Fish Mercury Project in the Dehcho Region, NT

History and reason for work: In August 2012, a workshop ("*A Return to Country Food*") was held in Jean Marie River First Nation, NT, to discuss safety, security, and health of traditional foods. During the workshop, it became clear that neither communities nor scientists fully understand why fish mercury levels are high (above consumption guidelines) and increasing in some Dehcho lakes, but are low (below consumption guidelines) and decreasing/stable in other lakes. Dehcho communities identified the need for a partnership with a researcher who would work with them to understand why fish mercury levels are so variable in the region. A partnership was developed between Dehcho communities, the University of Waterloo, and the Aboriginal Aquatic Resource and Oceans Management Program to investigate patterns of fish mercury accumulation in nine Dehcho lakes. We are investigating patterns of bioaccumulation and biomagnification in 9 lakes - some of these lakes are known to have higher mercury levels whereas others are known to have lower mercury levels. We want to find out why the lakes are different, and then link the results to climate change. There are many factors that determine mercury levels in fish, and all of these factors, such as lake chemistry, fish age, and structure of the food web could be affected by climate change. Right now we have a very poor understanding of how climate change may affect mercury levels in fish from the Dehcho Region.

Where does mercury in the North come from? Mercury is a natural element, just like oxygen, and in small amounts it is not harmful. We get concerned when mercury starts to build up in lake food chains because mercury can then start to accumulate in fish. Mercury in northern lakes mostly comes from the atmosphere – coal burning and other industrial activities in the south release mercury into the atmosphere, and the mercury travels to the north on air currents. Once mercury is deposited onto a lake or the land surrounding a lake, it can start to build up in the food chain. Small amounts of mercury are also naturally-occurring in all lakes – mercury is found naturally in different kinds of rocks. Mercury can also be released to the atmosphere (and then transported to the north) by volcanoes.

Objectives of this work:

Determine what factors (e.g., fish age, position in the food web, feeding strategy, lake chemistry) best predict mercury levels in fish in the Dehcho region. We will relate species-specific fish Hg levels to a suite of possible explanatory variables that reflect fish ecology and life history, lake ecosystem ecology and chemistry, and watershed characteristics.

- Identify most important variables for future cumulative effects monitoring.
- Evaluate whether intensive fishing could lower fish Hg levels in lakes with consumption advisories.

Activities: Field work was carried out in 2013, 2014, and 2015. The final field season will occur in 2016. In each sampling year, environmental monitors and community members (from Jean Marie River, Sambaa K'e, Ka'a'gee Tu, and Liidlii Kue FN) work with University of Waterloo researchers (Heidi Swanson) to sample fish, water, and aquatic bugs. Ekali, Sanguez, and Trout lakes were sampled in 2013, Gargan, McGill, and Tathlina lakes were sampled in 2014, and Mustard and Kakisa lakes were sampled in 2015 (Big Island Lake was scheduled to be sampled but poor weather was a problem). In 2016, Big Island and/or Willow Lakes will be sampled, and all lakes will be re-sampled for water. At the end of each season, samples are brought back to University of Waterloo, and analyses are ongoing. Fish samples are analyzed for mercury level, but also for

healthy nutrients such as omega-3 fatty acids and selenium. Aquatic bugs and water are analyzed for mercury so that we can trace mercury uptake and transfer through the food chain.

Timeline: Interim results presented at regional workshop in January 2016 (date TBA). Final results available by mid 2017.