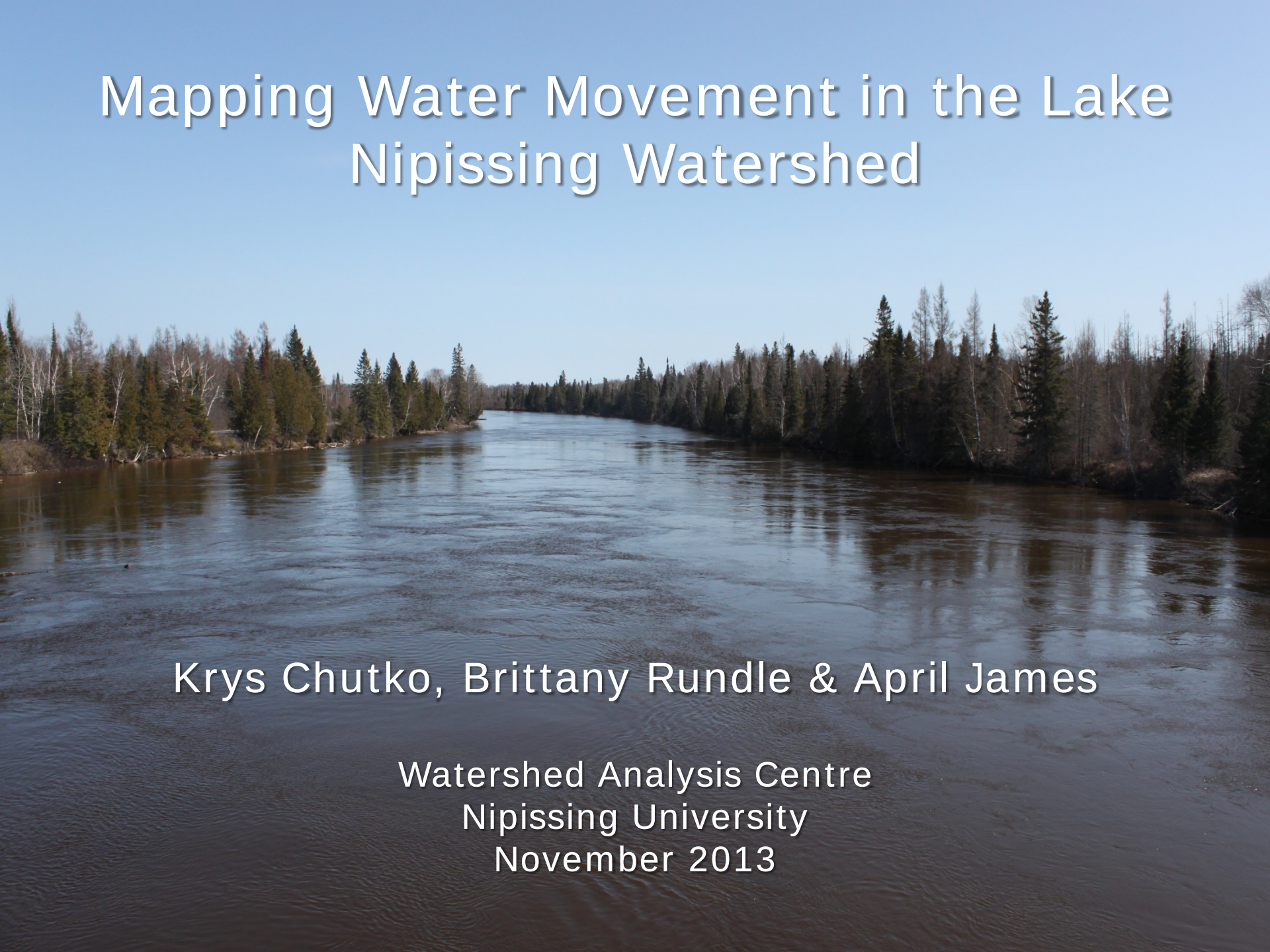
Mapping Water Movement in the Lake Nipissing Watershed



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Watershed Analysis Centre
Nipissing University
November 2013

“Panta Rhei – Everything Flows”

International Association of Hydrological Sciences

Scientific Decade 2013-2022

- hydrological systems are the interface between the environment and human needs for water

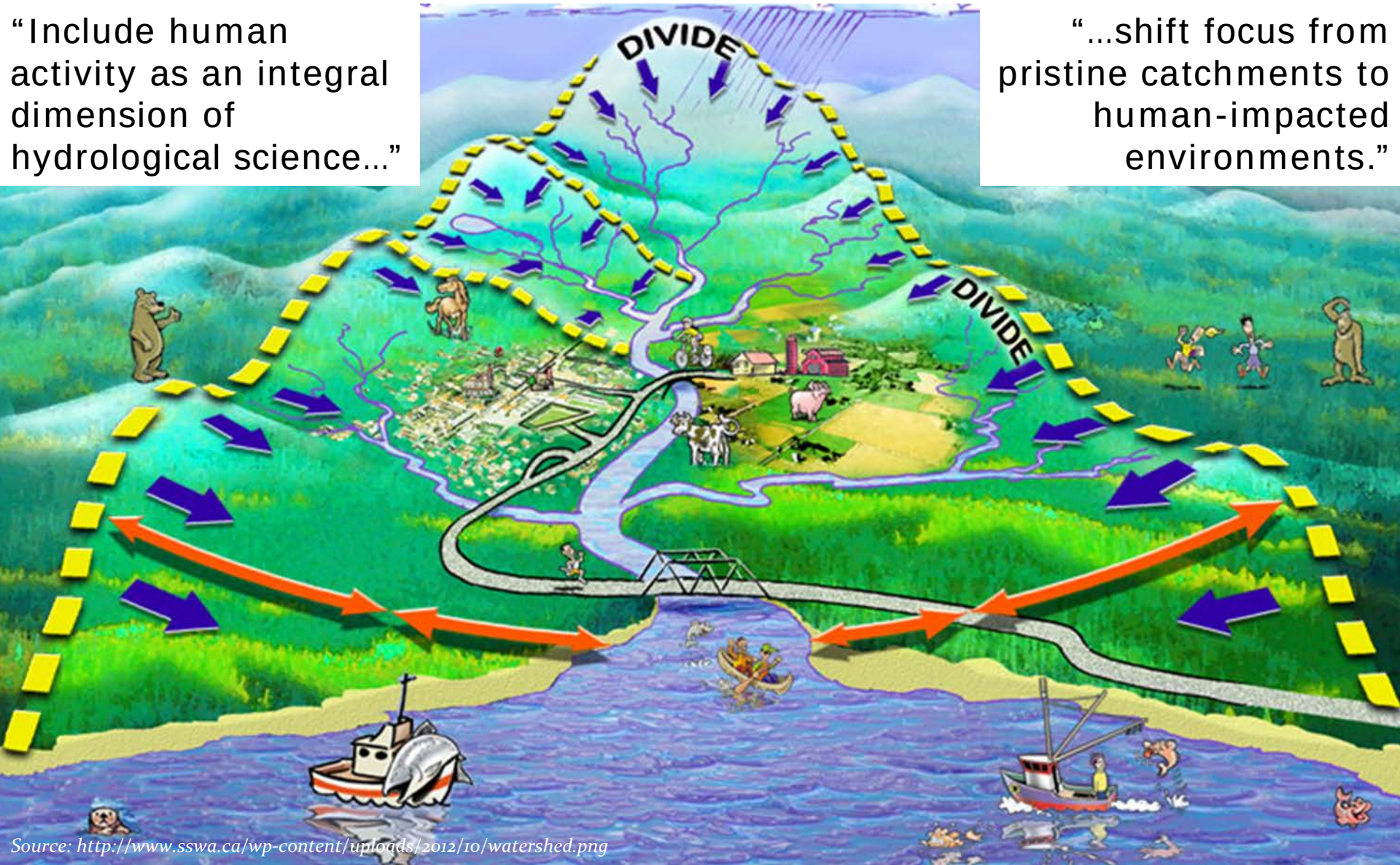
1. improved understanding of change (natural and human-induced)
2. better estimation and prediction
3. exchange between science and practice
    - key to planning sustainable water exploitation
    - managing water supplies
    - considering natural ecological environments

Montanari et al. (2013). http://distart119.ing.unibo.it/pantarhei/

“Panta Rhei – Everything Flows”

“Include human activity as an integral dimension of hydrological science…”

“…shift focus from pristine catchments to human-impacted environments.”



Source: http://www.sswa.ca/wp-content/uploads/2012/10/watershed.png

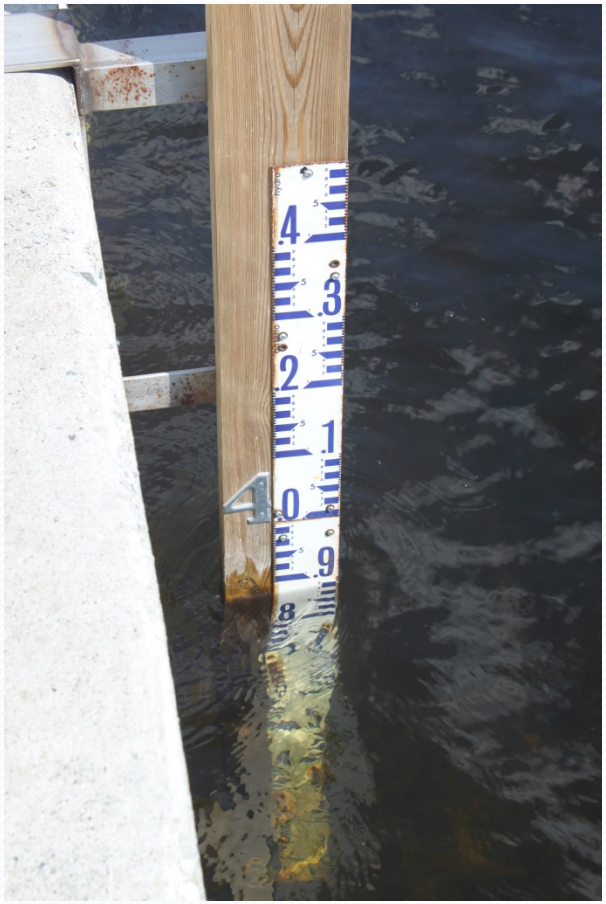
Panta Rhei in the Lake Nipissing Watershed

1. Expanding our **studies** to a set of sub-basins that surround Lake Nipissing, including urban North Bay, agricultural regions of Wasi, Sturgeon Falls, and Verner, hydropower generation, and recreational forested landscapes.

Photo: N. Mountain

Panta Rhei in the Lake Nipissing Watershed

2. Ask hydrological science **<u>questions</u>** focused on understanding the influence of storage (snowcover, lake, subsurface) and rainfall on streamflow.



Panta Rhei in the Lake Nipissing Watershed

3. Add a new **<u>toolbox</u>** (water isotopes and isoscapes) to monitor watersheds and water sources and intercompare across the expansive set of sub-basins.

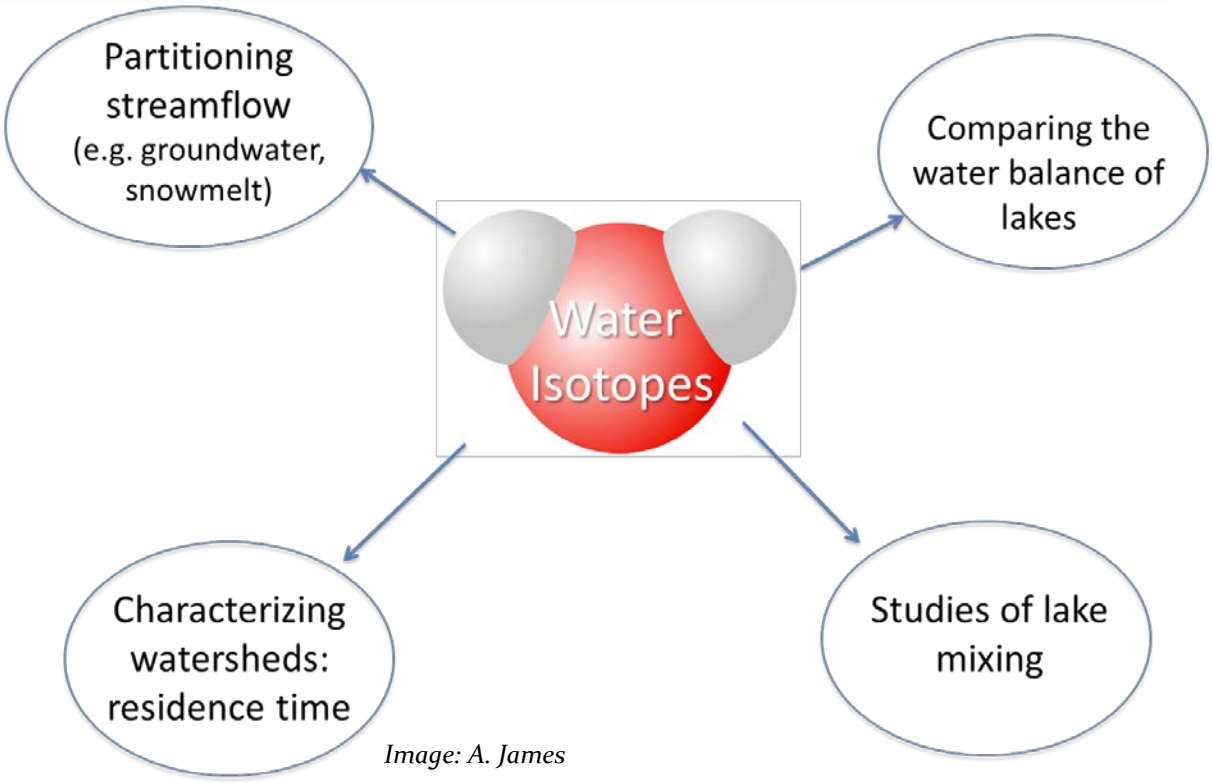
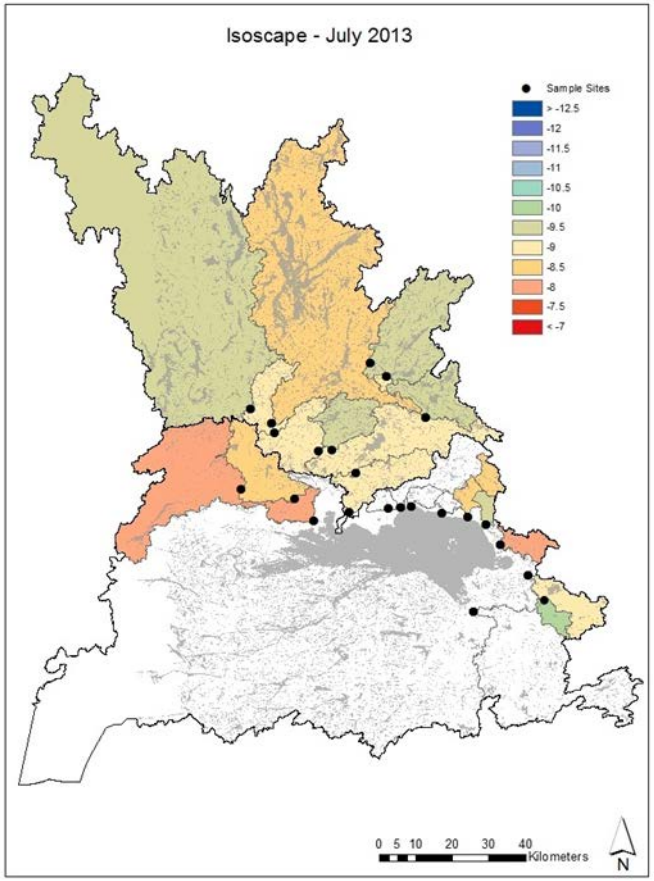


Image: A. James



Panta Rhei in the Lake Nipissing Watershed

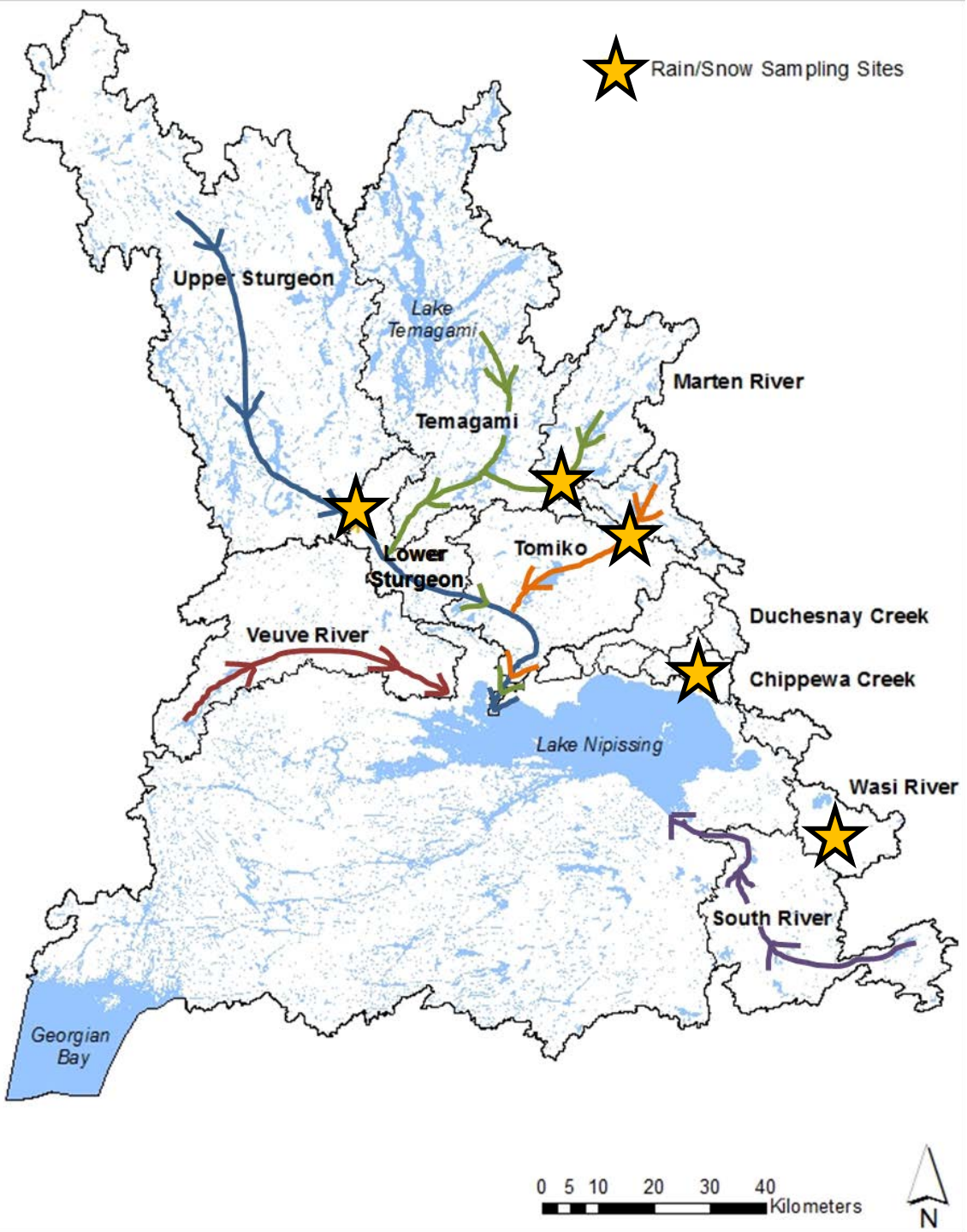
4. Establish new **<u>partnerships and collaborations</u>** (NU, MNR, MOE, NBMCA) allowing us to communicate and share this information and integrate into a hydrological-societal conversation on water security for our region (eg, Lake Nipissing Summit).

Photo: M. Blackman

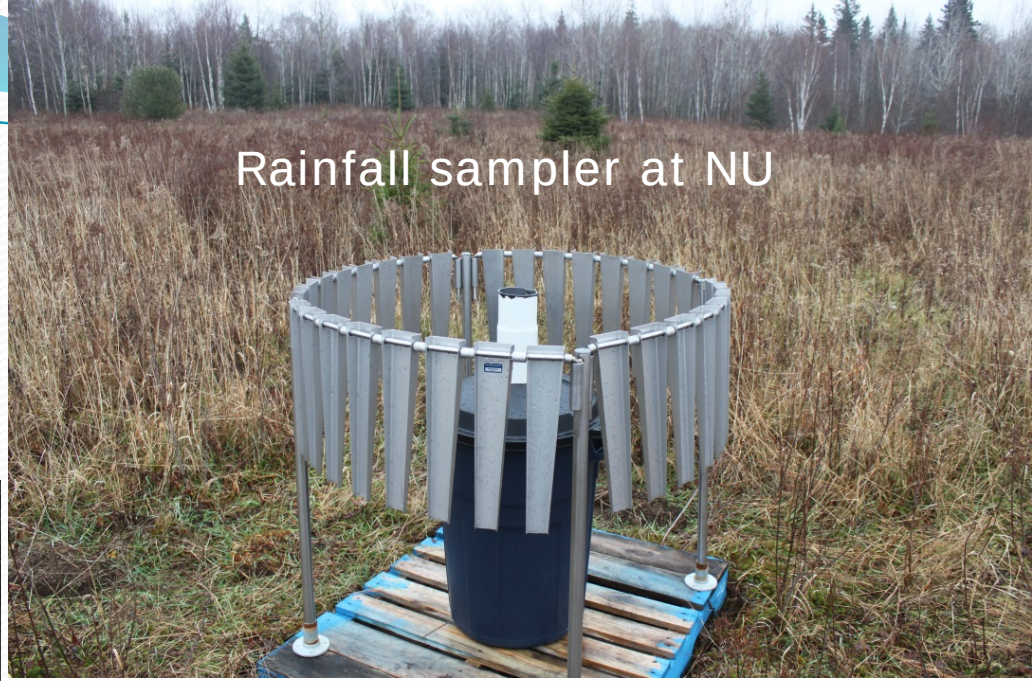
Photo: A. James

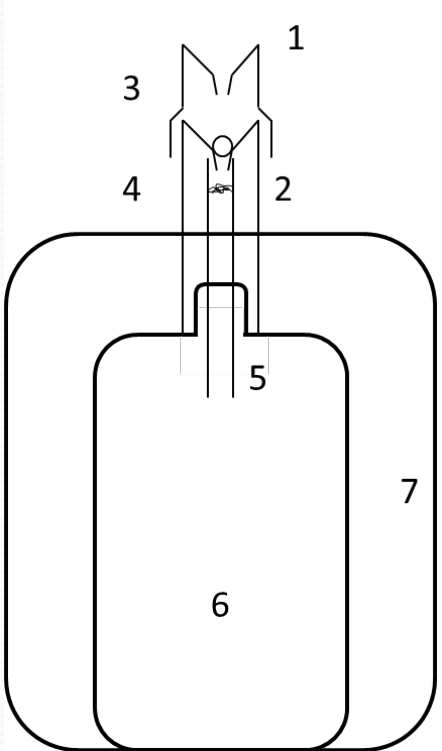
Lake Nipissing Sub-Basins

- 5 – 27 sub-basins sampled at least once per month since January 2013
- includes river, lake, groundwater and precipitation sampling
- ~9500 km^2 total



Sampling & Analysis

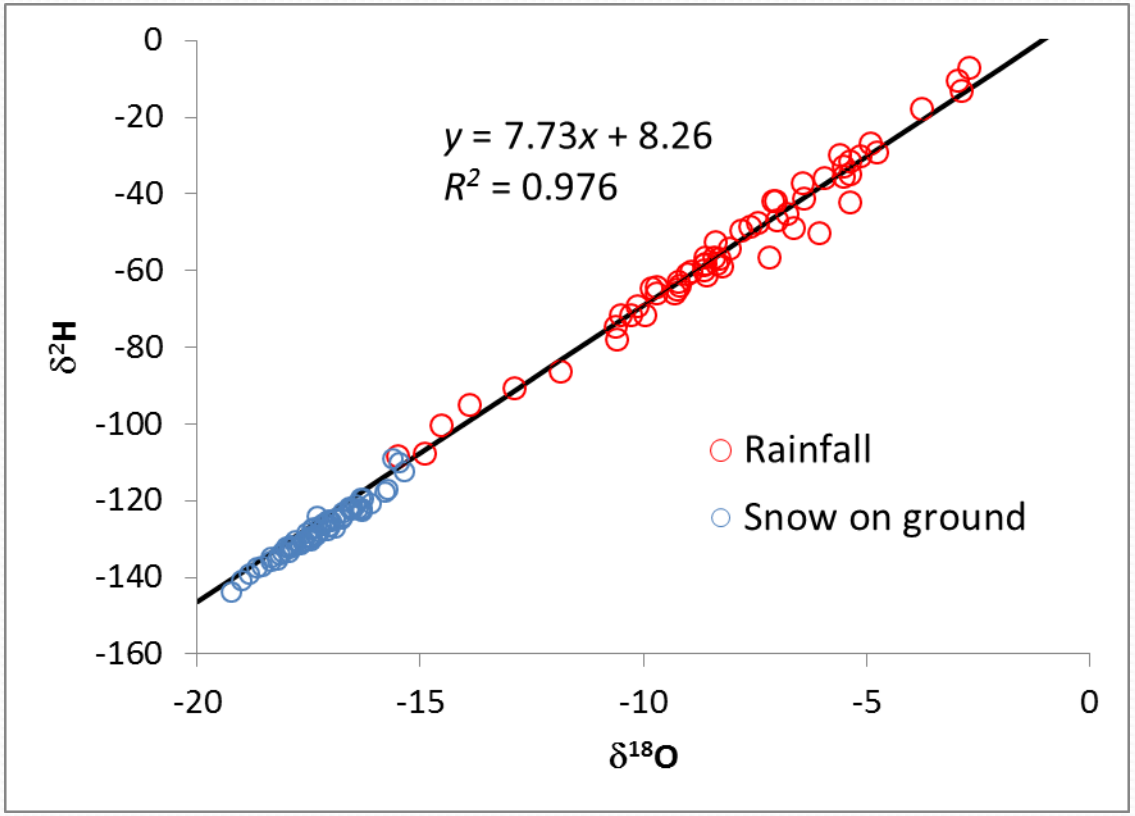




- custom built 2-stage funnel and collection chamber
- buoyant ball valve to minimize evaporation
- surrounded by Alter shield to minimize influence of wind on catch

Nipissing Meteoric Water Line

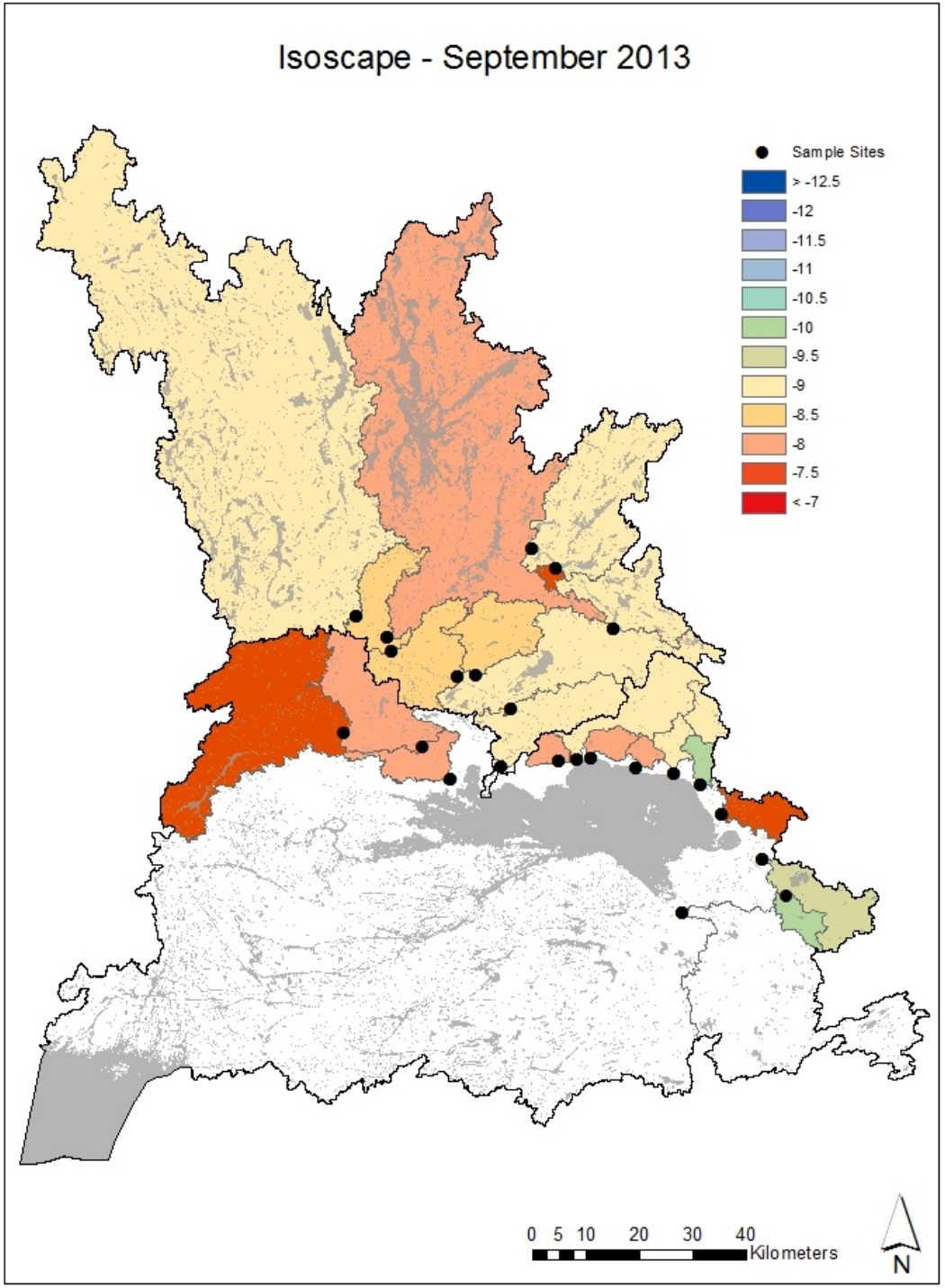
a local MWL provides an isotopic reference point for determining sources of groundwater recharge, for the evaluation of surface water and groundwater interaction, and for analyzing many other hydrologic and geochemical problems[1]



1 Benjamin et al., USGS SI Report 2004-5126

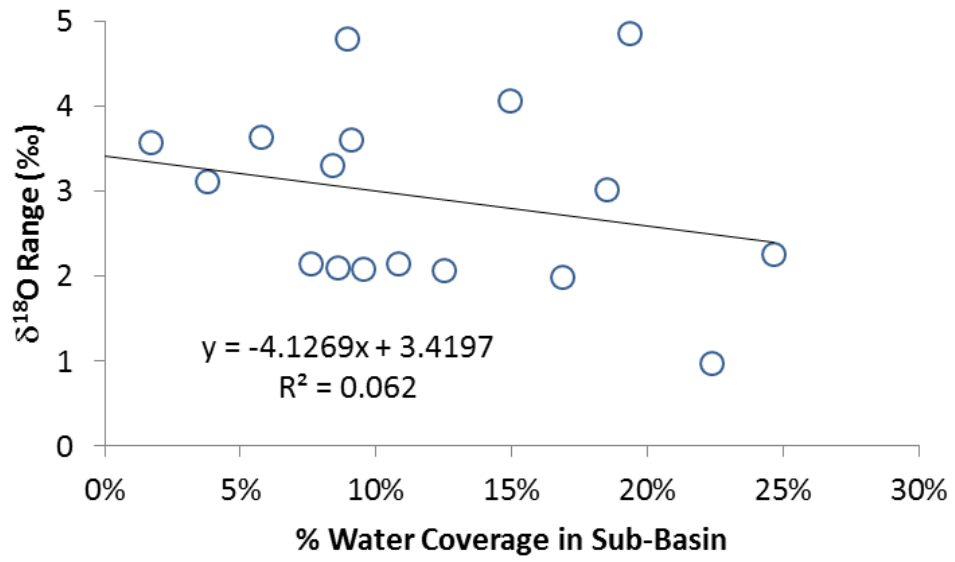
Isoscapes

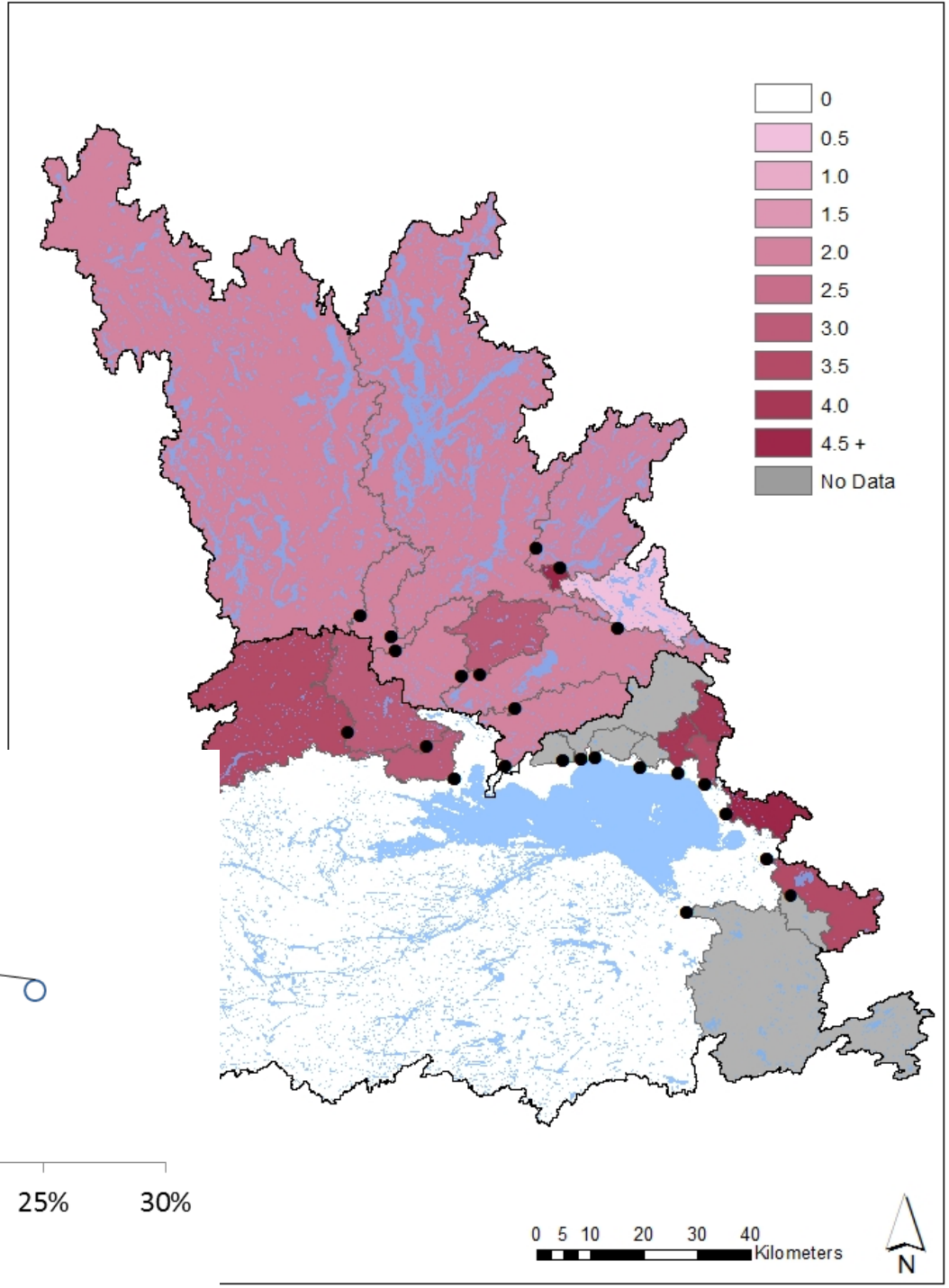
- isoscape: a visualization of the intercomparison of $\delta^{18}O$ signatures of the sub-basin network
- based on monthly samples, or averaged isotopic signatures for >1 sample per month (weighted by discharge where possible)



Isoscapes

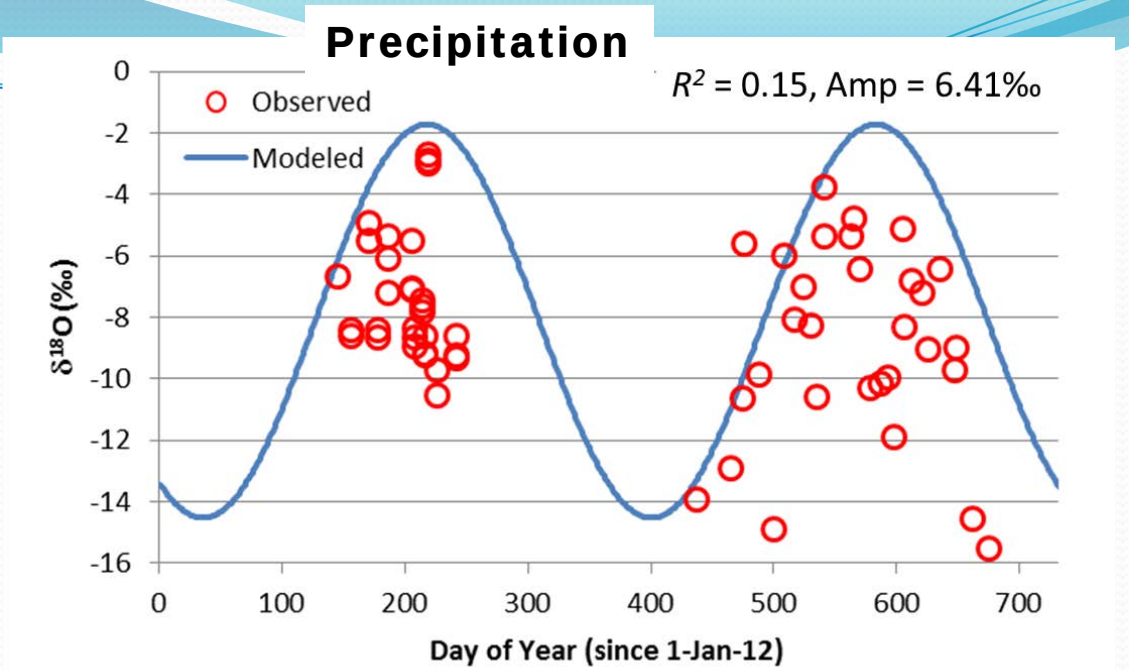
- darker colours represent greater variation between the isotopically-light season (spring) and isotopically-heavy season (autumn)
- grey regions show insufficient data

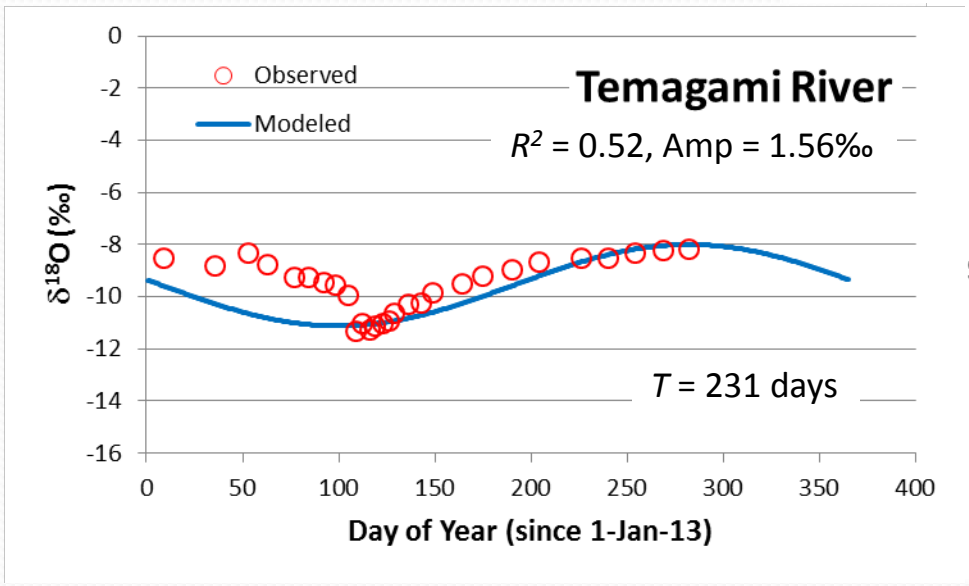


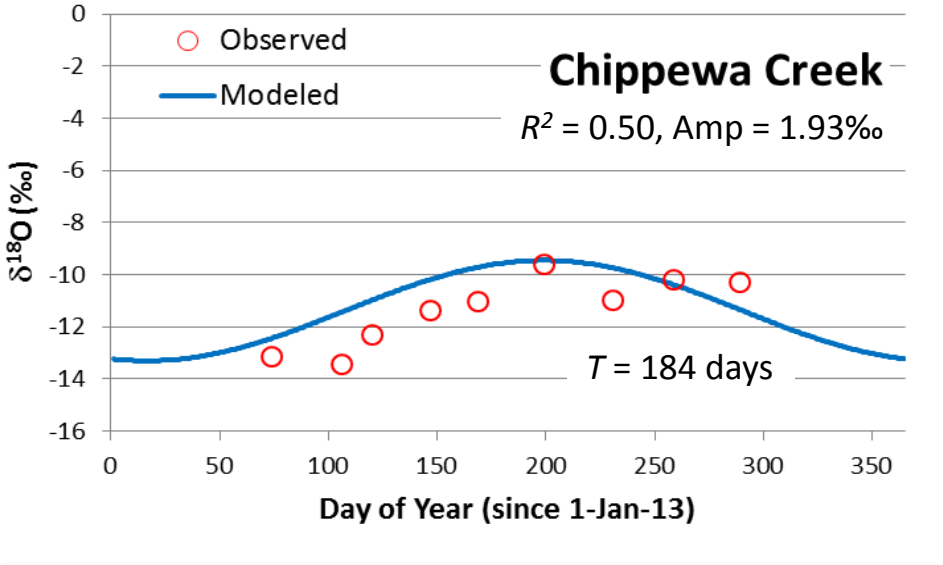


Ongoing Work

estimating sub-basin residence time – a vital metric for understanding contaminant throughput

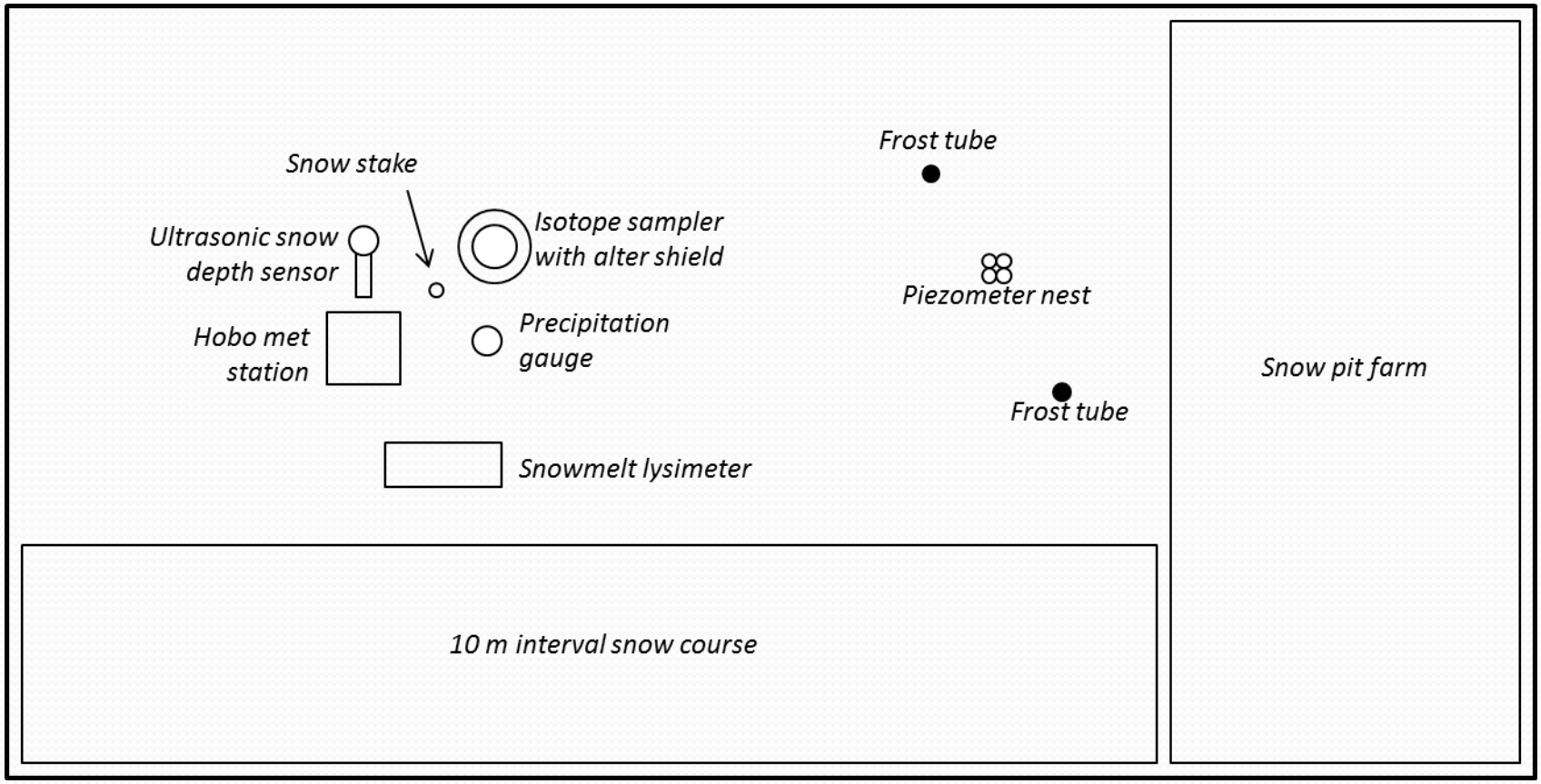






Ongoing Work

- continued field sampling
- winter 2013-14 snow sampling



Acknowledgements

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