"Water is a living thing"
Environmental and Human Health Implications of the Athabasca Oil Sands for the Mikisew Cree First Nation and Athabasca Chipewyan First Nation in Northern Alberta.

Phase Two Report:
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Prepared by:
Stéphane M. McLachlan, PhD
Environmental Conservation Laboratory,
Clayton H Riddell Faculty of Environment, Earth and Resources
University of Manitoba
Winnipeg, Manitoba R3T2N2

Environmental Conservation Laboratory

Dedication

We dedicate this work to the residents of Fort Chipewyan, Alberta who aspire to livelihoods that at once are grounded in their traditions and the present, and that enable them to adapt in the future

Acknowledgements

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Disclaimer

While the primary author did his best to bring forward information known to him within the scope of the study, nothing in this report should be taken as a definitive list of uses, rights or impacts, nor should it be taken as a limitation on the uses or rights of the First Nations.

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EXECUTIVE SUMMARY

Oil sands development in northern Alberta has generated much economic prosperity for Canada. The Athabasca Oil Sands represent the largest reservoir of crude oil (bitumen) and the only oil sands deposit in the world that is suitable for large-scale surface mining. Yet many argue that this intensive and fast-growing industrial activity has adverse and poorly understood implications for environmental and human health. Indigenous People, including members of both the Mikisew Cree First Nation (MCFN) and Athabasca Chipewyan First Nation (ACFN), live downstream from these industrial activities on the Athabasca River, activities that continue to escalate in scale and impact. These and other downstream Indigenous communities are especially vulnerable to these impacts, in part because their traditional livelihoods, cultures, and wellbeing are so closely linked to the environment. Although these impacts continue to grow in scale, any existing monitoring has been widely criticized as inadequate by scientists, community members, and the broader public alike.

The overall goal of the Phase Two component of this long-term project has been to characterize the impacts of upstream industrial activity associated with the Athabasca Oil Sands for wildlife, environmental and especially human health as it affects the MCFN and ACFN.

Our specific objectives were:
(i) to evaluate contaminants levels by testing the environment and culturally important wildlife;
(ii) to identify potential exposure of community members to contaminants by documenting the consumption of wild-caught foods;
(iii) to explore any implications of these changes for community health and wellbeing;
(iv) to promote capacity in community-based monitoring to address any environmental concerns; and
(v) to facilitate effective cross-cultural risk communication that incorporates both western science and TEK in sharing the outcomes of this project.

This project emerges from a collaboration initiated by the MCFN and ACFN in northern Alberta and with scientists from University of Manitoba and University of Saskatchewan. Outcomes of this community-based participatory research have been shaped and controlled throughout by ACFN and MCFN. Phase Two of this project built on the strengths and expanded on the results of the previous phase, which had documented Traditional Knowledge of the complex environmental change in the region and the factors responsible for these changes, as well as contaminant levels in wildlife.

In Phase Two, wildlife was again evaluated by veterinarians and tested for environmental contaminants including heavy metals and polycyclic aromatic hydrocarbons (PAHs). Interviews were also conducted with community members regarding ongoing impacts of upstream development. We documented consumption patterns of wild-caught (traditional or country) foods and assessed to what degree any changes in concern and consumption patterns were attributable to industry-associated declines in the environment. Changes in community health and wellbeing as well as likely causes of and responses to these changes were identified by group interviews with community

members. The role of community-based monitoring and cross-stakeholder engagement in building capacity among local youth and in addressing shortcomings in existing governmental monitoring plans was documented in the form of a Youth-Elder Camp. Finally, the impacts of the Oil Sands and other upstream development were communicated to community members and a broader audience in the form of a feature-length documentary film.

Outcomes regarding contaminant levels in wildlife largely reflected those of Phase One, with some important differences. Harvesting was more strategic and broadened to include beavers, which are recognized as a more effective indicator species than muskrats, which have been effectively extirpated from the Athabasca Delta by upstream development. Arsenic levels were high enough in in muskrat and moose muscle; duck, moose, and muskrat livers; and moose and duck kidneys to be of concern for young children. Cadmium levels were again elevated in moose kidney and liver samples but also those of beaver and ducks, although muskrat samples were again low. Mercury levels were also high for duck muscle, kidneys, and livers as well as moose and muskrat kidneys, especially for children. In contrast to the last phase of the study, selenium levels were high enough in the muscle, kidney, and livers of all wildlife species to be of concern for adults and children alike. Yet human exposure rates to these contaminants were generally not of health concern. This reflects the relatively low amounts of traditional foods that are now consumed as community members transition towards store-bought foods. These high levels of heavy metals are also consistent with impacts from the upstream Oil Sands, which have become Alberta's greatest emitters of mercury and cadmium.

Total levels of PAHs and levels of carcinogenic and alkylated PAHs were very high relative to other food studies conducted around the world. The mean concentrations of benzo[*a*]pyrene, a relatively well understood carcinogenic PAH, were about mid-way compared to studies conducted elsewhere in the world. The daily intake of total PAHs in our study was also high, almost 3X that of the next highest study. However, the daily dietary intake of carcinogenic PAHs was lower than the other two comparable studies. Indeed, dietary intake of benzo[*a*]pyrene and its equivalents was effectively zero. This again reflects the relatively low consumption levels of traditional foods compared to the past.

Our diet study shows that ACFN and MCFN members still consume a wide diversity of traditional foods, albeit at lower levels than in the past. The mostly frequently consumed kind of food was moose in the previous two months, about equal to all the other traditional foods combined. Moose was followed, in descending order, by ratroot, duck, wild mint, spruce gum, pickerel, caribou, and Labrador tea. Participants were concerned about declines in the quality of these foods, in the greatest part because of environmental pollutants originating from the Oil Sands. It was notable how many participants no longer consumed locally caught fish, because of government-issued consumption advisories and associated human health concerns. Muskrat consumption had also declined precipitously, along with muskrat populations, a decline that was attributed to changes in hydrology and contaminant levels associated with the WAC Bennett Dam and the Oil Sands. The only effective alternatives to traditional foods are store-bought foods. The latter consist of either healthy options that are cost-prohibitive and low in quality or convenience options that, while cheaper, are relatively high in fats, sweeteners, and salts. Consumption of convenience foods was most prevalent among younger community members, and is already having adverse health implications. Most participants anticipated that these trends would continue into the future as the Oil Sands expanded and as wildlife species decline in availability and safety.

All participants were worried about ongoing declines in the health and wellbeing of their community. They generally viewed themselves as less healthy than their parents, who rarely got sick. Neurological illnesses (e.g. sleeping disorders, migraines, and stress) were most common followed,

in descending order of frequency, by respiratory illnesses (e.g. allergies, asthma) as well as circulatory (e.g. hypertension, coronary) and gastrointestinal (e.g. gallbladder, ulcers) illnesses. Yet, everyone was most concerned about the current and escalating cancer crisis. Indeed, of the 94 participants, 20 (21.3%) had experienced 23 cases of cancer. Cancer types included four cases of breast cancer, two each of lung, cervical, colon, gallbladder, kidney, prostate, and stomach cancer, as well as one case of cholangiocarcinoma or bile duct cancer. Cancer occurrence increased with age and was most frequent in women. For the first time, we showed that upstream development and environmental decline are affecting cancer occurrence. Thus, cancer occurrence increased significantly with participant employment in the Oil Sands and with the increased consumption of traditional foods and locally caught fish.

When human health was examined as a whole, participants identified the Oil Sands as the cause of health decline, followed in descending order of importance by upstream agriculture, substance abuse, and the WAC Bennett dam. Widespread increases in type 2 diabetes and obesity were attributed to the increased consumption of processed foods from the South, declines in physical activity, and depression. These declines in health and wellbeing were aggravated by poor risk communication, inadequate health care in Fort Chipewyan but also an overdependence upon often-inferior health care in urban centres to the south. Many felt that the continued expansion of the Oil Sands would continue to undermined health and wellbeing into the future, especially as related to cancer.

The inadequacy of existing and mostly culturally inappropriate and exclusively science-based monitoring was also emphasized by many participants, and seen by some as putting these communities further at risk. A highly successful Youth-Elder camp was held in spring 2012. Local youth engaged with and learned from Elders and outside scientists regarding environmental monitoring on the land as did younger children at the local community school. The development of these skills, at once grounded in both Traditional Knowledge and western science, will play a key role in enabling young community members to further engage in an already effective community based-monitoring program, which is documenting changes in water and wildlife health and which is informed by both knowledge systems.

These cross-cultural monitoring programs will also help address community concerns regarding existing risk communication. Typically, most outside scientists fail to adequately communicate their research outcomes with community members, much less adequately involve community members in the research projects. This communication gap combined with inaccessible governmental consumption advisories help foster fear and worry regarding traditional foods, which are still much more desirable than most high-cost, store-bought alternatives. A 60-minute documentary film was developed that will facilitate such communication within Fort Chipewyan and with other impacted communities, but also with outside stakeholders including government, industry, civil society, and the public as a whole. The film documents the above changes and decline in environmental and human health as experienced and communicated by community members. Yet, it further argues that this development also represents many opportunities for community members and, regardless of outcome, asserts that that these communities need to be centrally involved in any future decision-making. Finally, a news aggregator web site has been launched that increases the visibility of these northern views.

In conclusion, represented here is a perfect storm of decline and opportunity, a storm that places these and other downstream communities at progressively increased risk. Substantial employment opportunities are generated by the Oil Sands. However, this development, as well as upstream hydro projects, compromises the integrity of the environment and wildlife, which in turn adversely affects

human health and wellbeing. Associated changes in land use as well as decline in access to and concerns regarding the quality of traditional foods act to separate community members from these food sources and from their livelihoods and traditions. These changes and inadequate outsider-controlled monitoring programs and risk communication just aggravate these concerns and further displace their traditions. The failure of the healthcare system to address and mitigate ongoing adverse impacts and plans for rapid expansion of the Oil Sands in the future only act to ensure that an already grave situation will worsen. Recommendations included in this report focus on the increased role of these communities in decision-making and management of Oil Sands development as well as the need to conduct additional health research that build on this study, recommendations that will work towards the benefit of these communities and all Canadians alike.

13. CONCLUSIONS AND RECOMMENDATIONS

13.1 CONCLUSIONS

- Substantial declines to the environment have taken place over the last 50 years, especially as related to heavy metals and polycyclic aromatic hydrocarbons (PAHs), and are generally associated with upstream Oil Sands development and hydro development. These declines will only continue to escalate in the future as the Oil Sands continue to expand and if the Site C dam is constructed in northern BC as planned.
- These environmental declines contribute to a change in diets as community members shift from healthy country foods to expensive and often nutritionally deficient store-bought foods, a shift that is only accelerated by concerns regarding the quality of and safety regarding locally sourced country foods.
- These declines in the environment and the quality and accessibility of country foods in turn contribute to corresponding declines in community health and wellbeing, most notably as they relate to increased rates of cancer.
- Cancer occurrence is positively associated with employment in the Oil Sands as well as the consumption frequency of traditional foods and more specifically locally caught fish.
- These notable declines in health and wellbeing are aggravated by poor communication by researchers and health agencies as well as inadequate health care in Fort Chipewyan as well in Fort McMurray and Edmonton.
- Communities are already playing an effective role in mitigating some of these declines in health and wellbeing, most notably the community based monitoring program, responses that outsider researchers can help support and facilitate.

FIG 13.1. Youth from MCFN and ACFN cutting up a moose on the Athabasca River.

1.0 Problem: existing and future decline in environment is occurring, and more specifically is affecting cultural keystone species such as muskrat and higher trophic level fish such as pickerel and jackfish.

- *1.1 Response*: mitigate the impact of these environmental declines on downstream communities.
  - 1.1.1 Background: our results show that ACFN and MCFN still have diets that center on country foods such as moose and ducks, medicines including ratroot and spruce gum, and fish including pickerel and jackfish. Oil Sands development and the WAC Bennett dam have reduced water levels in the delta. The Oil Sands are also contributing to high concentrations of heavy metals and PAHs in wildlife. These factors drive the decline of much wildlife, to the point that some species are no longer consumed by community members, that traditional livelihoods and local food systems are undermined, and that the ability of these First Nations to exercise their treaty rights is compromised.
  - 1.1.2 Recommendation: introduce credible mitigation plans to reduce the emission and impacts of heavy metals and PAHs arising from upstream Oil Sands operations.
  - 1.1.3 Recommendation: introduce regulations that establish mutually acceptable and enforceable levels of emissions arising from the Oil Sands.
  - 1.1.4 Recommendation: compensate downstream Indigenous communities for any loss of livelihoods arising from these declines in wildlife and plant populations.
  - 1.1.5 Recommendation: compensate downstream Indigenous communities for increased costs associated with purchasing foods used to replace wild-caught foods that have been or are being extirpated or that are no longer trusted.
- *1.2 Response*: address community worries and concern regarding these environmental changes.
  - 1.2.1 Background: our results show that there is much worry and concern regarding environmental decline related to environmental contaminants, including heavy metals (e.g. mercury, cadmium, arsenic) and polycyclic aromatic hydrocarbons (PAHs). This in part reflects the inadequate involvement of communities in any research and decision-making and the absence of effective risk communication.
  - 1.2.2 Recommendation: mandate meaningful involvement of affected Indigenous communities in existing and new government-funded environmental research conducted in the region surrounding Fort Chipewyan.
  - 1.2.3 Recommendation: mandate that government scientists provide outcomes at all stages in the research process, which can in turn act as best practices for industry and university scientists.
  - 1.2.4 Recommendation: require scientists conducting environmental research in the region to provide plain-language summaries of research outcomes to GIR and IRC and directly to community members in the form of relevant and accessible community presentations.
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        - 12.5 Recommendation: involve leadership and the Nunee Health Board in the development of culturally sensitive and appropriate health advisories regarding traditional foods.
        - 1.2.6 Recommendation: develop researcher data agreements that can be used to facilitate community-government research partnerships that generate data useful to both parties but that are controlled by ACFN and MCFN.
        - 1.2.7. Recommendation: support and mentor community capacity to conduct their own environmental research, especially for youth members.
- *2.0 Problem*: our results show that industry-associated impacts on environment are occurring that are still poorly understood by outside stakeholders and community members alike.
    - *2.1 Response*: conduct further collaborative research as to better understand and respond to these changes.
        - 2.1.1 Background: wildlife species harvested in Phase Two had substantially higher levels of selenium than those tested in Phase One. These levels are high enough that consumption limits for all species are restrictive, sometimes approaching zero for liver and kidneys. Moreover, levels of total, carcinogenic, and alkylated PAH found in Phase Two were high relative to those found in other studies conducted elsewhere in the world. The sources of these contaminants and the reasons underlying the inter-year dynamics remain poorly understood.
        - 2.1.2 Recommendation: continue and even expand existing monitoring programs to augment existing data for the region by increasing sample size, which will increase the power of these studies.
        - 2.1.3 Recommendation: expand existing data collection to include other wildlife species, especially those consumed or otherwise used by downstream communities. Expand this data collection to include other areas, notably those areas close to the Athabasca River that are recognized by traditional knowledge holders as contaminated. Moreover, expand to areas that are seen as currently uncontaminated but that will be affected by development in the short-term future, notably the Birch Mountains and Lake Claire.
        - 2.1.4 Recommendation: investigate causes of high selenium concentrations, which were much higher than those found in Phase One and which may reflect spills from or remediation of existing or past uranium mining amongst other sources including bitumen mining and upgrading processes.
        - 2.1.5 Recommendation: support and expand existing scientific monitoring capacity that exist within Fort Chipewyan through youth mentorship programmes.
    - *2.2 Response*: expand community-based monitoring of these environmental changes
        - 2.2.1 Background: our results show that there is little if any community involvement occurs in existing environmental monitoring. This is also true of the science-based Joint Oil Sands Monitoring (JOSM) program, from which ACFN and MCFN recently withdrew. Yet, Traditional Knowledge (TK) regarding the Peace Athabasca Delta extends back thousands of years, and represents a rich source of information of great use for shaping management and decision-making regarding the Oil Sands. Both MCFN and ACFN have been actively engaged in community based monitoring over the last six years, a

program that is already highly effective in tracking environmental change, that reflects best practices for integrating science and TK, and that represents a reasonable and cost-effective way of addressing some of the shortcomings in the existing JOSM program.
        - 2.2.2 Recommendation: provide core funding to the existing community based monitoring program, which can serve the needs of the Peace Athabasca Delta (PAD) as well as local communities but which can also be promoted as an appropriate response to industrial development elsewhere in the North.
        - 2.2.3 Recommendation: provide added funding support for mentorship by Elders and by scientists in order to facilitate their increased involvement in community based monitoring as well as other mostly science-based monitoring initiatives.
        - 2.2.4 Recommendation: provide funding support for land-based monitoring programs and camps that cater to youth and that help build interest in and capacity surrounding both Traditional Knowledge and environmental science,
- *3.0 Problem*: a diet transition away from country foods towards store-bought foods is occurring, which is, in large part, associated with the adverse impacts of upstream Oil Sands development.
    - *3.1 Response*: support proactive programs that promote country foods
        - 3.1.1 Background: our results show that many ACFN and MCFN members worry about the quality of some country foods, particularly fish and increasingly ducks and moose. Ongoing environmental decline is adversely affecting access to some key wildlife species, notably muskrat. Yet country foods are still generally the most healthy and affordable food option for many community members.
        - 3.1.2 Recommendation: provide proactive programs that communicate the safety of country foods, in isolation or when combined with other risk communication, most notably health advisories.
        - 3.1.3 Recommendation: provide in-school meal programs that are culturally appropriate and feature country foods as well as healthy food alternatives, and address restrictive food safety regulations that are inappropriate in the North.
        - 3.1.4 Recommendation: provide programs that foster increased local control over food production, including in-town and land-based gardening programs, country food sharing programs, composting programs, and construction of three-season greenhouses.
    - *3.2 Response*: support proactive programs that increase accessibility to healthy store-bought foods.
        - 3.2.1 Background: our results show that many people are shifting from country to store-bought foods in large part because of fear about environmental contaminants. Yet, healthy options in town are expensive, poor in quality and often difficult to prepare. Thus, many residents, especially children and youth, opt for processed and nutritient-deficient alternatives. Moreover, food insecurity is increasing because of the high costs of store-bought foods.
        - 3.2.2 Recommendation: support programs that build on the existing "healthy eating" programs within Fort Chipewyan regarding food preparation and meal planning regarding store-bought foods.

        - 3.2.3 Recommendation: support food box programs, buying clubs and other ways of subsidizing store-bought foods purchases that can make food, especially healthy foods, available at a lower cost for community members.
- *4.0 Problem*: there is a continued decline of community health and wellbeing
    - *4.1 Response*: work towards a better understanding of the nature of this health decline
        - 4.1.1 Background: our results show that community members are confronted by a notable decline in health and wellbeing, especially as it relates to Elders and children. Almost everyone indicated that people are dying earlier and from different illnesses than in the past. This was seen as related to environmental contaminants arising from Oil Sands development, upstream agriculture, and substance abuse. This decline in part is characterized by increases in neurological illnesses (e.g. stress, depression), diabetes, respiratory illnesses (e.g. heart disease, asthma), and arthritis. But everyone was most alarmed by the increased rates of cancer. Our research shows that these elevated rates of cancer occurrence were positively associated with the consumption of traditional foods and locally caught fish as well as employment in the Oil Sands.
        - 4.1.2 Recommendation: support a comprehensive, and long-term baseline health study that meaningfully involves MCFN, ACFN, and Metis Local 125. This should be done in an inclusive and culturally appropriate manner with regular updates and community meetings. It should be overseen by community leaders, Elders, and well as health scientists, be holistic in nature, incorporate both health sciences and TK, and be accountable to the three communities.
        - 4.1.3 Recommendation: support additional body-mapping exercises where all interested participants record their own health experiences, and also complement these with participant health records if they see this as appropriate.
        - 4.14 Recommendation: extend existing body mapping result to focus on these cancer survivors and cancer victims to explore underlying factors through risk mapping and detailed case histories.
        - 4.15 Recommendation: better document the relationship between cancer occurrence and employment in the Oil Sands industry through a detailed study that examines the implications of work site conditions for the wellbeing of Oil Sand workers that live in Fort Chipewyan and elsewhere.
    - *4.2 Response*: provide more effective communication regarding health risks.
        - 4.2.1 Background: our results show that declines in community health are incontrovertible, especially as they relate to cancer, respiratory illnesses, arthritis, and type 2 diabetes. Yet, the lack of accessible and independent information regarding these changing health patterns aggravates community worries and fears in a needless way.
        - 4.2.2 Recommendation: develop relationship-based programs of communication between government health officials and community leaders that adequately reflect both western and traditional approaches to health. The knowledge brokers that work in these programs can help facilitate communication.
    - *4.3 Response*: increase the effectiveness of existing health care support systems.

        - 4.3.1 Background: our results show that there was widespread dissatisfaction and criticism of existing health care in Fort Chipewyan but also in Edmonton and Fort McMurray. These shortcomings fail to address and even aggravate the observed declines in community health and wellbeing. Thus, a physician is only present one week per month in Fort Chipewyan and other health professionals (e.g. physiotherapists, nutritionists, dentists) are not available at all. The infrastructure that was created to support these practices is therefore underused. These shortcomings result in long delays when identifying and treating illnesses in town and also in urban centres to the South. With respect to the latter, many characterized treatment programs as needlessly expensive, rushed, disrespectful, insensitive and in some cases racist. Earlier diagnosis of cancer and other illnesses through increased access to improved health care will benefit the communities, especially in light of anticipated expansion and impacts of the Oil Sands in the future.
        - 4.3.2 Recommendation: conduct a systematic review of the existing healthcare system as used by community members. Short- and long-term strategies for strengthening existing and expanding in-community health care should be explored. Initiatives such as the Fort Chipewyan Elder Care Centre currently under construction should serve as best practices of such approaches.
        - 4.3.3 Recommendation: conduct a proactive and community centered study that identifies and promotes effective solutions to these ongoing declines in health and wellbeing, ones that are grounded in self-care and cultural traditions and that are at once sustainable and empowering for community members. Examples would build on existing interests and capacity including culturally appropriate and evidence-based ways of mitigating type 2 diabetes, obesity, stress, smoking, and substance abuse.
        - 4.3.4 Recommendation: provide training to and mentorship programs for interested community members to address some of the needs for health care professionals in Fort Chipewyan including message therapists, nutritionists, physiotherapists, and nurses ideally in conjunction with the local school and the Keyano College.
- *5.0 Problem*: inadequate influence on decision-makers regarding these long-standing changes in environment, diet and health that place communities at risk.
    - *5.1 Response*: direct interaction with high-level decision-makers in government and industry.
        - 5.1.1 Background: the WAC Bennett dam was constructed in the mid 1960s, at the time that production in the Athabasca Oil Sands began to rapidly increase. Fifty years later, few if any outside stakeholders are responding to these declines in environmental or community health, despite much media attention and pressure by the public. This, in part, reflects the great financial stakes and controversy regarding the Oil Sands, the absence of any trust or effective channels for communication, and the isolated nature of the affected communities and environments.
        - 5.1.2 Recommendation: conduct direct outreach with politicians and appropriate government staff in Edmonton and Ottawa as well as executives in

industry and present the outcomes of this study in order to build cross-sectoral networks of communication.

- 5.1.3 Recommendation: conduct systematic outreach campaigns with media regarding this report to reach as wide an audience as possible.
- 5.1.4 Recommendation: promote worldwide distribution of the associated feature-length documentary film that presents both the impacts of but also the benefits of the Oil Sands for downstream communities as experienced and communicated by residents.
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FIG 13.2 Lake Athabasca during a spring rain.