

“A Return to Country Food”

Meeting and Workshop

August 21 to August 23, 2012

Jean Marie River, NWT

Community Gym and Kelly Lake Campground

The Return to Country Foods workshop was funded by the AANDC, Northern Contaminants program and the Dehcho AAROM program

Final Report

Prepared for

Dehcho First Nations

AAROM Program

by

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Participants

Jean Marie River First Nation, Jean Marie River

- Chief Stanley Sanguetz,
- Richard Sanguetz, community member
- Yvonne Norwegian, community member
- Margaret Ireland, PAS Chair
- Billy Norwegian, community member

Sambaa K'e Dene Band, Trout Lake

- Jessica Jumbo, community member, on behalf of Chief Dolphus Jumbo,

Ka'a'gee Tu First Nation, Kakisa

- Chief Lloyd Chicot,
- Shawn Laidlaw, Environmental Coordinator
- Melaine Simba, Environmental assistant

Liidlil Kue First Nation, Fort Simpson

- Cheryl Cli for Chief Keyna Norwegian,
- Jermaine Gargan, Communication Officer,
- Edward Cholo, AAROM monitor,
- Nicholas DePelham, AAROM monitor,
- Allan Bouvier, Resource Manager,

Pehdzeh Ki First Nation, Wrigley

- Daniel Steiner, Lands Coordinator

Deh Gah Gotie Band, Fort Providence

- Chief Wayne Sabourin,

- Priscilla Canadien, Resource Management Board
- Greg Sabourin, AAROM Monitor
- Joe Lacorne, AAROM Monitor

Fort Providence Métis Nation

- Richard Lafferty, Fort Providence Métis Rep. and AAROM Advisory Committee member

Fort Simpson Métis Nation

- Marie Lafferty, President, Fort Simpson Métis

Resources

- Mike Low, Dehcho First Nation, AAROM Technical Advisor
- George Low, Dehcho First Nation, Dehcho AAROM Coordinator
- Dr. Erin Kelly, GNWT-ENR, Manager of Watershed Programs and Partnerships, Land and Water Division.
- Jennifer Fresque-Baxter, GNWT-ENR, Water Stewardship Advisor, Land and Water Division.
- Dr. Kami Kandola, Deputy Chief Public Health Officer, GNWT-Department of Health and Social Services
- Dr. Marlene Evans, Contaminant Researcher, Environment Canada
- Bruce Townsend, BEAT Environmental Inc. Facilitator and Presenter
- Caroline Lafontaine, Environmental Consultant, Recorder

1.0 Overview

Regarding contaminants, AAROM works on the premise that people need to be warned if there is a risk but also need to be reassured if the benefits outweigh the risks, and be provided with the necessary information to make informed choices. Mercury concentrations in fish have significantly increased in some Dehcho lakes over the last few years. A workshop was held to inform community leaders about increasing mercury concentrations and discuss the risks and benefits of consuming country food. George Low, Coordinator of the Dehcho First Nations, Aboriginal Aquatic Resources and Oceans Management Program (AAROM) organized the workshop, with funding from Health Canada and Aboriginal Affairs and Northern Development Canada (AANDC), Northern Contaminants Program. The resources people invited for this workshop were AAROM's research and education partners and the rest of the participants were from communities who were part of the recent mercury studies conducted by AAROM. Six of the nine Dehcho communities were represented. The gathering was also an opportunity to present a state of the knowledge and identify community concerns to guide future research.

The two-day session held on August 21 and 22, 2012 in Jean Marie River aimed at:

- Reviewing the state of knowledge and research in regards to available data on contaminants in water and fish with a focus on mercury;
- Reviewing the consumption advisories and their implications, and discussing the availability of low risk species and fisheries;
- Discussing where contaminants originate and how they get into our aquatic systems;
- Exploring educational tools to promote the understanding of mercury pathways and issues;
- Exploring the direction that needs to be taken based on the knowledge gained to

date. Questions that the group sought to answer were: What information do the communities need? What research and monitoring is required to address community issues and concerns? Are we measuring the right things?

- **Figure . Mike Low's passionate teachings about the life habits of the northern pike and its body parts captivated many curious youth.**
- Discussing the power of partnering and identify potential partnerships;
- Promoting a better understanding of the risks and benefits of including country food in the diet. Identify the main messages and the ways to share them with community members.

Chief Stanley Sanguéz from Jean Marie River First Nation opened the session with a warm welcome and a prayer for guidance. Chief Sanguéz then commented on the importance of this workshop for his community: “There is a concern in this community as to how climate change is affecting everything, the food chain, the country food that we love so much. This is why our community is persistent to continue studies on climate change. We still live off fish, rabbit, porcupine here but it is changing very quickly. How do we get the community to understand it? I am very glad the resources people are here. We have been working with them for the past three years to understand what is happening with fish. There is a great deal of concerns and questions about contaminants. What is it? Where does it come from? How long has it been there?

Ten to fifteen years ago, DFO tagged fish and we now understand their movement. **Figure . Sampling fish also means preparing the remaining fillets for a feast.**

Levels of contaminants are now scaring people; a few have stopped eating fish. I was hoping that we would talk about contaminants in a way that it would not stop people from eating fish. The reports are very scary and the levels found may be damaging to the fish. I have been talking with George about taking out some fish (to reduce mercury concentrations) and use them as bait for marten. It is something that we have been talking about for a while. We are still struggling to understand this and everybody here around this table has concerns. It is not only about a few lakes around this community, it is about all the small lakes within the Dehcho. Are all lakes within the Dehcho elevated in mercury? I hope that, when we leave, everyone will understand what is happening. Our kids will ask: ‘What do we do at the end of the day? What is it we are facing here?’ When they see the advisories, they say ‘I don’t think I want to fish here anymore’. It is already damaging tourism and I need somebody to help us tell people that they can still eat fish.”

The rest of Day 1 was dedicated to the resource people who provided knowledge on various aspects of mercury, such that communities could identify local and regional concerns, and make informed decisions about their consumption of country food. The day was concluded by the visit of Dehcho Grand Chief, Herb Norwegian.

Day 2 began with a review and discussions on the highlights and ideas that emerged from the first day (Appendix 1). Bruce Townsend entertained and educated the crowd with a colorful presentation of the SMART Program educational modules. Then, the representatives of each community were invited to share their contaminant and environmental concerns, and answer the following questions:

- What Lakes/Rivers do you presently fish?
- Have they been tested for mercury (Hg)?
- Do you want them tested?

Originally discussions were supposed to explore each basin in more depth but due to time concerns, the following topics initially included in the agenda, will be investigated during AAROM's future community visits and workshops. A few of the following items were discussed throughout day 1, but in less detail:

- Discussing human activities in the Watersheds that are potentially causing impacts.
- Discussing what else we know about the Watershed and if changes have been seen
- Clarifying the goals/questions to be answered by future monitoring activities for hydrology (water quantity), sediment, water quality, fish and water insects, wildlife, vegetation, air and climate.
- Discussing how monitoring could answer these questions.
- Prioritizing the most important questions to be answered for each topic and overall.
 - Mini discussion on the effective indicators of ecosystem health for a monitoring program to address community concerns related to the various watersheds.
 - Identifying the next steps towards the development of community-based monitoring programs.

The communities who wished to develop their own community-based monitoring programs or a source water protection plan, which would involve a thorough assessment of the watershed, were invited to contact Dr. Erin Kelly, GNWT-ENR, Manager of Watershed Programs and Partnerships, Land and Water Division. Sambaa K'e and Radili Ko (Fort Good Hope) engaged in such a process this year and are developing their own community-based monitoring programs.

Finally, the group discussed the content of the messages that needed to be shared and brainstormed on the ways of reaching community members and the public. The two-day session was concluded by a fish fry at Ekali Lake, a lake locally known as Kelly Lake.

Figure . Cleithrum bones (lower jaw) of northern pike are used to age the fish.

On August 23rd, participants and youth were invited to a mini "SMART Youth Ecology Camp". Bruce Townsend led the youth and delegates through his various aquatic modules. On the menu were food, activities and demonstrations on aquatic ecology (gillnetting and seining, dredge sampling and plankton hauls, YSI sondes and other water quality measuring equipment)

The next pages of this report offer a summary of the presentations of the resource people and of the comments/questions of participants (section 2.0); a summary of the concerns of individual communities (Section 3.0), and of the other brainstorm and discussions results (Section 4.0). The full presentations of resource people are included in the Appendices 2 to 6 and their contact information is in Appendix 7.

2.0 Presentation Summaries

2.1 George Low, Dehcho First Nation, AAROM Coordinator

Following an opening prayer and the kind words of welcome of Chief Stanley Sanguéz and the introduction of participants, George Low, Dehcho First Nation AAROM Coordinator, recognized the high regard and respect the Dene and Métis have for the environment, the water, the fish and wildlife and just the importance of the land to their culture and identity. He emphasized the change in fish harvest: “Traditionally people camped along the river, cut dry fish and smoked it. Now most camps are empty. People have turned to wage economy and less to subsistence.” George then presented the history of the contaminant studies AAROM is currently conducting:

“My First Job which was with Fisheries and Oceans was to assist in the assessment of the resource impacts of the proposed pipeline in the early seventies. Later, working for Fisheries and Oceans Canada (DFO), I became involved with the study of mercury levels in fish in 25 lakes in the Dehcho and the Sahtu. With AANDC (INAC then) and DFO funding, I worked with contaminants scientist Dr. Lyle Lockhart of the Freshwater Institute in Winnipeg.

Mercury pollution, mobilized by industrial processes and coal burning in various parts of the world has been settling out of the atmosphere on the Arctic and sub-arctic, adding to the so-called “naturally occurring” mercury, which is mostly anthropogenic (human released) as well.

Figure . Participants were attentive to the wealth of, sometimes complex, information offered by the presenters.

We found that some predatory fish species in some of the lakes were contaminated with mercury at levels, which according to Health Canada guidelines could pose a health risk to people who traditionally ate a lot of fish. GNWT Health and Social Services issued health advisories as necessary.

More recently Dr. Marlene Evans and other researchers started to see further increases in mercury levels in some fish in a few of the previously studied lakes. Red flags were raised and many questions arose: Why? What was happening? What’s changing? Climate? Increased pollution? Changes in the methylation process? Researchers are working on answers.”

George then summarized AAROM orientations and achievements since the program was established and finally emphasized the importance of partnerships: “...I was a bit unsure if DFN AAROM program should get involved in a study which might further turn people off fish - such a good healthy food. But whenever I talked to the leadership or community harvesters, there were always deep concerns about contaminants. Not only mercury but contaminants from mining, contaminants from upstream of the NWT; forestry, pulp and paper, agriculture, dams, and particularly the tar sands mega projects.

AAROM is an aquatic resource management program. We have been building capacity in the communities with increasingly good results. We deal with a variety of resource management concerns such as the Great Slave Lake fisheries management; run-away sports fisheries (fisheries that have been increasing at a rapid rate) - such as in Fort Providence and other communities; and resource use in other areas.

A couple of years ago, based on community concerns, we decided that we should also be monitoring basic water quality as a part of our community-based monitoring program. This will be a long-term monitoring project which will allow us to see trends in

temperature, dissolved oxygen, pH, and other parameters along the Mackenzie River from Fort Providence through Jean Marie River and Liidlii Kue, and now on to Wrigley. We also monitor Trout Lake and Kakisa. So we have invested in some expensive equipment but more importantly we have invested in a partnership with the NWT Water Stewardship Strategy. They have provided us with more equipment and are increasing the scope of the monitoring to include some contaminants. I understand Sambaa K'e is bristling with monitoring equipment this year!

Figure . George Low discussed fishing techniques with the group.

There is strength in partnerships and successful partners must each contribute and benefit from these relationships if the partnerships are to endure. AAROM, I hope, is good at working with our Dehcho community partners. Capacity building initiatives have provided training in boat safety, environmental monitoring, stream assessment and on-the-job training of community monitors. The communities have been equipped with boats, monitoring and safety gear. They are project ready – summer or winter.

AAROM and Dehcho communities have become good at collecting data for the most part. Community members are directly involved in our studies. Partners such as Environment Canada, Fisheries and Oceans and GNWT-ENR Water Strategy can help us process samples, summarize and interpret data, and bring back the story to the communities.

Bruce Townsend continues to develop and deliver youth education on aquatic ecology at our annual Youth Ecology Camp and other forums. He also instructs at Aurora College.

AAROM has become fairly proficient at finding funding partners such as AANDC, Northern Contaminants Program (NCP) and the Cumulative Impact Monitoring Program (CIMP), Health Canada, GNWT ENR and ITI to name a few. DFO provides the AAROM program with core funding and some project funding.

That's the power of partnerships and hopefully that is what this workshop is all about. How can we work together? How can we pool our talents to make a difference locally, nationally, internationally? Many of the problems in the Dehcho territory are caused by distant sources, upriver contaminants, atmospheric fallout, and climate change. Affected people armed with knowledge, both traditional and scientific, have the power to affect national and international policy. Are we ready for that? Are we doing some of it already?

I think this is an evolution point for the Dehcho to make a difference. And it starts with understanding the problems.”

In summary:

- The Dene and Métis cultures have a high regard and respect for the environment. The Land is part of their identity and cultures.
- Over the last decades, since people have turned to a wage economy, subsistence fishing has decreased in the Dehcho.
- Contaminants in fish from Dehcho lakes have been studied for over 25 years. Studies show that some predatory fish have mercury levels higher than the recommended Health Canada guideline and could pose a health risk to people who traditionally ate a lot of fish. Recently, mercury levels have shown further increases in some fish from lakes studied many years ago.
- Most mercury is from anthropogenic origins.

- AAROM is working with communities and researchers to initiate and support community-based aquatic monitoring initiatives to monitor long-term changes.
- In the last years, AAROM has become proficient at developing partnerships, finding funding and building capacity of environmental monitors.
- The research (scientific and traditional knowledge) in the Dehcho can provide arguments to affect policies at the national and international levels. Many problems from the Dehcho are caused by distant sources.

Comments/Questions from participants

- Chief Sanguéz, JMRFN: “It is important to understand study design. An upcoming issue on which members needs to be educated is fracking. If we do not understand, we should not get involved in this. It affects ground water. How do we work around this? Training programs need to be targeted to what is happening.”

Answer: George informed participants that AAROM offers a 5-week course to train environmental monitors. This course establishes a ground of understanding of what monitoring is, but cannot cover everything. Monitors need to further their education to deepen their understanding of environmental sciences. Aurora College in Fort Smith offers a two-year diploma titled Environmental and Natural Resources Technology Program (ENRTP).

Dr. Erin Kelly has already discussed curriculum with Aurora College. She pointed out that the first step to improve the relevance of the ENRTP is to identify community concerns, which will be done during this workshop, and then review the program and adjust if required.

Regarding fracking, Caroline Lafontaine requested an update from Shauna Morgan, Pembina Institute, regarding the talks held last winter about a fracking workshop in the Dehcho. Shauna replied on August 28th, 2012: “We have applied to many sources for funding the fracking workshop in the Dehcho, but have been turned down by government sources. Our latest proposal is to a foundation, we have not heard back yet whether they will fund it. In the meantime, if there are people in the community who have specific questions, feel free to pass them on to me and I will do my best to find some answers, based on what we know right now.” Shauna can be contacted at shaunam@pembina.org.

- Chief Sanguéz (JMRFN) commented on the importance of partnership as the federal government has weakened environmental legislations and reduced the number of people that worked to protect it. Dehcho needs to get together and explore what can be done to change the current situations/policies.

Figure . The information available allowed participants to expand their analytical approach to mercury and identify potential concerns in their respective regions.

Answer: Erin emphasized that GNWT-ENR are concerned about changes to federal environmental legislation and decreased numbers of federal scientists. ENR will keep close tabs on what this mean for water and fish monitoring and research in the NWT. ENR has corresponded regularly with the Federal Government about these concerns. Consistent monitoring is also of concern relating to transboundary water management agreement negotiations.

George informed the participants that a letter was drafted for the DFN Grand Chief's comment to the Federal Government regarding the amendment of the Fisheries Act.

- Cheryl Cli (LKFN) questioned the sharing of information between Communities-ARROM-GNWT-Federal Government. "Is the information sharing efficient? Can it be improved?" She also requested information on the contaminant history of each lake (how far back does the data go?) and that the kinds of changes observed be documented. "Advisories are scaring people. We need to know what size and species of fish are affected. We used to eat a lot of fish out of Cli Lake. Now we are hesitant to eat them."

Answer: The comment was taken into consideration; some of the information requested was presented during the course of the two days. Circulation of information is clearly not as efficient as hoped. For example, George recently found out that Environment Canada is sampling on the Mackenzie River; AAROM will investigate to ensure community concerns are taken into account.

AAROM Action Item: A strategy and action plan to improve communication between agencies involved in contaminant research is warranted.

Marlene Evans continued: "We do not have high quality fish data sets from the past. Mercury levels depend on the lake and the species. These research findings will be shared later today".

Dr. Kami Kandola clarified that the consumption advisories are limits outlined for regular consumers of fish over a lifetime period. The Health Canada consumption guideline limit for retail fish is 0.5 ppm. If levels exceed this concentration of mercury, GNWT Health and Social Services will issue a consumption advisory. The reporting mechanism needs to be improved to ensure people do not stop eating fish. Many participants noted that different forms of reporting (i.e. more visual, less text, etc.) would be more helpful in conveying the message about fish consumption.

GNWT-DHSS Action Item: Improve the reporting of mechanism by considering the suggestions offered during this workshop and ensure people do not stop eating fish.

- Finally, Chief Wayne Sabourin (DGGB, Fort-Providence) emphasized the importance of integrating both traditional knowledge and science, and better use the Dene Way of managing the land as it has been sustainable for a long time.

2.2 Mike Low, DFN AAROM, technical advisor

Mike presented a summary of the data of the last three years of mercury studies in the Dehcho. As Dehcho First Nations' employee, Mike coordinates and helps carry out the AAROM community-based monitoring programs in the various communities.

Figure . Mike Low shows how to retrieve the otoliths in a Whitefish head.

In the 1990's, high levels of mercury were found in some fish in the Sahtu and in the Dehcho. As people wished to know if levels had increased since these first studies were conducted, a partnership with Dehcho communities, AAROM and Dr. Marlene Evans was established to answer this question. The objectives of this study were to 1) update data on mercury levels in fish from lakes that had shown high levels, and lakes that are used traditionally; 2) help determine why levels are rising and 3) identify which lakes and

fish species are used for subsistence. Nine lakes were tested around Kakisa, Fort Providence, Trout Lake, Jean Marie River, and Fort-Simpson. In addition to mercury levels, data were collected on length, weight, age, sex, and maturity of each collected fish. This provided valuable stock data. These studies through an agreement with ENR and a Protected Area Strategy process, contributed towards information on the five lakes included in the Jean Marie River Protected Area Strategy. Logistics for studies conducted by AAROM are planned to maximize economic benefit returns to the communities involved, including the distribution of the collected fish to community members after samples are collected.

Mike presented and discussed the data with participants. The data shows that:

- Predatory fish always have more mercury than species that are lower on the food chain.
- Lake Whitefish in all lakes tested are healthy and excellent for consumption.
- Larger predatory fish are still safe to eat, but one needs to eat less of them and less often.
- Smaller predatory fish have less contaminant than when they are larger.

The complete presentation and data set are in Appendix 2 of this report.

Comments/Questions from participants

- Chief Sanguez, JMRFN: Advisories are difficult to understand; they need to be modified. One helpful change would be to include measurements in pound, along with grams. Fish guts are often eaten in Jean Marie River and recommendations are for the muscle of the fish. Fish parts that are consumed by community members should be tested. Stanley also inquired about the relation between mercury and the cooking method.

Answer: Kami confirmed that cooking does not change anything as mercury is bound to the proteins in the fish tissues.

- Richard Lafferty, Fort-Providence Métis: The Mackenzie River should be added to the list of water bodies tested. The North Nahanni and the Mackenzie River should be tested at the sites where people are fishing, therefore around the communities. Beaver Lake has never been tested and it should.

Answer: George commented that the levels of mercury in fish are generally acceptable in the Mackenzie River. Burbot was sampled and tested but data could not be retrieved prior to the workshop time. This is an AAROM Action Item; it will be made available when obtained. George then explained that the focus of the study has been on inland lakes so far, and the next step is to identify the lakes where mercury levels are lower.

Erin noted that sampling of the different species would be done at different times of the year, as sampling would follow the fish runs.

- Marie Lafferty, Fort Simpson Métis, requested a clarification considering the data Mike presented: “How high is high?” Does this mean that walleye are not good to eat?”

Answer: Dr. Kandola explained the current Health Canada retail consumption guidelines: below a mercury level of 0.5 ppm, there is no restriction in fish consumption; above that, a consumption advisory is typically issued, which means there is a limit on the

amount of fish that should be eaten on a regular basis. Specific to walleye, the age/length of fish has to be taken into account. The number of fish considered in the average result is also important. If only a few big fish were submitted, the average will be high and an advisory will be issued as a precaution. At least 20 fish of different sizes are needed to obtain a representative average.

- Chief Sabourin, DGGB, pointed out that it is not possible to visually tell if mercury is in the fish and historically, mercury was probably also present.

2.3 Dr. Kami Kandola, GNWT-Department of Health and Social Services

Dr. Kami Kandola, GNWT Health and Social Services, was invited to speak about the benefits of country food to healthy nutritional habits, the low risk of contaminants when mercury levels are low, and the importance of fish to Dene and Métis cultures. More precisely, Kami discussed 1) the health status of the NWT residents; 2) current issues related to food, nutrition, and traditional foods; and 3) mercury and the fish consumption advisories. The goal of the presentation was to give enough details about mercury and advisories so people can decide what fish to eat, how much children, women, and men can eat, and not be afraid to eat all fish. The complete presentation can be found in Appendix 3. Below is a summary of the points to remember with regards health and country food:

- **Figure . Bruce Townsend also commented on the health benefits of eating fish.**
- In the NWT 70% of all death and 50% of all hospital stays are related to chronic disease. These numbers are similar across Canada. There has been a switch from infectious diseases to chronic diseases as the main cause of death and illness in the last years. There are a number of contributors to chronic disease but one contributor is diet and unhealthy eating. “What we know about inappropriate western diets is that high salt, high sugar and high fat is not good for your health, and not good for preventing chronic disease. What we do know about traditional foods is that they are typically low in salts, sugars and unhealthy fats and are a lot healthier food source.” Other factors are lack of physical activity, alcohol use, smoking, high blood pressure and social factors such as education, ability to work, housing, etc...
- In the NWT, similar in Canada, the top causes of death are cancer, heart disease, injuries, and respiratory diseases, so most of the top causes are chronic diseases. The most common cancers in men are prostate, colorectal and lung cancers. In female, breast, colorectal and lung cancers are the most prominent. These are chronic diseases.
- “We know that adopting a diet with high salt, high sugar and high fat is a contributor to being overweight and obese, and in the NWT we have a high percentage of overweight and obese than the rest of Canada.”
- “We can get a lot of nutrients and fibers from food such as vegetables and fruits, such as berries but here in the NWT, the Health Canada recommendations of 5 servings a day is achieved by only 25% of the population.”
- Incidence of diabetes in the NWT has increased from 3.1% to 4.4% between 2003/2004 and 2007/2008. “What we eat in our diet predisposes us to diabetes, so if we eat diets high in salts, sugars and fat this increases our risk for Type 2 diabetes. Similar trends are observed for the incidence of cancers”.

- There is a decreased trend in traditional food eating. This translates into low intakes of many nutrients, including vitamins A, C and minerals (calcium, folic acid, iron, fibers). Not having a diet that has these elements can increase your risk for chronic diseases.
- Traditional foods protect our health as they are low in unhealthy saturated fats, high in good (unsaturated) fats, high in proteins, low in salt and sugar, and are high in iron and zinc.
- Traditional foods are of many nutritional benefits as they help reduce the risk of chronic disease; provide iron, a key element in how children are learning; folic acid which prevent nerve issues in babies, calcium which is essential for the development of their teeth and bones; and zinc which helps fight infections.
- Diets are much healthier when traditional food is included. Dr. Kandola gave many examples comparing traditional and store bought foods, which can be found on slides 23 to 31 of the presentation (Appendix 3).
- It is true that some traditional foods have contaminants but they also contain nutrients that are not always easy to replace by store bought foods. With most traditional foods, the benefits often outweigh the risk.
- Harvesting protects our health because it improves the physical activity, as one has to work hard and walk long distances.
- Eating traditional food, healthier food, contributes to strengthen cultural values and celebrate the culture and traditions.
- Many barriers to traditional food use were identified, and include pollution, time required and costs for harvesting, and licensing to purchase ammunitions (slides 32-36). They contribute to youth consuming less traditional foods. An increased use of traditional food is part of an ideal solution to improve health but for many it may not be possible or practical in the wage economy. Communities may want to investigate these barriers and find solutions to increase the intake of traditional foods by youth.
- Dr. Kandola then offered a series of resources and tips (slide 37 and 38) and reiterated that the benefit of eating fish, especially fish that are not predators, outweighs the risks.

Table : Summary of the benefits and risks associated with the consumption of traditional foods.

Benefits	Potential Risks
<ul style="list-style-type: none"> • Protects our health because it is highly nutritious (low in unhealthy fats, low in salt, low in sugar, filled with vitamins and minerals, high in protein). • Better quality than store-bought equivalent. • Contribute to reduce the incidence of many chronic disease, including hearth problems, diabetes, cancers, and obesity. • Important source of nutrients often not consumed in sufficient amounts in the NWT. • Provide minerals that help control iron deficiencies, fight infections and heal 	<ul style="list-style-type: none"> • Related to pollution of the environment. For example, exposition to elevated levels of mercury could affect the nervous system, particularly of fetuses and developing children. • Potential for accidents during harvest. <p style="text-align: center;"><i>The benefits of eating country foods obviously outweigh the risks.</i></p>

<p>wounds, good vision and strong bones and teeth.</p> <ul style="list-style-type: none"> • Stabilizes food security issues as it is available and accessible, and can cost less than store-bought foods. • Promotes physical activity. • Maintains cultural way of life (allows to celebrate culture and tradition and maintain cultural values). 	
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- The many aspects of mercury were discussed: the mercury pathway through the food chain, the health effects, Health Canada recommendations and GNWT advisories and the benefits of consumption in relation to risk were explained (slide 39 to 54). The main messages to remember are:
 - Canada's Food Guide recommends at least two servings of fish per week.
 - Concentrations of mercury in water are low and require special methods to detect, which only recently have been developed. Mercury may become of concern when it bioaccumulates and biomagnifies through the food chain to higher levels. From water up the food chain, mercury can magnify up to a million times.
 - Not all forms of mercury accumulate in fish, only methyl-mercury.
 - There are various sources and form of mercury. Two-thirds (2/3) of the mercury is from human sources and influences (flooding, coal burning in China and Russia, etc...). Volcanoes and forest fires are also sources of mercury. By and large, the large increases we have seen are due to man-made emissions.
 - Methyl-mercury is normally in organic forms (associated with a carbon); it can be picked up directly by the various aquatic species or can accumulate through the food chain. It can magnify up to a million times up the food chain. This is why predatory species, such as pike, walleye and marine mammals, usually have higher levels of mercury.
 - Mercury accumulates in the human body over a lifetime; half of the mercury consumed will be excreted from the body within 50 days. The main sources are from fish, seafood and marine mammals. We all have trace amounts of mercury that can be detected in blood and hair. What we have to look at is the amount that causes health effects. Half of the mercury consumed will be excreted from the body within 50 days.
 - Health Canada toxicology department do the health risk assessments. They consider factors such as the type of mercury, the amounts, the age and weight of the person, the length of time the person has been exposed to the substance and other illnesses the person may have. The main health effect with mercury is on the nervous system.
 - Of all the hair and blood studies conducted in the NWT, where fish and marine mammals showed elevated levels of mercury, no individual has ever been found to be at immediate risk for mercury. No one has ever been sent for treatment, but a change in diet was suggested in a few individuals.
 - Advisories are stricter for pregnant and breastfeeding women, women who may

become pregnant and young children because they are the ones that are most vulnerable to the effects of mercury. They are the ones who need to be aware of what types of fish are good choices for frequent consumption and which should be eaten less often. They still should eat fish, but aim at the ones who are low on the food chain and respect the advisories.

- It is very important that pregnant women eat fish with very low levels of mercury as developing fetus are significantly more sensitive than adults to mercury. Developing fetus and young children benefit from the nutrients offered by fish but they are also at risk from mercury exposure and so fish with high mercury concentrations should be avoided.
 - Adults are not as sensitive to mercury; impacts are over long periods of time. A list of symptoms is presented on slide 45. Over long periods of times it could cause dementia. A blood test can tell if mercury is contributing to the dementia. It is rare. Dietary history have shown that the typical type of individual showing high levels of mercury is an elderly male who has eaten predatory fish on a consistent basis over a long period of time.
 - Health Canada guideline is 0.5 ppm for mercury; in the U.S.A., it is 1 ppm. Canada has a larger safety margin. Interestingly, most of the advisories in the Dehcho would not be advisories in the United States. Only a few lakes, like Lac Ste Therese and Cli Lake, have mean mercury concentrations in some predatory fish above 1 ppm.
 - For sport fishing, it is GNWT's responsibility to issue the advisories. However, for what is sold in the stores, it is the responsibility of Health Canada. In federal parks, it is Parks Canada who publishes the health advisories.
 - Cleaning and cooking does not remove mercury.
 - Advisories are based on someone who would eat fish several times a week over a lifetime period, which is not normally the case for most people.
 - Current advisories can be found on GNWT-HSS website: <http://www.hss.gov.nt.ca/health/environment-and-your-health/mercury-levels-fish>. Advisories are based on fish sent for analyses. Often only big fish are received so levels are higher and advisories are issued. If a wider range of sizes could be tested, advisories could be more specific. It was possible to do that in Trout Lake, lake trout smaller than two feet are not above guideline.
- In summary:
 - There are high methyl-mercury levels in SOME fish.
 - Concerns are largely for developing children however; they should eat fish that have low mercury levels.
 - Women of childbearing age and children should avoid or limit fish that contain high mercury levels. See slide 46 for recommended levels.
 - Maternal consumption of fish low in methyl-mercury is safe.
 - Don't stop eating fish – understand what it means and manage your consumption. The benefit of eating fish outweighs the risk.

Comments/Questions from participants

- Participants investigated the possibilities of reducing mercury, which gave rise to heartfelt laughter: Hanging the fish by the tail will not get all the mercury in its head and vice-versa! Boiling will not dilute or evaporate the mercury either! Mercury is throughout the whole fish, bound to the proteins.
- Cheryl Cli (LKFN): Are there hair/blood samples collected from people who are eating from the lakes AAROM studies to see if people are being affected? Are studies done on whole families to determine family mercury profiles (grand-parents, parents, children)? Cheryl suggested producing a poster that would present local food chain and bio-accumulated levels.

Answer: A dietary profile and hair study was done in the Sahtu a few years ago as an advisory was issued for Kelly Lake. The hair samples results came back normal. It was observed that there were discrepancies between what people say and actually ate. As other participants were interested in the hair studies, Kami confirmed she will take this request into account. Funding could come from the Northern Contaminants Program. She further explained that it is also possible to obtain a history of one's mercury intake if the person has long hair; blood samples give information only on the recent consumption of mercury.

- George Low (AAROM): If an individual walked in a clinic, could he get tested?

Answer: Kami answered positively. A neurological assessment and many questions on sources of uptake would likely be asked to evaluate if the test is deemed necessary.

- **Figure . Youth were invited to observe the stomach contents of the fish caught.**
- Richard Lafferty (Métis, Fort-Providence) voiced the importance of this issue and inquired about the possibility that this test be part of the standard blood test series, and could be checked off when deemed necessary. This would mean changing the sheets in the NWT clinic. He also mentioned that the guides at the lodges, who eat fish twice a day for three months in a row, are a group of individuals that are susceptible to mercury poisoning and should be included in the studies.

Answer: Kami confirmed this issue needs to be taken seriously as mercury poisoning is not something one will think about and it is reassuring to that person if the test comes back normal. More education of the health practitioners and nurses is needed. For example, a series of questions to ask patients needs to be designed to target patients at risk. From the information gained from the blood/hair studies conducted to date, GNWT-DHSS has a good idea of the levels a person would have knowing their dietary habits.

- Chief Sabourin (DGGB, Fort Providence) mentioned that other sources of mercury could cause health effects. He also expressed concerns about mercury in waterfowl and small mammals, such as beavers and muskrat. They have never been tested in Fort Providence area.

Answer: Kami confirmed that mercury can cause health effects and it is indeed the case but under different circumstances. For example, mercury vapors are toxic and this situation would need to be handled differently. Mercury is more of a concern in fish and marine mammals.

Marlene pointed out that waterfowl and mammals that eat fish may have higher mercury concentrations, e.g. mergansers, loons, and mink. However are they eaten traditionally? Mercury was tested in seabird eggs (NCP study) and mercury levels were not high. Contaminant studies were also conducted in caribou, Dall sheep, moose and goats. Nic Larter, GNWT-ENR Dehcho regional biologist, could be contacted for results. Erin pointed out that birds and mammals that eat fish would eat small fish, so they would be exposed to small concentration of contaminants. Finally, Kami mentioned that the main concern for waterfowls and mammals would be lead, but lead pellets are not used anymore.

Caroline Lafontaine noted that Brett Elkin, GNWT-ENR Diseases/Contaminants specialist, is conducting a study on contaminants in small mammals and asked if it was possible to include a few animals from Fort Providence area (a reply had not been received when this report was completed).

- Richard Lafferty raised the question about the importance of including wetlands in the future studies, as they can be important source of mercury.

Answer: Bruce Townsend attempted to explain the environmental conditions that promote methylation of mercury. Recent ecosystem scale experiments have shown that although wetlands can be important sites for mercury methylation, often at higher rates than occur in lakes, differences in hydrology greatly affect how wetland sources are exported into lakes. He also indicated that although moose feed in wetland habitats, the plant material that they eat has very low mercury levels so very little transfers to the meat. Marlene clarified that in the studies conducted, wetlands were considered in data interpretation although the wetlands were not studied. Study designs are based on the questions that need to be answered and wetlands were not considered in the fish sampling.

- Chief Sanguéz wondered if contaminants could be the cause of the death of the five moose found recently.

Answer: Anthrax seems to be a likely cause. Brett Elkin was contacted to obtain further detail on these deaths but a reply had not been received when this report was completed. Kami mentioned that there are cadmium issues with kidneys and liver of large mammals in the Mountains.

Erin reiterated the importance of understanding the pathways of bioaccumulation. Moose eat vegetation that has low levels of mercury so they are less likely to accumulate high levels of mercury. Many ducks eat benthic organisms, which are also low on the food chain; they would likely be low in mercury too. Age is also an important factor to consider. As fish and wildlife get older, and have been exposed to mercury in their food for a longer time, the chances of higher mercury concentrations are greater. “You can have big fish that are young because they grew quickly but what we are concerned about is big old fish. However, to tell fish age an aging structure is needed (otolith, cleithrum) so it is recommended to eat smaller fish and not as many big fish.”

- Chief Sanguéz wanted to know more about the study that would involve removing big fish to reduce mercury levels.

Answer: Marlene and Erin explained removing fish would change the fish populations of the lake. Big fish are wise and better at catching food easily. They restrict the number of fish and speed at which other fish can grow. If big fish are removed, other younger fish will be able to eat and grow more quickly. If fish grow faster, the levels of mercury should be lower.

- Cheryl inquired about the possible impact of the changes in harvest on mercury accumulation. “My grand-parents used to fish way more than we do. Now we harvest 200 fish from Cli Lake. In those days for the whole year, it was way more, 500 or a thousand. We used to fish a lot in that lake, mercury did not have time to accumulate. Now we barely harvest.”

Answer: Marlene confirmed it is part of the reason for the old fish with higher mercury levels. Erin confirmed that this is a situation that we have across the NWT. “When lakes are not fished as they used to be, things change and one thing that can change is accumulation of mercury.”

2.4 Dr. Erin Kelly; GNWT-ENR, Manager of Watershed Programs and Partnerships, Land and Water Division.

Dr. Kelly gave an overview of the NWT Water Stewardship Strategy: “Northerners expressed concerns about their water for quite a while as it is used for subsistence, transportation, and cultural and spiritual purposes. A few years ago, there was a collaborative effort of Aboriginal leadership, community governments; regional, territorial and federal governments, regulatory boards, and nongovernmental organizations such as Pembina Institute and Ecology North, as well as industry, and that resulted in a draft NWT Water Stewardship Strategy. Then Steve Kakfwi and David Livingstone went on a community tour and public input was incorporated. The final strategy was released in May 2010. The representative for the Dehcho at the time was Joe Acorn and now, it is Dhati Tsetso.”

“The vision of the strategy is that the waters of the Northwest Territories will remain clean, abundant, and productive for all time. The strategy stresses the need for water partners to work together and share ideas and knowledge to make sound decisions about responsible water use.” Erin discussed the Action Plan which ensures the Strategy will be implemented and evaluated. Community-based Monitoring and Source Water Protection are two Keys to Success that offer opportunities for building partnerships. The third Key to Success discussed at this meeting was negotiation of Transboundary Water Management Agreements.

The goals of the NWT Water Stewardship Strategy are:

- Water that flows into, within or through the NWT, are substantially unaltered in quality, quantity and rates of flow.
- Residents have access to safe, clean and plentiful drinking water at all times.
- Aquatic ecosystems are healthy and diverse.
- Residents can rely on their water to sustain their communities and economies.
- Residents are involved and knowledgeable about water stewardship.
- All those making water stewardship decisions work together to communicate and share information.

Erin pointed out that Goal 1 uses the exact same wording as the land claims.

Figure . Dr. Kelly (left) and Christine Wenman, Wilfrid Laurier University

prepared the sonde for installation.

One of the many implementation activities of the Strategy is the Slave River and Delta Partnership which began in 2010. “People on the Slave were catching fish with bumps on them (see picture in presentation in appendix 4) and were really concerned about this. Through a series of conference calls with communities, Aboriginal governments and organizations, territorial and federal governments, and researchers, we identify what had been done, what was being done and who was doing what, what communities want to do in the future and how can the group best work together to answer the questions/concerns communities have. Communities requested a workshop to identify how the environment should be monitored and how science and traditional knowledge can be brought together to monitor the Slave River. An Aquatic Ecosystem Health Indicators workshop was held in Fort Smith, in March 2011. People talked about all of their concerns, local and those from outside the NWT, but overall they wanted to know:

- Can we drink the water?
- Can we eat the fish?
- Is the ecosystem healthy? Will our children and grand-children still be able to do the same things we are doing?”

“A step in the process was to compile all that is known about all components of the environment/watershed in the area, and then identify what is NOT known, and of those gaps, what are the things we want to know first.” This information is in the State of the Knowledge (SOK) report and the Vulnerability Assessment and prioritization report. Funding was requested for the items on the priority list. Monitoring and research is currently underway.

The Community-Based Monitoring process from the Slave is a made-in-the north framework for doing community monitoring and the Slave is a pilot project. Any community can initiate this process. GNWT-ENR Land and Water is currently working with Sambaa K’e and Radili Ko (Fort Good Hope) to develop their own watershed-wide monitoring program.

GNWT-ENR Land and Water has purchased various monitoring equipment (YSI units, GPS, cameras and passive samplers) and communities can borrow it. Land and Water also offers various capacity building and training services. They also support communities by identifying funding sources and partnership. Finally, a calendar, which identifies funding sources where communities can apply for community-based monitoring projects, was published in 2012, and a calendar on source water protection is planned for 2013.

Figure . Mike Low installing a sonde in Trout Lake during spring 2012.

After presenting the sampling equipment in more detail, Erin shared information about the current monitoring programs. In addition to the work done in Sambaa K’e, Radili Ko and on the Slave, eleven (11) sondes were put out during the ice free season. These sondes measure temperature, conductivity, pH, oxidation/reduction potential, dissolved oxygen, turbidity and chlorophyll on a continual basis. Sondes were put in the Slave River (in the Delta near Fort Resolution and near Fort Smith), on the Hay River, the Peel River (this was lost when it floated out to sea but was replaced), and along the Mackenzie from Fort Providence to Inuvik. The Liard River will be set up next year. Devices (passive samplers) that can be used to collect samples for dissolved polycyclic aromatic hydrocarbons and dissolved metals will also be deployed at the same locations. In addition to this, a full suite of basic parameters in grab water samples will be analyzed at each location. All data will

be available on a website that is being developed.

Regarding Source Water Protection, workshops were held in Inuvik and in Yellowknife in March 2011. GNWT worked with Robert Patrick, a Saskatchewan expert in source water protection and representatives from communities in the NWT to produce a NWT Source Water Assessment and Protection Program. All NWT communities were invited to the workshop, which provided information and training on source water protection. Participants were given the opportunity to reflect on the needs of their communities and develop a preliminary plan. Resources are available and communities who wish to pursue this plan further can contact Erin (erin_kelly@gov.nt.ca).

The last key to success for the Water Stewardship Strategy is the development of bilateral Transboundary Water Management Agreements with Alberta and other upstream jurisdictions. The purpose of these agreements is to protect NWT waters. These agreements will be discussed on a watershed basis: Slave River, Hay River, Liard River and the Peel River. Negotiations with Alberta for the Slave River should begin in fall 2012 and options for discussion will be clarified by in January 2013 (tentative date). No substantial change to water quality, quantity and flow is one of the key interests of the NWT. Limits for individual physical and chemical water quality parameters will be negotiated.

The Mackenzie River Basin is very big. “We have concerns about what is happening in Alberta, British Columbia, Saskatchewan and Yukon.” It is important that data is collected throughout the basin, and that monitoring data be comparable with upstream jurisdictions. Currently, Mikisew Cree (MCFN) and Athabasca Chipewyan First Nations (ACFN) in Fort Chipewyan in Alberta, who have their own monitoring programs, are invited and participated to some NWT meetings. The Slave River and Delta Partnership is currently designing a study to assess contaminants in mink/beaver/muskrat. MCFN and ACFN also have a muskrat monitoring program. There are concerted efforts between GNWT, these First Nations, and the Technical Services of Alberta Group to coordinate data. This sort of partnership and concerted efforts are important as they allow gaining an understanding of what is happening on rivers, not only in a specific community but in the whole watershed.

Finally, a new website will be available this fall: www.nwtwaterstewardship.ca. Packages have been sent out to communities. Jennifer Fresque-Baxter is leading this project and is hoping for your comments.

Dr. Kelly’s presentation can be found in appendix 4.

Comments/Questions from participants

- Participants wanted to know about the sediment core and fish study results of the summer in the Slave River and delta.

Answer: Erin could not release the information. The information is shared with the communities first, and then communities decide how and when the information will be released widely.

- Participants inquired about the passive samplers. Richard Lafferty asked that these devices be compared to the type of instruments used in the Oil and Gas Industry, an instrument that is very precise; take measurements at one location but cost hundreds of thousands of dollars.

Answer: The polyethylene membrane devices (PMDs) and the polar organic chemical

integrative sampler (POCIS) are relatively inexpensive (around 50-100\$ each) although the analyses are costly (\$350-\$400 per sample). This is interesting as you can have many devices at many different locations for a reasonable cost. GNWT bought 200 last year. What is interesting with those samplers is something you cannot do with a water sample: archive the samples for a long time before analysis. The PMDs stay in the water for thirty days and the POCIS for three days. The length of time is also an interesting aspect of this type of sampling as it can pick up an average of everything that is passing by that one location during the time it is in the water.

- Cheryl Cli (LKFN) inquired about the process of negotiation and if industry is involved. “How can water protection happen when the federal government influences the issuance of the permits for the oil sands? How are they going to be unbiased to ensure that our water is going to be safe here? It is a question out there for everybody. I am not expecting an answer but it is something we need to think about.” Cheryl also requested that representatives of the communities along the Mackenzie River be present during the negotiations to ensure traditional knowledge is taken into account.

Answer from Dr. Kelly: “Negotiations are government to government; they do not include industry. In the NWT, Aboriginal Affairs and Northern Development Canada (federal department previously Indian and Northern Affairs Canada) has the mandate for water management, and GNWT through devolution would get that mandate, both parties are at the negotiating table. Various GNWT departments currently have mandates over water: Municipal and Community Affairs is in charge of affairs related to the provision of drinking water, Health and Social Services is responsible to assess if water is safe for drinking, Environment and Natural Resources works on source water and at the watershed level, and Public Works and Services’ mandate is related to equipment and maintenance. These departments work together through a group named “Interdepartmental Committee on Water”

To ensure fair negotiation and representation of community concerns in the agreement, ENR requested community input and aboriginal leadership input throughout the process and continues to do so as the process moves forward. The Chief Negotiator for the NWT is Merrell-Ann Phare, who is a world-renowned Canadian lawyer for Aboriginal water rights. People on the negotiating team are working hard to make sure it is the best agreement that it can be. The NWT and Federal governments have signed onto Land Claims, which say there will not be substantial change in quality, quantity and rate of flow. GNWT is clear on that the Land Claims and Treaties in effect need to be respected, and it is how it is proceeding at this point. Signing an agreement with Alberta is the best tool we have to ensure that the levels of various parameters, including quantity and rates of flow, will be met at the border, and that action can be taken in case these criteria are not met; it is what we need to do to protect our water. An Aboriginal Steering Committee that provides guidance and input guides the Water Strategy, including transboundary water management agreement negotiations. Dahti Tsetso, who is now replacing Joe Acorn, is on this committee and is also providing input as a technical advisor for the DFN. A negotiation package is being prepared and sent out to all chiefs and Bob Overvold will meet with leadership to decide what should be factored in the negotiation.

- Richard requested that Mills Lake and Beaver Lake be considered in the sampling and hope sediment cores be collected there too. Back eddies could be a good place to sample.

Answer: (Erin) Sediment cores are more easily obtained in a lake than in a river. In the main channel of a river, the water fast and sediments move. Marlene mentioned that

cores were collected in GSL and results will dictate what the next step is, where further sampling is needed.

George informed that DFO has collected sediment cores from Trout Lake last winter but the federal government has eliminated the DFO contaminants section and the samples are archived. A proposal has been submitted by GNWT to get the analyses funded.

- Marie Lafferty mentioned that government employees have suggested they should not drink the water.

Answer: Erin confirmed that data from MACA does not show that and the monitoring done this summer will reveal more information. “Parasites such as Giardia (beaver fever) can be in the water so it needs to be treated” added Marlene.

- Chief Sabourin noted that tar sand operations will expand and more water will be used. Already there are areas where we can walk across creeks we never been able to walk across. In addition, tailings ponds are seeping from the bottom and contaminate water.

Erin confirmed that this would be taken into consideration in the negotiations. We know climate change affects the level of the water, quality and quantity. In the transboundary agreement, we will agree on an amount that can be used in the Alberta portion of the Mackenzie River Basin. They will agree on levels of various parameters that will define water quality and levels regarding quantity and rates of flow. Mechanisms of actions in case of non respect will also be included in this agreement (for example, compensation, legal actions, etc..).

- Cheryl finally suggested that we might need another water conference. The last one in the NWT was in 2007.

George informed that AAROM funds some travel to the “Keepers of the waters” is a national annual conference.

- Participants then shared their concerns on drinking water, chlorination and trihalomethanes, the carcinogenic compounds that may be formed if too much chlorine is used. Some community members drink directly from the lakes and rivers, but not as often as they used to. Others filter their chlorinated water twice. People do not like the taste of chlorine. Solutions were suggested by participants: letting the water sit to reduce chlorine concentrations, filtering at the tap, etc..

Many questions were raised: Is the chlorine in the water causing cancer? Do carbon filters remove contaminants and chlorine? What about the quality of the bottled water? Any data available on these questions?

Answer: Those questions were not completely answered and should be included in future educational programs. Kami explained that chlorination is needed to kill pathogens and that the levels of trihalomethanes are monitored. If water were not chlorinated people, particularly those who are most susceptible (e.g. kids and elders) could develop diarrhea and other sickness. Erin clarified: “If the water is chlorinated in the appropriate amounts, it does not create trihalomethanes. It is when it is over chlorinated that those

trihalomethanes are formed.”

Figure 12. Participants and presenters from left to right at the table : Jessica Jumbo, Jennifer Fresque-Baxter, Marlene Evans, Kami Kandola, and at the back, Yvonne Norwegian, Marie Lafferty and Margaret Ireland.

2.5 Dr. Marlene Evans, Environment Canada; Contaminant studies in the Dehcho

Dr. Evans presentation is in appendix 5.

“Scientists are people that never take things for granted; they always ask questions”, said Marlene with an enthusiastic passion for her work to encourage everyone to question what is happening around them and be curious enough to continue to seek answers. The main goal of the presentation was to present enough information about mercury such that communities could identify the lakes/ rivers that may be of concern in their area.

Marlene began her talk with an explanation of what mercury is and where it comes from: “Inorganic mercury, which is everywhere in the environment, is transformed by bacteria into organic mercury, a form that can be taken up by plants and animals. For this reaction to occur, certain conditions need to be present: a slightly acidic environment, warm temperatures, and the presence of organic matter and bacteria. Mercury can be harmful when it is in the organic form and at certain concentrations.” Inorganic mercury is much less harmful.

Marlene then shared on mercury through history and how mercury moves in the environment. Sediment core studies show that more mercury was released in the 1800-1900s than earlier times but concentrations decreased in the 1970s-80s as people learned how to reduce mercury emissions and releases. She went on explaining the importance of understanding the movement of mercury on the planet and importantly, the food web as it determines the bio-magnification of contaminants. Mercury levels have been measured in various species over the years and have determined this biomagnification. The data presented (slide p. 8 and 9) show that fish at lower trophic levels, such as Cisco, do not accumulate as much mercury as those at higher levels (Lake Trout or Northern Pike). Levels of mercury also tend to increase with fish age and length. “The reason this happens is because the fish do not release mercury that quickly and it accumulates over time. It is somewhat different in humans because humans can vary their diet more, eating different kinds of plants and animals while the fish diet does not vary so much. Human can control their uptake, so you can eat fish that has mercury and not eat it for a while and release the mercury you took up during that time.” Dr. Kelly added that levels in fish can also change when they move from one river system to another and change their diet for a long period of time; diet also changes as fish get larger. However, it is not the case for most fish in the Dehcho lakes as fish are mostly confined to their water body.

In the Dehcho, mercury concentrations in fish are higher in some lakes than others even though there is no coal combustion, flooding from hydro projects, chemical plants or municipal and industrial wastes released in the immediate watershed. Why? “Conditions around the lake and in the lake are favorable for mercury to be converted into forms easily taken up by the fish. DFO studied many lakes in the Sahtu and the Dehcho between 1998 and 2002 and then Environment Canada conducted further food web studies were conducted to understand the high levels. It was found that small lakes had higher mercury concentrations in water. The water was brown and warmer. It was also

found that predatory fish had higher levels of mercury and that mercury concentration began to exceed 0.5 ppm once fish reach 10-12 years old. Mercury concentrations were highest in fish that were not fished much. However, whitefish from all across the NWT are good to eat, being below 0.2 ppm on average.”

Studies were conducted on two species (lake trout and burbot) from three locations in the Mackenzie River Basin, downstream from the influences of Albertan activities. These were burbot at Fort Good Hope and lake trout and burbot in the West Basin and East Arm of Great Slave Lake. Increases in mercury concentrations were observed in both species from all locations and these increases were related to warming and other climate trends. The long-range transport of mercury from the increased burning of coal in Asia also is under investigation. There was no evidence that this increase was related to oil sands activities; a recent study found no evidence that mercury concentrations were increasing in fish in the oil sands area although this study did not focus on lake trout and burbot but walleye and pike. The mechanisms that explain the observed increases in mercury in the Mackenzie River Basin are not fully known.

During the coming years, the mercury studies will aim at identifying if increases continue to occur and if they are driven by air temperatures, permafrost melt, increased bacterial activity, increased Asian emissions, or a combination of those. Dr. Evans will continue to study the lake sizes, depths, and their water chemistry, including background levels of mercury, and the food chains, fish age and length to gain a deeper understanding of the dynamic of mercury in those lakes.

Marlene then presented the results of the recent studies in Deep Lake, McGill Lake, Sanquez Lake, Ekali/Kelly Lake, Tathlina Lake, Trout Lake, Willow Lake, Big Island Lake, and Fish Lake. In general:

- Mercury is transformed to an organic form by bacteria and this occurs more efficiently in warm and productive lakes such as wetlands and in shallow lake waters.
- Concentrations differ between species:
 - Low concentrations in whitefish and suckers.
 - Higher concentrations in pike, walleye, trout and burbot.
 - Higher concentrations in predatory fish older than 10 years old
 - Old fish suggests low fishing pressures.
- Mercury concentrations vary with the lake:
 - Higher in small, warm lakes with lots of wetlands.
 - Lower concentrations in large, deep cold lakes.

Finally, Marlene outlined the continuing mercury studies and suggested work for the future. As this increase seems to be related to climate change and the trend is toward further increase in temperature and further melting of the permafrost (release of trapped mercury in water ways), periodic assessment of mercury levels in fish will be required. Assessing mercury sources, particularly local sources (man-made and natural), reservoirs and long-range transport, is also of value. Moreover, in addition to monitoring, understanding the changing environment, the condition of the lake, is essential. She encourages everyone to include other aspects, such as productivity, in the monitoring

programs that will be developed.

This year Environment Canada will:

- Continue the contaminant trend monitoring program on Great Slave Lake, fish will be monitored at Hay River, Lutsel K'e and Fort Resolution
- Develop a monitoring program with Fort Resolution (CIMP funding received). Water will be monitored at the water intake and tested weekly for total phosphorus and chlorophyll measurements, and once a month phytoplankton, metals, nutrients and major ions. Temperature, pH, turbidity, water colour, iron and manganese concentrations are routinely being measured by the plant operator. This new monitoring will help understand seasonal variability in productivity cycles and, after several years, if the productivity is changing in Great Slave Lake and why. Because community members are doing this sampling, this is a good example of a community based monitoring program. Marlene is working with Fort Resolution on data presentation and interpretation.
- Continue mercury studies around large mercury emitters in southern Canada. This program looks at atmospheric trends and concentrations in mercury in sediments and fish, spatial patterns in mercury around the emitters, and food web biomagnification. The focus is the coal fired plants in Alberta, the smelter (now closed at Flin Flon) and coal fired power plants in southern Saskatchewan.

Comments/Questions from participants

- Richard Lafferty: Would wetlands be more of a concern than the lake themselves? Horn Lake system is surrounded by wetlands. It is similar in Trout Lake, surrounded by wetlands. (see answer above).

- George Low: What would be the levels in human flesh?

Answer: Marlene guessed it would probably be like a whitefish or lower because we are not eating meat and fish all the time. Kami confirmed that blood levels normally measured in humans are normally parts per billions (ppb), not parts per million as in fish. The amount of fish consumed and the duration (how long one has eaten fish) are factors to consider when evaluating how quickly mercury is cleared from the body. The person's size and weight are also factors of importance in accumulation. The concentration in blood is an indication of the accumulation in the body, including the brain. Mercury can be managed well in adults but not as well in babies and young children as mercury is incorporated in their tissue while they are developing.

- Chief Sabourin: Mercury accumulates in nervous tissues. It is possible that the behavior of fish could be affected?

Answer: George commented on a study on the behavior of marine mammals that looked at the effect of mercury on behavior and suggested that it is possible that fish behavior could be affected as mercury affects the nervous systems.

- Richard reasoned that fish should be healthier in the spring, before freshet since they spent the winter in cold water and the methylation slow during the winter.

Answer: Marlene said some results suggested that some fish lose weight over the winter and mercury could be more concentrated at that time. However, a study of Arctic Char showed that these differences were not large. It may be that because fish flesh is more watery when fish are not well fed, this tends to lower their mercury concentration somewhat even if they lose weight.

- Chief Sanguetz noted that water that have high phosphorus, such as water containing fertilizer and sewage, could contribute to increased algae growth observed and phosphorus should be monitored. Jean Marie River has concerns regarding their sewage lagoon. He also inquired about the phosphorus being included as a parameter in the transboundary agreement.

Answer: Certain temperatures and nutrient levels are needed for the promotion of algae growth. There are fair amounts of phosphorus in the NWT but nowhere near the concentrations observed down south and they have a longer growing season down south. A monitoring program could look at total phosphorus and chlorophyll. Erin confirmed that transboundary agreements would include phosphorus and nutrients. Phosphorus is routinely monitored in the Slave and other rivers as part of water quality monitoring programs.

- Richard Lafferty talked about the possible inputs coming from the Akaitcho territory and affecting the waters of downstream jurisdictions. There is a lot of nutrient rich chemicals and diesel fuel used in blasting during exploration activities.

Marlene mentioned that the dilution capacity of Great Slave Lake is so large it would likely not be detected at current release rates. Impacts would likely be observed locally if any impact can be detected. Environment Canada, Environmental Protection Division monitors such issues in the Slave and Mackenzie River. Erin added that the mines have independent review committees that review this type of activity. Aquatic effects monitoring are normally done by consultants specialized in the field.

- George warned that of lesser scrubbing standards of the coal burning industry and guidelines in the USA, and that Canada might follow these standards shortly. It is important to pressure for strict regulations. As climate warms up, trapped mercury will be released and methylation will increase.

Answer: Marlene added that there would be a review report coming out in a year or so about mercury in the Canadian environment under the Clean Air Regulatory Agenda (CARA); this program also is supporting some of her mercury studies in southern Canada. This report can be used to help negotiate mercury releases at an international level.

- Richard Lafferty shared his flying experience: “At 15000 feet in the air, there is a brown layer of air that is visible.” He mentioned that there are only two air quality monitoring stations, one in the Mackenzie River Delta, and one in Nahanni Park. “We should encourage the installation of a monitoring station. We should have a station here in the Sahtu.”

Answer: Marlene commented that the “the long term data set from Alert does not say much about mercury in the air down here.” Erin informed that there will be a new station in Fort Smith and that there is one around Inuvik. The one in Fort Smith will measure deposition in snow and rain. As it is unlikely that it will be possible to set up an air quality station in the Dehcho due to cost restraints, snow studies could be conducted. It can be easily done and trends can be followed over time.

Sambaa K'e expressed interest in a station and snow studies to CIMP/GNWT earlier this year.

- Cheryl would like to see more snow studies. She inquired about the quality of the various snow: “Grand-ma prefers the crystallized snow, not the fluffy stuff.”

Richard Lafferty pointed out that there might be different concentration of contaminants in the different layers and at different time of the year. The Dehcho region normally gets a lot of snow in February and March.

Answer: Erin explained that, although dilution is a consideration, snow studies are usually done on integrated samples, which means the whole depth of snow, not every layer. There have been a few studies on different layers but this is not normally what is done. If a problem is detected then layers can be studied. Marlene confirmed that levels are normally in parts per trillion (ppt), so it is not usually a concern for drinking. Snow and water are normally not of concern, as the mercury it contains is not methylated. Mercury that can enter the food web is of concern, particularly in a warm, acidic, anoxic (without oxygen) environment. However, accumulation of inorganic mercury over time in an area where methylation can occur could be of concerns. Also it would be of concern if mercury levels in snow were increasing over years of monitoring.

- Richard asked about the effectiveness of methylation in acidic and basic environments, and discussed the possible variation of acidity over the years. He also shared a story by Elder Daniel Sonfrere: “Leaves on willow trees are the size of muskrat ears when the pickerel run.”

Answer: “It is better in slightly acidic environments”, confirmed Marlene. Erin added that it is easier in anoxic (no oxygen) environments. Bruce Townsend pointed out that the lakes in the Dehcho are normally well buffered, and can neutralize inputs of acid rain. Marlene noted that acidity and oxygen levels have been tested and were not of concern although low oxygen conditions do develop near the sediments in some lakes. It seems to be a combination of factors that are involved in the changes seen, including the size/depth of the lake and how old are the fish. Studies at the surface of the bottom layer of those small lakes, where organic layer and bacteria are, could reveal interesting information. George acknowledged the value of bridging traditional knowledge and science, and pointed out that the story would more likely correspond to a change in temperature in the water, not a change in pH.

2.6 Grand Chief Herb Norwegian, Dehcho First Nation

Day 1 was concluded by Grand Chief Herb Norwegian who shared stories about fishing and recent studies in the Dehcho: “Fish on the Horn Plateau are all different than the ones from the low land; mercury levels are not as high.

The communities of the Dehcho feel that our waters need to be protected. We are people of the water - water is part of our living. Fish that live in it are part of our food chain. We are doing studies and are involved politically to protect the watersheds, like the South Nahanni, a big initiative. The other piece we were working on was the Edézhíe, Horn Plateau. A part of that plateau is my traditional hunting ground. It is where we did the fish survey. Fort Providence has also done a similar study in the south end of the Horn Plateau. We found out that the fish are incredibly healthy. Our elders talk about the Horn Plateau; at some point if things are to get serious down in the low land, people need to be retreating back to the Horn Plateau where the animals, the fish and the water is still healthy. Those are the things that are still very strong in the mind of our elders. Water is

a sacred thing for them and for us too as we live with it every day, our very body is roughly 70% fluid. So when we talk about water, we are not talking about it out there we are talking about ourselves, how we live. It is **Figure . Dehcho Grand Chief Herb Norwegian emphasized the importance of using and caring for the land, the water and the fish.**

important that we share the same kind of view and that we try to make this environment better for ourselves.

When we first talk about protecting the Horn Plateau, we drew a circle around it and we said: "We are going to protect it." Now, we are at the final stage of getting permanent protection. These kinds of places, and of course with Ekali Lake, the five finger lakes and area around them are very important to us. Fish are part of us. One of the first things we do is to check to see how the inside are, what kind of shape they are in. When you cook them on the fire, you want to know what the texture is like. In our own traditional way, we are doing our own research, assessing whether the fish is a fat fish, a healthy fish. This is the kind of thing that we were doing in conjunction with the contaminant survey that was going on down the valley. Those fish that we ran across at Big Island Lake were incredible. There are places where we had set nets and we were pulling out, out of 100 yards nets, in roughly 3-4 hours, approximately 100 fish. I don't know what the story is for Willow Lake, we used to fish there too. These places in the Horn are loaded with fish and really good fish. We want to keep the fish healthy. From a tradition stance, we need to harvest them more. We need to go in, take the fish out so it can replenish itself, so it can bring itself back to its normal state.

This is what I have been doing. I have been in the Horn Plateau for over 20 years and every winter we are there harvesting fish. In three weeks, I will be there again, doing the same kind of thing. This is about doing something about it. If you are not polluting the water, it is important to go out there, to do something to show that you care and make the life better for the people that are coming behind. It is important to bring young people with you so they see what you are doing. How you fish, what you are looking for. It is real important work that needs to be done.

Figure . While youth learned about the food web with Bruce Townsend, adults prepared the feast.

Right in front of our very eyes, things are slowly falling apart. Along the Mackenzie River you see cliff that are starting to cave in, a lot of landslides. We never used to see that. Same thing with the buffalo in Fort Providence - the anthrax. And then you see the fish issue, where mercury is increasing. Right before our very eyes, we are seeing something that is slowly happening to us as a result of us not taking care of our water, not taking care of our land.

My take has always been we need to be out there, we need to harvest, and we need to bring children out there. Give them stories; tell them what it is they are up against. For the last few years, I have been doing that. I brought a couple of young kids up to the Horn last winter and the stuff that they talk about: "Why aren't people living up here? It is a beautiful place; people should be living up here and take advantage of that way of life." If there are young people that are actually thinking like that, there is hope that something will eventually happen. It is up to us, people around this table; we have children. We have to put the emphasis that it is their job now. We will do anything we can to protect the land but they need to take it from there and put good practices into place.

I have been listening to the good work that everyone has been doing and I really appreciate that people like you are there caring for the land, caring for the water, caring

for the fish. It is that kind of commitment that people have to have to make a better life for ourselves. And really care. Thank you, and keep up the good work. ”

2.7 Bruce Townsend, BEAT Environmental Inc.

Bruce Townsend introduced the educational modules that have been developed to support Youth Ecology Education in the Dehcho Region. The program is called SMART (Science, Music/Memory, ART) to acknowledge and honor different ways of knowing and the incredible intelligence of First Nations Youth. The modules have been designed to align with the GNWT-Experiential Science curriculum and it was noted that the recently released “Freshwater Systems” grade 12 textbook contains numerous pictures taken during recent Youth Ecology Camps held in the Dehcho Region.

Figure 15. Bruce Townsend proudly presented the article about his program published in the Dehcho Drum last year.

The programs goal is to help convince regional youth to stay in school and pursue careers in the environmental field. Kody Hardisty-Sangris assisted Bruce who acknowledged his commitment and the environmental knowledge and skills he has gained over the last few years. During the summer Kody assists with the Jean Marie River environmental monitoring program and is mentored by the community’s environmental monitor. Note that the cover picture on Mike Low’s presentation (appendix 2) is from a youth educational activity at Kelly (Ekali) Lake and Angus, Bora and Kody participated.

The strategic plan for the SMART program was presented and it is included in appendix 6 of this report. The plan seeks to answer an issue at hand: “Can we use community based science education programming to help build capacity and to strengthen monitoring programs, cumulative impact studies and collaborative management efforts within the Dehcho”?

Finally, the following Science modules were introduced:

- Toilets & Toothbrushes: reviews the water cycle and our place in it by asking the question “Whose toilet has your toothbrush been in?” It’s easy to point the finger upstream but what happens to the water after we use it? The module introduces basin morphology and using common bathroom fixtures (toilet, sink & bathtub) explores water retention, flushing times, and mass balance. This helps set the stage to consider what happens when a pollutant enters the mix.
- Quick Silver Sam: explores common sources of mercury, the history of its use, why it slips through the food web and how climate change can affect its movement.
- Marsh-Mellow Madness: introduces atoms, elements and the periodic table. Marsh-mellows are used to build molecules (water, carbon dioxide & methane) and we discuss how green house gases “trap” heat while roasting/eating our creations!

Figure 16. Bruce Townsend presented a short version of the various activities of his program to the participants.

- Ain’t it Peachy: explores the origin of water and using a peach we discuss the geology of the earth and how it became the “blue planet”.
- Buckets of Sunshine: starts by mixing acrylic paint (yellow representing “Mrs. Golden Sun” and blue for “Water” to get green for “Algae”), then uses beads and

- string to explore how energy becomes matter and how the Sexy (Secchi) Dish is used during monitoring programs.
- Freshwater Food Webs: involves field collections using a wide assortment of sampling equipment.
 - Biomagnification: uses pennies, dimes and loonies to explore how toxins accumulate in the food web and how this knowledge can be used to help make healthy “country food” choices.

3.0 Summary of community concerns

Representatives of each community were invited to share their contaminant and environmental concerns and answer the following questions:

- What Lakes/Rivers do you presently fish?
- Have they been tested for mercury (Hg)?
- Do you want them tested?

The following summarizes the discussion for each community. The items were not prioritized due to time constraints.

3.1 Tlhets'ékhe (Jean Marie River)

- Landslide: there is an area where the river is almost closed between the community and Check Point bridge;
- Water monitoring around Check Point (remediation site) – Past and current program needs to be assessed;
- Need to monitor the potential impacts of the community itself - Design a municipal environmental quality assessment and monitoring program;
- Sewage treatment plant needs to be assessed;
- Uranium: a barge sunk in the 1940's beside the community – GNWT can provide advice on how to assess this.
- The burbot study needs to be completed – Need to find new partners, as Gary Stern is not available any more. Fish were collected and archived, it is possible to collect more fish this year and archive them until funding is located. A proposal needs to be written.

Action Item: a conference call will be organized with GNWT-ENR and Environment Canada to discuss a workplan. Environment Canada (Marlene) has a new mercury analyzer and so could handle more analyses for trend monitoring studies.

- Capacity building is needed with respect to monitoring activities;
- Intercommunity liaisons to ensure communication is required;
- JMR is interested in partnering with graduate students to conduct fish studies and

mercury studies;

- The lakes that need to be tested are:

Reid Lake,

Mackenzie River (fish and water quality)

Gargan Lake (retest),

Deep Lake (retest)

Saddleli (pipeline runs by it).

3.2 Zhatie Kue (Fort Providence)

- (raised by the ZKFN) Identify all sites of concerns within the community. There are concerns around the sewage lagoon, dumps, two runoffs of brown water into the Mackenzie River, and the bridge. It was suggested that the community approaches MACA to discuss this;
- (raised by the ZKFN and Metis) Develop collaborations to design an environmental quality assessment/monitoring program for the following locations:
 - Water Intake
 - Horseshoe rapids (spawning habitat; baseline needed before development begins)
 - Mink Lake, Fawn Lake and a third one (needs a baseline before development begins; accessible by boat and snowmobile; winter fish testing possible; spring freshet should be targeted for water monitoring; it is used by the community, it is a hunting area)
 - Mills Lake (sediment sampling maybe worthwhile; there was an old Army Site at Axe Point that was investigated a few years ago)
 - Beaver Lake – big northern pikes are delicacies in the spring.
- (raised by Métis) There is a need for a discussion of the territory as a whole to identify other rivers and lakes on the territory that require sampling;
- (raised by Métis) Although representatives of the Acho Dene Koe Band (Liard River) are not present, it is important to mention that there is a gel-like substance on the territory that will eventually reach the Liard River and end up in the Mackenzie. The substance needs to be identified and monitored as it could affect downstream communities;
- (raised by Métis) Independent monitoring in areas where mining industries are. There are concerns about the cumulative effects of exploration activities that may not be monitored in the Akaitcho territory. Exploration activities use a mixture of diesel and ammonium nitrate that could eventually end up in lakes and rivers, flow down to Great Slave Lake via the Yellowknife River for example, and eventually contaminate the Mills Lake areas. There is a need to design a study that would look at the impacts of those exploration activities, determine best tests, timing and sampling location, and sources of funding – It was mentioned that these activities are on another territory and AAROM cannot go on other territories to conduct this research. Concerns need to be

raised with the Water Board and other First Nations Bands. The potential impacts from the input of those contaminants, if any were to be observed, would be localized around the exploration areas;

- (raised by Métis) Increased transportation on the highway due to the development in the Sahtu: The slopes of the highway at the river crossings are steep and the heavily loaded trucks are working hard; wearing off their brakes, and likely releasing fluids and asbestos. These chemicals will eventually reach the waters. Monitoring of the creeks and rivers along the highway is needed. – AAROM suggested identifying water bodies for CABIN protocol program.

3.3 Pehdzeh Ki (Wrigley)

- Landslides (evaluate the effects on waterways);
- Phosphate foams;
- Assess the potential impacts of the wastewater treatments of upstream communities;
- Recent spill from pipeline (duck hunting area): 7-8 Integrity digs – results not received yet – will require follow-up;
- Willow River requires a hydrocarbon monitoring program - How do we test areas that go dry in the summer?
- Saline River – It is important to put pressure on Enbridge to change the slope and pipe at this crossing as soon as possible as it is the expected next break of the pipeline (pers.comm. from an engineer to a participant);
- It is important to engage in the monitoring of the pressurization of the pipeline. Liquid chemicals were sent prior to oil flow (opening of the pipeline) and it may have accelerated/initiated corrosion of the pipeline;
- Water bodies of concern:
 - Fish Lake – Trout samples needed
 - Black Water Lake
 - Yendi Lake (also called Yendo): It is a small lake, accessible by ATV, hiking and snowmobile.
 - Bulmer Lake – requires baseline information
 - Greasy Lake
 - Allan Lake

3.4 Liidlii Kue (Fort Simpson)

- Water Analyses: The community would like a water laboratory to conduct analyses such as turbidity, pH, etc... It was explained that water laboratories require sophisticated and extremely expensive equipment, accreditations and certified personal to ensure data quality. There are field instruments, such as YSI that are available from GNWT-ENR Community-based Monitoring Program for field measurements of those parameters the community is interested in. AAROM recognized a need for more

efficient organization that could reduce cost: training on water sample collection and shipping to Taiga Laboratories in Yellowknife is needed, and recalibration of the YSI handheld and YSI sondes is needed in the communities;

- Tugboats and barges apparently don't have a holding tank, sewage is flowing in the Mackenzie – AAROM will investigate;
- There are Army trucks along the cutlines. They were buried full of fluids. Their locations need to be inventoried;
- Other sites used by the Army need to be inventoried;
- Potential impacts of the sections of the pipeline underwater need to be assessed. The community is not aware of any contingency plan for those sections. The community members do not know what to do if it breaks;
- The community is interested in developing partnership with universities;
- Groundwater has changed color during Cheryl's lifetime. She also observed changes in sediment loads;
- Education of members on how to reduce contaminant loads in the household;
- Review medical practices to ensure pills and other medications are disposed of properly. There has been instances where they were drained down the toilet and sinks;
- Assess the efficiency of the wastewater treatment plant;
- Mercury needs to be assessed in fish species of the following lakes:
 - MacKenzie River
 - Cli Lake
 - Little Doctor (already on the list, need to clarify fish collection strategy)
 - Three lakes that are used by residents on a regular basis: Tsetso Lake, Sebeston Lake, Antoine Lake
 - Horn Plateau Lakes (to be further discussed)
 - Mustarel Lake
 - Tlolah Lake (where Marie Louise Sangris cabin is)
 - Martin River (lamprey found)
 - Moose River (lots of pickerel)
- Fish Derby can be a way to encourage people to participate in the studies and collect fish that are needed and also to promote fish consumption.

3.5 Ka'a'gee Tu (Kakisa)

- KTFN has an environmental quality assessment program underway to help identify potential concerns. Most of the immediate concerns are being addressed through this program. Remaining issues are:

- The tributaries east of Tathlina and the long lake, south of Cameron Hills, which will serve as a control site for sediment sampling this winter. These need to be tested for contaminants in water and fish and it would be a good time to do this work as a team is going in, but funding is needed. The lake contains bigger whitefish with wider scales, it is a good fish for fly-in sport fishing;
- Keep an eye on the mercury levels on the commercial fishery in Tathlina. Conduct testing as soon as possible - DFO mandate.
- There are many slumping areas due to permafrost melt on the territory. Could these areas be sources of mercury loading? Can permafrost research help explain the slumping? Mapping could help compare historic and current shorelines and wetlands surfaces and maybe help explain mercury increases. – Caroline Lafontaine provided the contact information of Steve Kokelj, Environmental Scientist, Renewable Resources and Environment Industry, Tourism and Investment, Northwest Territories Geoscience Office and Micheal Palmer, CIMP Environmental Scientist Aboriginal Affairs and Northern Development Canada, Land Administration to Shawn Laidlaw and Chief Chicot to investigate the matter on August 28, 2012.
- Assess fish for mercury in Kakisa Lake and Kakisa River. Take sport fishery/tourism into consideration when doing so.
- Funding is required to get Melaine Simba working full time as a community monitor/environmental trainee.

3.6 Sambaa K'e (Trout Lake)

- A few community concerns:
 1. Effects of contaminants on dogs. It was recommended by Dr. Kami Kandola to vary their nutrition, not to feed them fish all the time.
 2. Can eutrophication, death of aquatic life and their accumulation at the bottom lead to mercury accumulation? – Marlene confirmed that it is not necessarily so some mercury is lost through evaporation from the lake surface. In addition, some mercury is trapped in the sediments as new particles form in the lake and settle to the lake floor. A low oxygen layer at the bottom could facilitate mercury transformations to methyl mercury. Mixing of the water with winds and heating and coloring could bring mercury back up to the surface.

Water bodies of concern

- Moose Lake and Moose River
- Island Lake – open military wells (area where there is no beavers anymore?)
- Cormack Lake
- Salabita lake
- Old Army site beside the fishing lodge.

4.0 Communications

4.1 Sharing the message with community members.

The workshop provided a lot of information. An essential outcome of this two-day session was to identify the main messages and the ways to share them with community members.

It was agreed that the message could be summarize to include the following elements:

“Fish are healthy: Generally, there are no concerns, even if there are advisories, because of the small amount most people normally eat. The advisory is directed to people that eat fish every day, especially predatory fish. In addition, pregnant women and young children are more sensitive to mercury (see explanation is section 2.3) and so should be more careful in frequently eating predatory fish.

Then one should discuss the lake, the species and the size of the fish:

- **Location:** Not all lakes have advisories; certain lakes are perfectly fine. The small shallow lakes tend to have fish with higher levels of mercury in predatory fish. Predatory fish on big lakes tend to be of better quality.
- **Species:** Not all species are of concerns: Longnose suckers and Whitefish are of excellent quality. Only predatory fish (Northern Pike, Walleye and Lake Trout) tend to accumulate mercury in amount that may be of concern. Lake Trout, Northern pike and Walleye (pickerel) are good to eat in certain lakes.
- **Size:** Smaller fish have less mercury. On small shallow lakes, members should avoid Northern Pike, Walleye and Lake Trout.

Other elements that help convey the message to people who developed a fear of eating fish were identified:

- A new depth of understanding was gained with the more recent studies but there is still a lot of work being done to identify the lakes where mercury levels are low in fish and no advisories are needed.
- There are more benefits to eating fish compare to the risk, which is very low. The benefits outweigh the risks.
- Half of the mercury taken in is flushed out of the body within 50 days.
- Pregnant woman and children can benefit from eating fish, especially fish that are not predators.
- It is ok to eat certain sizes of fish, i.e., smaller fish.

4.2 Communication channels

Participants brainstormed on the ways to share the message to the community.

- **Public Media**
 - Public media are essential as understanding mercury accumulation is important for everyone in the NWT. As a first step, George and Kami met with the DehCho Drum Editor and an article was published in the September 30th edition.

- Encourage NewsNorth to follow-up on DehCho Drum story - DHSS
- Publish the information on the AAROM Website.
- Encourage members to share about the workshop on social media.
- Encourage authorities to publish the information (MLA facebook pages, Dehcho Newsletters, etc.)
- Door to door information.

AAROM has funding available to hire a First Nations individual. The person could be in charge of coordinating the transmission of the information and visit homes to educate those who want about mercury, the studies conducted, the risk associated with mercury, the benefits of eating traditional foods and encourage people to eat fish. The coordinator would include in their home presentations: explanation of advisories, comparative pictures and tables, nutritional value of store bought (appropriate (vegetables, eggs, fish, steak) and inappropriate (chips, candy, coke, ice cream, bologna) food and emphasize good traditional and good store bought food. Community members wishing to be visited at home could call their band office to make arrangements. This method was deemed the most suitable to reach elders, particularly those who stopped eating fish. The Band Offices should identify Elders that need to be reached.

- Public Health Nurses.

Public Health Nurses need to be trained to convey the information to visiting patients. A poster, with a lot of pictures, should be posted at every nursing station in the Dehcho.

- Teaching in the schools

Ensure the information is incorporated in the Junior Science Modules and Aurora College Science and Nursing Curriculum

- Promote community fish fry.
- Promote lakes where all fish species tested perfectly good to eat. (media communications, big sign, etc..).

Appendix 1 : Workshop Highlights

Highlights of Day one were summarized and discussed on Day 2. Community members commented and information was added. This is the value added product. The group that raised the item is identified in brackets.

A. Considerations for future studies.

Prioritization was not completed due to time constraints.

- Ensure both traditional knowledge and science are integrated in all research

(DGGB).

- Ensure the Dene Way of Managing resources are better used in the current management practices (DGGB).
- Include stock assessments in lakes where contaminant studies are conducted. (LKFN)
- Conduct fish and water quality studies around each community at various time of the year. Ensure fish along the North Nahanni and Mackenzie River are assessed. (Métis-Fort Providence)
- Test fish organs for metals and organics. Focus on organs that are eaten traditionally by community members, such as fish guts. (JMRFN)
- Include all sizes of fish caught including smaller fish during mercury assessment studies. (Dr. Kami Kandola)
- Investigate harvest of big fish to decrease mercury levels (GNWT-ENR).
- Investigate history of mercury using otoliths (GNWT-ENR).
- Effects of mercury on fish behaviour (DGGB).
- In future study reports include a discussion on the changes in traditional harvest (reduced fishing) on contaminant accumulation in aquatic life/fish (LKFN).
- Conduct a hair/blood study in the Dehcho – include fishing lodge employees (Métis and LKFN).
- Study impacts of mining exploration (blasting mixtures (diesel and ammonium nitrates and by-products) on water quality (Métis).
- Study contaminants in small mammals in Providence area (DGGB). GNWT-ENR researcher Brett Elkin is conducting a study on contaminants in small mammals (mink, beaver, etc...). Caroline Lafontaine informed him that DGGB was interested to participate.
- Initiate snow studies.
- Continue sediment core studies. Métis of Fort Providence are interested in sediment information from Mills Lake and Beaver Lake.
- Conduct air quality studies.
- Initiate food chain monitoring studies.
- Study nutrient levels in water (JMRFN)
- Investigate what coast guards use to “burn” the plants on the shoreline of the Dehcho. Are they using herbicides that are banned in other provinces? Ensure it is tested for at the Mackenzie River sampling sites (LKFN, Métis; AAROM action item).

B. Subjects on which community members need to be further educated:

- Monitoring Program Design: Gaining an understanding of how an environmental quality monitoring program is designed would allow for a different perspective on

our approach to water and land in that way (Jean Marie River).

- Fracking: A workshop that inform community members on the various types of fracking, identifies the gaps in current information and the elements to consider in decision making, and address safety issues is required. Who will lead this project? This is particularly important since new technology is to be introduced (propane) and the shale deposits they now want to access are closer to the surface. (Jean Marie River)
- Current state of knowledge: Prepare plain language summaries of information available in each watershed based on the state of the knowledge reports (see content in Section C below).
- Sources and forms (including ionized) of mercury in relation to safety and accumulation in water bodies, fish and human (detail mercury cycle).
- Summarize hair/blood study results and inform members that they can request mercury tests.
- Explain advisories: how they are calculated, what they mean.
- Comparison of the quality of bottled water and current tap water quality in each community, and filtered water.
- Transboundary Agreement Negotiations.
- Importance of traditional foods in the diet for First Nations culture and health: Teaching should reach youth as they eat more store bought food than elders.
- Feedback from National Water Conference. Should we have another water conference in the NWT? By whom? Regarding a water conference, George informed participants that the Dehcho will send delegates in October to Fort Nelson “Keepers of the Water” gathering. Sam Gargan, Sam Elize and Keyna Norwegian were funded as delegates for the Dehcho.
- Ensure Brett Elkin from GNWT-ENR follows-up on the five dead moose found recently. (Anthrax?)

Comment from George regarding funding available and future AAROM activities: GNWT-ITI (Industry, Tourism and Investment) has funding for those who want to attend conferences (SEED program). There is also funding available for boat safety training. AAROM applied for funding to deliver a course to meet the new requirements. Certificates for pleasure/non pleasure use will be mandatory shortly. Too many people are drowning. AAROM is looking for funding to deliver the MED3 and SVOPC as monitors need to be certified for next season. No pleasure craft certificate is needed if one has a MED3 certificate. It was discussed that the tests need to be adapted to the reality of the NWT. Most youth cannot pass the test. The reason why adults do not pass the test is usually because they missed a day.

C. Suggested Next Steps

- Continue to monitor water and fish quality and quantity by:
 - Monitoring lakes used by communities as a priority
 - Monitor subsistence fishing where it is substantial

- Communities interested in developing an environmental monitoring program can contact AAROM and/or GNWT-ENR. The process could include:
 - An assessment of municipal sites of concerns.
 - State of the knowledge (SOK) reports for the community watershed.
 - Vulnerability assessment study.
 - A Municipal and Watershed-wide monitoring program design that addressed the most urgent concerns
 - Development of partnership with universities and other agencies.
- Discussion with Andy Sanderson, Wilfrid Laurier University in September 2012 to decide what will be done on five lakes (JMRFN). Decide on the forms of partnership needed.
- Prepare plain language summaries of information available in each watershed to inform community members, include (and ensure SOK include this information also):
 - History of contaminants of each lake (clearly stating the first and last year of data available)
 - Type of changes observed on the territory.
 - The contaminant levels in all environmental components (moose, muskrat, waterfowl, fish, etc.).
 - Local food chain graphs and bioaccumulated levels of mercury.
 - Information on fish stock of fish in the various lakes of the territory.
 - Meaning of advisories.
 - Information clearly identifying the size and type of fish that can be eaten, effects of cooking on mercury levels, etc...
- Ensure training programs (Aurora College and others) are adapted to what is happening in the NWT and community concerns (JMRFN).
- AAROM will develop a strategy and action plan to improve communication between agencies involved in contaminant research.
- Improve the advisory reporting mechanism to ensure people do not stop eating fish. Consider:
 - Changing current advisories to include amounts in pounds along with amounts in grams.
 - Changing the signs that are currently posted because they scare people. Use more pictures of all different species and sizes to clearly state what can be eaten.
 - Jean Marie River will work with GNWT-HSS to design a better sign.

- GNWT-HSS should visit communities to further explain the meaning of the advisories to community members.
- Many barriers to traditional food use were identified, and include pollution, time required and costs for harvesting, and licensing to purchase ammunitions. They contribute to youth consuming less traditional foods. Communities may want to investigate these barriers and find solutions to increase the intake of traditional foods by youth.
- Conduct a dietary profile and hair/blood study in the Dehcho – include fishing lodge employees (Métis and LKFN)
- Prepare an information package to inform and raise awareness about mercury contamination. Prepare a communication strategy across the NWT. - Action item GNWT HSS
- Change blood test sheets at the medical centers in the NWT to include hair/blood test for mercury. Develop a series of questions nurse should ask patients before the test. (could be a great project for 2012/2013 - Nursing student).
- Develop a workshop:
 - To find ways to get our voices together to express concerns/results to stop impacts due to weakened legislations and explore what can be done to change current situations/policies (JMRFN).
 - On environmental indicators to consider when companies approach communities (type of companies and their contaminants of concerns/best environmental components to detect them)
- Regional brainstorm on the development of a process for communities to be better included in consultations and views.
- Encourage developers to hire community monitors to ensure proper monitoring protocol is being followed. Train community monitors on monitoring techniques.
- Comment on GNWT-ENR new NWT Water Strategy Website. The letters were sent out last week.
- Continue to work towards common sampling methodology/parameters with First Nations in the Mackenzie River Watershed in British Columbia, Alberta and Saskatchewan.
- Find funding to analyze the sediment cores already collected.
- Organize a conference call with GNWT-ENR and Environment Canada to discuss a workplan for the completion of the burbot study in Jean Marie River. Environment Canada (Marlene) has a new mercury analyzer and so could handle more analyses for trend monitoring studies. Find new partners, as Gary Stern is not available any more. Fish were collected and archived, it is possible to collect more fish this year and archive them until funding is located. A proposal needs to be written.
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Appendix 2: Presentation Mike Low, Dehcho First Nation, AAROM Technical Advisor

Appendix 3: Presentation of Dr. Kami Kandola, GNWT-Department of Health and Social Services

Appendix 4: Presentation of Dr. Erin Kelly, GNWT-ENR, Manager of Watershed Programs and Partnerships, Land and Water Division.

Appendix 5: Presentation of Dr. Marlene Evans, Contaminant Researcher, Environment Canada

Appendix 6: Document presented by Bruce Townsend, BEAT Environmental Inc. Facilitator and Presenter

Strategic Plan : Science Education

Issue:

Can we use community based science education programming to help build capacity and strengthen monitoring programs, cumulative impact studies and collaborative management efforts within the Dehcho?

Background :

Until recently the Dehcho AAROM program has focused on capacity building issues such as equipment procurement, training, research and monitoring program development but now the emphasis has shifted towards collaborative management initiatives designed to integrate monitoring and research efforts using a common platform to support the collection, analyses, reporting and publishing of community generated data.

In the past few years the AAROM program has partnered with ENR to deliver a blend of terrestrial and aquatic ecology training to Dehcho youth. Introducing science as a simple fun and easily understood activity will hopefully encourage students to become more involved and interested in pursuing career opportunities within the field. It was also realized that it would be advantageous to increase the general science awareness and technical skills of community monitors so that they could more effectively represent their communities and advise their leadership.

To further review training partnerships, the AAROM Coordinator attended an education workshop in Yellowknife February, 2011 to discuss integrating monitoring and education.

The workshop objectives were discussed and then collated by theme headings into a summary document and the following elements support DFN-ARROM programming:

- Promote environmental science & management as a career option.
- Create linkages with educators, youth and communities in the NWT.
- Create a youth/elder program that is tied into the school curriculum.
- Develop opportunities for educational staff to receive relevant scientific training and develop Northern-based projects.
- Use standardized protocols to build monitoring capacity in schools.
- Work with local, community, and scientific experts to establish indicators to monitor aquatic ecosystem health.
- Establish a NWT wide network of community based monitoring sites to be directed and run by community monitors.
- Develop a process so ongoing traditional knowledge monitoring can be used to guide research and program objectives.
- Ensure community concerns, perspectives and traditional knowledge is heard by regulators and used in the decision making process.

Aquatic Ecology Training Modules

To better support training outcomes, science education modules were developed for use in either classroom or field camp settings and for a wide range of applications and age levels. In order to promote educational validity and recognition an attempt has been made to harmonize module content with the NWT Experiential Science curriculum.

The key elements of the Aquatic Ecology Training Modules are:

- Fast, fun, with lots of hands on exercises and experiments.
- Suitable for Youth & Elders – honouring both old and new.
- Dehcho Culture/Language – “Gu,nah.tsiia” is Slavey for Scientist!
- Link Science and Spirituality – engaging both Head & Heart.
- A Sense of Place and Community – we are all connected!
- A Leadership Connection and Policy Development Component.

The modules are structured as follows :

- Program Level: grade school - high school – monitors - college.
- Module Level: category (geology, physics, chemistry, biology), title, science concept, performance objectives, methods, and management application. Each module will introduce science concepts that can be applied to community issues

The modules introduce the following material:

- Water Sheds, Lake Basins & Water Cycle
- Atoms, Molecules, & Greenhouse Gases
- Microbial Production & Respiration,
- Photosynthesis & Nutrient Cycles
- The Food Web & Bioaccumulation
- Fisheries and Habitat Management
- Field Measurements & Data Management
- Current issues in the Dehcho Region

Venue Options

In addition to the Youth Ecology Camp the following venue options are also possible:

- High School (Fort Simpson, Providence, & Hay River): partnering with an enthusiastic teacher is the key to success for this option.
- Winter Camps: allows year round involvement.
- Dene Yati Program: opportunity to include the critical element of language.

Recommendations:

In keeping with the above noted objectives the following components should be included within the Dehcho aquatic ecology program design:

- Youth/Elder/Leader environmental programs linked to school curriculum.
- Increased technical capacity and leadership links for community monitors.
- Youth/Monitor/Elder liaisons with strong ties to language, education and collaborative management programs.
- Immediate follow-up of the 2012 Sandy River ecology camp with visits to Providence and Fort Simpson high schools to discuss/present modules and explore options that will enhance delivery strategies.
- Develop a generic template that can be used on an annual basis to obtain CTS credit.
- Present a review of the Ecology Youth Program during the “Return to Country Food” workshop at JMR Aug 2012.

Appendix 7: Contact Information of Resource People

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Appendix 8: NNSL Newspaper Articles