Literature Review

Local and Traditional Knowledge In the Liard River Watershed

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trackingchange

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SUMMARY POINTS

The Liard River Basin is a complex, multi-jurisdictional watershed. The Liard River begins its journey in the Pelly Mountains of southeastern Yukon, flows through northeastern British Columbia, and then crosses into the Northwest Territories, where it drains into the Mackenzie River. There are roughly 9,000 people living in the Liard sub-basin. Most of the population is centered in Fort Nelson, BC and Watson Lake, Yukon. Fort Simpson, which lies at the confluence of the Liard and Mackenzie rivers is considered those in the Mackenzie-Great Bear Basin. First Nations people make up approximately 27% of the population. There are at least nine Aboriginal groups with historic or contemporary connections to the Liard River Watershed. Many of these groups relocated into British Columbia with the settlement of Alberta in the 19th century. Archival data suggests an important historic and contemporary value of fish species in the Liard River system. Twelve species of fish have been identified as importance to local subsistence, including chum salmon. Sport fish species include Arctic grayling, chum salmon, bull trout, inconnu, lake whitefish, mountain whitefish, northern pike, and burbot.

There are limited sources of documented and available sources of local and traditional knowledge about most aspects of aquatic ecosystem health. As with other areas of the Mackenzie, these gaps do not reflect a lack of local and traditional knowledge, but limited resources and opportunities for research as well as a lack of socio-political security around intellectual property rights.

Media reports suggest the need for more research; there are many concerns about the increasing pace and scale of resource development activities and their implications for First Nations and other communities in the Liard Basin and downstream communities. A cumulative effects perspective on resource development may prove valuable, given the long history of fur harvesting, forestry, mining, and petroleum extraction and the compounding problems of climate change. Early fur trade activity in the 1800s is thought to have altered fish species in some lakes in the basin. Forestry has had the most significant impact in the Liard Basin to date. Logging occurs primarily in the Fort Nelson Timber Supply Area. The Liard sub-basin also contains extensive mineral, oil, and gas reserves. Currently only three mines are operating (tungsten, jade/nephrite), however there are more than 40 sites in the Liard that represent historic exploration and development. Tourism and outdoor recreation are growing contributions to the economy. There are also a growing number of studies that point to the impacts of climate change on such issues as water flow and water quality. Flow in the Liard River has declined slightly over the past few decades, possibly resulting from changes in climate. This decline is consistent with a decline that was reported in the Smoky River. Whether the declines are due to climate change or whether they are part of a normal pattern of long-term variability is unknown.

Table 1: Summary of Knowledge by Indicator Theme

Indicator	LTK	Notable Sources, Programs, Projects
Traditional Land Use—Indigenous		Limited sources.
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 Liard River Basin

The Liard River flows through Yukon, British Columbia, and the Northwest Territories, Canada. Rising in the Pelly Mountains in south-eastern Yukon, the Liard River flows over 1,000 km southeast through British Columbia, marking the northern end of the Rocky Mountains and then flows northeast again back into the Yukon and Northwest Territories. The Liard River joins the Mackenzie River at Fort Simpson, Northwest Territories. The river basin drains approximately 277,100 square kilometres of boreal forest. The basin is characterized by mountain, boreal forest, and muskeg. Tributaries include the Dease, Hyland, Kechika, Coal, Trout, and Toad rivers. The 30 km long Grand Canyon of the Liard, with rapids called Hell's Gate and Rapids of the Drowned, is located between the confluence of the Trout and Scatter rivers.

METHODS

This report was developed for the *Tracking Change…* project with the aim of synthesizing and documenting existing local and traditional knowledge about social and ecological change in the Liard River Watershed. The identification, synthesis, and reporting on Traditional Knowledge for this region is complex, owing 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 carried out, 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 valuable time and resources to sharing 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 Liard River Watershed.

Searching for Secondary Sources of Publicly Available Traditional Knowledge

A search of publicly available sources of Local and 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 Liard River Watershed.

The majority of information was found through searches of the following public databases:

- 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 Basin 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 around 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 Liard 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 decline 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. Living in the environment has also created a strong emotional and spiritual connection to the land that may make Traditional Knowledge holders particularly attuned to ecosystem change. Similarly to oral-history research, accepted methods for land and resource use studies vary across the Liard 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 environment 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. Relevant to this research is knowledge related to sustainable management, including ways of respecting the land, water and wildlife (ex., rules, practices and tools)

Assessment/Impact Specific Studies

Traditional Knowledge studies conducted in the Liard River Watershed that relate to specific human activities or effects (such as agriculture, oil sands mining, hydroelectric dams, etc.) have been somewhat common. Considered within this context are studies related to community risk perceptions and studies 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 upon 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), provides 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 ad the *Guardians* program in Fort Chipewyan, which is being led by Mikisew Cree First Nation and Athabasca Chipewyan First Nation.

Other

Given there are significant gaps in the availability of Traditional Knowledge in the Liard 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 included 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 is important to many communities, who see themselves as informed by many sources of knowledge and information.

One of the most comprehensive Traditional Knowledge studies undertaken in adjacent watersheds was the Northern River Basins Study (NRBS). The broad objectives of the NRBS research program were to identify and quantify 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 study Board identified goals, objectives and sixteen 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 to coordinate a combined approach to research and reporting of results in order 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, carried out in the mid 1990s, largely centred on the impacts of the W.A.C. Bennett Dam with a geographical focus on the Athabasca, Peace, and Slave River deltas.

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

PEOPLE OF THE LIARD BASIN

There are more than four main Indigenous groups with historic use of the Liard Basin including the Kaska, Sekani, South Slavey, Dogrib, Beaver, Hare, Tahl-tan and Sauteaux, For many anthropologists, the Upper Liard is the traditional territory of the Kaska people, while the Lower Liard is the traditional territory of the South Slavey peoples.

> The Liard River Corridor overlaps with traditional use territories of the Kaska Dene First Nations of McDonald River, Fireside, and Lower Post; and the Slavey Cree and Beaver Cultures of Fort Liard and Fort Nelson Indian Bands. Moose was

> a mainstay of the aboriginal people and they historically utilized the river corridors.
> http://www.env.gov.bc.ca/bcparks/explore/parkpgs/liard_rv_corr/nat_cul.html

The Ross River Dena Council and the Liard First Nation of Watson Lake are the only two of the fourteen Yukon First Nations, that have not concluded land claim negotiations.

Historically, the Kaska and Beaver Dena led nomadic lifestyles—hunting, trapping, fishing and traveling together in small family groups throughout the region and neighboring river basins. Settlement patterns changes with exploration and trade (Gimbarzevsky *et al.* 1979).

Oral histories suggest the Kaska peoples have lived in the Liard Basin for generations. Currently, five bands that comprise the Kaska Dena Nation are the Dease River First Nation, Daylu Dena, Kwadacha First Nation, Liard First Nation, and the Ross River Dena Council. The Dane-zaa, also known as the Beaver tribe, are an Athapaskan 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, and north to Lake Athabasca as well as territory north of the upper Peace River.

> The Kaska Indians are a nomadic tribe of the great Dene (Tin nih) stock, which inhabits the northern interior of British Columbia and the Mackenzie. According to my informant, the Kaska Indians were very numerous before the coming of the white man, which took place about the time of the first gold rush in the Cassiar. Today the total population is 150. This population, however, includes not only the Kaska group, but also individuals from the neighboring nomadic tribes, namely, of the Up Liard, Fort Grahame, Fort Nelson, and also a few from Fort McLeod and Bear Lake, British Columbia. These latter tribes are of the Dene stock, but are more generally called by the tribal name, Sekannai (Si kan ni). The Kaska language, so far as I could learn during my short stay with them and also from my informant, is very much the same as that of the neighboring Sekannai (Allard 1929).

Archival records by such missionaries as Petitot, highlighted the importance of fishing resources in the Liard to the well-being of local communities. But trading activities in the region affected patterns of subsistence, including fishing practices.

Alexander Mackenzie journeyed to the confluence of the Mackenzie and Liard rivers in 1789. A fur trade post was established on this site—now Fort Simpson (1804). This led to further European exploration of the Liard River and the creation of other trading outposts along the lower Laird at Fort Liard and Nahanni Butte. The Liard River was used as a route to the Yukon interior during the Klondike Gold Rush from 1897–1899. In 1942, the Alaska Highway was built along the Liard River—fromTrout River to Watson Lake. This construction spurred the development of the Liard Hot Springs, which remains a popular stop for travelers along the Alaska Highway. The area was among those (including the Peace River Basin) offered as cheap land for settlement by the federal government following World War II.

The history of land and resource use in the Liard Basin can be understood by the Aboriginal place names that exist for the Liard River itself as well as related tributaries. Among the place names are those associated with Yamoria and the 'Creation Story':

Yamoria – Examples of Place Names (South Slavey)

- **Nácháhdeh (Liard River)** - Zhamba Déja chased the giant beavers down the Liard River to the Mackenzie River;
- **Tthenáágoa (Little Butte)** - Near Little Butte there is a long, calm stretch on the Liard River where the giant beavers had a feeding ground;
- **Echaot'î Kõç (Liard Rapids)** To escape from Zhamba Déja, the beavers broke through their dam, creating the Liard River Rapids;
- **Echaot'î Kõç (Liard Rapids)** Zhamba Déja ch'á ezhi ts'ácho ejiogedéhtthé lõõ dets'á kñ ghônaogeniddhah, ezhi ts'îhæõ ésãã dúh ekô Echaot'î Kõç déhgá ndee tahchoh gølî.

http://www.nwtexhibits.ca/yamoria/documents/Yamoria-Map.pdf

Figure 1: *Yamoria – Place Names (South Slavey)*

LANDSCAPES AND PLACE NAMES

The landscape of the Liard can be understood from a variety of cultural narratives; these narratives detail historic periods of resource scarcity and loss, as well as what is described as 'mythic.'

> Specific places, for instance, are mentioned in both historic and mythic accounts. Places such as Pelly Banks, Yukon and *Tes Ni'd,* Yukon are central to the Kaska account of the starvation of the Hudson's Bay Company traders in 1850, but places such as Thibault Lake, British Columbia, are also identified in accounts of *Suguya,* stories that are from a mythic period. Similarly, both traditional stories and historical accounts often feature animal spirits or the spirit powers of medicine men, both common features of Kaska belief (Moore 2002:46).

There are many kinds of place names that can provide insight about the value, nature and dynamics of aquatic ecosystems. Johnson is among the notable anthropologists who has documented detailed place names with the Kaska people.

> Water terms are prominent for fisheries and as routes or obstacles to travel… . Wetlands are more prominent [in the Kaska lexicon] in Witsuwit'en country and especially in Kaska country, where extensive areas of permafrost and rolling glaciated topography help to produce relatively large areas of peatlands. In contrast, aspects of the rivers themselves, ponds, lakes, tarns, waterfalls, and the like are more conspicuous in Gitksan country… . For all three groups, obvious features like river, confluence, waterfall, eddy, canyon, lake and island are named. All three groups also named high bank, a feature of river shores highly significant to canoe upstream navigation, where tracking at the base of such high high banks

> is challenging. They also distinguished creeks flowing into, and out of, lakes (Johnson 2011:314).
>
> In Kaska country, place names for wetlands are well-developed, prominent on the landscape, and of significant ethnoecological significance because they are associated with moose habitat, waterfowl habit, and beavers as well as having implications for traveling on the land (Johnson 2011:317)

Compared to many areas of the lower Mackenzie River Basin (e.g., Gwich'in region), few place names have been documented in the Liard River Basin.

FISH AND FISHING LIVELIHOODS

Fish and fishing practice feature prominently in the cultural narratives of the Kaska: "the details of how the girl catches a fish using her own flesh for bait are dramatically detailed in *The Girl Who Survived on Fish* (Moore 2002:46).

As with many other peoples within histories in the Mackenzie, the Kaska organized themselves at fish lakes/at fish runs "to catch whitefish and to socialize and dispersed into small family groups for most of the rest of the year" (Main-Johnson 2010).

The natural resources of the Liard River Basin contribute significantly to the economy, health and well-being of local communities. For the Slavey people of the region, "caribou and sheep hunting areas in the southern Selwyn Mountains, along with rich trapping and moose hunting areas in the Mackenzie lowlands on either side of the Liard River provided a diverse environment for subsistence" (Andrews 2011).

The way of life of the Liard people has always been highly dynamic. Prior to the construction of the Alaska Highway, the only access to Kaska territory was up the Mackenize-Liard-Dease rivers (Johnson 2010:96).

Mobility within this region and other parts of the upper Mackenzie was a critical aspect of use. Honigmann (1964:46) distinguishes between two patterns of mobility: groups of people moving with their belongings seasonally to various locations, and more local mobility, where men or women travel from camp to hunt, check nets, snares or traps, collect firewood, and related activities (Andrews 2011:32).

> Contact with Europeans probably began around the early 1800s when Fort Liard and Fort Simpson were established. After this time, several additional trading posts, both private and Hudson Bay Company, were established in the area. The arrival of the Europeans also meant that the Kaska became directly involved in the fur trade. This resulted in the depopulation of the Kaska traditional territory. After the decline of the fur trade, Kaska communities remained quite remote until the building of the Alaska Highway and the establishment of the community of Watson Lake in the 1940s, when road access became available to the villages of Lower Post and Upper Liard. Other areas, like Kwadacha (Fort Ware) remained very remote until the early 90s, when logging activities brought road access to the community (Swaak 2008:5).

Historical accounts of the significance of this fishery are limited. However, Hanks and others, in their analysis of early exploration observations by Mackenzie, as well as trading post records, suggest the fishery was a critical resource for the subsistence of communities in the Liard region. Archaeological evidence, although tenuous due to the erosion of river banks, etc., points to the pivotal importance of the spring–summer fishery to local cultures and economies—"the fishery under normal conditions provided a low-risk-high-return source of food that could be cached and stored for winter" (Hanks and Winter 1991:51).

In the upper Liard, including the Fort Nelson River which flows into the Liard River, river systems were important transportation corridors as much as they were sources of fish as food. Some rivers were less important as fishing rivers, such as the Fort Nelson River.

> Although the Fort Nelson River was widely used by the First Nations community, the people of the Fort Nelson First Nations did not fish the Fort Nelson River because the water levels of the river were generally very high and the waters extremely muddy… . Klua Lakes were historically and presently important to the First Nations community due to the whitefish populations occurring in the lake. People depended on the whitefish populations as a food source for themselves and their dogs. In general, the rivers in the area were of importance, not for their fish populations, but for the means of transportation that was provided within them (Woods 2001:8).

Similar to other theories emerging from the anthropological and archaeological record about the importance of fishing resources as a constant, archaeologists have documented the relative importance of caches in this region and others in the upper Mackenzie, particularly in cold winter months and in years when other resources were less abundant.

> According to Thomson (1800) the Natives moved from cache to cache when hunting became difficult… . The continued importance of cached food in the Dene subsistence economy throughout the post-contact period is confirmed in the modern oral tradition. The fishery has continued to provide a major source of food caching. (Smith 1986). (Hanks and Winter 1991).

Details about the harvest levels and value of local resources are not documented for many areas and communities (particularly in the Yukon and British Columbia); however, some indication can be gleaned from assessments undertaken of Łue Túé Sųlá and research with Jean Marie River.

> For generations, members of the Jean Marie River First Nation, other members of the Deh Cho First Nation and local Métis have used Łue Túé Sųlái and the surrounding areas for hunting, trapping and fishing. In 2008, 90% of households of Jean Marie River relied on hunting or fishing for 50% or more of their food consumption. In 2005, residents of Jean Marie River harvested 45 moose and 5 woodland caribou. It would have cost about $170,000 to buy the same amount of meat from a store. It is not known how many animals were harvested inside the boundaries of the proposed protected area (http://www.nwtpas.ca/areas/document-2015luetue-socio-ea.pdf).

Women's role in the subsistence economies of the Kaska are not well defined or described in ethnography. Moore (2002) suggests women did play an important role in Kaska fishing livelihoods, particularly after the adoption of the seine nets which made fishing easier.

WATER QUALITY

Water quality in the Liard is variable. In summer, erosion from snowmelt, river ice, and heavy rainfall results in muddier water than at other times of year. No documented sources of local and traditional knowledge were found about water quality for this region.

WATER QUANTITY AND FLOW

No documented sources of local and traditional knowledge were found about water quantity and flow for this region. The exception would be any documentation associated with consultations, assessment hearings, and monitoring programs related to mining and petroleum exploration and development activity. Deh Cho First Nations research activities and programs such as that funded through the Government of the Northwest Territories and Department of Fisheries and Oceans (e.g., AAROM —[The] Aboriginal Aquatic Resource and Oceans Management) has resulted in the documentation of related knowledge about this basin but it is not publicly available.

FISH HEALTH

Fish health is a major area of concern for Liard communities due to the significance of fish to the diet, economy, and culture. There are a diversity of fish species valued in the basin.

> Fishery values along the Liard River are high. Twelve species of fish have been identified, including the only known anadromous salmonid (chum salmon) in northern British Columbia. Sport fish species include Arctic grayling, chum salmon, bull trout, inconnu, lake whitefish, mountain whitefish, northern pike and burbot. Other non-game fish consist of the long nose sucker, lake chub, flat head chub, slimy sculpin, white sucker, round whitefish and the long nose dace. http://www.env.gov.bc.ca/bcparks/explore/parkpgs/liard_rv_corr/nat_cul.html

Particular fish and fish values are important to First Nations; among these is burbot liver. Harvester reports of rare or invasive species is another important dimension of local and traditional knowledge. There is increasing evidence of chum salmon in the basin, which is not well documented.

> In addition, several Arctic species of anadromous fish species are known to occur in the Liard River (e.g., Arctic cisco [*Coregonus autumnalis*] and Arctic lamprey [*Lampetra japonica*]). McLeod and O'Neil (1982) first reported chum salmon in the Liard River. These authors report small runs of chum salmon in the Liard

> River from September to November in 1979 and again in 1980 (Hamilton *et al.* 2002:1).
>
> Chum salmon are the Pacific salmon most frequently caught by the fishermen in the lower Mackenzie River area (Hunter 1974), whose nets are in the water during the upstream spawning migration of the isolated chum salmon populations in the Slave and Liard rivers of the upper Mackenzie River drainage basin (Babaluk *et al.* 2000:162).

There were no sources of documented local and traditional knowledge found related to the health of fish or fish diversity, condition, population, distribution, etc. in the Liard River Basin. The exception is documented observations associated with consultations, assessment hearings, and monitoring programs related to mining and petroleum exploration and development activity in the region. Deh Cho First Nations research activities and programs, such as that funded through the Government of the Northwest Territories and Department of Fisheries and Oceans (e.g., AAROM) has resulted in the documentation of related knowledge about this basin, but it is not publicly available. Fort Nelson First Nations and others in the Liard Basin have also been leading their own studies; however, these reports are not publicly available.

RESOURCE DEVELOPMENT IN THE LIARD BASIN

Indigenous communities including the Slavey, Kaska, and others have a long history of use in the region. It is generally assumed that these and other Indigenous peoples lived sustainability with the environment of the Liard Basin, including water and fishing resources. However, the 'discovery,' of the region by explorers and the creation of trading posts in the Liard Basin changed the stresses on aquatic ecosystems.

The area was a productive trading area from the time of its early discovery and traverse by Alexander Mackenzie and continued use by the Northwest Company and others. In 1822, a post was built on an island at the confluence of the Liard and Mackenzie rivers. Observations and accounts of Mackenzie in the early years of exploration suggest a limited subsistence fishery. Some archaeologists and historians have questioned the rigour of the these explorer observations and subsequent trading post accounts, suggesting that explorers may not have had full understanding of local ecosystems (Hanks and Winter 1991).

At the time of the Klondike gold rush and the movement of thousands of travelers into the Yukon and Alaska regions, the Liard also became a focus for mineral prospectors. As the area became a 'frontier' for development, it gained prominence in the visions of the federal government as a potential source of power or as part of a potential 'power trench':

> The 'power trench' was a way of imagining how the Rocky Mountain Trench—a valley that runs from Flathead Lake in Montana to the Liard River in northern British Columbia—could be turned into a massive reservoir, holding the flows from four of BC's most important river basins (the Columbia, Fraser, Peace, and Liard) so they could be converted into hydroelectricity. What's striking is the degree to which the vision of the power trench has been realized; much of its length is taken up by Lake Koocanusa, Kinbasket Lake, and Williston Lake, the

> reservoirs for the Libby, Mica, and Bennett Dams on the Columbia and Peace Rivers (Loo and Stanley 2011).

Mining

As access increased to the area, so too did mining exploration activity. There are three mines operating in the Liard Basin today; however, there are more than forty former mining exploration and development sites in this region, most of which are located in British Columbia.

> Mineral development followed access, and mineral development affected various areas of Kaska territory, especially the Faro mine site near Ross River on the Pelly system. Sa Dene Hes, a short-lived mixed sulphide mine, and Cantung (a tungston mine) were accessed from the Campbell Highway. Mining continues to be a catalyst for change in the land, altering water ways, disrupting fisheries and animal migration, and raising concerns about food contaminants. Tensions between the need for economic development and the need for a healthy landscape, relationship to land, and uncontaminated food have presented difficult choices (Johnson 2012:1).

Recreational Use

There are numerous valued recreational areas in the Liard region that have the simultaneous benefit of providing recreational benefits, harvest opportunities for First Nations, as well as protection of aquatic resources from extraction and development. Among these is the Nahanni National Park. Sport and commercial fishing in the Liard Basin is a major issue for First Nations because of resource competition. For example, recreational use of the rivers, including catch and release and recreational fishing, is a major concern to communities in the Fort Nelson area. According to Elder George Behn, the use of jet boats during periods of low water is a related concern:

> In the many years that the Fort Nelson First Nations have survived and lived in the area, they have seen many changes experienced by the land. The most important change observed by the people is the increasing use of jet boats on the rivers in the area. The jet boats are detrimental to the river system because of the harm that they cause to the fish populations. Due to low water levels and the timing of spawning runs, jet boat use during the summer and fall months contributes to a large number of fish deaths in the rivers (George Behn in Woods 2001:9).

In addition to recreational angling in many areas of the Liard, a commercial fishing enterprise operates at Bistcho Lake in northwestern Alberta. Between thirty-one and seventy-eight tonnes of walleye, pike and whitefish have been harvested each year since 1990. The total commercial harvest of fish from Bistcho Lake declined during the mid-1990s, but increased from 1997 to 2000. This recent increase in total harvest was due primarily to an increase in the catch of whitefish.

Conventional and Unconventional Petroleum Development

Petroleum exploration first began in the region in 1955. A total of 13 wells have been completed in the Liard Basin in southeast Yukon. Approximately 570 line-kilometers of seismic activity has also been acquired by the industry. The Liard Basin is now considered to be Canada's second-largest known gas resource and it ranks ninth in the world.

Conventional gas exploration, as well as fracking, have had significant impact on the landscape—it's a major issue of concern for many local First Nations, including the Fort Nelson First Nation.

While there have been highlights in the media, there has been relatively limited documentation of local and traditional knowledge about the impacts of gas exploration and development. 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 developments on drinking water and freshwater ecosystems including the habitats and the fish, wildlife and other species that depend on them for survival.

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

> 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 a lack of evidence and limited consultation about the environmental impacts and their concerns about groundwater 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).

Cumulative Effects

Cumulative effects of resource development are a major issue of concern for First Nations of the Liard Basin, particularly those in British Columbia, as has been reported in media, environmental assessment hearings and court challenges to the government. However, very little local and traditional knowledge related to cumulative effects has been documented. The greatest sources of insight come from forestry-related research. The cumulative effects of forestry has been a major concern for communities in the Liard, with the impacts on water and fishing resources of lakes, creeks and streams being among the concerns and management challenges of 'sustainable forestry' (Swaak 2008).

> A number of present and forthcoming land uses in the Liard River Basin have the potential to alter the river. Among the current activities, metals mining, logging, and oil and gas developments in British Columbia are seen as having the greatest potential effect on the Liard River in the NWT. Many of these activities, especially mining and oil and gas extraction, are currently expanding and will probably increase further in the future. Finally, the British Columbia portion of the Liard River has been studied as a potential site for one or more hydroelectric reservoirs. Large reservoirs have profound effects on the hydrology, chemistry, and ecology of rivers for hundreds of kilometres downstream, and would have major consequences for the Liard River and many of the species it supports (Taylor *et al.* 1998:5).

> Aboriginal respondents: there were concerns expressed about drinking water quality around the village and fish populations due to natural resource extraction. They felt that this expectation was only somewhat met through industry tenures. Most of these concerns were related to forestry operations, but some respondents mentioned mining operations as sources of water contamination, in particular plans by a mining company to dump mine tailings from their operation into a fish lake (Swaak 2008:78).

The development of a trans-boundary agreement related to the management of the Liard Watershed identified concerns over subsistence harvesting and drinking water as major concerns. There were also significant concerns about the implications of development on the spiritual well-being of Liard communities.

> Potential effects of upstream industry on rivers downstream, particularly as related to the subsistence lifestyle, were quickly identified as the single most important issue in transboundary negotiations. Water bodies in the NWT are important as direct sources of drinking water and as habitat for many wildlife species that local people harvest by hunting, fishing, or trapping. In particular, domestically harvested fish are vital food sources for people who live off the land. The river has spiritual importance for many people too, as northerners generally have a strong sense of connection with the land (Taylor *et al.* 1998).

CLIMATE CHANGE

There has been very limited research involving Indigenous communities in the Liard, including research on impacts related to climate change. Few sources of documented local and traditional knowledge related to the impacts of climate change on the Liard River Basin were identified. A case study research program was undertaken about the experience of Fort Liard with climate change (as compared to that of Attawapiskat, Aklavik, and Fort Liard). Of particular relevance to this study were observations, perceptions, and explanations of the causes of flooding, as well as resilience to flood events.

> The frequency with which particular signs of potential flooding are mentioned varies between study communities, reflecting differing perceptions of which conditions influence flooding and are thus likely to trigger preparedness activities. For example, repeated episodes of flooding in Aklavik have increased local sensitivity to the thickness of ice and particularly ice jamming at Horseshoe Bend. In contrast, with the mountainous regions around Fort Liard, local attention focuses on the amount of snow in the watershed and unusual climatic conditions (i.e., Chinooks) prior to break-up. With a history of seven episodes of flooding in the last 34 years, the residents of Aklavik exhibit a confident understanding of the potential interaction of hydro/climatic factors. In Liard, direct experience with flooding is limited, creating an uncertainty of explanation (Newton 1995:116).

Also notable, there has been some oral history work related to climate variability and climate narratives such as those documented by Moore (2002) and Cruikshank (2001).

> Inland, Yukon elders report intense periods of cold, privation, and loss of life during late stages of the Little Ice Age. In 1975, Rachel Dawson and Angela Sidney each told harrowing accounts of a ‘year there was no summer’ during the 19th century, when even lakes failed to thaw and starvation took the lives of young and elderly. Similar depictions are elaborated by Kaska living in southeastern Yukon… (Cruikshank 2001:387).

More climate-related research about these histories, as well as contemporary observations are needed.

GOVERNANCE AND STEWARDSHIP

Consideration of this area as only an area of development and resource extraction is being tempered by community-based efforts to protect lands and resources according to other cultural and subsistence values important to local Indigenous peoples, such as the Fort Nelson First Nation.

> The Liard River was the focus of a potential BC Hydro development for many years. In 1992, this section of the Liard was identified as an Area of Interest (AOI) to the Protected Areas Strategy, and was subsequently officially included in 1995 as the Grayling-Liard River AOI. The Fort Nelson Land and Resource Management Plan established protected status for this area in 1997. http://www.env.gov.bc.ca/bcparks/explore/parkpgs/liard_rv_corr/nat_cul.html

There have been significant conflicts and tensions related to the governance of the Liard, particular in recent years as development pressure increases. A lack of security and clarity around First Nations rights in British Columbia is a majority challenge to the sustainability of aquatic ecosystem in the Liard. More local and traditional knowledge research is needed related to the governance of the basin.

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