as one participant questions where Synenco will get all of the project's water from (MC17).

Other project-specific concerns include ease of access for non-local hunters (MC08) and the success reclamation projects (MC20). Because Synenco will be closer to the community, there will be increasing numbers of people entering the area on all-terrain vehicles (MC08). It will be difficult to prevent these people from hunting local wildlife (MC08). Although industry asserts that they can develop better reclamation methods, one participant questions claims of successful reclamation (MC20). This participant points out that muskeg and fens take a thousand years to return to their original state (MC20).

Mikisew participants put forth a variety of project-specific recommendations. A few members recommend SAGD over open pit mining operations (MC11, MC17). Synenco needs to be considerate of the potential to adversely impact local waters and wildlife (MC17). Particularly, care should be taken to prevent polluted water from entering the Athabasca River (MC02). One participant suggested that Synenco consider alternate water sources such as McClelland Lake or the Firebag River (MC17). Another community member remarks that she is fine with new projects and that the accompanying noise and air pollution is to be expected, especially with the use of heavy machinery (MC21). So long as industry is working toward developing ways to make things liveable and continuously improving their environmental practices (MC21), and care is taken to not further damage the water or air (MC02), development of the Synenco project would be okay.

1.3.2.12 Consultation and Regulatory Process

Participants voiced a number of concerns regarding consultation and the regulatory approval process. Of primary concern are the apathetic attitudes of both government and industry regarding the adverse impacts of oil and gas activities on local communities. A number of participants feel as though consultation is essentially a 'lip service' exercise on behalf of industry, considering that development proceeds regardless of Aboriginal opinion. Community members have found the ways in which industry arrives, mines the land, and subsequently abandons it, to be profoundly disrespectful. The well-being of Mother Nature needs to be considered not only for future generations of Aboriginal people, but for the future of all generations. Given the aforementioned concerns, Synenco is applauded for being the first oil and gas company to effectively involve Mikisew members in their environmental impact assessment.

Generally speaking, there is a sense among community members that despite the community's efforts to voice concerns, industry will not take issues seriously; development proceeds despite community concerns (MC01, MC11, MC18, MC20). "No matter what we say. Well we try, but it doesn't help" (MC01). There is a sense of hopelessness in talking to industry (MC01, MC04). One participant points out that there is no way a community can stop oil and gas production (MC04). "We don't want it, but it's going to go anyway. That's what we think" (MC01). Another community member remarks that he has lost faith in talking to industry (MC11). Industry will not listen because they want to make money (MC18). One participant describes industry consultation as 'lip service' (MC20). The government treats community concerns in the same manner (MC01); projects will always be approved despite community concerns (MC11). Furthermore, participants feel as though communities are being deceived by industry (MC03) and government (MC16) regarding the amount of air and water pollution that is generated (MC03).

A number of community members voiced the opinion that industry is not concerned about the effects their activities have on Aboriginal communities (MC01, MC03, MC16). One participant questions the purpose of industry's consultation efforts – it seems like a pointless exercise as no changes stem from Aboriginal consultation (MC01). The feeling is that "they don't care about this area" (MC03). Industry apathy is demonstrated by the fact that they will 'wine and dine' an Aboriginal community prior to license approval. However, "when they get their license approval suddenly we're no longer a concern and we're not given any consideration of anything" (MC16). Promises made by industry never come to fruition (MC18) and foreign workers are brought in despite the fact that a large number of Aboriginal people are unemployed and on welfare (MC16).

Industry apathy is mirrored by the government's passive stance. Government has demonstrated that it "hasn't really prepared…didn't have a plan" (MC16), and is criticized for its failure to listen to the Aboriginal community (MC01, MC11). The government too, only sees the financial benefits of industry activities (MC16). "The government has to … look at what state we're in right now. We're at the point of no return where we can't get it back to where it was or is there an opportunity to be able to do something about it. Having a joint effort with the community by way of using the community's knowledge, how we can best achieve that" (MC16). One participant points a finger at the Alberta government for 'selling off' water (MC12). Furthermore, the federal government has been neglecting their legal obligation to honour Treaty rights (MC16). The activities, or lack thereof, of both the provincial and federal government have demonstrated a lack of concern for Aboriginal issues.

A number of community members see oil and gas projects proceeding without proper and thorough consultation (MC09, MC11, MC17). There is reluctance on behalf of industry and government to slow down so that Aboriginal concerns can be properly dealt with (MC09, MC23). Oil companies are not thinking or planning ahead (MC23). Some companies disregarded their consultation responsibilities and proceeded with production without taking Aboriginal concerns into consideration (MC11, MC17). Two participants cited the actions of BC Hydro as an example of a project that proceeded without consultation and had adverse impacts on the local environment and traditional lifeways (MC05, MC22). BC Hydro's project has resulted in significantly reduced local water levels; today people cannot go anywhere because of the low water levels (MC05). If BC Hydro and oil companies had consulted with affected communities 40 years ago, plans could have been developed and implemented to protect the land (MC22). Synenco, on the other hand, is applauded for being the first oil and gas company to initiate TEK discussions with Mikisew (MC22). One community member remarks that she trusts that Synenco is doing everything possible to inform the community and that the information they are sharing is appreciated (MC21).

One participant explained the importance of consultation with Aboriginal community members and what it means for environmental management:

> You send a strong message to industry and to the government, this land is not just land to come in, mine the tar sands out of this and just cover it up and walk away. This land has been home to us First Nations people, you know the area, you know, we're the landlords of this land. We've been given that right because we were placed here. You know, coming in here with no respect at all, first of all to us as people, second to the land and by the way of destroying the land and you know, killing the whole environment, the water, the air, killing off our animals and killing our people off I suppose. It's not for us to judge but one day it's

> all going to correct itself, like I was saying, but before that comes I think it's best thing is just for everybody that we all pay attention to what's going on, the messages that we're getting. … One lesson that I would want to send to whoever is going to listen to this tape in the future generations to come, we all have a responsibility to this land. Nobody owns the land, it doesn't matter how much [inaudible] we're just the keepers of this land. … I think industry needs to really seriously look at how they can work with First Nations [inaudible] to try to better manage the lands, along with the province and Canada. … And when Chief Waquan said at the CNRL hearing and asked the question, 'When is enough, enough?' You know, myself and what I was thinking about the animals and everything, like I say, enough already. I think we need to seriously look at what we're doing to this land of ours. You know when something happens in your home and you destroy your home or you feel your home is dirty, boy, Saturday you want to clean it out and clean everything out as well. This is our home, our Saturday is every day. [inaudible] … clean our home, replenish our home (MC16).

It is important for government and industry to recognize that although money may be given as a form of compensation, no amount of money can remove the pollution that has already damaged the environment (MC01). One participant, while discussing noise from industry activities, remarks that there is no way to satisfactorily mitigate the effects that industry will have (MC07). In fact, the only effective mitigation is to not proceed with development (MC07).

Given the fact that development will proceed regardless of community concerns, a number of recommendations were discussed. Some participants suggest that both government (MC09) and industry (MC05) place a higher priority on consultation with affected communities prior to approving and commencing projects (MC09). One community member recommends annual or bi-annual meetings with the decision-makers of oil and gas companies (MC23). These meetings would involve Elders, Chief and Council, as well as the youth of the community. Many young people in the community do not see the opportunities they have; these meetings would be one way in which opportunities could be presented and discussed. Furthermore, Elders would be provided the occasion to voice their concerns. This is particularly critical as many Elders are passing on; what they say now should be taken to heart (MC23). One participant expressed her appreciation of Synenco's current efforts to consult with Mikisew Cree First Nation. She recommends that they continue working together, informing and communicating with each other, for the betterment of everything (MC21).

One participant discusses the importance of traditional values and argues that government needs to find ways to help Natives survive while not forcing them to forget who they are; Aboriginal peoples should be proud of themselves (MC16). In particular, efforts need to be directed to the community's youth as they will be the ones that will suffer the consequences of development (MC23). The government should be exploring ways in which financial support can be provided for youth programs in Fort Chipewyan (MC16).

Other suggestions offered by community members focused on studies and monitoring programs. One participant recommends a socio-economic study due to the high cost of living (especially fuel and electricity) (MC11). Another participant discusses water, recommending that the government ration the water as well as monitor it (MC12).

1.4 Application Case Assessment

The issues and concerns raised by Mikisew participants with regard to existing and Project-specific effects are organized into three categories:

- Environmental management and protection
- Employment and education
- Socioeconomics and consultation

The analysis of potential impacts is presented according to the perspectives of participants. Mitigation recommendations provided by participants are also listed in the following section. While some mitigation measures are Project-specific, other types of mitigation may require regional cooperation or government support.

1.4.1 Environmental Management and Protection

A number of issues around environmental management and protection were discussed by Mikisew participants. Issues talked about include: water quality, water quantity, air emissions, reclamation, noise, access management, monitoring and testing, industry environmental management, Project-specific effects and cumulative effects.

1.4.1.1 Water Quality

Water quality is an area of grave importance to Mikisew participants.

Mikisew Mitigation Recommendations

That discharges into the Athabasca River be stringently monitored.

That a filter or net be erected on the Athabasca River at its mouth so as to catch pollutants traveling downstream.

That clay dykes are placed around leases to prevent the seepage of pollutants.

That only clean, potable water be released into the Athabasca.

That thorough water quality studies are carried out; these studies should be carried out with input from and agreement from community members.

That water samples are taken to and tested at university laboratories.

That people, rather than electronics, be responsible for monitoring water quality.

1.4.1.2 Water Quantity

Water quantity was also an area of primary concern to participants. Water is at a critically low level. The adverse impacts of the substantially reduced water levels ripple through the entire ecosystem, affecting all wildlife and vegetation.

Mikisew Mitigation Recommendations

That industry explore alternative ways to extract oil – methods that either do not require, or substantially reduce the need for, water.

That the government ration industry water use.

That restrictions on the times of year that water can be taken are put in place.

That community members are consulted regarding preferred times of year to take water.

That alternate water intake locations (e.g., inland lakes, streams, Lake Athabasca) are utilized so that the Athabasca River can replenish itself.

That more stringent monitoring on withdrawals is put into effect.

That a control dam be constructed at Dog Camp along the Quatre Fourches River.

That the water is surveyed, by helicopter, during spring break-up and that senior industry officials are part of this survey.

1.4.1.3 Town Drinking Water

Mikisew Cree participants are concerned about the state of Fort Chipewyan's drinking water. The community's water is believed to be responsible for the plethora of health problems that community members are experiencing.

Mikisew Mitigation Recommendations

That town water (both reservoir and tap) be tested more than once a year.

That industry supply the community with bottled water.

That alternative water intake locations be investigated; the current intake location across from the mouth of the Athabasca is not considered safe. Suggested alternative intakes include inland lakes or deep wells (drilled to a depth of approximately 400 meters) within town.

1.4.1.4 Bennett Dam

The Bennett Dam is listed as a contributor to the current state of local waters. Specifically, the construction of this dam is the main contributor to low water levels. Furthermore, the time of year that

water is released from the dam has adverse impacts to local wildlife and people.

Mikisew Mitigation Recommendations

That BC Hydro release water at a different time; a release in the spring/summer season will replenish Delta water levels (facilitating travel), and a release in September instead of November would avoid interference with the winter ice roads and facilitate the construction of ice bridges.

That BC Hydro contribute to the construction of an all-weather road for the community.

1.4.1.5 Air Emissions

Community members expressed concern regarding emissions from industry activities to the south.

Mikisew Mitigation Recommendations

That oil and gas companies develop less polluting means of extracting oil, and ways of reducing emissions.

That studies are carried out so as to better understand the adverse impacts of air emissions.

That more air monitoring stations be established in the traditionally used areas around Fort Chipewyan.

That operators use low-emission vehicles for their projects.

That air emissions be vented through the tailings ponds or underground caverns.

That filters be placed on smoke stacks.

That Aboriginal groups in northern Saskatchewan and Manitoba be consulted regarding air emissions from oil sands in Alberta.

1.4.1.6 Wildlife Protection

Mikisew participants expressed concern regarding the state of local wildlife and the degree to which they have been adversely impacted by oil and gas production to the south.

Mikisew Mitigation Recommendations

That industry erect both flares and fencing around leases and in high traffic areas.

1.4.1.7 Reclamation

Participants questioned the quality and success of reclamation projects. They were concerned about industry's long-term commitment to such projects. It is felt that the community should be involved in reclamation projects.

Mikisew Mitigation Recommendations

That industry make adequate, long-term financial commitments to reclamation projects.

That Mikisew Cree First Nation be consulted and involved in reclamation projects.

That community Elders participate in surveys of target areas so as to transmit knowledge about and facilitate the identification of medicinal/spiritual plants.

That reclaimed areas contain *all* original vegetation (e.g., berries), and not just grasses and trees.

That mined areas are reclaimed directly following mining activities.

That left over monies are not released back to industry until reclamation projects are proven successful.

That industry thoroughly understands the local ecosystem before proceeding with reclamation projects and that reclaimed areas be continually monitored after the project has been completed. Community members should be involved in and carrying out this monitoring.

1.4.1.8 Access Management

Encroachment on traditional territories and unsafe hunting practices by non-Aboriginal hunters are a safety concern for the community.

Mikisew Mitigation Recommendations

That monitoring is improved and patrols are increased in Wood Buffalo National Park as a joint effort between Mikisew and Park officers.

That industry hire Mikisew members to patrol traditional areas.

That trappers be compensated for lost revenue.

That ‘no hunting’ and ‘no trespassing’ signs be posted throughout Mikisew territory.

That a collaborative effort is made between forestry officials and Mikisew to curb unsafe hunting practices.

1.4.1.9 Monitoring and Testing

Mikisew participants expressed concern over a lack of air, water and wildlife monitoring and testing.

Mikisew Mitigation Recommendations

That there is increased air, water and wildlife monitoring.

That test results are delivered to the community.

That a testing centre be created in Fort Chipewyan where community members could take samples to be tested and studied.

1.4.1.10 Industry Environmental Management

Community members expressed concern over industry's environmental management practices.

Mikisew Mitigation Recommendations

That industry continues to work to improve their environmental management practices and standards.

That Mikisew community members are involved in making sure industry is working toward improving these standards.

1.4.1.11 Project-Specific Effects

Participants discussed project-specific effects. Given past adverse impacts to the local environment, specifically water quality and quantity, community members are concerned about the impact that the proposed Project will have.

Mikisew Mitigation Recommendations

That Synenco utilize SAGD over open pit mining operations.

That care is taken to prevent polluted water from entering the Athabasca.

That Synenco use alternate water sources, such as McClelland Lake or the Firebag River.

That Synenco establish water collection and monitoring stations and that Mikisew community members be involved in the collection and monitoring of water.

That all equipment and garbage is removed, rather than buried, upon project completion.

1.4.1.12 Cumulative Effects

Mikisew participants expressed concern over the fact that they can no longer use the land as they once used to. Water levels have dropped substantially and local wildlife and vegetation have been irreversibly damaged. Community health is also of great concern.

Mikisew Mitigation Recommendations

That thorough comparative, environmental studies are conducted on the adverse effects that industry activity has on local wildlife and vegetation. Such studies should be carried out before any more oil and gas operations proceed and results made available to Mikisew Cree First Nation.

That Mikisew youth (around 30 years old) work together with the Elders to develop solutions to the problems detailed in this report.

That improved health and seniors care is provided to community members.

That bottled water is provided to Mikisew Cree First Nation.

That industry activities be ceased and no more land be taken for development purposes.

1.4.2 Employment and Education

1.4.2.1 Employment

Community members expressed concern about the community's current unemployment situation. It is felt as though there is a lack of initiative, on behalf of oil and gas companies, to provide employment opportunities to young First Nations members. It is felt that racism is a real issue and that there is a lack of cultural awareness among industry workers, making it difficult for youth to secure gainful employment.

Mikisew Mitigation Recommendations

Participant recommendations regarding employment include:

- That Aboriginal peoples are priority hires by industry;
- That community people be hired regardless of whether or not they have completed a Grade 12 education if they are competent and ready and willing to work;
- That Aboriginal peoples have the opportunity to move into management and office and/or professional positions;
- That people with families to support are priority hires;
- That community members be provided with subsidies for clothing, food, rent and bus tickets as work incentives;
- The provision of trades training locally (e.g., through Keyano), including the provision of equipment, so that individuals can be trained in their home community;
- That Mikisew contractors are hired for pollution control;
- That industry send representatives to meet with youth, either in schools or in a training facility. This should be aimed at students from Grade 6 onward as there are a lot of high school drop outs;
- That a youth cross-cultural exchange program be implemented either in the workplace or in schools;
- That industry effectively communicates employment opportunities (e.g., increased community advertising, advertising appropriate to community) to community members;

- The implementation of a job sharing/rotation programs (e.g., six months on, six off) so as to provide employment to more community members; and
- That industry adopt a zero-tolerance policy toward racism and introduce cross-cultural awareness workshops that outline Aboriginal cultural values (e.g., attendance of funerals) to oil and gas workers.

1.4.2.2 Education and Grade 12

Concern was expressed over the numbers of students that are not completing a Grade 12 education; it is felt that there is a lack of incentives to finish high school. Students are experiencing discipline problems. Community members report that there is a lack of educational support in the community of Fort Chipewyan. Although it is felt that education is important, there is concern over the fact that traditional values are not emphasized in the curriculum.

Mikisew Mitigation Recommendations

That industry send representatives to speak with students in the classroom so as to provide students with incentives (e.g., letters of intent from industry) for seeing their studies through and prepare them for the working world.

That more staff (e.g., guidance councillors, in-class assistants) are hired to cope with the discipline problems that children are experiencing.

That traditional values and skills training (e.g., bush school) become a part of the school curriculum.

That younger generations be provided with the education they need to succeed.

1.4.2.3 Training

A number of specific recommendations regarding training opportunities were forthcoming from Mikisew participants.

Mikisew Mitigation Recommendations

Participants recommended that Synenco provide the following:

- On-site training to all Aboriginal new hires;
- Apprenticeship training (up to four years);
- Job shadowing, summer jobs, training and trade preparation for youth prior to graduating so that they are better prepared to secure steady employment;
- Cultural training for Fort Chipewyan community members. Cultural training should focus on such issues as racism, scheduling, culture shock and ways to work;
- An equipment training facility within the community of Fort Chipewyan for hands-on and on site experience. Night classes could be provided as part of this type of training; and

- Upgrading opportunities for workers.

1.4.2.4 Fly-In/Fly-Out

The idea of a fly-in/fly-out program was well-received by community members. Participants consider a fly-in/fly-out program from Fort Chipewyan to be an excellent option for Mikisew members who may take a job with Synenco. This program is particularly attractive given the high cost of living in Fort McMurray. Furthermore, a fly-in/fly-out program would enable community members to reside at home.

Mikisew Mitigation Recommendations

That the fly-in/fly-out program for the Project proceed as a means to encourage and support the employment of community members.

1.4.3 Socio-Economics and Consultation

The socio-economic situation of community members, as well as current and past consultation efforts, are areas of concern for Mikisew participants. Discussion centered on consultation, compensation, community programs, health and well-being, traditional lifeways, traditional foods and the cost of living.

1.4.3.1 Consultation

Community members expressed frustration with the lack of consultation on project proposals. It is felt that ongoing and meaningful consultation is an important part of the process of developing creative solutions to existing problems.

Mikisew Mitigation Recommendations

That both government and industry place a higher priority on consultation with affected communities prior to approval and throughout the planning stages of projects.

That industry adopt consulting policies that bring all Aboriginal communities together in the consultation process.

That fewer industry representatives are present at meetings and that more industry meetings are held so that everyone has the opportunity to voice their opinions.

That community members meet with industry ‘decision-makers’ as opposed to representatives.

That meetings are video taped so as to preserve the recommendations and discussions.

That a consistent and fair honorarium is given to participants (e.g., 55 years of age and older).

That industry follow through with those promises made to the community during consultation.

That community members are taken to leases *prior* to project commencement so as to better

understand project impacts and discuss solutions.

That consultation involve post-interview group meetings where interview participants can discuss issues and concerns as a collective.

That the community's youth play an active part in meetings with industry.

That community leadership (Chief and Council) actively participate in the consultation process (e.g., attend meetings).

That BC Hydro commence community consultation.

That a meaningful and on-going relationship be established between Mikisew and Synenco.

That Synenco regularly meet with Mikisew Cree First Nation Chief and Council, Elders, and all community members, to identify community needs.

1.4.3.2 Compensation

Mikisew members feel that industry is obligated to provide compensation for the adverse impacts of their activities as well as a loss in traditional lifeways. Participants expressed forward-looking concerns such as the permanency of the oil and gas industry in the region as well as the livelihood of future generations.

Mikisew Mitigation Recommendations

A variety of forms of compensation were suggested by participants:

- Subsidized living for Elders;
- Financing for education;
- A portion of government oil and gas royalties;
- A share of industry profit;
- Support for the youth of Fort Chipewyan;
- General community support that does not steer Aboriginal peoples away from their traditional values; and,
- Supply of winter fuel.

1.4.3.3 Community Programs

Participants feel as though the community of Fort Chipewyan is lacking in community programs. Of primary concern is the fact that the community is in desperate need of appropriate medical facilities. The lack of an all-weather road is a problem for sick people that need to be transported to Fort

McMurray on short notice.

Mikisew Mitigation Recommendations

That industry provide financial backing for a good health facility (either hospital or expanded clinic) in Fort Chipewyan.

That an all-weather road be constructed to facilitate the transfer of sick community members to Fort McMurray.

That funds be provided to update seniors' care and provide them with medical care so that they do not have to leave the community.

That funds be provided to improve and/or construct recreational programs and facilities for youth (e.g., repair of arena, pool hall).

That Fort Smith's treatment and support of Elders be used as a model for the implementation of facilities and programs in Fort Chipewyan.

1.4.3.4 Health and Well-Being

The health and well-being of Fort Chipewyan community members is a serious concern to participants. The noticeable decrease in the community's health is attributed to pollutants stemming from industry activities to the south and a decline in the quality of food. Participants expressed frustration with industry's unwillingness to take responsibility for the decline in community health.

Mikisew Mitigation Recommendations

That industry carry out in-depth studies on the impact that developments have had on community health.

That industry supply the community with bottled water, traditional foods and medical supplies.

That industry workers have their health thoroughly checked more than once a year.

That funds be provided to properly care for the community's Elders in Fort Chipewyan.

That improved medical services and facilities, including a full-time doctor, are made available to the community.

1.4.3.5 Traditional Lifeways

There has been a progressive loss of traditional lifeways and values. Historically, people lived in the bush year-round. A number of changes in the past few decades, attributed to industry activities and government policies, have led to a further loss in traditional lifestyles. Community Elders do not want to lose their traditional way of life.

Mikisew Mitigation Recommendations

That industry support the incorporation of traditional values and practices into the school curriculum.

That the provincial government explore ways to improve water levels.

That industry provide route markers to ensure safe water travel.

1.4.3.6 Traditional Foods

Mikisew members report a change in traditional foods. This change is primarily in the way that traditional food tastes, however, abnormalities in local wildlife have also been observed. A shift from traditional foods to store-bought food is cited as a contributor to the variety of health problems currently experienced by community members. Pollution from oil and gas activities to the south is linked to changes in traditional foods.

Mikisew Mitigation Recommendations

That industry carry out a traditional foods study regarding the impact of their activities on local wildlife and vegetation.

That community members be provided with traditional foods (e.g., buffalo).

1.4.3.7 Cost of Living

Participants report that the cost of living is too high in Fort Chipewyan. This is particularly true of food and gas. Community members that move to Fort McMurray to work experience difficulties due to the high cost of living there as well.

Mikisew Mitigation Recommendations

That an all-weather road (e.g., from the Peace River to the Gardner River, from Fort Chipewyan to Fort Fitzgerald) be constructed to cut down on the costs of bringing basic goods into the community.

That community members, as opposed to councillors for the municipality, are consulted in regards an all-weather road.

That a socio-economic study be carried out to examine the high cost of living in Fort Chipewyan and the impacts that are felt by community members.

That reserve land be set up in close proximity to Fort McMurray so that Mikisew members who are forced to leave Fort Chipewyan and live there can reside on reserve.

1.5 Cumulative Effects Assessment

The cumulative effects assessment for the application considers existing effects in conjunction with

potential Project and future effects. As Mikisew perspectives largely address either existing or Project-specific effects, the discussion of potential ‘cumulative effects’ is presented in the Application Case Assessment, which addresses both Baseline and potential Project effects.

1.6 References Cited

1.6.1 Literature Cited

Alberta Environment. 2006. Final Terms of Reference for the Environmental Impact Assessment Report for the Northern Lights Oil Sands and Extraction Project. Northern Lights Partnership. Edmonton, AB.

AXYS Environmental Consulting Ltd. (AXYS) 2004. Historical Resources, Traditional Land Use and Resource Use Environmental Setting Report. Prepared for Albian Sands Energy Inc. Muskeg River Mine Expansion. Calgary, AB.

Battiste, M. and J. Youngblood Henderson. 2000. Protecting Indigenous Knowledge and Heritage. Purich Publishing Ltd. Saskatoon, SK.

Bill, L., J. Crozier and D. Surrendi. 1996. A Report of Wisdom Synthesized from the Traditional Knowledge Component Studies. Prepared for the Northern River Basins Study. March 1996. Edmonton, AB.

FMA Heritage Resources Consultants Inc. (FMA) 2005a. Traditional Land Use Report for the Deer Creek Joslyn SAGD Project. February 2005. Calgary, AB.

FMA Heritage Resources Consultants Inc. (FMA) 2005b. Traditional Land Use Study for the Imperial Kearl Lake Project. (Section 6). Prepared for Imperial Oil. July 2005. Calgary, AB.

FMA Heritage Resource Consultants Inc. (FMA) 2005c. Traditional Land Use Report for the Petro-Canada MacKay II Project. September 2006. Calgary, AB.

Golder Associates. 1997. Traditional Land Use Report for the Shell Muskeg River Mine Project. Baseline. Prepared for Shell Canada Limited. December 1997. Calgary, AB.

Golder Associates. 2002a. Traditional Land Use Environmental Setting Report for Jackpine Mine – Phase 1. Prepared for Shell Canada Limited. May 2002. Calgary, AB.

Golder Associates. 2002b. Traditional Land Use Assessment for Jackpine Mine – Phase 1. Prepared for Shell Canada Limited. May 2002. Calgary, AB.

Golder Associates. 2002c. Traditional Ecological Knowledge and Land Use Assessment for the Horizon Project (Volume 3: Section 3). Prepared for Canadian Natural Resources Ltd. June 2002. Calgary, AB.

Golder Associates. 2002d. Traditional Land Use Study for the Horizon Project (Volume 3: Appendix A-I). Prepared for Canadian Natural Resources Ltd. June 2002. Calgary, AB.

McCullough, E. J. and A. McCullough. 2005. Traditional Land Effects Assessment Wellness Methodology. FMA Heritage Resources Consultants Inc. Calgary, AB.

McKillop, J. 2002. Toward Culturally Appropriate Consultation: An Approach for Fort McKay First Nation. Master's Thesis. Faculty of Environmental Design. University of Calgary. Calgary, AB.

Northern River Basins Study (NRBS) Board (Canada). 1996a. Traditional Knowledge (Section 3.4). Northern River Basins Study: Report to the Ministers. June 1996. Edmonton, AB.

Northern River Basins Study (NRBS) Board (Canada). 1996b. First Nations/Métis Issues Recommendations to the Northern River Basins Study Board (Section 5.2). Northern River Basins Study: Report to the Ministers. Presented by the First Nations Committee. June 1996. Edmonton, AB.

Oakes, J., R. Riewe and K. Kinew. 1998. Sacred Lands: Aboriginal World Views, Claims, and Conflicts. Canadian Circumpolar Institute. Edmonton, AB.

Ray, A. J. 1996. They Have Lived Here Since the World Began: An Illustrated History of Canada's Native People. Lester Publishing Limited and Key Porter Books, Toronto, ON.

Ross, M.R. 2003. Aboriginal Peoples and Resource Development in Northern Alberta. Canadian Institute of Resources Law. Occasional Paper No. 12. Calgary, AB.

1.6.2 Internet Sites

Farr, D., Kennett, S., Ross, M., Stelfox, B., and M. Weber. 2004. Al-Pac Case Study. Prepared for the National Round Table on Environment and Economy's Conserving Natural Capital: The Boreal Forest Program. Available at: http://www.nrtee-trnee.ca/eng/programs/Current_Programs/Nature/Case-Studies/200407-AlPac-Case-Study/200407-AlPac-Case-Study_Contents_E.htm. Accessed: April 28, 2006.