Literature Review

Local and Traditional Knowledge in the Peace River Sub-Basin

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trackingchange

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TABLE OF CONTENTS

List of Figures and Tables

Figures

Tables

SUMMARY POINTS

This document is produced for the Athabasca Watershed Council and for the *Tracking Change*… project at the University of Alberta. Given the limits of resources and time established for this project, the report should not be considered a comprehensive overview of all available documented Traditional Knowledge for this watershed. The Peace River Watershed is home to many Aboriginal peoples of the Treaty 8 region who have lived in the area since time immemorial. The Peace River and its tributaries have always been an important travel corridor for First Nations, Metis and other settlers and was a foundation for subsistence fishing for many generations. The watershed has undergone significant change in recent decades as a result of resource development, including that related to hydro-electric (e.g., WAC Bennett Dam), forestry, and petroleum industries.

Although there is some documentation of the combined social and ecological changes, much local and traditional knowledge has not been documented. Little place names research of this kind has been carried out in Alberta and the Peace River Watershed. Further Traditional Knowledge research is needed to document toponyms that can yield valuable insight about the Peace River unique from western science. In the absence of these culturally appropriate categories, this report uses the scientific categories of water quality and flow, water quality, waterfowl, and aquatic wildlife to communicate the observations and experiences of elders and land users within this region. The levels and dynamics of water flow have been a key theme of Traditional Knowledge research in the Peace River as a result of inquiries into the impacts of the W.A.C. Bennett Dam. There is limited documented Traditional Knowledge related to water quality in the Peace River Watershed. Many Aboriginal communities have observed a marked decline in water quality, according to such indicators as color, tea scum, algal growth, and proximity to development. The level of contaminants resulting from development activities is another major issue. In addition to hydroelectric development, forestry, conventional and unconventional petroleum exploration are increasing foci of research. A limited amount of data has been collected about the effects of climate change from the perspective of local and traditional knowledge holders.

Indicator	LTK	Notable Sources, Programs, Projects
Traditional Land Use—Indigenous		Northern River Basins Study
Contemporary Use—Indigenous		
Subsistence Values/Historical—Fisheries		
Commercial Values/ Historical—Fisheries		
Subsistence Values/ Contemporary—Fisheries		
Commercial Values/ Contemporary—Fisheries		
Fish Diversity		
Fish Health		
Fish Movements and Migration		
Water Quality		
Water Flow, Levels		
Climate Change Effects		
Effects of Disturbance		
Traditional Stewardship Practices		

INTRODUCTION

The Peace River Watershed is home to many Aboriginal peoples of the Treaty 8 region who have lived in the area since time immemorial. The Peace River and its tributaries have always been an important travel corridor for First Nations, Metis, and other settlers and was a foundation for subsistence fishing for many generations. The watershed has undergone significant change in recent decades as a result of resource development, including hydro-electric (e.g., WAC Bennett Dam), forestry, and petroleum industries. Although there is some documentation of the combined social and ecological changes, much local and traditional knowledge has not been documented.

METHODS

This report was developed for the *Tracking Change…* project with the aim of synthesizing existing documented local and traditional knowledge about social and ecological change in the Peace River Watershed. The identification, synthesis, and reporting on Traditional Knowledge for this region is complex, owning to the large number of Aboriginal groups who have documented historical and contemporary land and resource use and interest in the region, the absence of documented Traditional Knowledge research conducted, as well as the socio-economic and political inequities and tensions that exist between regional and provincial governments and many Aboriginal communities. Many Aboriginal groups may feel there is little purpose in devoting valueable time and resources to sharing their knowledge to a reporting process that is largely structured according to western science parameters and would seem to benefit a public council rather than their own communities.

Traditional Knowledge is generated differently from 'western science' and is tied to a unique set of values, perspectives, and historical/contemporary experiences. It is important that the following is acknowledged:

- Traditional Knowledge has many meanings; it is generally broader and more holistic of other ecological and socio-cultural variables than conventional scientific definitions of 'aquatic ecosystem';
- Documented and public sources of Traditional Knowledge only recognize a small percentage of existing Traditional Knowledge;
- The collection of Traditional Knowledge should increase the capacity of First Nations and Métis communities to participate in the planning, monitoring and management of the Peace River Watershed.

Searching for Secondary Sources of Publicly Available Traditional Knowledge

A search of publicly available sources of Traditional Knowledge was carried out between January 2016 and May 2016. This report accounts for six different kinds of secondary sources of Traditional Knowledge and related community studies gathered through the Peace River Watershed.

The majority of information was found through searches of public databases including:

- Academic Search Elite Database (University of Alberta)
- Google/Google Scholar;
- Royal Commission on Aboriginal Peoples Database (Our Legacy);

- National Energy Board (NEB) of Canada/Energy Resources Conservation Board (ERCB) of Alberta
- Northern River Basins Study (Database);
- Personal Communications/Sharing of Reports.

Through this research, the following kinds of documents were found:

Oral Histories
Traditional Knowledge is most closely associated with oral histories about the land, water, and wildlife in specific regions. As a consequence, much Traditional Knowledge documented to date in the region has been focused on understanding the distinct worldview, values, and way of life of Aboriginal peoples.

Traditional Land Use Studies
Land and resource use studies are fundamental to our understanding of Traditional Knowledge in the Peace River Watershed. For many communities and scholars, traditional land use practices like hunting, fishing, trapping, and plant harvesting are the means by which Aboriginal people have come to know about ecosystems and ecosystem change. In other words, Aboriginal people have come to know about the land, not by some detached method of investigation; but by living or dwelling within ecosystems. Any changes or declines in ecosystem health, in that sense, are not viewed as data but as a threat to the socio-economic and cultural well-being of communities. Such dwelling has also created a strong emotional and spiritual connection to the land that may make Traditional Knowledge holders particularly attuned to ecosystem change. As for oral-history research, accepted methods for land and resource use studies vary across the Peace River Watershed.

Ecological Knowledge Studies
Traditional Knowledge is of increasing interest to policy-makers and environmental managers, in large part because of the potential expertise and insight that can be gained about environments and environmental change. In that context, communities, in collaboration with anthropologists, ecologists and others have focused attention on documenting many aspects of ecosystems and ecosystem change. Related to this research is knowledge related to sustainable management, including ways of respecting the land, water and wildlife (e.g., rules, practices, and tools).

Assessment/Impact Specific Studies
Traditional Knowledge studies conducted in the Peace River Watershed that relate to specific human activities or impacts (such as agriculture, oil sands mining, hydroelectric dams, etc.) have been somewhat common. Considered within this context are studies related to community risk perception and those guided by communities that seek to communicate about environmental risks. As noted by scholars such as Usher et al. (1992), perceptions that something is *wrong* with a given resource can be profoundly disturbing to land-based communities, whose livelihoods depend on the continued health and sustainability of those resources. The Northern Contaminants Project, as well as other work done through agencies such as the Centre for Indigenous Peoples' Nutrition and the Environment (CINE), provide valuable guidance on documenting risk perception in northern communities.

Traditional Knowledge Monitoring

An emergent area of Traditional Knowledge documentation and sharing is through community-based monitoring and regional monitoring initiatives such as the *Guardians* program in Fort Chipewyan, which is being led by the Mikisew Cree First Nation and Athabasca Chipewyan First Nation.

Other

Given there are significant gaps in the availability of Traditional Knowledge in the Peace River Watershed, this report has also made room for other kinds of knowledge and information that would be considered outside the definition of 'Traditional Knowledge.' These include studies that address the following:

- Did the study involve documenting sources of Traditional Knowledge (i.e., documentation of the values, knowledge, practices and institutions of a particular Aboriginal group?)
- Was the study focus defined by Traditional Knowledge? (i.e., selection of issues or valued ecosystem components being studied)?
- Was the study led or guided by an Aboriginal community?
- Did the study have some other relevance to Aboriginal communities?

Studies that were either defined or guided by Aboriginal organizations or communities were recognized as important to our understanding of community perspectives on the state of the aquatic ecosystem. The inclusion of other kinds of knowledge and information is important to many communities who are informed by many sources.

One of the most comprehensive Traditional Knowledge studies in the Peace River Watershed was the Northern River Basins Study (NRBS). The broad objectives of the NRBS research program were to identify and quantify the multiple and diverse stressors acting on the Athabasca, Peace, and Slave river basins, and to assess the ecological consequences of exposure to those stressors. The NRBS Board identified goals, objectives, and guiding questions. The decision was made to undertake a Traditional Knowledge study separate from the other aspects of the study on water and ecosystem health. Greater efforts could have been made at a combined approach to research and reporting of results to develop a more holistic understanding of environmental change. The key questions guiding the study included:

- *How has the aquatic ecosystem been affected by exposure to organochlorines or other toxic compounds?*
- *How can the ecosystem be protected from the effects of these compounds?*
- *What is the current state of the water quality of the Peace, Athabasca, and Slave river basins, including the Peace-Athabasca Delta?*
- *Who are the stakeholders and what are the uses of water resources in the basins?*
- *What are the contents and nature of contaminants entering the system and what is their distribution and toxicity in the aquatic ecosystem with particular reference to water, sediments, and biota?*
- *What is the distribution and movement of fish species? Where and when are they most likely to be exposed to changes in water quality and where are the important habitats?*
- *What concentrations of dissolved oxygen are required to protect the various life stages of fish, and what factors control dissolved oxygen in the rivers?*

- *Recognizing that people drink water and eat fish from these river systems, what are the current concentrations of contaminants in water and edible fish tissue and how are these levels changing through time and by location?*
- *Are fish tainted in these waters and, if so, what is the source of the tainting?*
- *How does and how could river flow regulation impact the aquatic ecosystem?*
- *Have the riparian vegetation, riparian wildlife and domestic livestock in the river basins been affected by exposure to organochlorines or other toxic compounds?*
- *What Traditional Knowledge exists to enhance the physical science studies in all areas of enquiry?*
- *What predictive tools are required to determine the cumulative effects of man-made discharges on the water and aquatic environment?*
- *What are the cumulative effects of man-made discharges on the water and aquatic environment?*
- *What long-term monitoring programs and predictive models are required to provide an ongoing assessment of the state of the aquatic ecosystems? How can Study results be communicated most effectively?*
- *What form of inter-jurisdictional body can be established, ensuring stakeholder participation for the ongoing protection and use of the river basins?*

The Northern River Basins Study, which was carried out in the mid 1990s, however, largely centred on the impacts of the W.A.C. Bennett Dam with a geographical focus on the Peace-Athabasca and Slave River deltas.

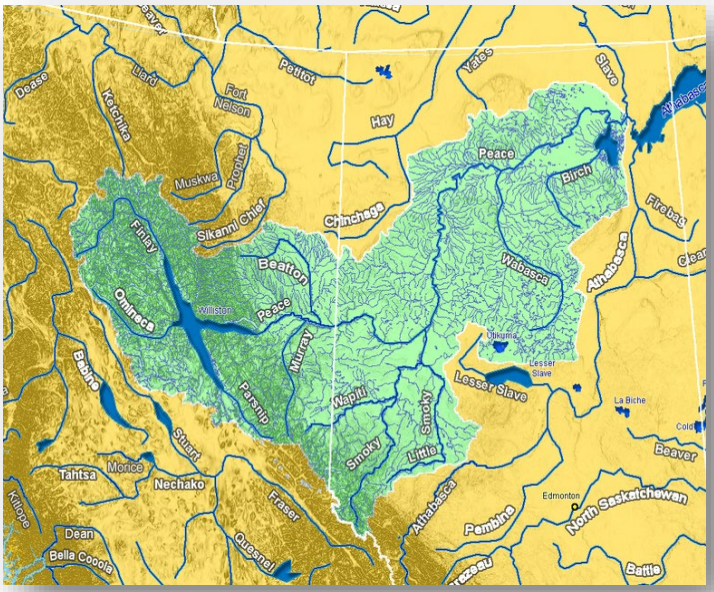
A complete listing of the sources can be found in the reference section to this report.

THE PEACE RIVER WATERSHED

Background and Area

The Peace River is part of the Mackenzie River system flowing from British Columbia to Alberta. The Peace River flows into the Slave River tributary, making it the largest water basin in Alberta. "According to Dane-zaa oral history, the Peace River is named for the settling of conflict between the Beaver and the Cree (T8FN—FGRC 2012:xiv)." British Columbia's Peace region spans an area of approximately 5,611,800 hectares of land and is a "key habitat for moose, elk and deer and is an essential corridor for migratory birds, caribou and grizzle bear populations" (Wilson 2014:7). The Peace River Watershed is situated within Treaty #8. In this territory, the 'river' has significant meaning for relations between Aboriginal and non-Aboriginal peoples. For many Aboriginal peoples, changes in the health and integrity of the Peace River have a deeper set of political and cultural meanings.

The natural pattern of water movement into and out of Lake Athabasca depends on water levels in the lake and the Peace River. "The Peace River originates in the alpine zones of the Rocky Mountains in northwestern British Columbia, some of which are also of glacial origin. Some of this headwater runoff is captured in the Williston Reservoir, with releases controlled through the W.A.C. Bennett Dam" (Gummer *et. al.* 2006:74). The W.A.C. Bennett Dam irrevocably changed the patterns that fed the delta. For most of the year, water flows into Lake Athabasca through the Athabasca River Delta and other tributaries, and northward out of Lake Athabasca via the Rivière des Rochers and Chenal des Quatre Fourches. These two channels join the Peace River to form the Slave River, which flows northward into Great Slave Lake, the Mackenzie River, and ultimately the Arctic Ocean. During spring or summer flooding, however, water levels in the Peace River can exceed the water level of Lake Athabasca, causing reversed southward flows (into Lake Athabasca) in the Rivière des Rochers and Chenal des Quatres Fouches.



Figures 1 and 2: *Peace River Basin*

Figures 1 and 2 show the location of the Peace/Slave River Basin (as well as other basins) in the province of Alberta, as indicated by the light green area. The Peace River also extends into British Columbia, as shown by the circle in Figure #3. In the Treaty #8 territory, the 'river' has significant historical meaning in relations between Aboriginal and non-Aboriginal peoples. The Treaty names the Peace River and other waterways in the region as areas providing a guarantee of Aboriginal hunting, trapping, and fishing, 'so long as the rivers flow.'

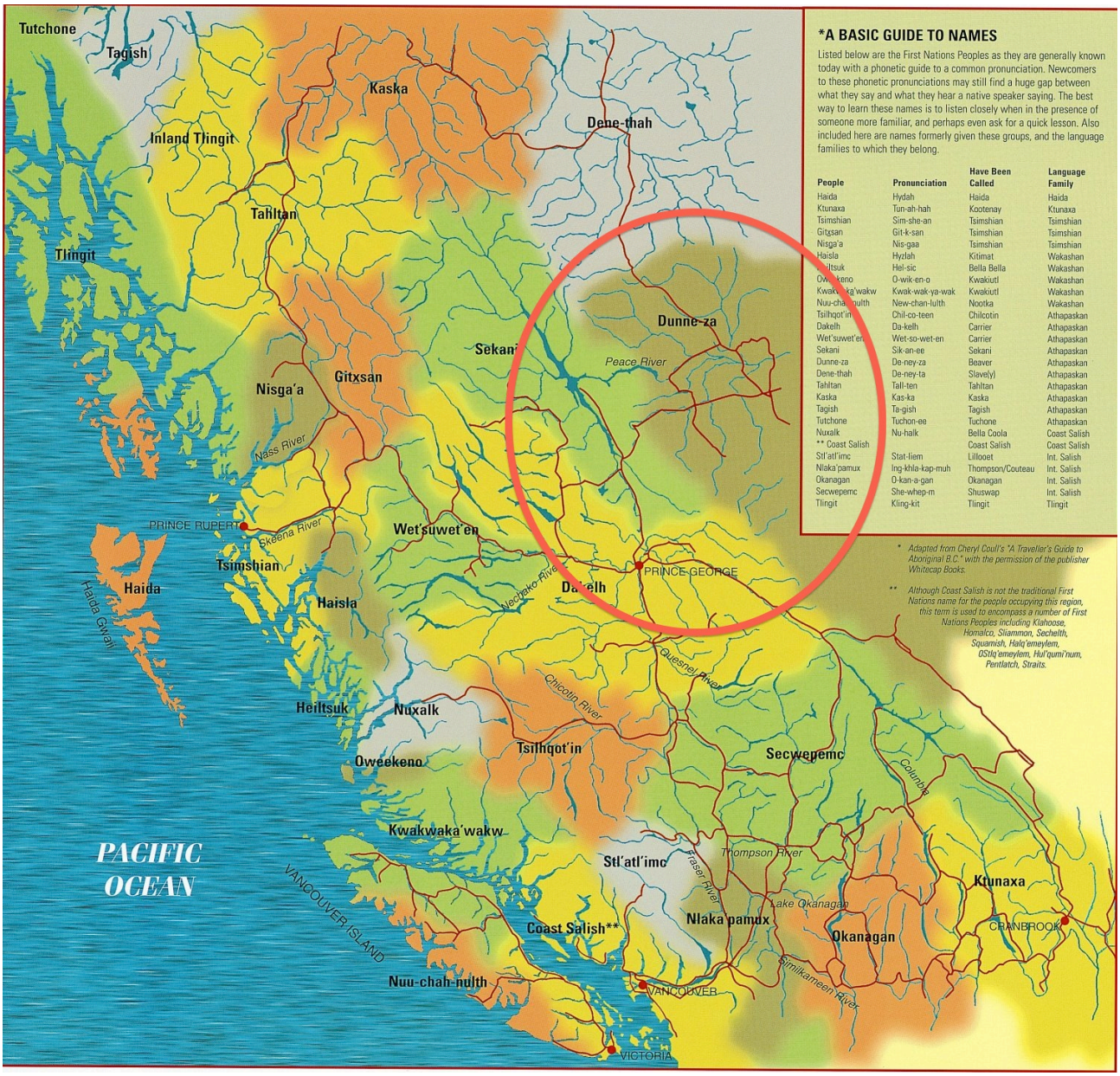


Figure 3: *Location of the Peace River in British Columbia*
https://www.bced.gov.bc.ca/abed/images/map2.jpg

ABORIGINAL PEOPLES OF THE PEACE RIVER WATERSHED

> Given the valley's abundance of resources (e.g., wildlife, fish, important plants, and water), it is easy to see why First Nations would have been attracted to the valley. Today, First Nations continue to value the Peace River for many of the same reasons that they valued the valley, thousands of years ago (Feinstein 2009).

The Peace River Watershed is thought to have been home to at least four Aboriginal groups: Dane-Zaa, Woodland Cree, Sekani, and Metis. The following list describes the major First Nations groups along the Peace River, as well as specific examples:

The **Dane-zaa,** also known as the Beaver, are an Athabascan population who currently reside in British Columbia as part of the Doig River First Nation, Blueberry River First Nation, Halfway River First Nation and Prophet River First Nation communities. Although currently these communities reside outside the watershed, prior to 1800 they inhabited lands further east, near the Athabasca River and Clearwater River, north to Lake Athabasca, and in the territory north of the upper Peace River.

- **Horse Lake First Nation**
- **West Moberly First Nations**

Woodland Cree comprise the largest Aboriginal population in northern Alberta. They are of Algonquian origin, having originated further east of the Athabasca. Prior to the 18th century, their territory was around Hudson Bay as far north as Churchill and east of James Bay to Lac Mistassini. Although their western boundary was uncertain, they had ventured into Northern Saskatchewan and Manitoba by the 18th century as middlemen, trading with western tribes. The Woodland Cree were one of the first nations to trade with European fur traders, as early as the 17th century. By 1800, the Cree were well established in Alberta, from the Peace-Athabasca Delta in the north, along the Peace River and south as far as the Saskatchewan River. Woodland Cree use legends to convey stories through time. Many legends are about aspects of the environment, such as *How the Raven Stole the Sun*, and *Deawitchita and the Fire Rock*. It is said that those who tell the legends have the most *ikanisha*, which means 'wisdom' in the Cree language. The community of noted reference in this report is **Duncan's First Nation.**

The **Sekani** (Tsay Keh Dene) are an Aboriginal population living in Northern British Columbia. They are "Athapaskan speaking hunters and trappers whose traditional territories encompass the upper Peace River drainage area, including the Parsnip and Finlay river watersheds" (Ridington 2008). Both these watersheds are tributaries of the Peace River. The name 'Sekani-Dene' translates to 'people of the rocks,' likely due to their location along the Rocky Mountain Trench. Traditionally, the Sekani way of life includes hunting of primarily wild game, gathering, and berry picking. The population is largely represented by the government of the Tsay Keh Dene First Nation.

- **Kwadacha First Nation**
- **Tsay Keh Dene First Nation**
- **McLeod Lake Indian Ban**

https://a100.gov.bc.ca/appsdata/epic/documents/p285/1223586260391_8e248a8d30d9cb279f2e8cbe454bb9c0eee21ef3c15a.pdf

Metis are represented in many communities throughout the Athabasca River Watershed. Alberta has the single largest provincial population of Métis (79,750 people). It is also thought to be one of the fastest-growing populations of Aboriginal peoples in Canada. The Métis were born from the marriages of Cree, Ojibwa and Salteaux women, and the French and Scottish fur traders, beginning in the mid-1600s. Scandinavian, Irish and English stock was added to the mix as western Canada was explored. The Métis from the 1700s played a very important role in the development and exploration of Northern Alberta with fur trade and freighting on the Athabasca River. Unlike other Métis populations in Canada, the Métis were given land rights (1,280,000 acres) by the province (1936) in the form of Métis Settlements. There are three official Métis Settlements in the Athabasca River Watershed: Peavine, Gift Lake, and East Prairie, which are located in the Lesser Slave Lake region. The Metis have many valuable sources of Traditional Knowledge, including the 'Metis Lifelong Learning Model,' which speaks to the importance of their knowledge as a guide for living.

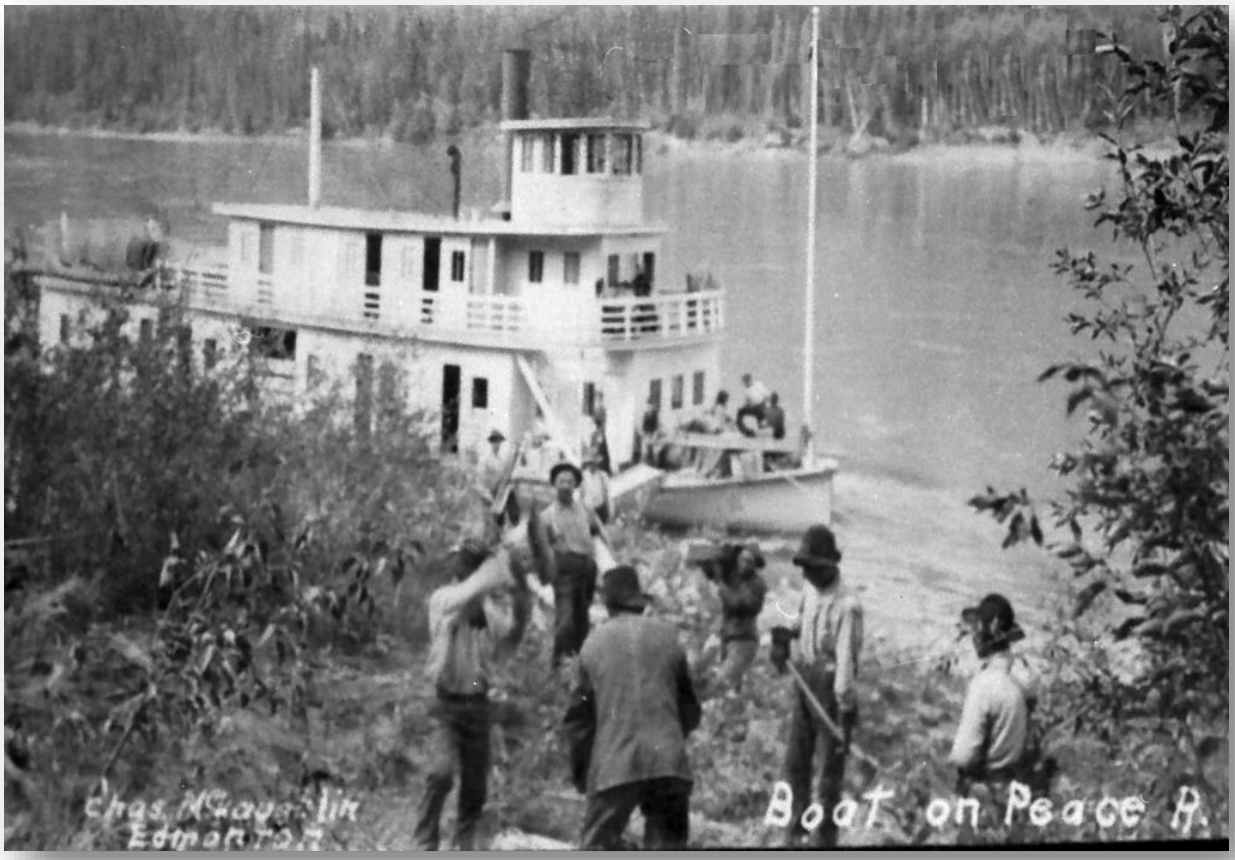


Figure 4: *River Boat Travel on the Peace River*

THE PEACE RIVER ECOSYSTEM

Ecosystems are complex structures that work together to provide for particular inherent values and functions as well as services to local communities and the globe. Traditional Knowledge holders do not always define and describe ecosystems in the same way as western scientists or politicians. Those who dreamt of the WAC Bennett Dam, for example, saw the Peace country as a hydrological system with the potential to provide energy to western Canada and the United States. This was a distinctly different view from those who lived in areas affected by flooding.

> Rather than a hydrological system, [the people of the Peace River] understood it as an intimate geography of belonging. Riverbanks, garden plots, lakes, and trap lines were prominent features in personal maps of attachment that located them in relation to each other and connected them to their past, present, and future. Yet these features were invisible at the scale and resolution that characterized the way politicians and scientists envisioned the environment and environmental change (Loo 2007:908).

There are also important differences between the ways in which scientists and Aboriginal people understand change and the value of change. In a river system characterized by seasonal flooding, for example, the impact of the hydro projects that limited the natural seasonal dynamics was socio-economically and ecologically devastating.

> … the only 'constant' in the Peace-Athabasca Delta is change. This context of variability makes it difficult to assess the meaning of change and its causes. If "change, per se, in a delta is not indicative of ecosystem stress or disease," then how do you sort out good changes from bad ones? More particularly, how can the changes in the delta caused by the Bennett Dam be distinguished from those that occur naturally? As time passes, the task becomes more complex: As other human activities affect the delta it becomes harder to separate the changes caused by the dam from those stemming from the operation of pulp and paper mills, oil sands development, and climate change (Loo 2007:911).

Some people consider ecosystems as an embodiment of self—of feeling, and identity. As noted by Tina Loo in respect of the effects of the WAC Bennett Dam, impacts were felt as much as observed:

> …changes were perceived through the body as much as the mind. The environmental history of the Peace was a history of the senses: the sounds of the bush, the color of ice, the shape of the river. For Hudson's Hope resident Earl Pollon, dynamite and earth movers signaled the ear-splitting arrival of modernity. While Pollon complained about the noise, downstream Josephine Mercredi worried about the quiet. Changes to the river's flow and ice formation meant that there were no longer the same spectacular ice jams in the spring that were so important to flooding and replenishing the delta. The land signaled its thirst with silence: "Today you go on Reserve [201], you look, you listen for the sounds of birds, waterfowl, ducks, geese. You don't hear anything anymore." (Loo 2007:905).
>
> But such rituals of environmental belief were almost impossible in desecrated landscapes. Upstream, the dam had killed the river, despoiling places of spiritual as well as material significance. A bush pilot recalled one particularly distressing moment for the Ingenika. "A piece of land had broken off and slid into the lake," explained A.C. Geddes. "It was where their graveyard was, and there were coffins, some whole and some all broken up, bones and bodies strewn all down the bank." It was a scene from a northern hell: dead bodies in a dead river already choked with the corpses of trees (Loo 2007:2009).

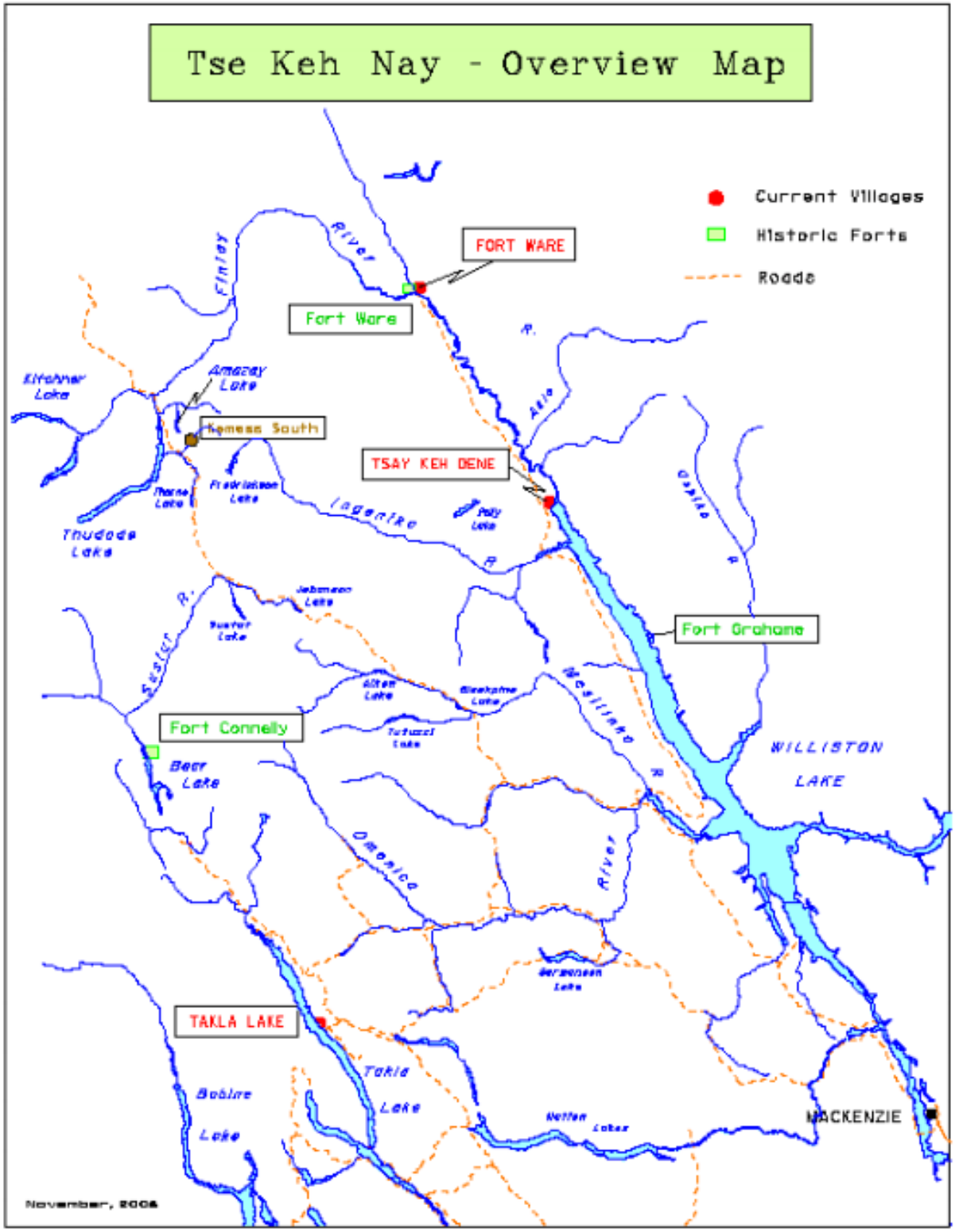


Figure 5: *Tse Keh Ney Traditional and Contemporary Land Use and Occupancy*
(Adapted from Littlefield *et al*. 2007:3).

Aboriginal languages of the region provide an important entry point for understanding Traditional Knowledge about the Peace River; placenames can provide particularly valuable insight into both the structure and dynamics of ecosystems and ecosystem change (McNeave *et al.* 2010). These place names are the beginnings of stories about particular experiences people have had and their relationship to the ecosystems and the effects of variability and change on those areas. They also indicate the historical dimensions of land use and occupancy.

The Dunne-za (Beaver) peoples are thought to have inhabited most of north central Alberta and parts of northeastern British Columbia until the height of the fur trade.

> According to Mackenzie,. the Dunne-za originally inhabited a vast area in north-central Alberta east to the Saskatchewan border). This theory suggests the Cree, who had obtained guns through the fur trade, invaded new territories when those further east were depleted of fur-bearing animals. In the case of the Cree and Dunne-za, relations were said to be openly hostile until peace was finally reached at Peace Point on what was thereafter known as the Peace River (Ridington date?:16; Dempsey date?:73).

The Dane-zaa (Beaver) language is spoken in the communities of Hanás Saahgé (Doig River), Blueberry First Nation, Halfway River, and Prophet River in British Columbia as well as at the Boyer River (Rocky Lane) and Child Lake (Eleske) Reserves in Alberta. Elders of the region have historic place names for the area such as those described by the elder Tom Attachie from Doig River:

> This is the place they call *Alédzé***.** Some Prophet named Alédzé is buried up this creek somewhere. Up north, this creek run from north. They got a cabin in there, that's what they call Sam's Cabin. And today just a little ways up here, you see them trees, that's where is Doig River… Alédzé Tsáá flows into Hanás Saahgéʔ (the Doig River), and this place has been an important camp along our travel corridor for as long as we remember… Hanás Saahgéʔ means 'Raft River' in our language. For as long as we remember, this area of the Doig River has been a major camping spot for our people. We used it on our seasonal rounds as we traveled to hunt, trap, and gather throughout our territories. We would often transport our furs down river from Alédzé Tsáá by raft following the spring breakup; this is why we call it Hanás Saahgéʔ (Raft River).
> http://www.virtualmuseum.ca/sgc-cms/expositions-exhibitions/danewajich/downloads/video_transcripts/en/TA-Aledze.pdf

The Dane-zaa people were greatly impacted by trade and settlement in the area, beginning in the late 18th century. Cree, Iroquois, Metis and Sekani populations moved into the area.

> There are no known place names of Sekani origin in Alberta, unless one counts Wanyandie Creek twenty-seven kilometres northeast of Grande Cache. The creek is said to be named after Vincent Wanyandi (b. 1850) of Iroquois ancestry (DB) who may have been descended from Ignace Waniante…

Sekani occupancy in the Peace River Watershed west of Alberta is contested, with some question of whether the Sekani are related to the Beaver or migrated to the area to trade in the late 19th century.

> The Tse Keh Nay consider themselves to be the original inhabitants of this region. Harmon (2006) and others (Morice 1895; Jenness 1937) speculated that because of similarities, the Sekani were once part of the Beaver Indians who lived to the east on the lower part of the Peace River and that they were recent immigrants. Most certainly the language of the Tse Keh Nay belongs to the Beaver-Sarcee-Sekani branch of Athapaskan and is mutually intelligible, indicating a close relationship at some point in history (Denniston 1981:435).
> http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf

(Littlefield *et al*. 2007:5)

These histories however, are tremendously interconnected at present. The Aseniwuche group of Nations, surrounding the community of Grand Cache for example, are predominantly Woodland Cree who also trace bloodlines to the Iroquois, Beaver, Sekani, Assiniboine, Ojibwa and Shuswap.

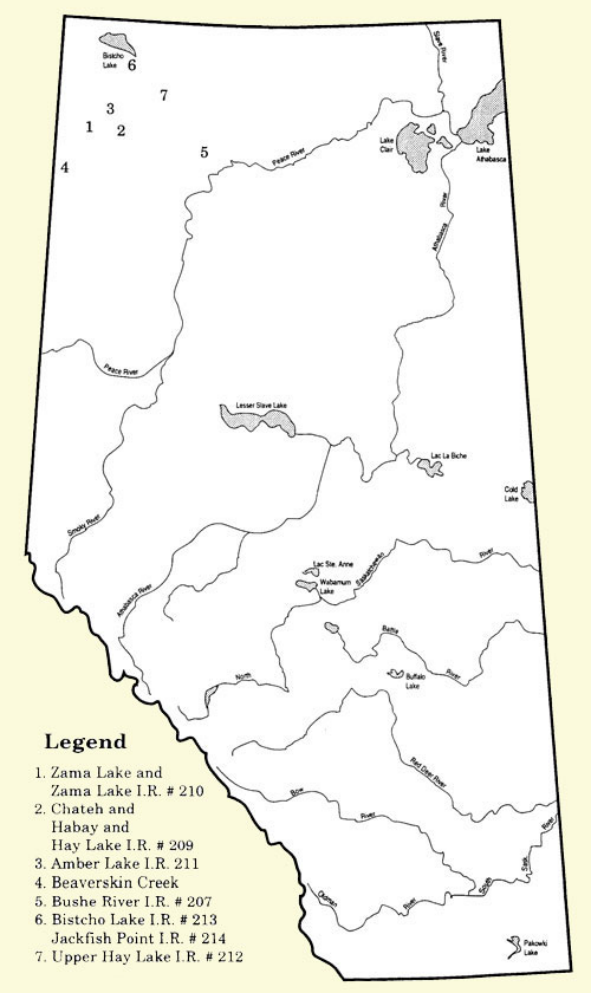


Figure 6: *Place names of the Dunne-za and Dene Tha (Government of Alberta)*
http://wayback.archive-it.org/2217/20101208160513/http://www.albertasource.ca/placenames/places/index.html

Little place names research of this kind has been conducted in Alberta and the Peace River Watershed. Further Traditional Knowledge research is needed to document toponyms that can yield valuable insight about the Peace River, unique from western science. In the absence of these culturally appropriate categories, this report uses the scientific categories of water quality and flow, water quality, waterfowl, and aquatic wildlife to communicate the observations and experiences of elders and land users in this region. Also included are aspects of land use and community well-being. In addition to place names, the Peace River Watershed, like other areas of the boreal region, is characterized by numerous kinds of trail systems demarcated by 'culturally modified trees.'

> Often associated with [spell out] (CMTs), are large trail system, which are located by linear paths of marked trees or paths, which are visible from continual use through generations. Within the Peace River Watershed, although some overland trails remain visible and have been identified in a small portion of the overall region, they have historically been known to occur throughout the landscape; however, modern developments and major roadways have all but destroyed or built over them, erasing their presence from the watershed. Where they still remain visible is in areas which have seen less development, along the slopes of the Rocky Mountains. Nevertheless, the location of trails as well as the location of CMTs aid in our understanding of the Peace River Watershed.

There are also ways in which communities spiritually 'know' the landscape in which they live. Dreams are an important part of the way in which the Dane-zaa in northern British Columbia understand and communicate about the environment, an insight celebrated in the volume by Hugh Brody, *Maps and Dreams* (Brody 1983).

> ...last summer when we [were] camping... at Thutade Lake. That little guy wake up in the middle of the night... and a great big frog stuck on his [touches the side of his neck] while he was sleeping. When he pull it out he said, "Grandma, I'm going to put this caribou heart on top of the cooler. I don't know where it come from... but it's a caribou heart." That's in his dream.... What that means, you know, is my grandfather is showing his family that he is still there... If you ever see my grandfather... he has a big frog imprint on his hand... when he was young that frog stuck to his hand when he was asleep in the same place at Thutade Lake. This time it stuck on [the boy's] neck... that shows that my grandfather is showing a signal that he's still there, he's still at Thutade Lake (Tse Keh Nay 2006 in Littlefield et al. 2007:37).

WATER QUANTITY AND FLOW

The levels and dynamics of water flow have been a key theme of Traditional Knowledge research in the Peace River, as a result of inquiries into the impacts of the W.A.C. Bennett Dam. The Peace River region is known to have important flood dynamics in support of local ecosystems; historical records are particularly vivid about ice jams in the region.

> "(April 21, 1905) River rose 1 foot during 24 hours. … (ID 135 and Abstract#1-3 in Bill *et al*. 1994:23).

Timoney (1997) reconstructed flood histories based on historical records, including muskrat harvests, to understand flood dynamics. Based on his analysis, it is climate, rather than the Bennett Dam which has led to a drying of the Peace River region and the Slave River Delta.

> For the period 1826–1995, the temporal pattern of flooding in the Peace-Athabasca Delta was non-random. Changes in flood frequency over the record reveal a pattern of oscillation described by a sine-based model. The history of spring flooding is linked to a variety of ecosystem indicators such as muskrat numbers, the annual area burned in Wood Buffalo National Park, and incised channels and dendritic drainage patterns in the bed of Lake Mamawi. Because the Bennett Dam was constructed during what appears to be a period of climatically-driven drying, the impact (if any) of the Bennett Dam on spring flooding may not be detectable for many years. Regardless of the dam, we conclude that climate has been important in determining the frequency of ice-jams in the Peace-Athabasca Delta (Timoney *et al*. 1997:480-481).

Much knowledge has been documented in relation to the impacts of hydroelectric developments that have severely altered flows in many Aboriginal homelands, including the Peace River. The W.A.C. Bennett Dam had major impacts in the Peace-Athabasca regions of British Columbia, Alberta and downstream in the Mackenzie River Basin.

> Changes to the river's water and ice regime changed its morphology. Lowered flows meant more sediment remained in the river. Sand and silt built up, narrowing the river at many points and creating sandbars, small islands, and wider shorelines, which were slowly colonized by vegetation. As new physical features appeared in the river and along its banks, old familiar ones disappeared. Islands became hills. Lakes vanished under willow and sedge. "Today, I don't know where that lake is," said puzzled trapper Daniel Marcel of Big Egg, one of the delta's large perched basins. Nevertheless, every day during trapping season he went out looking, knowing it was 'for almost nothing' (Loo 2007:907).

> Water was not a concern in the past because it was abundant and fresh in quality no matter where the people travelled. Water was taken only from flowing streams… During winter, snow and ice were used for drinking water, as it was easier to access than was river water… In recent times, they have had to carry water with them into the bush because water levels have decreased substantially over the years and there is some concern as to the cleanliness of the snow or ice on the lakes and rivers (Bill *et al.* 1994:77).

> The Dog River area was identified as having good water [but] elders believe that the water levels and quality have fluctuated notably since the Bennett Dam was developed. Many of the smaller lakes, creeks and sloughs have dried out and beavers are seen working feverishly to hold back the water. Prior to the big dam, low water levels were not a problem (Bill *et al*. 1994:77).

Some of the key parameters of water quantity revealed in the narratives of Traditional Knowledge holders include aspects of the following:

- Water levels (distance receded as measured by shoreline, or depth dropped as measured by riverbank);
- Flood patterns;
- Incidence of extreme flood events;
- Ease of river travel/navigability (minimum flow);
- Ice thickness and color;
- Timing of spring break-up/freeze-up;
- Incidents of 'unnatural' freeze/thaw events;
- Small creek/tributary dry-ups;
- Shifts in creek beds/flows.

Perhaps the most documented issue of the Peace River is the impacts of the W.A.C. Bennett Dam, and more recently, oil sands mining. In the lower range of the watershed, major changes have been observed in water flows and flood dynamics in the Athabasca as well as smaller tributaries. While much of this is attributable to oil sands mining and previous impacts of the W.A.C. Bennett Dam, elders also identify climate change as an influence. The drying up of wetlands and creek beds, while at the same time experiences of major flood events, are of concern in some areas. One of the major reference points related to change in 'water quantity' is the ability of people to use the river. Land users are finding it increasingly difficult to navigate the Peace River as its levels continue to change. Today there are land users who can no longer pass through or access some traditionally used areas due to low water levels.

> Ever since the construction of the W.A.C. Bennett and Peace Canyon hydroelectric dams in our Treaty territory, we are seeing more and more of our lands being crisscrossed by BC Hydro's transmission lines and taken up by BC Hydro terminals and substations. Hectare by hectare, kilometer by kilometer, our lands are being impacted to the point that we can no longer meaningfully exercise our Treaty rights in many areas. It is unconstitutional to continue to tell us to 'hunt elsewhere' where there are few (if any) places we can go to exercise various rights (WMFNs 2011).

> Bennett went on a tour of northern British Columbia. He asked his driver to pull over at a highway viewpoint where he could look out over the Peace River Valley. Seeing him, a passing trapper asked, "Mister, what are you staring at?" Bennett apparently pointed down at the valley and answered with a question of his own: "Look down there. What do you see?" "I see a small, winding, muddy river." "Well, my friend," said the premier, "I see dams. And I see power. And I see development. I see roads, highways, bridges, and growing communities. I see cities—prosperous cities with schools, hospitals and universities. I see beautiful homes with housewives baking bread" (Loo 2007:900).

> Of course, damming the Peace was not without environmental and social costs. In the immediate vicinity of the dam and reservoir, the problems were caused by too much water. The Bennett Dam turned parts of three rivers—the Finlay, Parsnip, and the

Peace—into a huge lake: the Williston Reservoir runs 250 kilometers north-south and another 150 kilometers east-west …. Its creation destroyed habitat, changed the immediate climate of the area, and compromised biodiversity. In addition to flooding 350,000 acres of forested land and drowning countless animals, the reservoir blocked the east-west migration of the now endangered mountain caribou across the Rocky Mountain Trench (Loo 2007:901).

The same waters that prevented the mountain caribou from migrating also forced some of the human residents of the Trench to move. Some forty or fifty members of the Tsay Keh Dene First Nation, Sekani peoples then known as the Ingenika, were relocated to new reserves when it became clear their settlements and traplines near Fort Grahame and Finlay Forks would be inundated by the reservoir's waters. The Ingenika were not the only human residents of the Trench who lost their lands, however. In all, approximately one hundred non-Aboriginal people and some fourteen thousand acres of land as well as mineral and timber rights were also at risk. The $1.7 million the BC Hydro paid to acquire all the properties and associated rights facilitated the construction of the dam, but did little to settle the issue….

The Peace River flows from west to east, and then north, emptying into the Arctic Ocean. Downstream, in Alberta and the Northwest Territories, the environmental and social problems caused by the dam were due to a lack of water. When the river was dammed and the reservoir began to fill (1968-1971), the impact on the area known as the Peace-Athabasca Delta became the focus of immediate attention, largely because of its ecological significance… (Loo 2007:903).

Approximately 400,000 birds use the delta on their way to the Mackenzie River lowlands and Arctic in the Spring, while more than 1 million stop there in fall during their migration south. In addition, the delta's undisturbed grass and sedge meadows are among the largest in the world and provide range for one of the largest free-roaming herds of bison. After the Bennett Dam was completed, water flows on the Peace decreased 15 to 70 percent, depending where on the river measurements were taken. Reduced flow meant that the river's channels were not scoured to the same extent: Water quality was compromised as sediments and toxins were left to accumulate rather than being flushed out. As well, water levels in the delta's lakes and its 'perched basins' (elevated bodies of water replenished by periodic flooding) fell, and over time some disappeared all together. The rejuvenating floods that had come every two or three years stopped. Since the mid-1970s there has only been one (Loo 2007:903-904).

The delta was drying out. By the time the Williston reservoir was full in 1971, the water cover had been reduced by 38 percent, and by 1989, wetlands and wet marshes had declined by 47 percent. As lake and basin levels fell, willows and sedge colonized the areas of the delta left exposed by the receding water… (Loo 2007:903).

Downstream, the seasonal draw-down meant winter water flows on the Peace were two-and-a-half times their pre-Bennett Dam level. The higher flows and higher

> temperature limited ice formation and thus decreased the extent of ice jams and spring flooding that was the key to re-watering the delta, especially its perched basins… .

WATER QUALITY

Many Aboriginal communities have observed a marked decline in water quality in the Peace River over the last 50 years. Some of the key parameters include:

- Colour;
- Silty, muddy water;
- Smell;
- Algal growth; algal formation in fish nets;
- Tea scum;
- Proximity to development project/site (perceived contamination).

There is limited Traditional Knowledge related to water quality documented in the Peace River Watershed. However, much Traditional Knowledge has been precipitated by oil sands development, and in the case of the Peace, the W.A.C. Bennett Dam.

> Those who were able to stay where they lived experienced a change in the weather. While it is widely accepted that large bodies of standing water like reservoirs have general climatic effects, the exact nature and extent of those effects for Williston Lake are largely unknown. But for those who lived in the area, they were clear. The most common complaint was how much windier it seemed. That was bad enough, but for Jed Woolley the change in climate also compromised his ability to make a living. He demanded that BC Hydro compensate the area's farmers for the increased cold and humidity which prevented their grain, legumes, and seeds from drying properly. Ed Summers, who ran cattle on the Tompkins farm, experienced the humidity in the form of a heavy fog that rolled over his land in the fall. While some dam supporters dismissed Woolley's and Summers's claims, there is scientific evidence to back their anecdotal observations, which suggested that temperatures fell and humidity increased in the area surrounding the reservoir (Loo 2007:902).

> Water is sacred to Kelly Lake Metis people, and is the source of all life (KLM04[1]), clean sources of water are not only important for drinking, but also for the nourishment of wildlife species that are harvested for food, plants that are used for tea and medicine, and for farmers that depend on it for economic well-being (KLM04). Water quality in Kelly Lake was 'clean,' meaning it was pure enough to drink untreated, until the 1950s (KLMOl; KLM02; KLM03; KLM04). Today, children cannot swim in the lake because the water is contaminated from various sources, including sewage from a school built in the town of Taylor (KLMO 1; KLM02) and drilling activity that has occurred on its banks in recent years (KLM02; KLM04). Industrial activity has also affected the quality of artesian well water of KLMSS members, resulting in the collapse of drinking wells (KLM04). Water drawn

[1] KLMxx refers to the coding used to identify participants in the survey.

> from local sources reportedly has an oil-like scent (KLM04) and KLM02 has observed combustible gas (through ignition) in local water pipes. Changes in water quality linked to industrial activity are contributing to decreased human and ecological health by participants. https://www.ceaa-acee.gc.ca/050/documents_staticpost/63919/85328/Vol5_Appendix-Kelly_Lake.pdf

ICE CONDITIONS

The elders interviewed during the Northern River Basins Study indicate the significance of winter ice and ice jams and associated flooding to the ecology of the region.

> Ice changes, such as the thinning and crumbling, were noticed by 22% of respondents. Others stated ice was dirtier and lower than previous years…
>
> The dissonance of environmental change was not just aural, but visual. Because the water released from the Williston reservoir in the winter was warmer than the water in the Peace, ice formed later in the river, and instead of freezing into the usual flat pans, the cover was thicker and rougher, especially on the middle portions of the Peace. It looked different. "Back in the 50s when the river broke up in the spring, the river ice that came down... was solid blue ice that broke up in big chunks," recalled Margaret Marcel in 1996. "But after the Bennett dam was built... you don't see the big thick blue ice.... Today all you see is small little chunks of ice (Loo 2007:907).

FISH AND FISH HABITAT

Fishing in the Peace River system has been a critical foundation of subsistence for Aboriginal peoples in the region for many many generations. There is limited availability of documented local and traditional knowledge about the significance and ecology of the fishery prior to resource development and settlement, including baseline condition, species population, diversity, movements, and harvesting prior to the development of mining and hydroelectric development. What has been recorded is available from the records of explorers such as Mackenzie and Black, whose journals provide insight about the experiences of the Beaver and Sekani.
Alexander MacKenzie (1995) traveled up the Peace and Parsnip river systems in the late 18th century and referred to the Sekani in his journals as the 'Rocky Mountain' Indians who were said to be living at the Parsnip River and at McLeod Lake. Simon Fraser referred to these same communities as the Meadow Indians in 1825 referring to Beaver/Sekani living in the upper Pine River, Nation River, and at McCleod Lake.

For example, the journal of Samuel Black, an early fur trader who visited the region in 1824, details 'Thecannie' historic use of the Thutade and Amazay lakes region.

A number of communities have their own databases related to the region, including the Doig River First Nation, where proprietary information can be foun (http://www.fishability.biz/Doig).

Early explorer and settler accounts of the fishery in this area suggested the rivers were not well populated with fish: "the Peace River country possessed but very few fish in its lakes and rivers (ID 205 and Abstract#9 in Bill *et al*. 1994:22).

> Twelve species of sport fish live in the Peace River mainstream, downstream of the Peace Canyon Dam between Hudson's Hope and Fort St. John. The most abundant are mountain whitefish, Arctic grayling, rainbow trout, lake whitefish, and walleye. Bull trout, Kokanee, and northern pike are present in lower numbers.
>
> Within the watershed, notable species that have been of great importance to First Nations include Arctic grayling, mountain whitefish, yellow walleye, burbot, bull trout, rainbow trout, goldeneye, kokanee salmon and northern pike. The Peace River has been and still is an important wintering ground and migration corridor for the fish, while many of the rivers' tributaries have acted as spawning grounds. In particular, the Halfway River has been distinguished as an important rearing habitat for whitefish and a vital migration corridor for bull and rainbow trout…
>
> Besides the major rivers and small tributaries, many of the small lakes, including Charlie Lake, have been associated with a great abundance of fish and an important fishing area by Indigenous peoples, particularly in early spring as a part of their seasonal rounds…" (Wilson 2014:46).

The Sekani territory included important fishing livelihoods.

> As well as hunting, the Sekani fished the many rivers, creeks and lakes in their territory for whitefish, suckers, Dolly Varden, and trout. Except for Bear Lake there were no salmon-bearing waters. Fish was abundant, particularly in the summer months when the water was high with snow melt. Sekani fishing technology consisted of hooks, weirs, and nets made of nettles and willow roots. In the winter months they speared fish through holes in the ice using three pronged leisters. http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf

Fishing was an important focus of explorer and trader journals. Although initially explorers in the upper Peace saw few 'fishing lakes' in the Peace River region (west of the Finalyson River), they later discovered that their lack of fishing technology and expertise accounted for their assumption of limited resources.

> The Fishing Lakes, or *Tototade*, are located after the big bend in the Upper Finlay River, in a valley where the Finlay River becomes a lake for six or seven miles. … http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf
>
> Ultimately, Black, who was doing reconnaissance in the region for greater trade may have been misled about the amount of game, including fishing resources as to ensure he did not return with more traders and settlers http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf

In the Lower Peace region, fishing was a critical component of the fur trade; according to Mackenzie's travel journals, there were more than 22 trading posts established in the region, the first being at Fort Vermillion. The more productive trading areas were in the lower Peace. The large size of the posts in the Slave River Delta necessitated significant dependence on fishing resources.

> Fish were the backbone of the food supply, particularly whitefish, supplemented by lake trout, northern pike, goldeye, suckers and burbot… In 1822, the traders recorder 65,000 fish landed in support of 118 people and 75 dogs… (Timoney 2013:307-308).

Table 1: Traditional Knowledge Indicators used to Describe Fish Health

Size/Shape	Length/weight ratio (some natural variation)
Population/community	Catch per unit effort
Fat	Fat around organs
Organs	Parasites
Flesh	Depth of colour (ex. darker red meat of trout is preferred)
Water levels	Levels in streams, rivers, lakes
Water quality	Taste (tea), smell, contaminants/chlorine
Respect	'Paying' the land (ex. offering respect)

Today the Peace River is home to Mountain Whitefish, Arctic Grayling, Rainbow Trout, Lake Whitefish, Walleye, Bull Trout, Kokanee and Northern Pike (BC Ministry of Environment 2017). However, a total of 42 different fish species have been encountered throughout the Peace River/Slave River watersheds, particularly in the Smoky-Wapiti River sub-basin (CharettePellPocente Environmental Corp 2012). The sport fish, however, are the species that are most commonly used by Aboriginal peoples for food. All fish are affected by changes in the environment. Multiple issues will arise, such as loss of fish for food, the potential to overharvest the remaining population, and loss of traditional food-sharing practices if the Peace River Watershed is not able to maintain healthy fish populations. For many Aboriginal communities, fish are a dietary staple, so access to healthy fish is imperative for quality of life.

Contemporary stresses on fish populations include resource development, tourism and climate-related changes. The Metis of Kelly Lake, for example, highlight concerns about 'winter kill' which some attribute to climate change. However, elders from the community also suggest it is a natural process of the lake cleaning itself.

> For participants in this study, fishing is not a primary means of obtaining food. However, it is for many Kelly Lake Metis, who harvest fish from Belcourt Lake and Onion Lake (unidentified) …. Belcourt Lake is habitat for wild Dolly Varden, and Onion Lake is stocked with Rainbow Trout (KLMOl; KLM03). Upper and Lower Blue Lakes are also used for fishing Bull Trout (KLM02). Steep Rock Creek (unidentified), near Kelly Lake is frequently used by Kelly Lake Metis for harvesting walleye and suckers (KLM02).
>
> Participants reported natural changes in fish and fish habitat in Kelly Lake: average fish size in Kelly Lake has decreased in the past 20 years due to two 'winter kills' (KLM02). A winter-kill is a phenomenon where a layer of oxygen-poor water trapped under the ice kills fish in the lake. As a result, average fish size (walleye) has

decreased (KLM02). This natural process is viewed by Elders in the community as one way in which the lake 'cleans itself' (KLM02). https://www.ceaa-acee.gc.ca/050/documents_staticpost/63919/85328/Vol5_Appendix-Kelly_Lake.pdf

Table 2: Environmental Observations Affecting Fish Health in the Peace River Watershed

Observation	Narrative	Reference
Decreasing rainbow trout population due to warming water temperature		(Irvine *et al.*, 2014:19)
Changing water levels	"The Dene Tha' have seen numerous changes in the water flow regime, plant life and animal habitat along the Peace River. Low water at certain times of the year, and flooding at other times, have killed trees and berry habitat, and the animal species that depend on them."	(Stevenson 2013:6)
Contaminated fish populations	"We were fishing and there was, again, a lot of contamination in the fish. I do remember suckers and jackfish, but all their skin was all bubbly and melted and it looked like some of the pieces of the skin was coming off. The lake had been quite highly polluted and contaminated at that time (P05, Site C TLUS, June 11, 2011)." Lake Trout nearly depleted.	(T8FN—FGRC 2012:75)
Fish deformities caused by mercury and other chemicals		
High rates of fish mortality	"Elders used to fish by the Peace River. We would take a little hook, potato, and bannock. Now, today, we would starve if we go down there and not bring a piece of beef (T8FNs member in Hendricks 2011).	(Hendricks 2011) (T8FN—FGRC 2012:184)
Declining water flows in the Slave River affecting spawning (likely caused by the W.A.C. Bennett Dam)		(Davidson and Hurley 2007:11)
Migration and spawning patterns of Bull Trout negatively affected	"Habitat changes have taken their toll on this species. Bull trout migrate into cold headwater streams to spawn over gravel beds."	(Government of Alberta 1995:1) https://archive.org/stream/albertastateofen1996albe/albertastateofen1996albe_djvu.txt

DUCKS, GEESE, AND WATERFOWL (BIRDS)

The Athabasca River Watershed, including the shared Peace-Athabasca and Slave deltas, provide some of the most valuable habitat for aquatic waterfowl in North America. The Peace-Athabasca Delta is the largest boreal waterway in the world, and the varied habitats, including shallow lakes, mud flats, fens, meadows, and forest provide habitat for over 200 species of birds, 44 species of mammals, 18 fish species, and thousands of different insects (RAMP Alberta 2010). The delta is

also one of the most important waterfowl nesting and staging areas in North America. Because of its ecological and habitat value, the Peace-Athabasca Delta has been designated a wetland of international importance under the *Ramsar Convention*. Types of birds found along the Peace River include:

- Trumpeter Swan
- Killdeer
- Sandpipers
- Canada Geese
- Ruffed Grouse

The Ruffed Grouse is the most abundant bird in the Peace River region, while the Trumpeter Swan is listed as an endangered species. Indigenous communities, understandably, have concerns about the wildlife in the area. While some bird species may not be listed as endangered, Indigenous peoples often witness changes in migration patterns, populations, and animal health that is sometimes missed by western scientists. This is the reason Traditional Knowledge plays such an important role in documenting environmental change.

OTHER AQUATIC WILDLIFE

The health of aquatic wildlife, such as muskrat and beaver, are also good indicators of environmental change in a region. They are two highly valued species, that are well-represented in Traditional Knowledge studies. Muskrat were an important resource in the fur trade and a valued indicator of aquatic ecosystem health in the delta regions. Historically, muskrat were the heart of the trapping economy—people harvested hundreds of muskrats for clothing and trade. Hydroelectric development is acknowledged to have had a significant impact on muskrat populations as a result of decreased water levels and changed patterns of flooding. One key indicator of concern is the mortality or the 'die-off' of muskrats at various times of the year. The population and health of beaver populations is also a key indicator of the health of the Peace River.

> These changes in water level and vegetation had further effects on fish and wildlife. There were fewer channels for Walleye to reach their spawning grounds and for juvenile fish to reach important nursery areas. If they got there, there was often less food available for them, further compromising their survival. In terms of wildlife, the delta's muskrat, migratory bird, and moose populations were threatened by the loss of wetland habitat. By 1996, for instance, muskrat had declined 89 to 95 percent from their pre-dam levels, a loss that had a severe impact on the Aboriginal peoples who relied on them (Loo 2007:903)

LIVELIHOODS AND TRADITIONAL FOODS

'Ecosystem health,' based on a Traditional Knowledge perspective is fundamentally connected to the capacity of Aboriginal peoples to sustain a 'traditional' way of life. When people are unable to continue that way of life in a holistic sense (often characterized by hunting, trapping, fishing, medicinal plant harvesting, berry harvesting), it is often assumed that the ecosystem has surpassed the threshold of ecosystem health—i.e., it is no longer a healthy place to live. That being the case,

some discussion on the 'traditional way of life' is warranted here. A full discussion of the complex and dynamic patterns of land and resource use of the nine Aboriginal groups within the watershed cannot be offered here, in part due to the limited scope of this report, but also due to the relatively limited oral history research conducted in the region.

Historically, the area was inhabited (according to historians) by six Aboriginal groups including the Beaver, Slavey and later Sekani and Iroquois who moved to the area (i.e., Fort Vermillion area) during trade with the North West Company in the late 1700s. The livelihood of the Indigenous peoples of the Peace River Basin was greatly affected by the development of trade and the consequent need to harvest fish and other game to support the Fort and incoming traders. The first forts were established in the Peace Region shortly after the arrival of Mackenzie and his team of explorers; the first posts were established at Dunvegan, Fort Vermillion, Fort St. John and McCleod Lake.

> The arrival of the Hudson's Bay Company in Eastern Canada in 1670 eventually had a major impact in the Peace River area. Guns made their way westward as trade goods and the Cree began to push the Beaver further west. The Beaver, in turn, pushed the Sekani deep into the Rocky Mountain Trench in the mid-1700s. A truce was eventually agreed to by the Cree and the Beaver and the great river they called *Unchagah* [Peace] became the boundary between their hunting territories. Two great rival fur-trading companies, the Hudson's Bay Company and the North West Company, pushed westward in the late 1700s. Their competition was sometimes marked by violence toward each other and even toward the Indians they depended on for both fur and food http://calverley.ca/brief-history-of-the-peace/ .

It is thought that trading, and the competition for resources by other groups and newly arrived Europeans, significantly impacted the capacity of local First Nations to sustain their communities and economies. There was a noted decrease in fish and game in the mid-1850s. The consequence is that the Indians, not only during the winter but also in summer, are in an almost constant state of semi-starvation.

> The records in the archives point to over a century of illness, death and starvation among the Aboriginal peoples who lived in the region. It is inevitable, therefore that burial sites exist throughout the region (Bill *et al.* 1994:46).

> The original tribe of the country, the Beaver Indians—are fast dying out through starvation and disease [by the mid-1850s]… . (Bill *et al.* 1994: ID #52 abstract #8).

The area of the Peace is thought to have been extensively 'managed' by Beaver, Dene Tha' and Sekani. The Sekani, for example, had extensive trail systems and hereditary traplines, which were important in winter. This system of community-based management was different than the system imposed by the province:

> *[O]ur keyoh and trap line are different. The keyoh are sustenance areas which have been handed down to our families from generation to generation. Trap line licenses are issued by the provincial government which can be issued to either the white man*

> *or to the Indian person. The trap lines are owned by specific people.* (Affidavit of Sandra Teegee 1997:para13 *in* Littlefield *et al*., 2007:30).

In this area of the Peace River region as elsewhere, fish and other resources (i.e., plants, wildlife) from the region continue to contribute to the health of the communities.

> It should be stressed that hunting and fishing remain important activities for the Tse Keh Nay. 'Country' food is not only a desired food but a necessary one as many families cannot afford to live off store-bought food. The freight costs added to imported foods make them prohibitive to families on limited incomes… . As supplies of game and fish become depleted due to increased population in the region and environmental impacts caused by industry, the Tse Keh Nay acknowledge that their life on the land is at risk.
> http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf

> Elizabeth Beattie and her husband had come to Hudson's Hope before the First World War, establishing a thousand-acre farm in the Peace Valley, a place where they could "grow anything... . It was more or less a vegetable valley." The $28,000 she got from BC Hydro for the family property was enough to buy her a house in town, but little more. The Beattie boys could not reestablish themselves on the land and went to work for wages, Jim for the Department of Highways, and his brother for an outfitter

> …for a minority of people, many of whom were Aboriginal, environmental change meant dependence, isolation, alienation, and illness. When the peoples of the Peace lost their farms and trap lines, they lost more than the land that fed them; they lost their autonomy. The holdings around Hudson's Hope and in the vicinity of the Williston reservoir were sufficiently productive to provide sustenance for many families, both Aboriginal and white… Full-time waged work supported the Beatties and other displaced white settlers, but it was either unavailable to Aboriginal peoples, or not wanted by them. For the Athabasca Chipewyan, a living delta with its large population of muskrat was, according to elder Victorine Mercredi, "like having money in the bank." But soon after the Bennett Dam was completed, the bank failed; welfare payments to both the Ingenika and the residents of the Peace-Athabasca Delta increased (Loo 2007).

> In Fort Chipewyan (the main community in the delta), average yearly per capita incomes declined by a third between 1965 and 1970. In the same period, the amount of federal social assistance rose 80 percent, while that provided by the province increased 300 percent. It was a trend that dismayed Ingenika like Albert Poole, who worried about the enervating effects of welfare. "[Nowadays most everybody gets social assistance," he remarked in 1989. The young people at Ingenika Point have "nothing at all to do.... We visit. Watch TV. Lots of TV. Lots of videos" (Loo 2007).

> If environmental change meant dependence, it also meant isolation: between generations and communities. Not only could welfare have debilitating effects, but it

> also cut young people off from their traditions. With social assistance, fewer young people were interested in spending time in the bush with their relations. The isolation from the past was compounded by the physical isolation of Aboriginal communities that came as a result of damming the Peace. Prior to 1968, the Ingenika had lived in Finlay Forks or in one of three reserve settlements—Fort Ware, Fort Grahame, or McLeod Lake—all former Hudson's Bay Company posts where many Ingenika families had traded furs for generations. The dam flooded Fort Grahame and Finlay Forks and turned the river into a large, dangerous, and unnavigable lake. For most boats, the waters of the reservoir were too rough and unpredictable to be travelled safely. Those who tried encountered unexpected winds, large waves, and hundreds of thousands of acres of debris trees that had been cut but not removed before the reservoir was filled. For all intents and purposes, the waters of Williston Lake separated the Ingenika at Fort Ware from relatives and friends at McLeod Lake and at the new reserves at Tutu Creek and on the Parsnip River… . In 1977, Hydro's own consultant argued that the isolation imposed by the reservoir had 'radically altered' Ingenika society and culture and was at least partially responsible for the 'high incidence of social disorganization' that characterized some of their communities (Loo 2007).
>
> Around Fort Chipewyan, the drying of the delta meant economic isolation. For almost two centuries, a staple economy had connected the northern community to the world. Established in 1788, Fort Chipewyan was one of the major centers of the fur trade and an important base for European exploration of the Canadian North and West, Although the trade began to decline in the late nineteenth century, trapping remained a central part of the region's economy in the postwar period, employing more than 60 percent of the male labor force. While the Bennett Dam did not the cause the decline of trapping, its ecological effects dealt a serious blow to the economic viability of the industry, causing it to fall off somewhat more steeply there than in other comparable parts of Canada (Loo 2007).
>
> The psychological effects of losing land were not limited to the Aboriginal population. Some whites who lost their livelihoods to the waters of the reservoir could not easily imagine a future for themselves. Despair turned, in some cases, to suicide. "[I]t was such a change to him that his riverboats were no good anymore on Williston Lake," recalled Jim Beattie of one unfortunate man. "[H]e was all finished (Loo 2007:907).

Closely related to livelihood as an indicator of ecosystem health is the health and availability of traditional foods. The Athabasca River Watershed offers numerous species of fish that are valued as traditional food by Aboriginal peoples in the region. The quantity and diversity of species harvested from each of the lower, middle, and upper regions of the watershed varies as a result of the abundance of those species but also due to other factors such as harvester access (physical/institutional) to harvesting areas, availability of Traditional Knowledge and skills for harvesting. Perceived health of the species and perceived risks of consumption on human health also matter significantly. Key indicators for a 'state of the watershed report' should include:

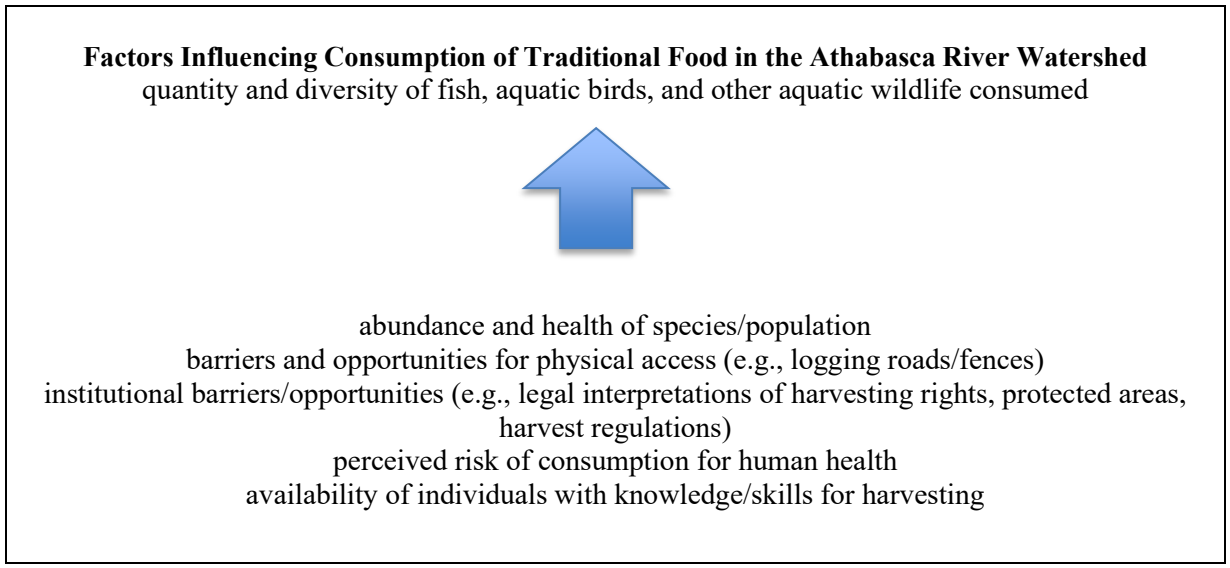


Figure 7: *Factors influencing consumption of traditional food in the Peace River Watershed*

ENVIRONMENTAL CHANGES DUE TO RESOURCE DEVELOPMENT

Due in part to legislated requirements of national and provincial laws for environmental protection and associated resources and institutional capacity for research and monitoring, point-source ecosystem disturbances or 'environmental impacts' are among the best studied and best documented of the indicators of ecosystem health. This is true in terms of western science as well as Traditional Knowledge. For many Aboriginal peoples, the specific projects are part of a larger cumulative story and history of settlement and development that has transformed both the biophysical and cultural landscape of the region.

> Nature has been transformed in Canada, first by the westward expansion of agricultural settlement, later by the relentless incursions of the modern industrial machine into the northern hinterlands (Ouellet 1991:137).

The kinds of indicators that are often tied to resource development are similar to those identified in earlier discussion. Research in the area of health risk perception with northern Aboriginal people has also revealed other kinds indicators that might be best described as 'risk indicators.' Some of these may include:

- Proximity of harvest area to an industrial or disturbed site;
- Degree of ecological change attributed to development (e.g., air/water temperature change, change in population health or other species);
- Perceived human health risk.

An additional set of 'community well-being indicators' also influence decision-making:

- Respect shown for Treaty rights ('as long as the rivers flow');
- Respect for Aboriginal rights to harvest resources from the Peace River

- Degree of shared use (e.g.,. percentage of land taken up for agriculture, tourism, resource development *versus* that available for traditional harvesting);
- Community trust in decision-making/institutions for management;
- Social, economic and cultural effects of environmental change.

The following sections of this report discuss specific resource development activities along the Peace River that have contributed to ecological change, as noted in Traditional Knowledge documentation.

Mining

The Gold Rush years did not impact the area very much, according to the archival records, since little gold was found in the area. Travelling through the Peace to the Klondike region further north was considered among the more difficult routes.

> The British Columbia portion of the Peace did not attract significant permanent European settlement until after 1912 when the land was first opened up for homesteading. This last great wave of agricultural settlement in Western Canada brought people from all over the world into the Peace River country. The Peace River area is separated from the southern Canadian prairies by a two hundred-mile wide band of muskeg and forest. It remained virtually empty and largely unknown until the early 1900s http://calverley.ca/brief-history-of-the-peace/ .

> In Fort St. John there was an Indian scare. The Beaver and Dog Rib tribes did not want the white man to come and stay in the country which they said was theirs. Some miners stole caches of food, snowshoes, etc. which were hidden in trees. On top of the hill at Fort St. John there were about seventy-five buggies, wagons and Red River carts left by miners. The Indians put the whole works down the hill and I could see afterwards broken wagons and equipment for 600 feet down (Ray 1999:26).

The anticipation that settlement and mining in the area would lead to great hardship for the local Aboriginal populations led to tensions and conflicts.

> There is no doubt that the influx of whites will materially increase the difficulties of hunting by the Indians, and these people, who, even before the rush were often starving from their inability to procure game, will in future be in a much worse condition; and unless some assistance is given to them by the Indian Department, they are very likely to take what they consider a just revenge on the white men who have come, contrary to their wishes, and scattered themselves over their country. When told that if they started fighting as they threatened, it could only end in their extermination, the reply was, "We may as well die by the white men's bullets as of starvation." A considerable number of prospectors have expressed their intention of wintering in this neighbourhood and I think it would be advisable to have a detachment of police stationed here, as their presence would go far to prevent trouble. The number of Indians, men, women and children in this District [vicinity of the 300) (Moodie in Ray 1999:26).

There were efforts on the Finlay River on the part of the Sekani to charge tolls to cross the area in order to compensate for the losses of other resources, including the stealing of horses by mining prospectors which were prized resources to the Sekani.

> One of a party of prospectors going through this district shot two stallions belonging to Chief Montaignee, because they were, he said, chasing his horses. On hearing of this the chief sent two parties in different directions to intercept the white men, declaring that if he was not paid for his stallions he would shoot all the prospectors' horses and then the man who killed his. I believe the matter was settled. Another man stole an Indian pony, and the owner followed him to Fort Graheme (Moody in Ray 1999:25).

The tensions associated with the influx of miners in the region ultimately led to the negotiation of Treaty 8 (See Figure 8).

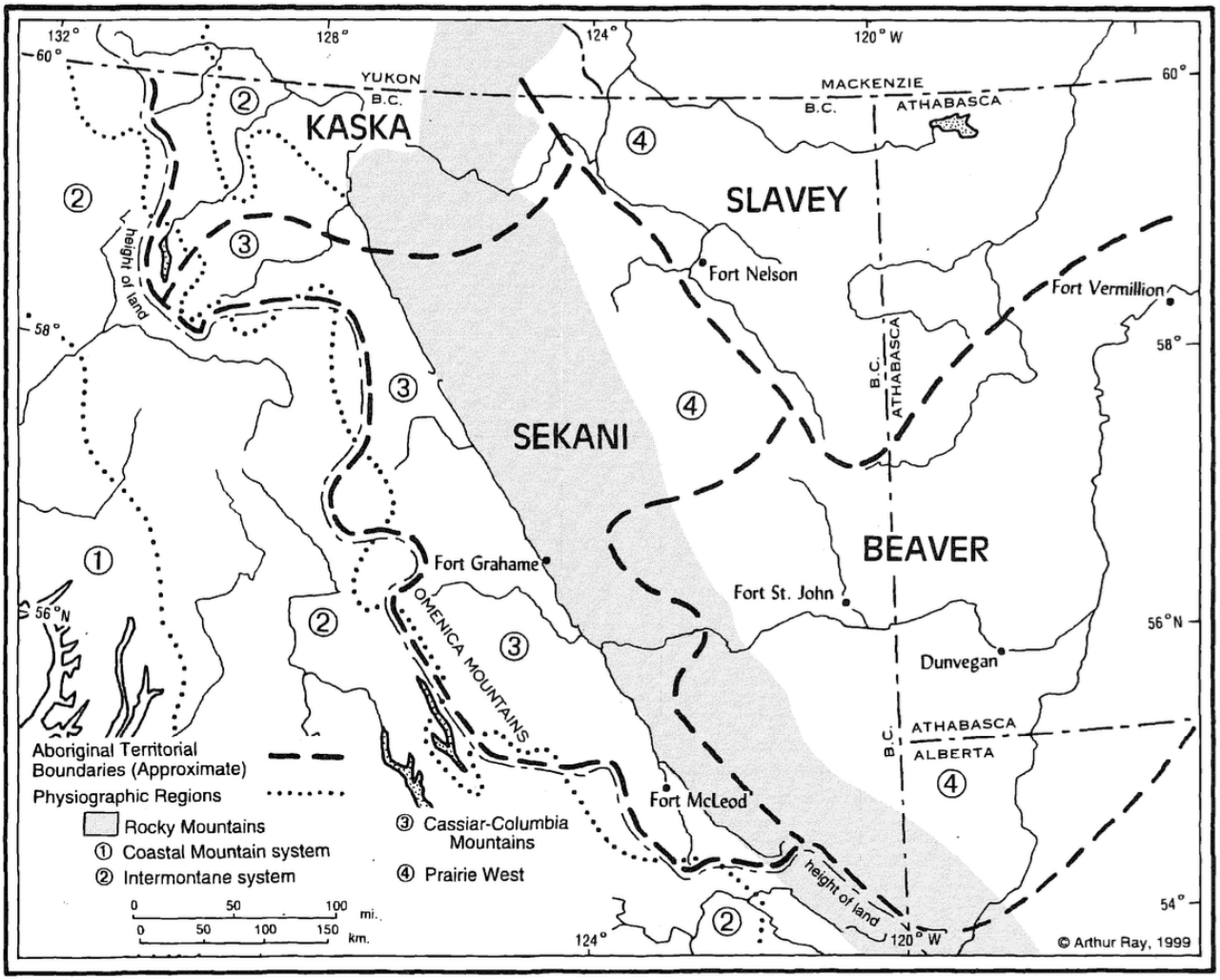


Figure 8: *The Boundaries of Treaty 8* (from: Ray 1999).

Conventional and Unconventional Petroleum Development

There has been relatively limited documentation of local and traditional knowledge about the impacts of oil and gas activity. Whether conventional drilling, pipeline corridors or unconventional fracking, there are consistent observations and concerns raised in environmental assessment hearings about the historic, contemporary and anticipated impacts of such development on drinking water and freshwater ecosystems, including the habitats, fish, wildlife and other species that depend on them for survival.

The major issue of focus has tended to be the failures and challenges of the consultation process and the lack of voice of First Nations in decision-making about small and large projects. This is a newly emergent problem, as unconventional gas plays an important role in areas such as the Horn Plateau which is the traditional territory of Fort Nelson First Nation.

> Fort Nelson First Nation is the only BC Treaty 8 First Nation with traditional territory overlaying the Horn River Basin (HRB). Between 2005 and 2008, tenures throughout the HRB were purchased without consultation. Fort Nelson First Nation was unaware that unconventional gas development was going to occur on its lands until industry representatives started showing up in its offices. As the lands director explained: "[It was] like a bit of a gold rush on our land. Ninety-five percent of our core territory was under tenure within three years. They came in 2008 and started talking about what they were going to do. You know, giving us coffee mugs and baseballs hats, shaking our hands, telling us what good guys they were" (Garvie and Shaw 2014:90).

There were numerous concerns expressed by communities about the impacts on groundwater resources:

> It's hard because some peoples' whole traplines have been written off technically, like there's no way they could go out and make a viable living off of hunting and trapping because there are no animals, there's no land, and you know, some of those traplines up there, they don't even want to go out there because it's dangerous and it smells and it's ugly and what's the point because all the moose and animals are disease-ridden and full of cancer and tumours. They don't want to go on the lakes and stuff because the lakes are polluted, you can't eat the fish, you know there's a really big issue with the groundwater. They're scared to drink muskeg water and that's, you know, a healthy functioning muskeg will have the best water around. People are too afraid to drink it now (Garvie and Shaw 2014:92).

Due to lack of evidence and limited consultation about the environmental impacts and their concerns about ground water resources in the region, Fort Nelson First Nation opposed any further development in their region.

> On 16 April 2014, Chief Sharleen Gale of the Fort Nelson First Nation stood in front of a room full of First Nation Shale Gas/lng Summit attendees in Fort Nelson, British Columbia, and informed government employees that they were no longer welcome on Fort Nelson First Nation territory and should leave immediately … The previous day, in an effort to speed up the already rapid pace of development of the

> unconventional gas industry, the provincial government had announced that sweet gas processing plants in the province would be fast-tracked, meaning that they would be exempted from environmental assessments. The decision was made without consultation with First Nations. In solidarity with the Fort Nelson First Nation, twenty-eight First Nations communities and political organizations signed a declaration against the unilateral decision (ibid.). Within hours, the government was forced to issue a public apology and revoke the exemption (Garvie and Shaw 2014:73).

Forestry

Forestry is a major concern in the Peace River system; many decades of logging have created soil erosion, loss of biodiversity, wildlife disturbance, as well as cumulative and antagonistic effects on the health of the Peace River and its tributaries.

> *The Omineca is one of the major rivers that runs in about halfway, right across the Finlay Fork. There's a big bay at Omineca that runs eleven miles, and there are camps everywhere, logging trucks by the hundreds, skidders and fallers and diesel oil and leakages and nobody cares, nobody gives a damn...* . (Pollen and Matheson 1989:230, cited in TKD 2002:83 in Littlefield *et al.* 2007:43)

In addition, the effluent from pulp mills, including regulated and accidental discharges, have led to the contamination of fish species valued as traditional food by many local Indigenous peoples (Dube *et al.* 2006). Managing the cumulative effects of forestry and other stresses in the Peace River is a major concern and focus of research and governance for First Nations such as West Moberly First Nation (Booth and Muir 2013).

Hydroelectric Development

The W.A.C. Bennett Dam is noted to have various negative impacts on the health of the Peace River. Moreover, it has impacted the population and migration patterns of surrounding wildlife, which in turn has impacted Aboriginal access to traditional foods.

> *The Sekannis were told their houses would be burned, but their belongings would be put in a safe place where the men could pick them up. They burned our houses with everything in them. Some of the men had guns and stuff underneath the floorboards, so nobody would know where they were, and all that was burned. And our pots and pans. Everything. There were five houses, our church and everything, burned in Fort Grahame, and another five or six houses burned—six houses to be correct—right here in Ingenika Point* (Pollon and Matheson 1989:338 in Littlefield *et al*. 2007:45)

> *They [BC Hydro] told us they were going to take the bones out and take them down to the Parsnip Reserve and rebury them. I think they just made a mass grave there, of all the bones of our peoples. We don't know who's where or anything. I mean, nobody likes their dead to be desecrated. Because the graveyards are sacred places.*

(Pollon and Matheson 1989:343-344 in Littlefield *et al.* 2007:45)
http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf

Williston Reservoir is a very large and potentially hazardous reservoir for the unwary. Boaters are cautioned that when the reservoir is not at its maximum level, snags and stumps may lie just below the water surface. Floating and submerged debris may be encountered in all areas of the reservoir. Boaters should also be aware of strong winds that occur suddenly, causing high waves (over 2 metres) and strong currents (Littlefield *et al.* 2007: 46).
http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf

The banks of the reservoir are easily eroded and subject to sloughing from reservoir actions. If wave action is severe and you need to reach shore, it may be difficult to make a safe landing due to cliffs, unstable banks and/or floating or submerged debris along the shoreline (Littlefield *et al*. 2007:46).
http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf

Snowmobiling and other winter activities are common on Williston Lake. When using the frozen surface of the reservoir, extreme caution must be exercised as winter hazards include pressure ridges, gas holes, open water, and broken shoreline ice. Rapid temperature changes that may cause ice melt and extreme cold and wind are also hazards to the wintertime users (BC Hydro 2005 in Littlefield *et al.* 2007: 46)
http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf

The Williston Reservoir had many other impacts. The flooding resulted in mercury poisoning in the water. Many of the fish in the reservoir are now unfit for human consumption. The rapidly changing level of the reservoir has created severe dust problems. When the waters fall, large amounts of dust particulate from the barren shoreline and subsurface are carried into the community at the Tsay Keh Dene Village. Many members and Elders have respiratory and skin problems from this dust and are forced to wear dust masks in their own homes (Littlefield *et al.* 2007:46).
http://www.ceaa.gc.ca/050/documents_staticpost/cearref_3394/hearings/SM01.pdf

Table 3: Observations of the Ecological Change Related to the W.A.C. Bennett Dam, Site C

Observation	Narrative	Reference
W.A.C. Bennett Dam floods the territories of the Dane-zaa, Ingenkia and Mesilinka in 1968	"In addition to flooding 350,000 acres of forested land and drowning countless animals, the reservoir blocked the east-west migration of the now endangered mountain caribou across the Rocky Mountain Trench."	(Loo 2007) (T8FN—FGRC 2012:60)
"Increased fish and game mortality, including at the beginning, reports of moose and other animals drowning en masse"		(T8FN—FGRC 2012:87)
"Changed animal migration patterns, with reduced numbers of certain animal species (ex. porcupine) on one side of the Reservoir, and especially damaging effects of caribou and fur beavers."	"Now when you go camping you won't see one caribou. There used to be a thousand. It is the WAC Bennett Dam that did this. When the dam came in there was no more fur." "People used to travel in area that became flooded by the original dams. We used to follow the game but we can't anymore because of the flooding. [I] heard that the caribou decline was related to the reservoirs (s)."	(Hendriks 2011) (T8FN—FGRC 2012:87) and (T8FN—FGRC 2012:89)
"Public safety issues associated with trees in Wiliston Reservoir, constraining use."	"When we go fishing, we have to dodge wood debris [in the Williston Reservoir]. It is not just about killing fish, it is about teaching our youth. To teach why fish like this; why this hole is good and that one not. It is hard to do this when you get blanketed with debris."	(Willson 2008) (T8FN—FGRC 2012:87)
"Loss of a natural seasonal flow regime for the Peace River."		(T8FN—FGRC 2012:88)
"The river no longer freezing up, so people and animals couldn't cross the river in the winter."		(T8FN—FGRC 2012:88)
Mercury in fish populations	"They found out that these fish were mercury contaminated, therefore enhancing their growth. And so they then started to post signs and stuff that if anybody was going to be eating fish out of the reservoir they need to limit the amount they eat to at most one serving a week… to this day there's not that much [fishing] activity that we can see on the reservoir."	(T8FN—FGRC 2012:89)
Caribou and moose numbers have substantially decreased		(T8FN—FGRC 2012:181)
Moose health/meat affecting harvesting	"It used to be a long time ago, you would see moose any place. You would have good meat. Now today, you open up the moose, and there is a bunch of bubbles on the meat… you have to throw it away—you can't eat that kind of meat (T8FNs elder, T8TA Treaty Education Team 2003b *in* T8FN 2012: 182).	(T8FN—FGRC 2012:182)

High rates of fish mortality	"Elders used to fish by the Peace River, we would take a little hook, potato, and bannock. .Now, today, we would starve if we go down there and not bring a piece of beef (T8FNs member in Hendriks 2011 *In* T8Fn 2012:184)	(Hendricks 2011) (T8FN—FGRC 2012:184)
Significant decline in waterfowl and wildlife	"Members used to catch thousands of muskrats, they would now only catch about a dozen with the same effort now."	(MCFN 20138)
Ice that used to form on the Peace River is now weak and full of sediment	"Releasing water from the dam [in winter], that's one of the problems right there. If you release that water at the wrong time of the year, just when it is starting to freeze, you don't get good ice."	(MCFN 2013:8)
Reduced quantity of migratory birds		(MCFN 2013:7)
Greenhouse gas emission/Impacts on air quality	*Hydroelectricity has substantial greenhouse gas emissions even though it is known as 'green energy.'	(Feinstein 2009:7)
Climate change		(Feinstein 2009:66)

> Ever since the construction of the W.A.C. Bennett and Peace Canyon hydroelectric dams in our Treaty territory, we are seeing more and more of our lands being crisscrossed by BC Hydro's transmission lines and taken up by BC Hydro terminals and substations. Hectare by hectare, kilometre by kilometre, our lands are being impacted to the point that we can no longer meaningfully exercise our Treaty rights in many areas. It is unconstitutional to continue to tell us to 'hunt elsewhere' where there are few (if any) places we can go to exercise various rights (WMFNs 2011)." – From (T8FN—FGRC 2012:162).

There are similarly numerous concerns about the proposed Site C project from First Nations in the region, including the Kelly Lake Metis. They anticipate the following changes in their traditional territory from the Site C Project:

- upstream flooding of creeks and drainages, indirectly affecting beaver and other wildlife;
- increase in the amount of stagnation in ground water and slow-flowing surface water upstream of the dam;
- reduction in water quality in the Peace River directly, as well as downstream, tributary, creek, muskeg and groundwater indirectly affecting ecological productivity and fish populations; surface water downstream of the Project will dry up;
- the possibility of dam rupture, and the resulting loss of human life;
- de-siltation of the Peace River downstream of the Project;
- high levels of emissions during project construction will settle, and then contaminate the ecosystem and Kelly Lake Métis food, drinking water and medicinal plant sources, ultimately affecting human health;
- effects on ecological communities upstream and downstream of the Project, including muskegs and moose licks;

- direct disturbance of sensitive ecological areas by road or facility construction and operation, or indirect interruption or disturbance of surface water flow will reduce ecological productivity and health; and,
- employment opportunities, if offered to Kelly Lake Metis people, would be beneficial.

(Kelly Lake Metis Settlement Society/Martineau 2013:6)

Table 4: Observations of Ecological Change in the Peace River Watershed
http://www.ceaa.gc.ca/050/documents/p63919/98108E.pdf

Observation	Narrative	Reference
Sparse berry picking spots		
Forestry		
Mining		
Unhealthy/skinny moose	"I wonder if we'll see anything? After three days of hunting last year, we found one skinny yearling moose." (Art Napoleon).	(Penn 2013:1) http://focusonline.ca/node/557
Climate change—Impacts on soil, wildlife, temperature, biodiversity, agriculture potential		(Feinstein 2009:4-8)
Industrial development (general)	"When people see development occur in these areas, it is more than just a loss of harvesting opportunity, it is also seen as an aesthetic and spiritual loss."	(Feinstein 2009:13)
Biodiversity		

Table 5: Observations of Ecological Change Related to Oil and Gas Development

Observation	Narrative	Reference
"Pipeline that carries oil from Taylor to Kamloops breaks on the Pine River, which flows into the Peace River." Oil then spills into the Peace River. Pipeline spills that have not been cleaned up are impacting the water and animal habitats.		(T8FN—FGRC 2012:63)
Impacts on animal migratory patterns	"Impacts of other projects like logging and oil are killing moose." "Moose are harder to find (HRFN member)."	(T8FN—FGRC 2012:63)
Unsafe drinking water	"Our Elders and members are forced to carry water out onto our lands because the drinking water our ancestors relied on for thousands of years has been contaminated. Many of our water sources in our Territory smell bad, look bad, or have been sampled and found to be unsafe to drink. We have also witnessed numerous areas where the oil and gas industry have contaminated waters and left them unfenced and unremediated, allowing fish and wildlife to be contaminated by them."	(T8FN—FGRC 2012:75)
Contaminated fish populations	"We were fishing and there was, again, a lot of contamination in the fish, I do remember suckers and jackfish, but all their skin was all bubbly and melted and it looked like some of the pieces of the skin was coming off. The lake had been quite highly polluted and contaminated at that time (P05, Site C TLUS, June 11, 2011)." Lake Trout nearly depleted.	(T8FN—FGRC 2012:75)
Air contamination		(T8FN—FGRC 2012:97)
Ice quality		
Water quality and health	"Community members were suffering from oil and gas related contamination in the form of 'sore eyes, smells and respiratory problems like increased asthma."	(T8FN—FGRC 2012:114)
Fish deformities		
Unhealthy moose populations	"Moose have been sick. There have been a lot of little cysts found in the meat. This is probably from oil and gas." "I remember hunting and we found a big cyst on the hide of the moose, size of an orange. We left the hide."	(T8FN—FGRC 2012:140)
Decreasing rabbit populations	"We used to have lots of rabbits; now we don't hardly see them anymore; rabbit soup would be good."	(T8FN—FGRC 2012:140)

Peace Canyon Hydroelectric Dam

Table 6: Key Themes and Indicators and Resource Development Issues in Water Quality in the Peace River Watershed Over the Last 50 years.

COMPONENT	INDICATOR OF CHANGE (OBSERVATIONS)	PRIMARY CONCERNS
Water Quality	silty, muddy water colour of water (green, black) smell algal growth tea scum proximity to development project/site (perceived contamination)	Oil sands development Forestry Climate change
Fisheries Indicators	Size/shape/length/weight ratio Population/catch per unit effort Fat around organs Parasites inside organs Depth of fish colour (e.g., darker red trout is preferred) Diversity of species	Contamination of water Farming Habitat loss due to forestry, oil, and gas development
Ducks, Geese and Aquatic Wildlife	Decreased water levels and changed patterns of flooding are said to have had a significant impact on muskrat populations	Hydroelectric industry Oil sands activity Climate change
Water Quality	'die-off' of muskrats at various times per year Health of beaver populations is an important indicator of environmental health	Forestry Habitat loss due to contamination
Air Quality	Smell	Oil and gas activity Forestry

There are other kinds of activities in the watershed about which local Aboriginal communities in the Peace River are concerned. In the Thutade Lake area of British Columbia, for example, there are significant concerns about the impacts of mining (i.e., copper, lead, zinc, silver). Thutade Lake, which is at the headwaters of the Finlay River, was an important traditional fishing area for the TsuKay. Among the more important fish species in the area is the Dollivarden (*Salvelinus malma).*

> [T]he dollivarden at Thudade Lake are very special because they grow up approximately thirty inches long. They have always been an important fish to our people and one of the reasons we go to Thudade Lake. I have never seen dollivarden that large in any other portion of the country that I have traveled. I am also told that it is a species of dollivarden found nowhere else in the world (Affidavit of Willian Charlie 1997:para 44 *in* Littlefield *et al.* 2007: 35).

CLIMATE CHANGE

Climate change impacts in the Peace River Basin have been comparatively less well-documented than in other regions of the Mackenzie Basin. A critical issue in this drainage system is the ways in which climate change may aggravate existing stresses in the basin, including those associated with forestry and hydroelectric development.

Some key concerns are around change in the flow regimes; in some areas warming temperatures are thought to be leading to lower water levels. According to some Indigenous peoples, these changes were predicted by prophets many years ago such as those from Kelly Lake.

> KLMSS members have observed changes in the seasonal weather patterns in Kelly Lake, including a decline in the amount of average seasonal precipitation, and an increase in the amount and intensity of wind, and decreases in the duration of wintertime lows. Lective Campbell, a Kelly Lake Metis Elder who passed away in 1989 prophesized that there will be absolutely no snow with tropical temperature in six generations (approximately 120 years) from his time. To his grandchildren he said, " ... you-won't see it and your grandkids won't see it, but their grandkids will" (KLM02). KLM02 was advised by his grandfather not to have children for this reason. Prophecies that have not yet been realized paint a bleak picture for generations of Kelly Lake Metis to come… (Kelly Lake Metis Settlement Summary/Martineau 2013:40).

There are also concerns about ice conditions and the potential effects on the safety of those subsistence harvesters who continue to use the Peace River Basin for harvesting. While there has been consideration of the role of First Nations from the Peace in some aspects of climate change adaptation, there has been no substantive focus on local and traditional knowledge as a source of observation or insight about managing climate change in this region.

GOVERNANCE AND STEWARDSHIP

There are numerous informal and formal principles and processes of governance that are relevant to our understanding and management of the Peace River Watershed. However, to date there has been limited documentation of local and traditional knowledge. The majority of the literature from this region highlights the interrelated problem of: i) lack of respect for First Nations' inherent rights to lands and resources in the Peace River; ii) limited consideration and incorporation of First Nations in large-scale resource development decisions; iii) limited consideration and incorporation of First Nations in land-use permitting; and, iv) socio-economic and cultural stresses and conflicts between First Nations and government in the Peace River region.

The following quote highlights some of the complexities around consultation in the region, particularly in relation to oil and gas activity.

> …numerous interviewees and community members referred to a permit that was fought by Halfway River First Nation as the *only* example of a permit application that has been denied or rejected due to a First Nation's objections. Subsequent to the denial of the application, Hunt Oil successfully sued the government of British Columbia for failing to consult with the First Nation prior to the sale of tenure and

for not informing the company of the First Nation's adverse interests (Dagg *et al.* 2011). The fact that this is the only known example of a nation successfully contesting a permit application highlights the procedural disconnect between the consultation process and decision-making. Equally concerning is Hunt Oil's successful lawsuit, which resulted in the province compensating the company for lost revenue. This sequence of events draws attention to the government's failure to correctly implement its own mandated processes in a way that fulfills its legal obligations (Garvie and Shaw 2014:89).

CONCLUSION

The Peace River Watershed is a large system that has undergone significant change, particularly in the last half century due to hydroelectric development and other land-use activities. Indigenous peoples have lived in the region for many generations; the population of Dene (Beaver) have historic roots that predate the fur trade era. There are well-developed archival records about the ecology of the region based on fur trade and related records. In the last decade, however, there are an increasing number of sources of documented traditional knowledge that highlight the significant and unique socio-cultural connection of communities to local landscapes. There are also valuable insights about the effects of hydro-electric development (W.A.C. Dam) as well as climate change that speak to both variability and change in this system.

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