# Spatial and temporal variability in mercury concentrations in predatory fish in lakes along the Mackenzie River and in Great Slave Lake


Marlene Evans[1], George Low[2], Derek Muir[3], Jonathan Keating[1], Xiaowa Wang[3], Mike Low[2], Diane Giroux[4], Mike Tollis[5], and Shawn Buckley[6]

Environment Canada / Environnement Canada

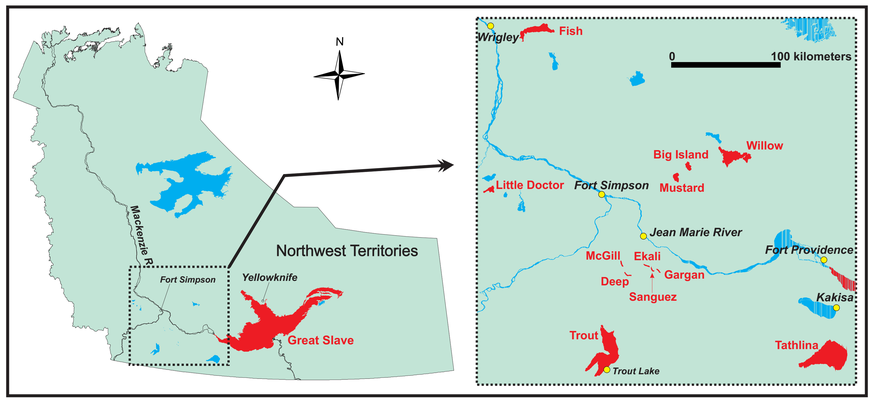
[1]Environment Canada, Saskatoon, SK; [2]Dehcho First Nations, Hay River, NT; [3]Environment Canada, Burlington, ON; [4]Akaitcho Territory Government, Fort Resolution, NT; [5]Lutsel K'e Dene First Nation, Lutsel K'e, NT; [6]Hay River, NT


## Abstract


Our previous research on mercury concentrations in predatory fish in lakes along the Mackenzie River determined that concentrations tended to be highest in small lakes, particularly where fish were old (mean age > 10 years), and lowest in large lakes like Great Slave Lake (Evans et al. 2005; Lockhart et al. 2005). Mercury continues to be of concern in northern environments because of warming trends and increased mercury emissions from Asian sources, which may be reaching the NWT. Climate warming may facilitate the transformation of existing mercury supplies into methylmercury, the form which is most readily biomagnified in food webs. This presentation highlights our investigations of 1) current mercury concentrations in fish in the smaller lakes along the Mackenzie River, comparing current concentrations with previous measurements and 2) our long-term trend monitoring of mercury in two species of fish in two regions of Great Slave Lake. We show an overall trend of increasing mercury concentrations with highest concentrations in predatory fish in small lakes.


## Introduction

- Over the past three years, Dehcho community members sampled fish populations in 12 lakes along the Mackenzie River to determine mercury concentrations in fish; these data can be compared with earlier studies.
- Mercury concentrations have been monitored annually (with some minor exceptions) in lake trout and burbot from the West Basin and East Arm of Great Slave Lake since 1998; earlier data are available from commercial fisheries records and more recent scientific studies.




## Results

### *Lakes on the Horne Plateau*

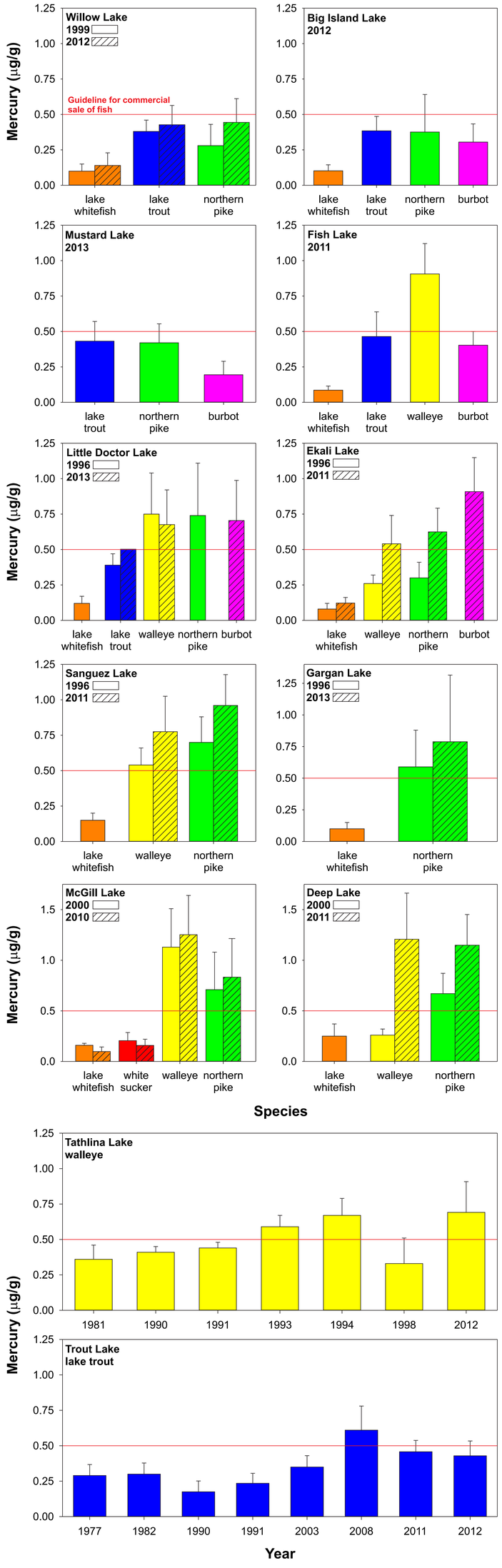
- Willow Lake (152 km$^2$): average Hg concentrations in 1999 were low (<0.05 μg/g) in lake whitefish and moderately low (0.02-0.05 μg/g) in lake trout and northern pike. Hg concentrations were slightly higher in 2012.
- Big Island and Mustard lakes (each <20 km$^2$): average Hg concentrations were low in lake whitefish (Big Island Lake) and moderately low in lake trout, northern pike and burbot from both lakes in 2012 and 2013, respectively.

### *Fish and Little Doctor lakes*

- Fish Lake (<20 km$^2$): average Hg concentrations in 2011 were low in lake whitefish, moderately low in lake trout and burbot, but high (>0.05 μg/g) in walleye.
- Little Doctor Lake (21 km$^2$): average Hg concentrations in 1999 were low in lake whitefish, moderately low in lake trout, but high in walleye and northern pike. Similar Hg concentrations were observed in lake trout and walleye in 2013; burbot Hg concentrations were high.

### *Ekali, Sanguez, and Gargan lakes*

- Ekali Lake (2.0 km$^2$): in 1996 average Hg concentrations were moderately high in walleye and northern pike. Hg concentrations increased in 2011 in both species; burbot Hg concentrations were high.
- Sanguez Lake (1.8 km$^2$): in 1999 average Hg concentrations were low in lake whitefish, but high in northern pike and walleye. Hg concentrations were higher in these predators in 2011.
- Gargan Lake (1.1 km$^2$): in 1996 average Hg concentrations were low in lake whitefish, but high in northern pike. Northern pike Hg concentrations were higher in 2013.




### *McGill and Deep lakes*

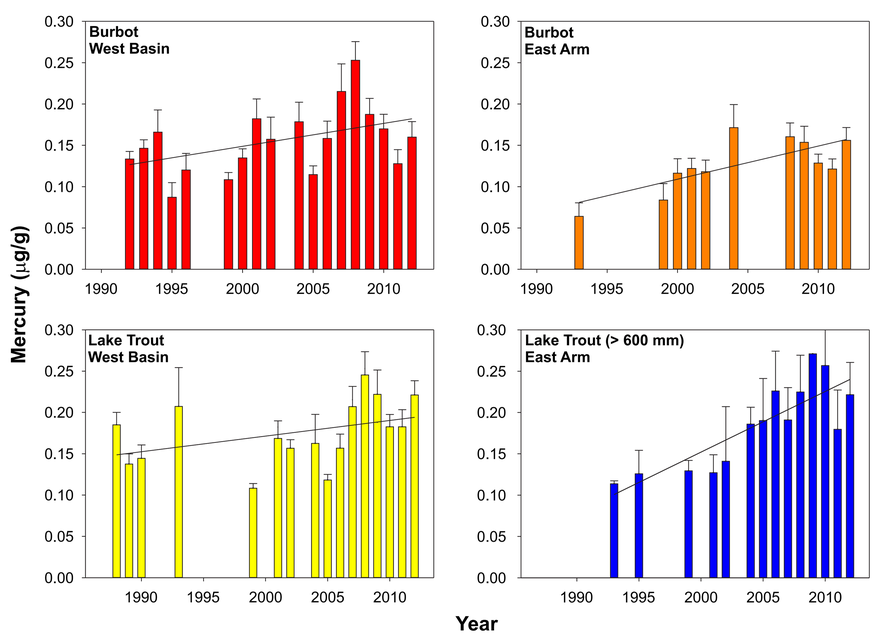
- McGill Lake (3.6 km$^2$): average Hg concentrations in 2000 were low in lake whitefish and white suckers, but high in walleye and northern pike. In 2010, Hg concentrations remained high in walleye and increased in northern pike.
- Deep Lake (2.1 km$^2$): average Hg concentrations in 2000 were moderately low in lake whitefish and walleye, but high in northern pike. In 2011, Hg concentrations were higher in walleye and northern pike.

### *Tathlina and Trout lakes*

- Tathlina Lake (574 km$^2$; 1 m deep): there is a long Hg record for walleye in this lake because of the periodic commercial fishery. Average Hg concentrations appeared to increase with time although sample size was low in most years.
- Trout Lake (520 km$^2$): has a relatively long Hg record because of the occasional commercial fishery. With the exception of 2008, average Hg concentrations were <0.5 μg/g. Sample size has improved in recent years allowing for more rigorous trend detection.

### *Great Slave Lake*

- Average mercury concentrations were low (<0.2 μg/g) in lake trout and burbot; concentrations were slightly higher in West Basin than East Arm fish.
- There was a significant trend of mercury increase in lake trout and burbot in both regions of Great Slave Lake. The reasons for this increase are being investigated, but do not appear to be directly related to warming trends. A paper (Evans et al. 2013) has been published on these changes.




## Conclusions

- ***Mercury concentrations appear to be increasing in predatory fish in lakes along the Mackenzie River.***
- ***Mercury concentrations are relatively low in predatory fish in Great Slave Lake, with observed increases occurring at a slow rate.***


**References**

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Lockhart, W.L. et al. 2005. Sci. Tot. Environ. 351-352: 427-463.
Evans, M.S. et al. 2013. Environ. Sci. Technol. 47(22): 12793-12801.



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