

TRAILBLAZER ADVENTURER INNOVATOR DEFENDER CHALLENGER

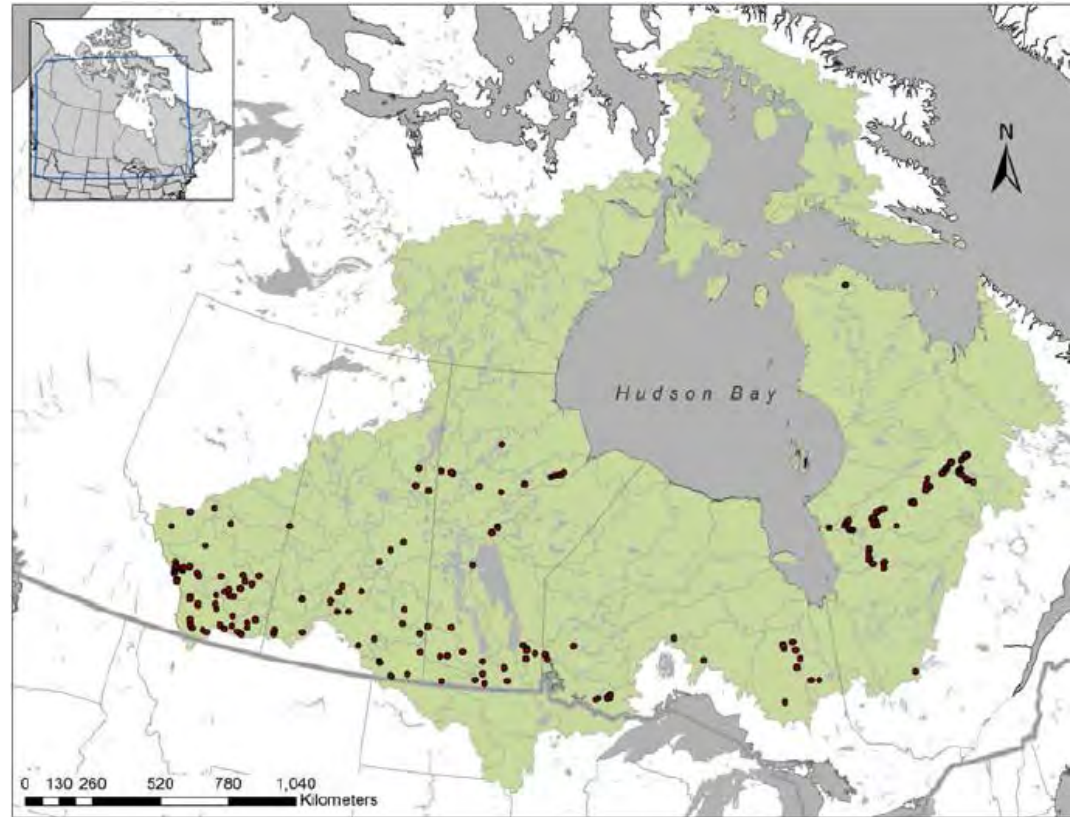
Evaluation of two high-flow-rate suspended sediment samplers for sediment source fingerprinting in the Nelson River

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and P. Owens**

May 17th , 2018

Introduction (Hudson Bay)

- Hudson Bay
- A network of 42 rivers
- > 250 dams
- A_{drainage}
- $A_{\text{Hudson Bay}}$
- Runoff yield
- 1964-2008

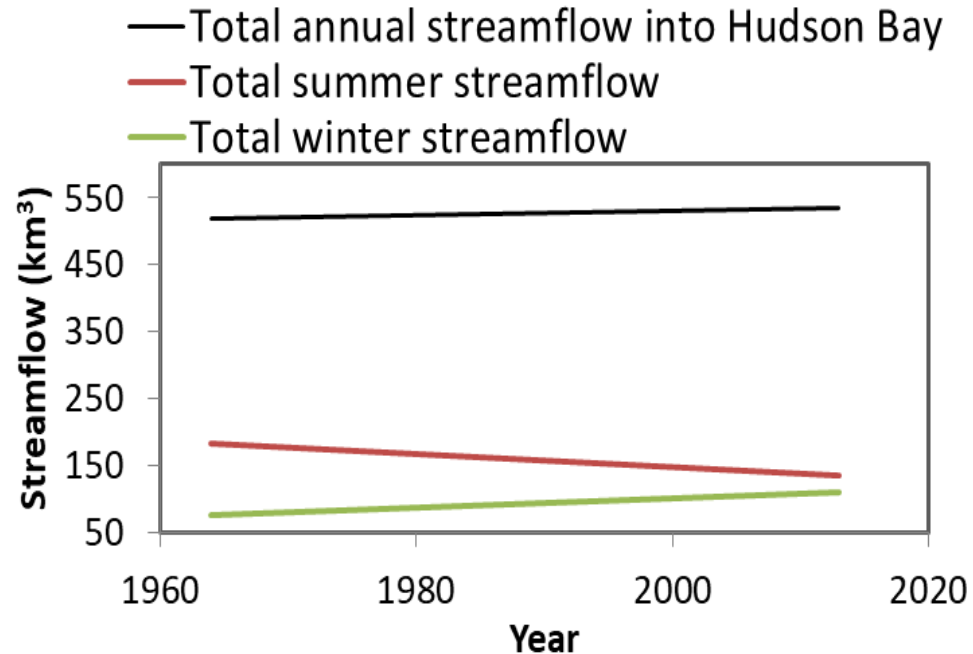


Stadnyk et al., 2016

Introduction (Anthropogenic Disturbances)

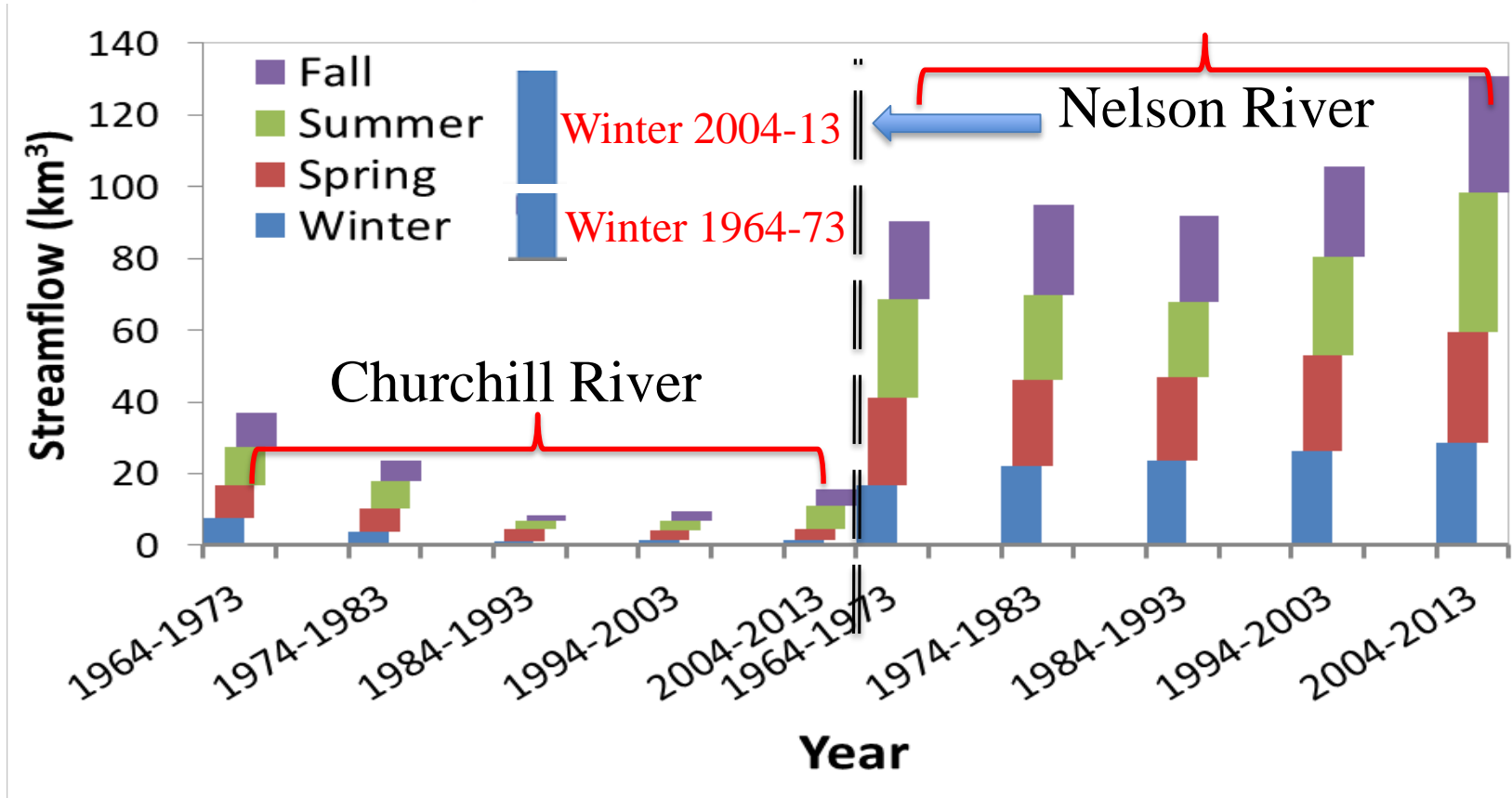
■ Nelson River

- Largest by area
- Largest by freshwater
- Influenced by:
 - Inter-basin transfer
 - Dam
 - Regulations



Dery et al., 2011

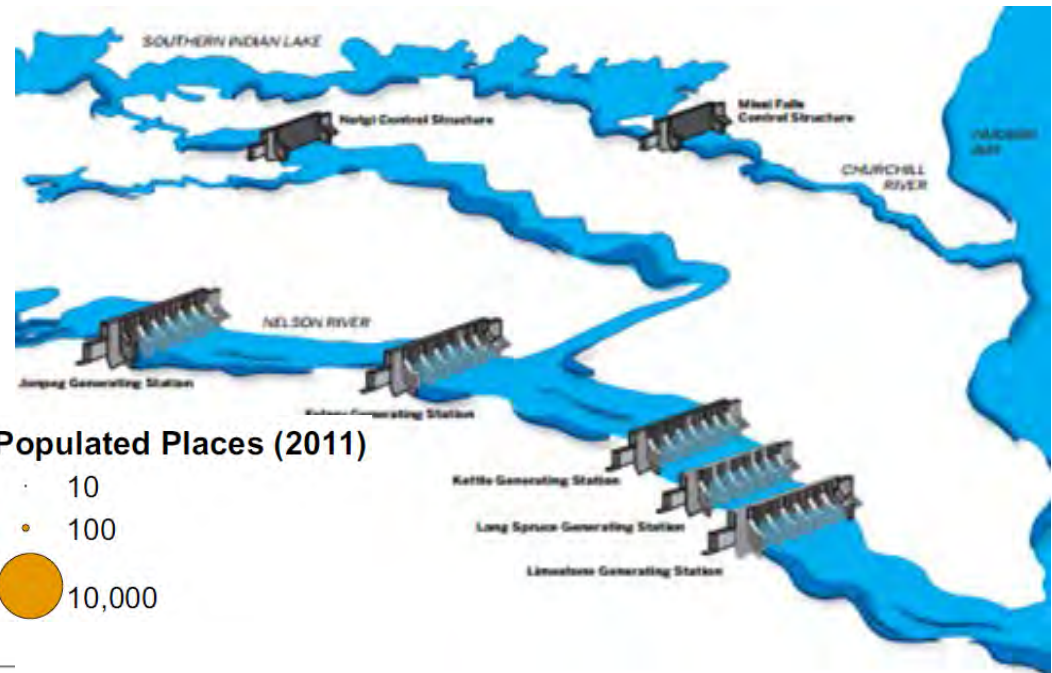
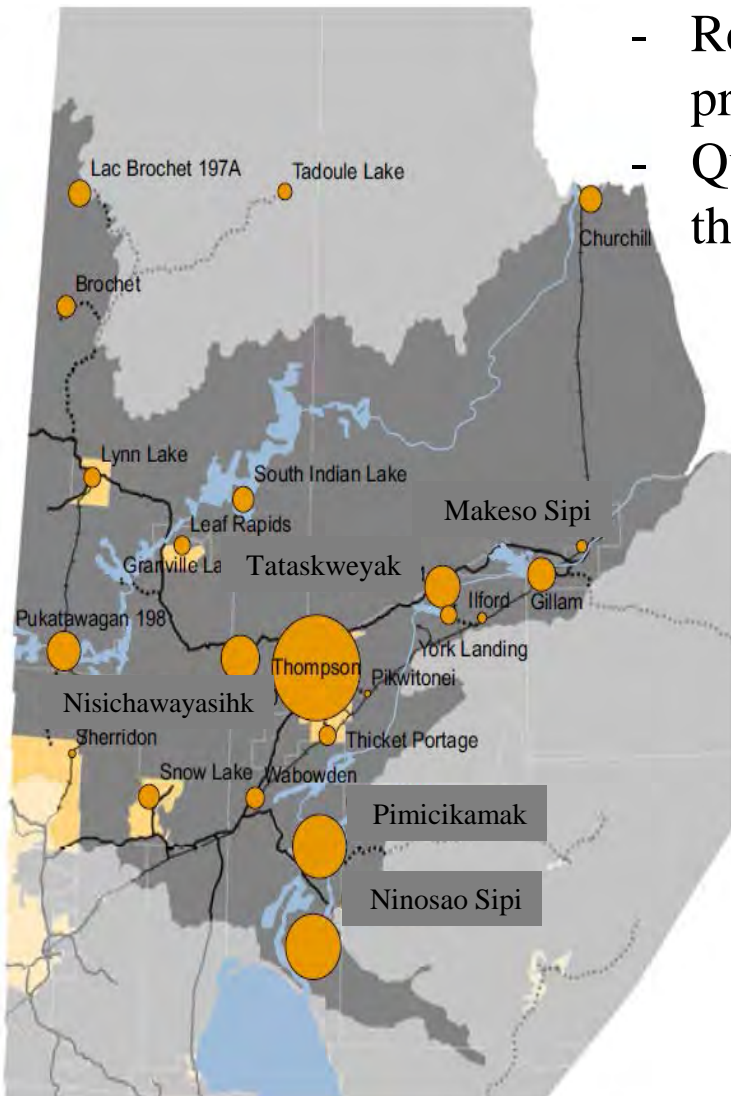
Flow Regime (Nelson and Churchill River)



Dery et al., 2016

Importance (Nelson River)

- One of the most highlighted contribution of this study
- Recent human activities may lead to excess sediment production. Therefore:
- Quantifying the effects of hydro dams can be one of the first essential steps to protect this water resource.

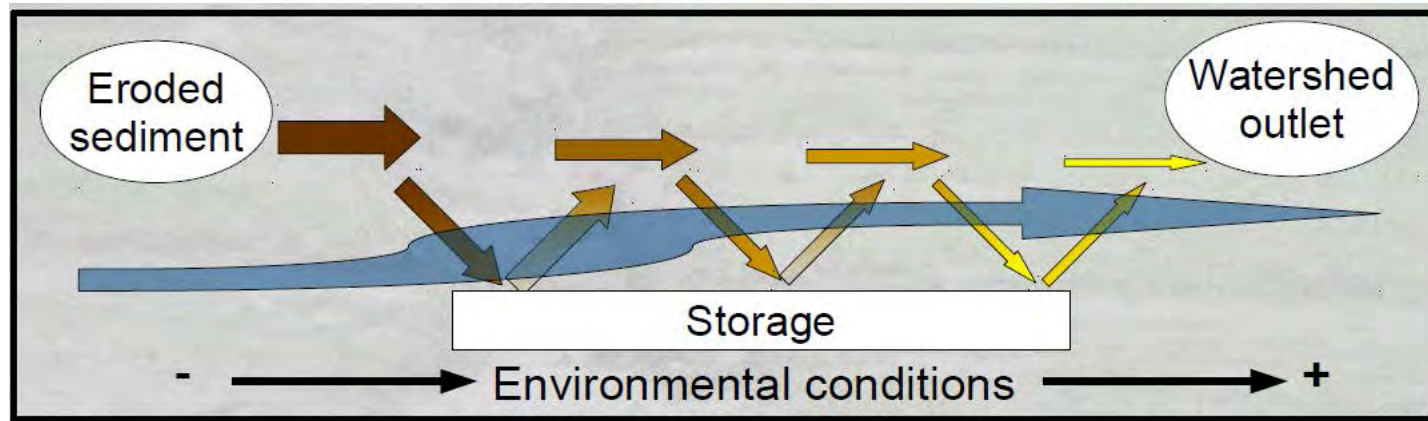


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Sediment Fingerprinting: moving from discharge to sediment

The ultimate goal of this work: provide an understanding of sedimentary processes in the Nelson River.

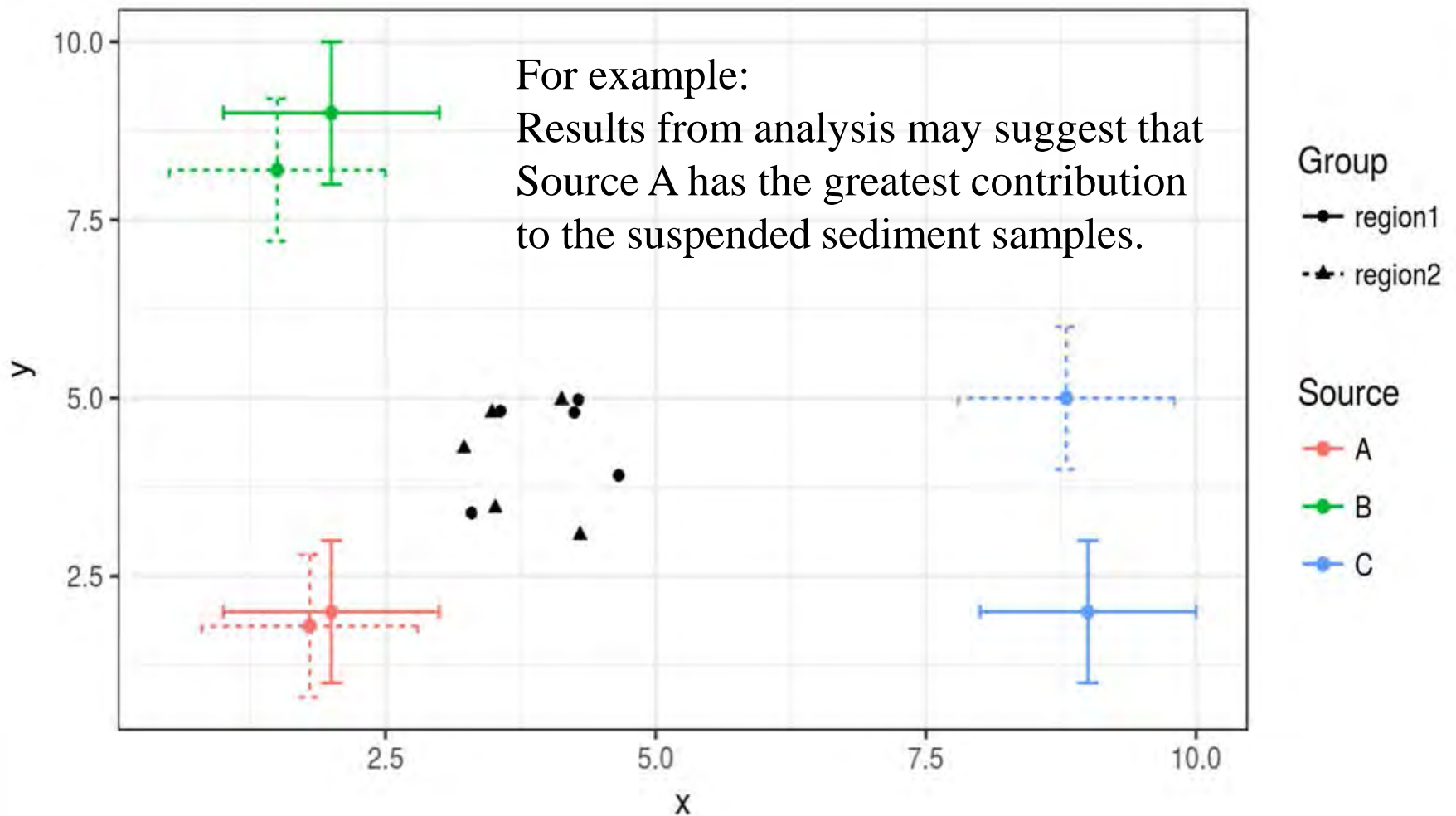
- Water, soil, and suspended sediment samples have been taken from different compartments of the area.
- Lab testing were performed to characterise these samples.
- One or more the properties of the sediment will reflect it source (i.e. by matching the fingerprint of sediment to those of the potential sources).



Sediment Fingerprinting

For example:

Results from analysis may suggest that Source A has the greatest contribution to the suspended sediment samples.

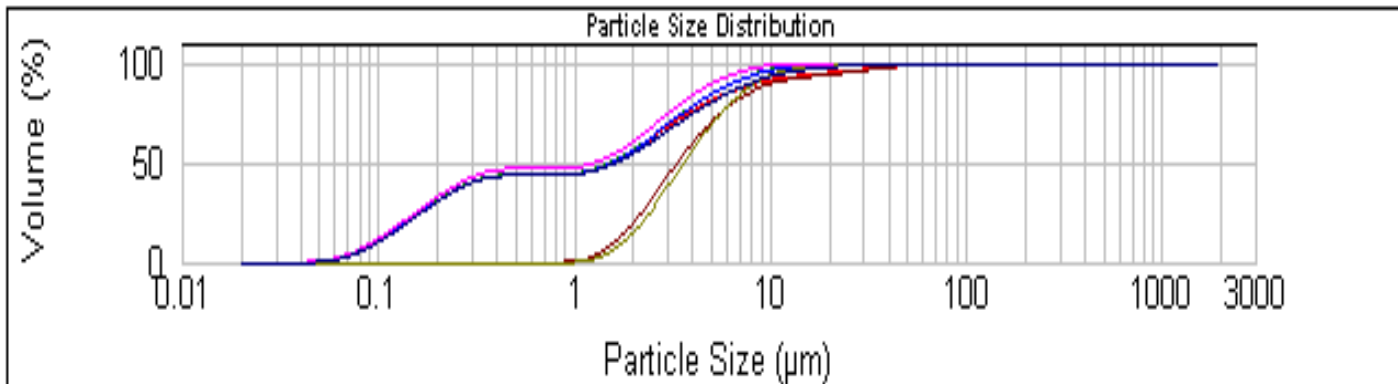


Methodology (Most challenging part)

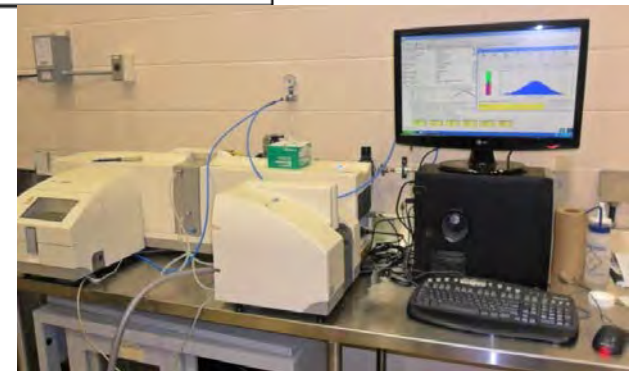


Lab Analysis (Suspended Sediment PSD)

- Obtaining *absolute* PSD of ambient and collected suspended sediment by two devices



— A7/STN2/INLET - Average, Monday, September 25, 2017 10:24:03 AM
— A7/STN2/ FILTER 2 OUT OF 4 - Average, Tuesday, October 17, 2017 12:58:09 PM
— A7/STN2/FILTER/3 OUT OF 4 - Average, Tuesday, October 17, 2017 1:05:01 PM
— A7/STN2/4 OUT OF 4 - Average, Tuesday, October 17, 2017 1:11:28 PM
— A7/STN2/CG/W GEO - Average, Monday, October 16, 2017 1:58:50 PM
— A7/STN2/CG/WOGEO - Average, Monday, October 16, 2017 2:05:12 PM
— A7/STN2/FILTER 4 OUT OF 4 - Average, Tuesday, October 17, 2017 1:11:28 PM



Sampling Program (Spring, Summer 2016 and Winter, Spring, Summer, Fall 2017 and Spring, Summer 2018)

- 24 River, lake and tributary sites
 - 7 in Rat-Burntwood River system
 - 10 in lower Nelson River system
 - 2 in upper Nelson River system
 - 5 Lakes including Lake Winnipeg
- Hudson Bay

Future Work

- Investigate the source of inorganic sediment being delivered from Lake Winnipeg to Hudson Bay through the Nelson River System.
- Explore the effects of natural (lake and reservoir) and anthropogenic (hydroelectric dams) features on the sediment dynamics in the river.

Acknowledgment



Thanks

Lake Winnipeg, June 2016