



The 10th International Conference on Mercury as a Global Pollutant (ICMGP)

This study built a watershed-scale framework to investigate total mercury concentration (THg) variations in freshwater sediments from active layers of streams and lakes (top 30 cm), using the open-file data compiled by the Geological Survey of Canada (GSC). The data used to ascertain these variations were taken from the lake sediments and water geochemical survey. This poster highlights the results so obtained for Nova Scotia (NS). **The framework includes the following steps:**

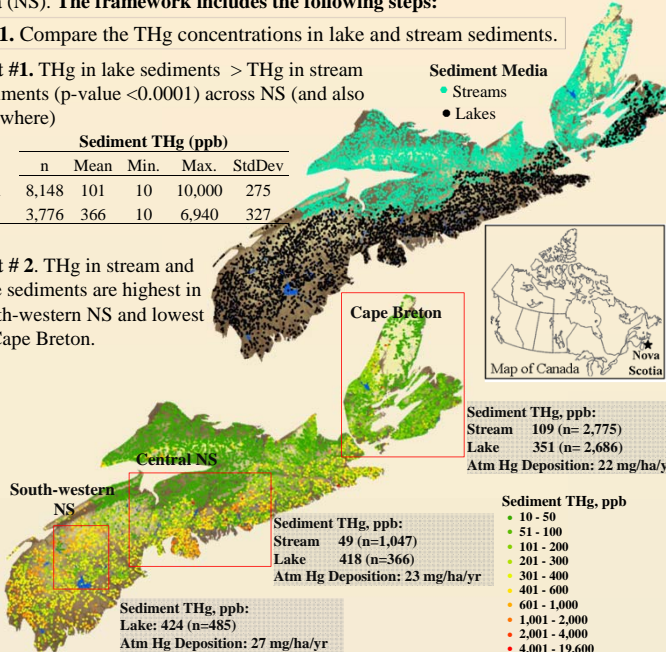
Step 1. Compare the THg concentrations in lake and stream sediments.

Result #1. THg in lake sediments > THg in stream sediments (p-value < 0.0001) across NS (and also elsewhere)

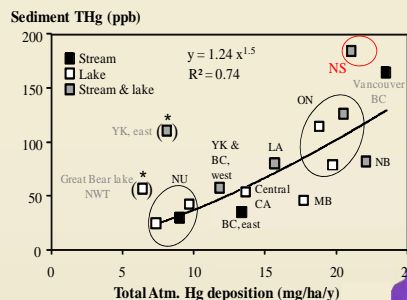
	Sediment THg (ppb)				
	n	Mean	Min.	Max.	StdDev
Stream	8,148	101	10	10,000	275
Lake	3,776	366	10	6,940	327

Sediment Media
 • Streams
 • Lakes

Result #2. THg in stream and lake sediments are highest in south-western NS and lowest in Cape Breton.

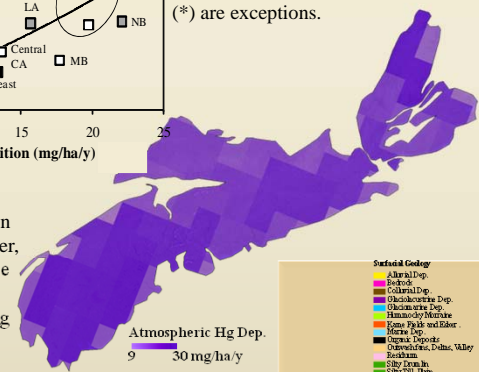


Step 2. Compare sediment THg with modelled atmospheric Hg deposition rates.



Result #3. Mean THg concentrations in lake and stream sediments are correlated with modelled atmospheric Hg deposition rates (GRAHM, 2005) across Canada, including NS, but areas with high geogenic Hg sources and past and current mining activities (*) are exceptions.

Result #4. Total atmospheric Hg deposition rates increase in NS from east to west. However, this gradient does not correlate to THg variations within the lake or stream sediments along the same direction.

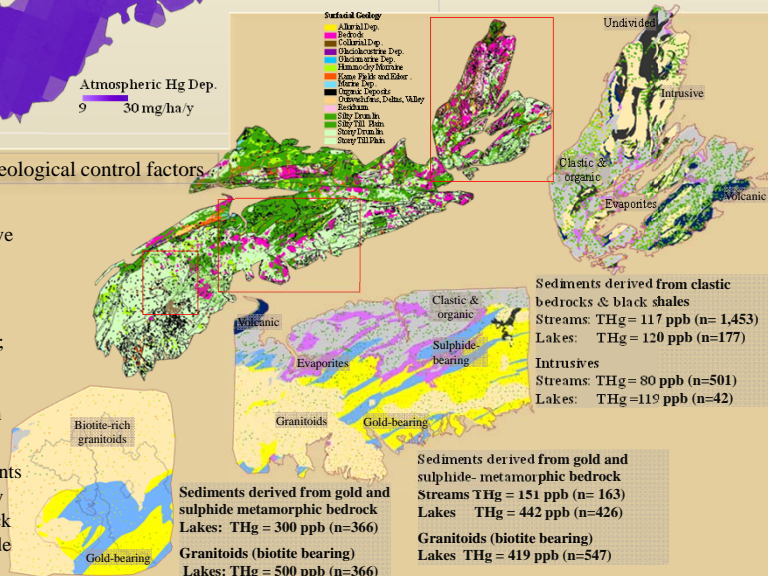


Step 3. Relate sediment THg to geological control factors.

Result #5. Areas with exposed bedrock at the surface generally have higher THg in sediments than areas with deep surface deposits.

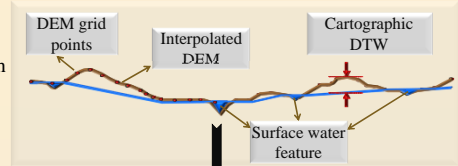
Result #6. Highest THg concentrations (2,040 – 10,000 ppb; n=30) are generally associated with gold and sulphide-bearing metamorphic rocks, and biotite-rich granitoids.

Result #7. In Cape Breton, sediments derived from clastic and organically enriched sedimentary bedrock (black shales) have THg as high as sulphide and biotite containing bedrock.

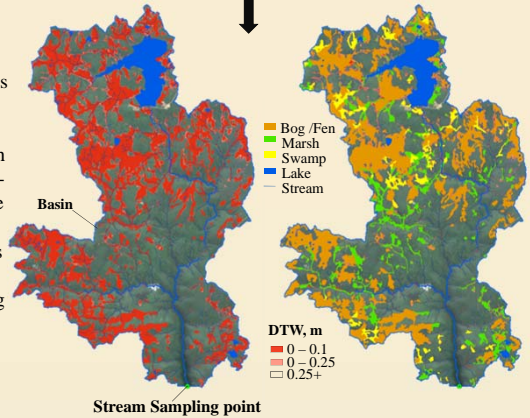


Step 4. Relate THg to the wet-area coverage per watershed above the sediment sampling locations, using the topographically and cartographically derived depth-to-water index DTW.

Result #8. All areas with DTW < 0.1m are generally poorly drained, and as such cover more area per basin than already delineated wetlands.

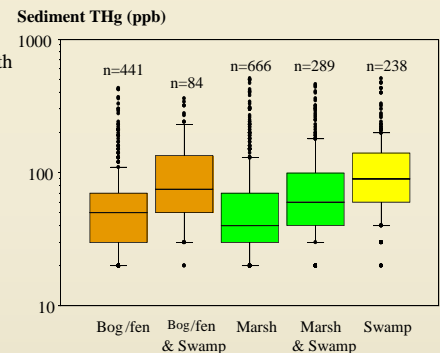


Result #9. The analysis of 2,652 Cape Breton THg data entries showed that basins with small wet-area to basin-area ratio (A_w/A_b) have high THg in stream sediments, while basins with high wet-area coverage have low THg in stream sediments.



Sediment log THg	Basin n	Basin-area (A _B) ha	Wet-area (A _W) ha	Mean (A _W /A _B) %	
				per basin	across basin
1.0-1.30	259	10.1	2.2	15.5	21.8
1.30-1.85	1,363	6.9	1.2	13.3	17.0
1.85-2.40	887	4.7	0.5	8.2	11.4
2.40-2.78	143	6.3	0.6	7.1	8.8

Result #10. Watersheds with swamps (swamp only, swamp and marsh, swamp and bog/fen) have higher THg concentrations in downstream sediments (p-value < 0.0001) than other wetlands without a swamp component



Summary. This study examined the GSC-compiled THg concentration data for Nova Scotia stream and lake sediments in relation to atmospheric Hg deposition, bedrock geology, watershed-scale wet-area coverage, and wetland type. The analyses showed that THg concentrations are higher in lake sediments than in stream sediments, and were highest in areas subject to past or current mining activities. Similar to general atmospheric Hg deposition pattern, THg is higher in south-western NS, specifically in areas underlain by biotite-rich granitoids. In addition, THg is higher in watersheds with small wet-area coverage and where swamps dominate than in watersheds with high wet-area coverage and no swamps.

