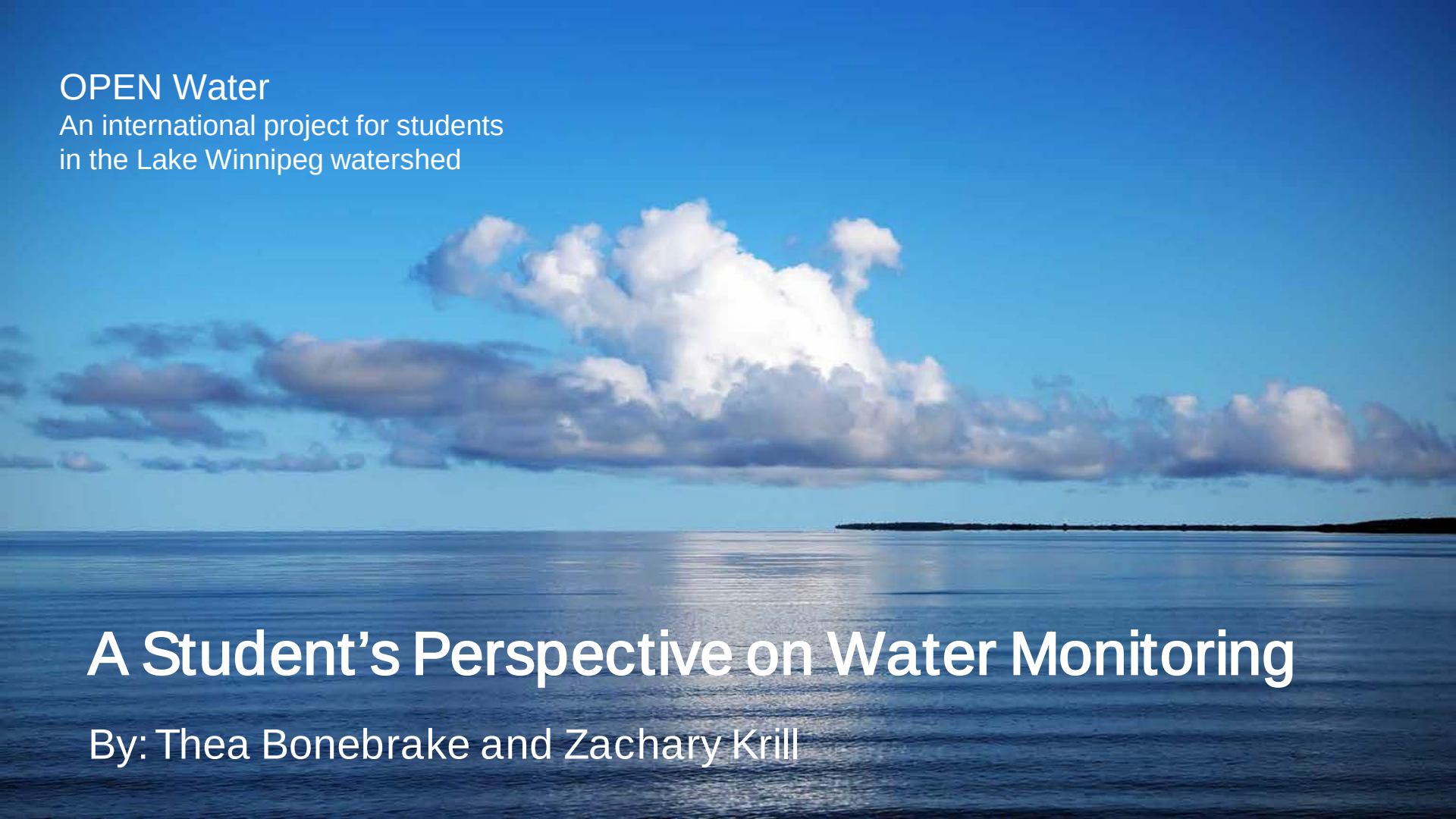


OPEN Water

An international project for students
in the Lake Winnipeg watershed

A Student's Perspective on Water Monitoring

By: Thea Bonebrake and Zachary Krill

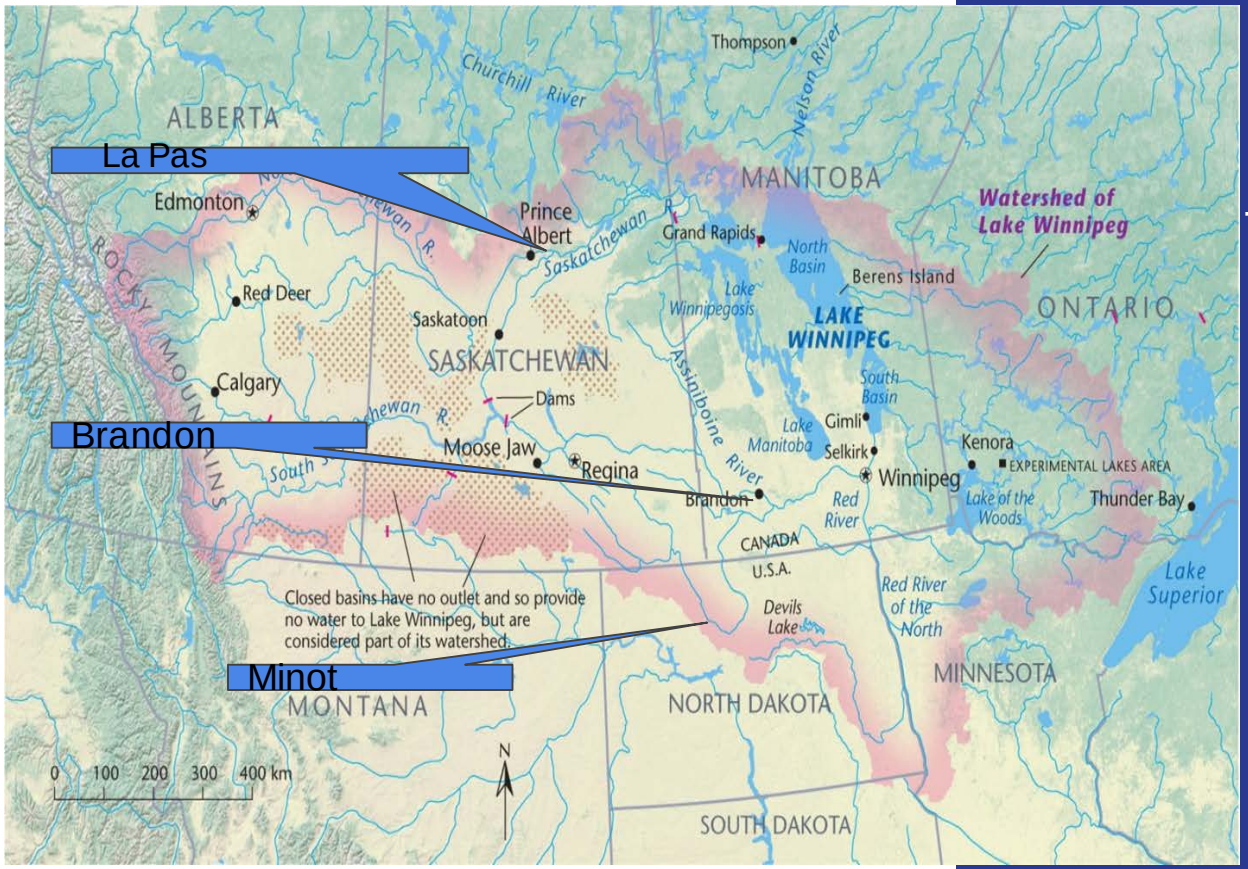
A Little Bit About Us

Juniors at Minot High School

Zach is interested in Chemistry and other STEM related fields.

Thea is interested in Biology and Dermatology.

We have taken Earth Science, Physical Science, Chemistry, Honors Biology, and Physics.



The OPEN Water Project

Observing

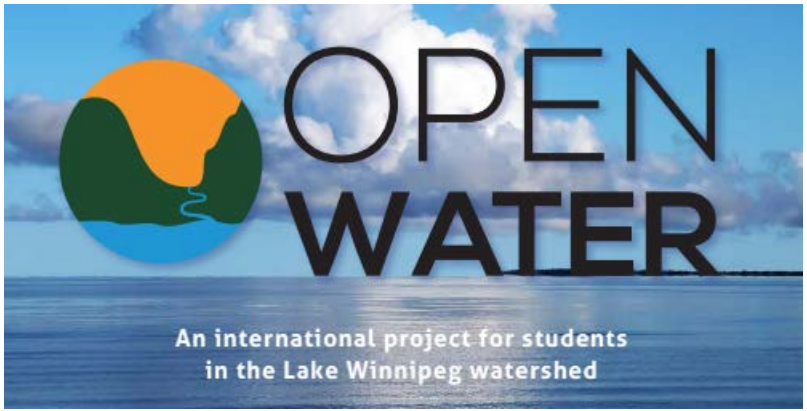
Participating

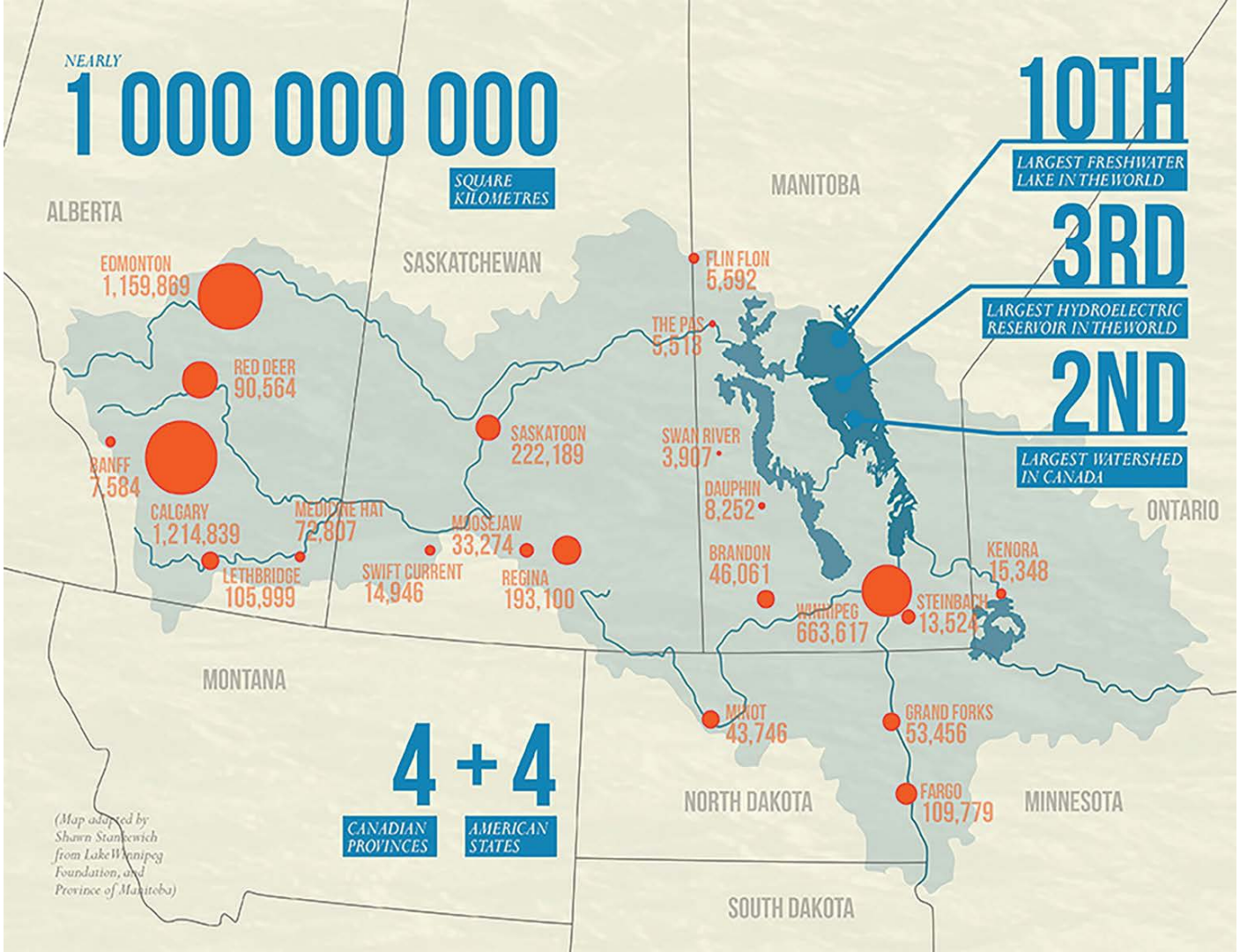
Experiential Learning

Networking

OPEN Water

The OPEN water project is a collaborative venture of the Canadian Geographic Education Alliance, the North Dakota Geographic Alliance, and the Minnesota Alliance for Geographic Education. OPEN Water is an international project that is distinguished by its transborder dimension and by its aim to accommodate scientific approaches and land-based traditional knowledge.




NEARLY
1 000 000 000
SQUARE KILOMETRES
10TH
LARGEST FRESHWATER LAKE IN THE WORLD
3RD
LARGEST HYDROELECTRIC RESERVOIR IN THE WORLD
2ND
LARGEST WATERSHED IN CANADA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
MONTANA
NORTH DAKOTA
MINNESOTA
SOUTH DAKOTA
EDMONTON 1,159,869
RED DEER 90,564
BANFF 7,584
CALGARY 1,214,839
LETHBRIDGE 105,999
MEDICINE HAT 72,807
SWIFT CURRENT 14,946
MOOSEJAW 33,274
REGINA 193,100
SASKATOON 222,189
FLIN FLON 5,592
THE PAS 5,518
SWAN RIVER 3,907
DAUPHIN 8,252
BRANDON 46,061
WINNIPEG 663,617
STEINBACH 13,524
KENORA 15,348
MINOT 43,746
GRAND FORKS 53,456
FARGO 109,779
4 + 4
CANADIAN PROVINCES
AMERICAN STATES
(Map adapted by Shawn Stankewich from Lake Winnipeg Foundation, and Province of Manitoba)

Zebra mussels spell doom for Lake Winnipeg ecosystem

Lake Winnipeg's ecosystem is likely to experience "a complete and eventual collapse" because of invasive zebra mussels, says a University of Winnipeg biologist.

Eva Pip told Global News in October that the zebra mussel problem in the lake was an irreversible problem, adding that the situation is so far gone it could be as little as two years before people start to see the effects of the mussels on the lake's ecosystem.

Posted by Harry Wilson on Tuesday, December 29, 2015

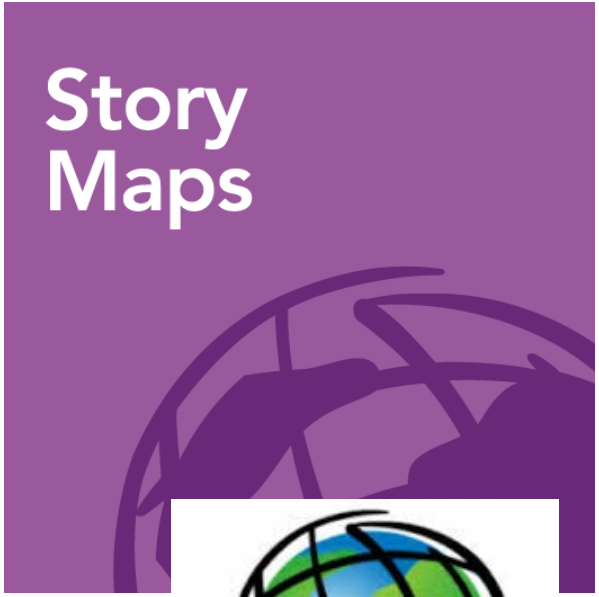
Story Maps

Interactive maps that allow students to share their experiences.

Gives a different perspective on scientific evidence.

An effective way to communicate data with peers.

An easy way to increase participation among students.

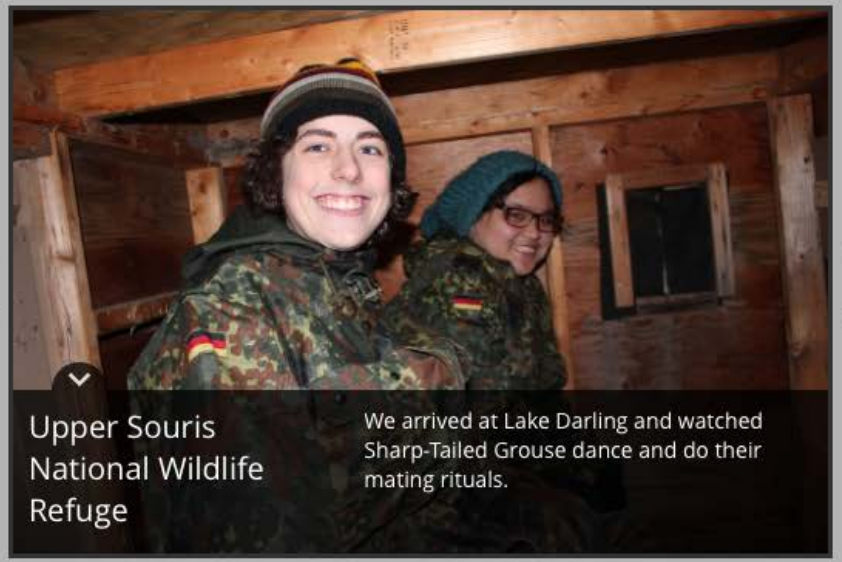


esri

Lake Winnipeg International Student Teacher Workshop

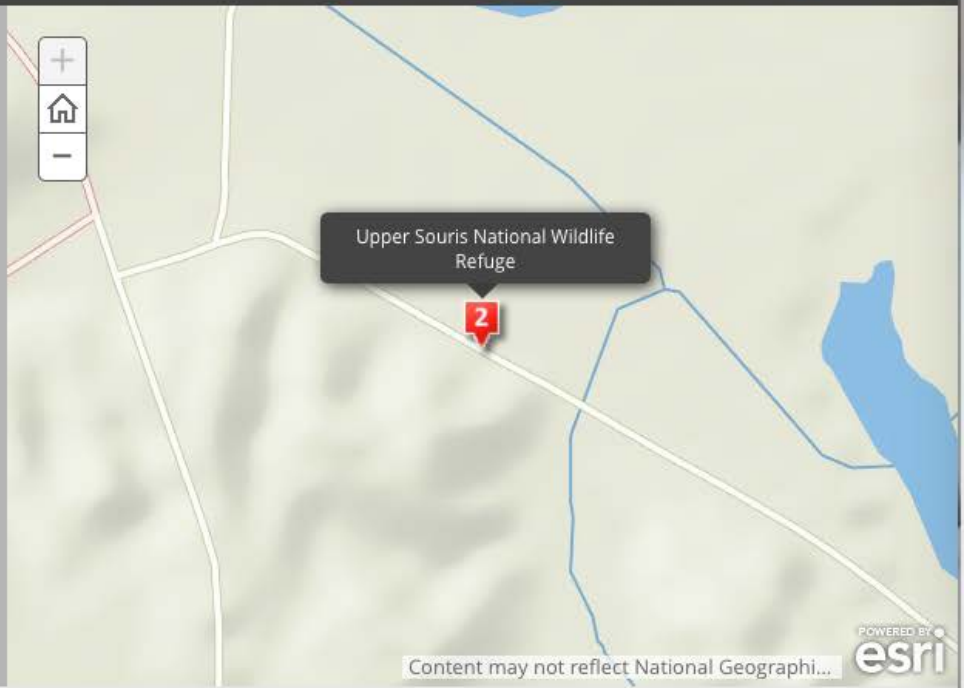
OPEN Water Project

A story map



Upper Souris National Wildlife Refuge

We arrived at Lake Darling and watched Sharp-Tailed Grouse dance and do their mating rituals.



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A story map

esri

Turkeys at Wildlife Refuge

On our way out of the Wildlife Refuge, we spotted about fifteen turkeys on the left side of the road.

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OPEN Water Project

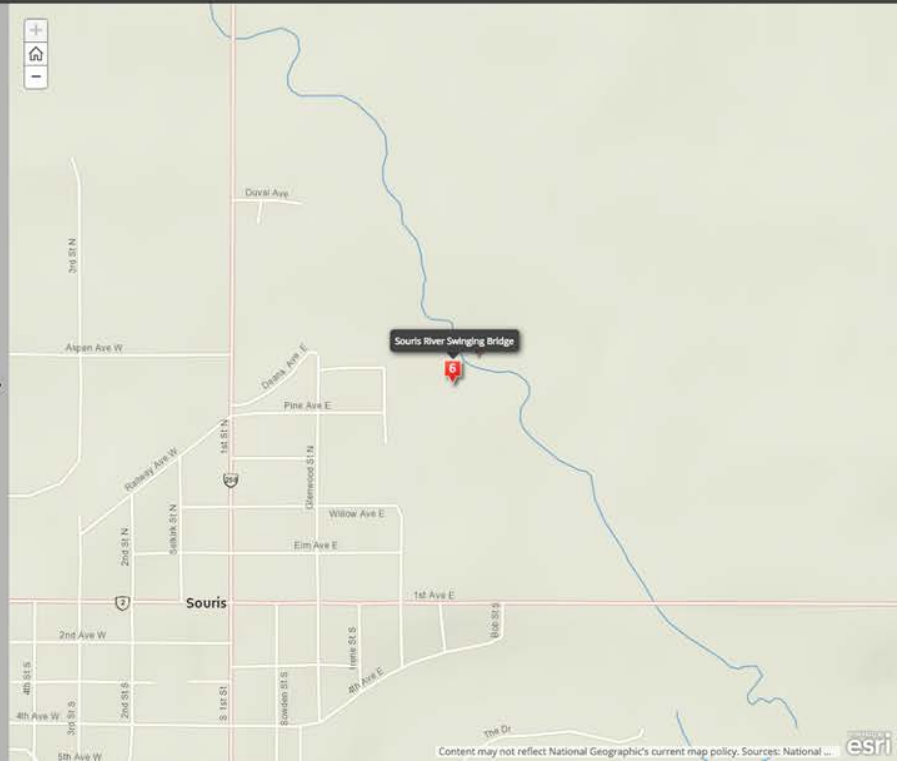
A story map

Sandhill Cranes at the US and Canadian Border

After we crossed into Canada, we happened upon a flock of Sandhill Cranes, about 1,500 in size.

Souris River Swinging Bridge

As we passed through Souris, we stopped to take water samples on the Souris River Swinging Bridge.



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OPEN Water Project

A story map

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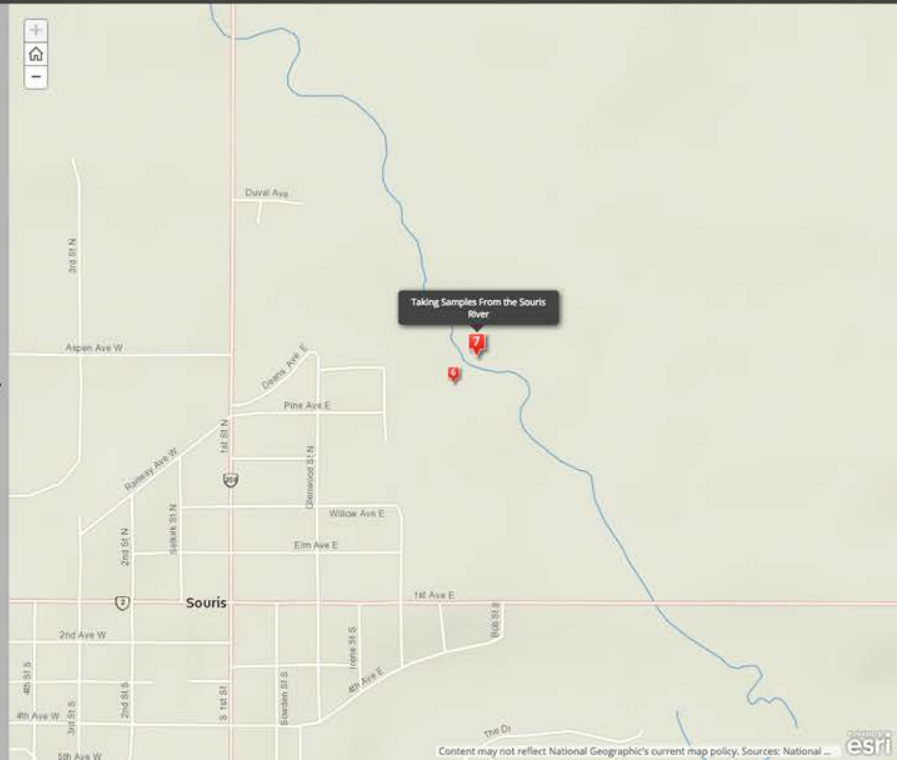
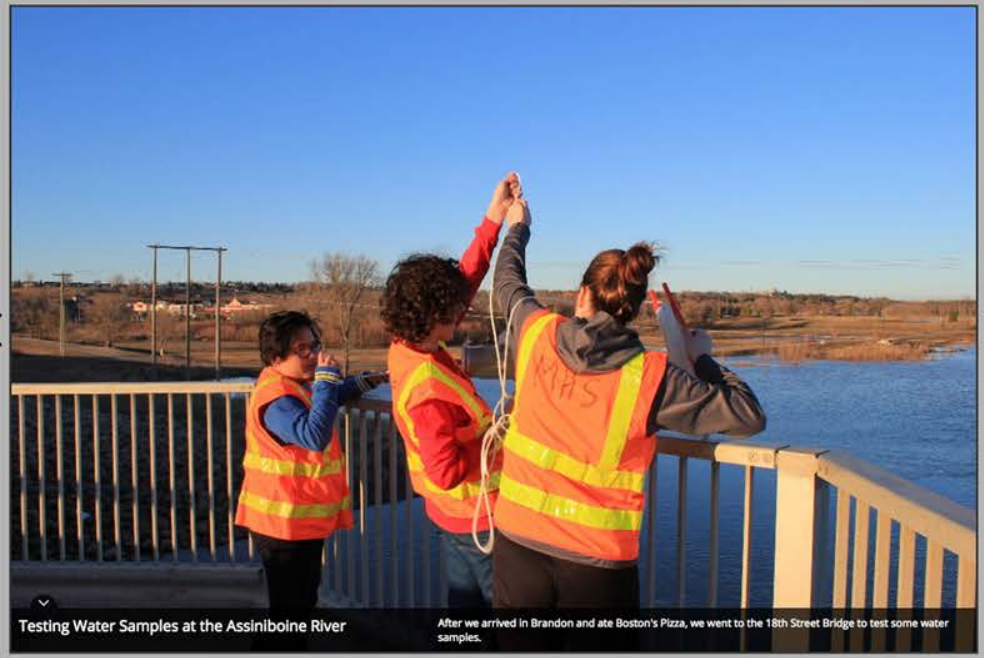
Taking Samples From the Souris River

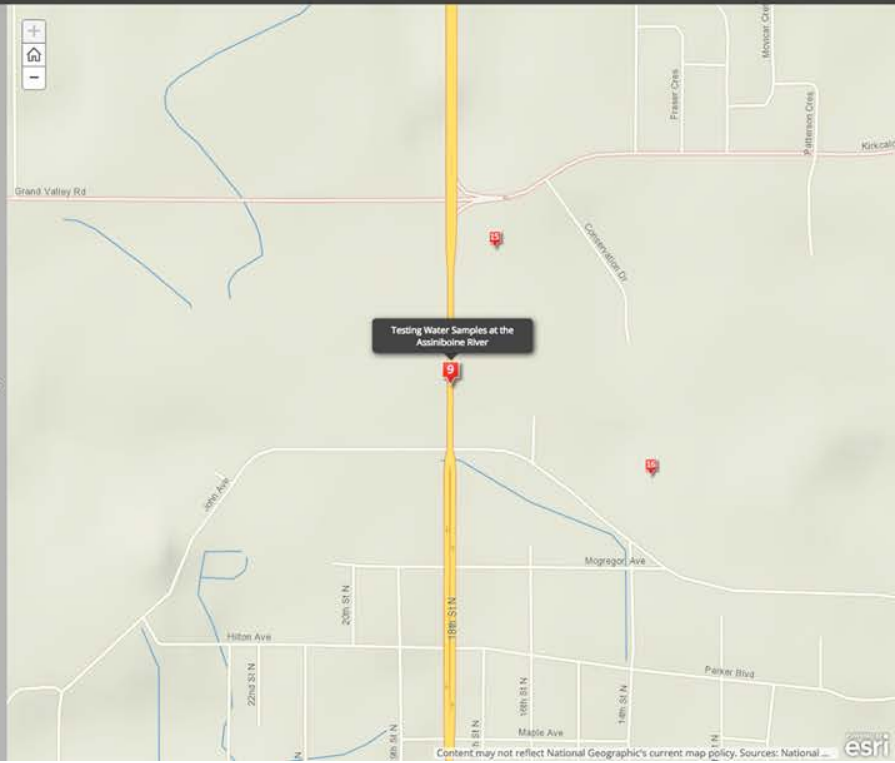
We took water quality samples from the swinging bridge.





Testing Water Samples at the Assiniboine River

After we arrived in Brandon and ate Boston's Pizza, we went to the 18th Street Bridge to test some water samples.



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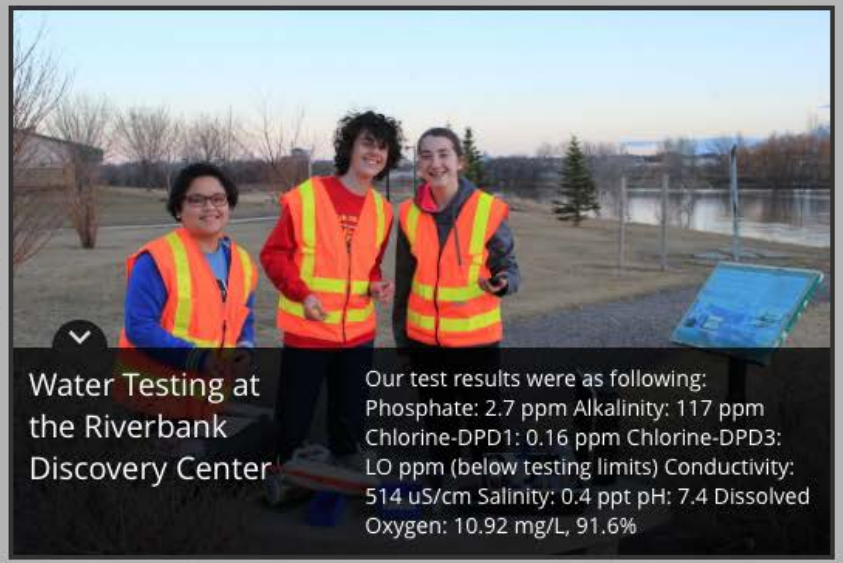
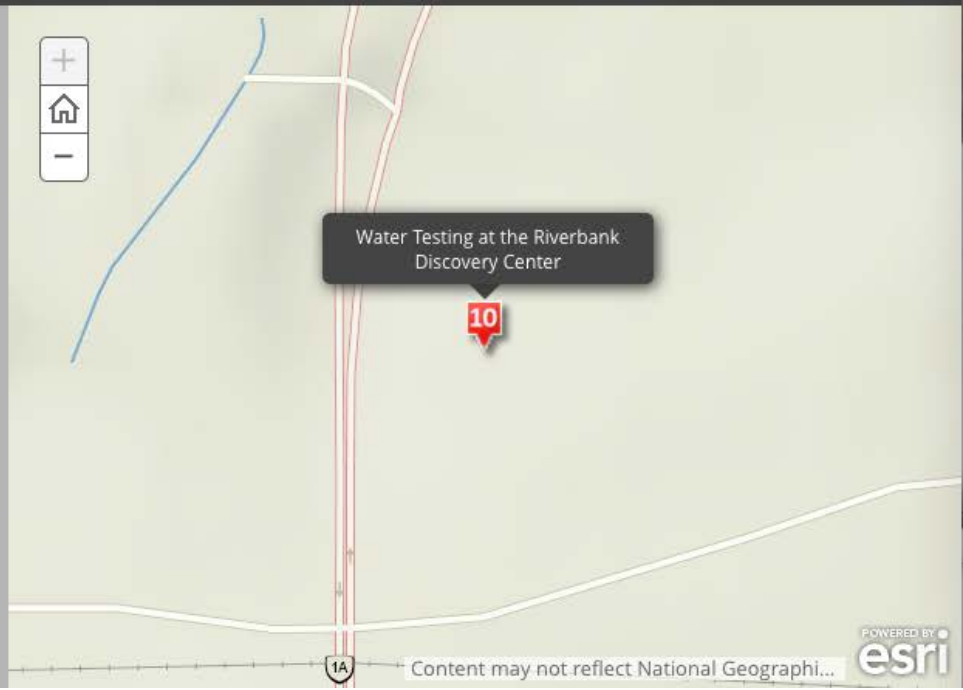
A story map



Water Testing at the Riverbank Discovery Center

Our test results were as following: Phosphate: 2.7 ppm Alkalinity: 117 ppm Chlorine-DPD1: 0.16 ppm Chlorine-DPD3: LO ppm (below testing limits) Conductivity: 514 uS/cm Salinity: 0.4 ppt pH: 7.4 Dissolved Oxygen: 10.92 mg/L, 91.6%



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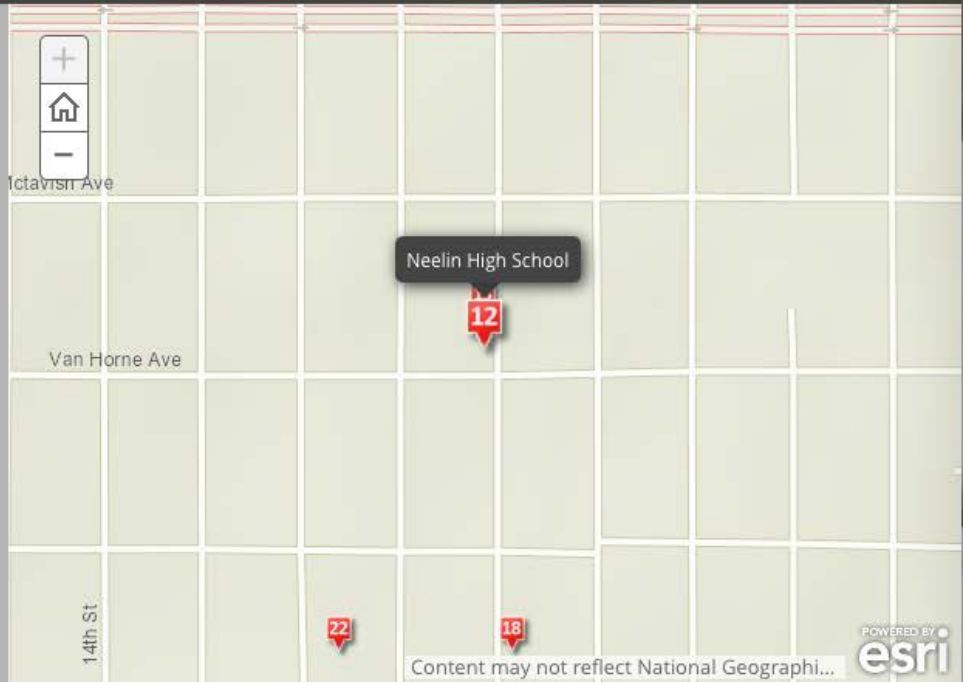
OPEN Water Project

A story map

Neelin High School

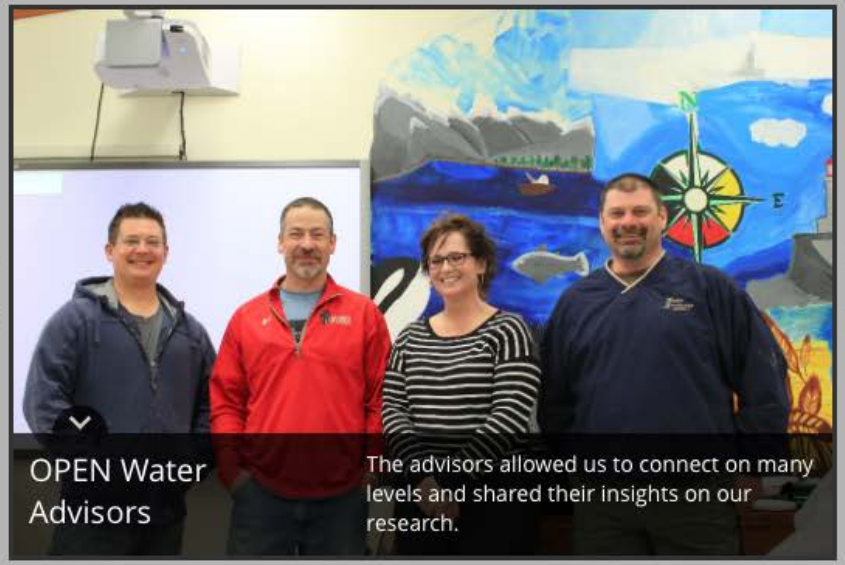
On the second day of our trip, we went to the school to start the OPEN Water Project.



Lake Winnipeg International Student Teacher Workshop

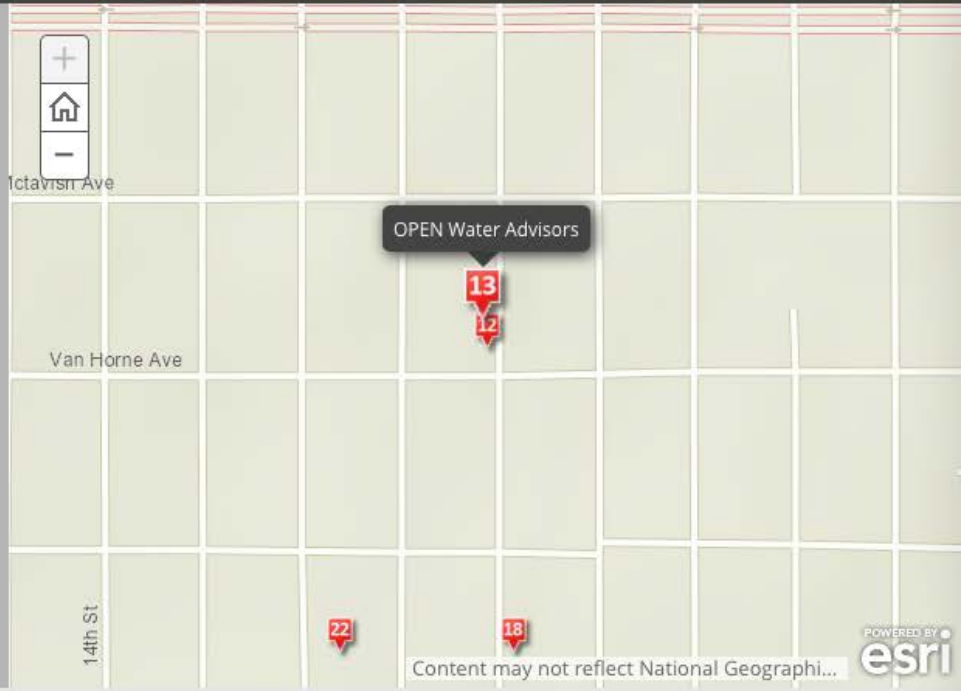
OPEN Water Project

A story map



OPEN Water Advisors

The advisors allowed us to connect on many levels and shared their insights on our research.



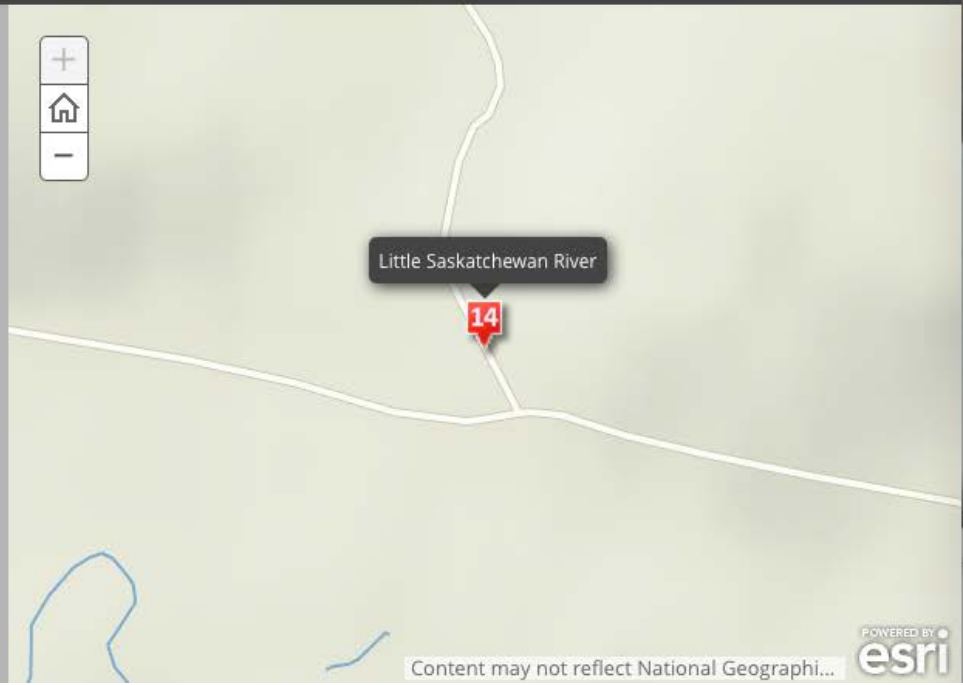
Lake Winnipeg International Student Teacher Workshop

OPEN Water Project

A story map

Little Saskatchewan River

Our first group sampling location was above the confluence of the Little Saskatchewan River and the Assiniboine River. The results were as following: DO: 13.72 mg/L, 106.2 % Conductivity: 380.2 uS/cm Salinity: 0.3 ppt



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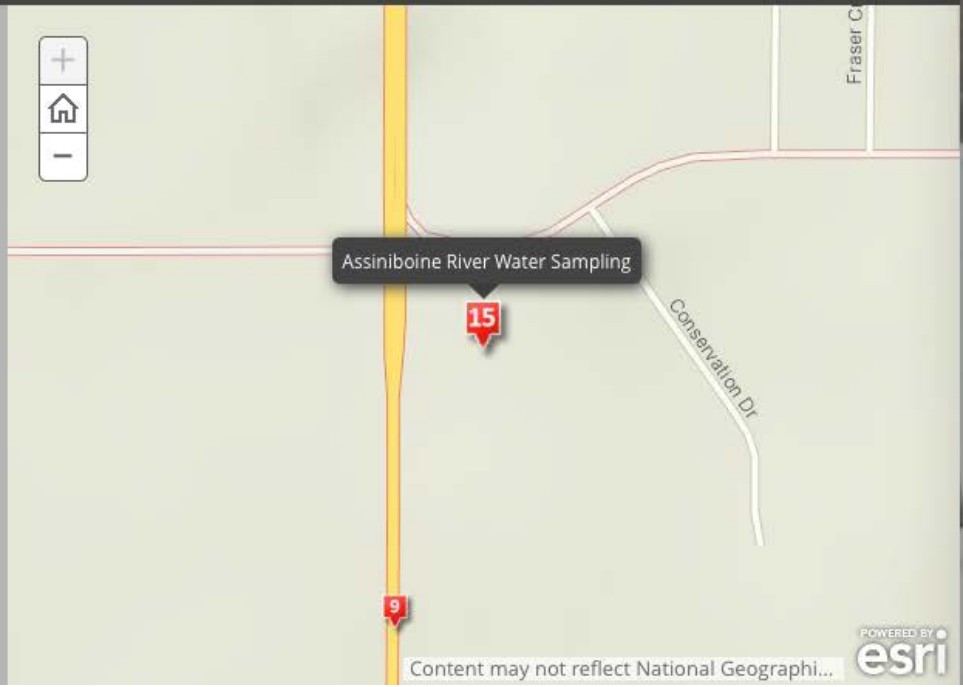
OPEN Water Project

A story map

Assiniboine River Water Sampling

After we sampled at the Little Saskatchewan River, we drove to the Assiniboine River, 18th Street Bridge. The results were as following: DO: 11.67 mg/L, 96.7 % Conductivity: 528 uS/cm Salinity: 0.4 ppt Phosphate: 0.52 ppm pH: 7.9



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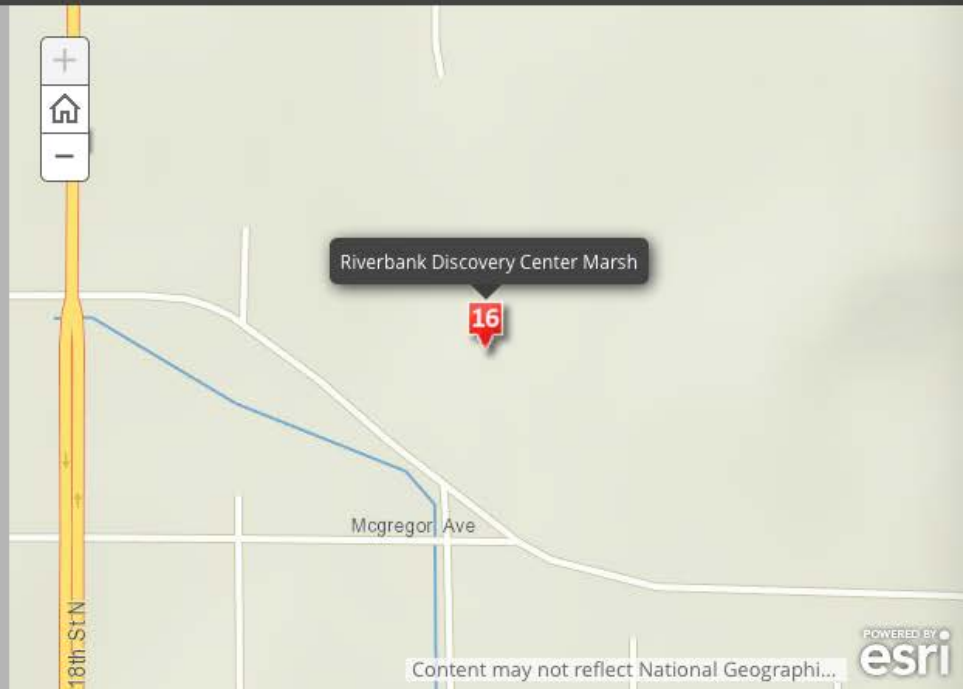
OPEN Water Project

A story map

Riverbank Discovery Center Marsh

Mr. Super and Mr. Langston into the marsh and collected a water sample to be tested. The results were as following: Phosphate: 0.79 ppm Sulfate: 217 ppm Nitrite: 0.05 ppm Nitrate: 1.88 ppm



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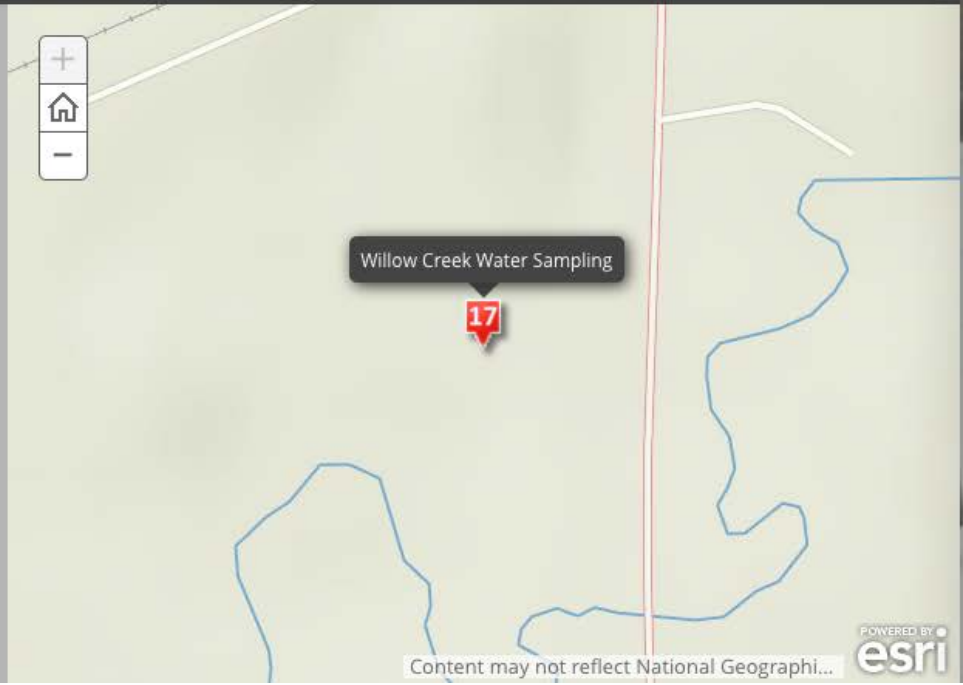
OPEN Water Project

A story map

Willow Creek Water Sampling

Mr. Langston got into the water to collect a water sample. The results were as following:
Phosphate: LO ppm Sulfate: 245 ppm
Nitrite: LO ppm Nitrate: LO ppm



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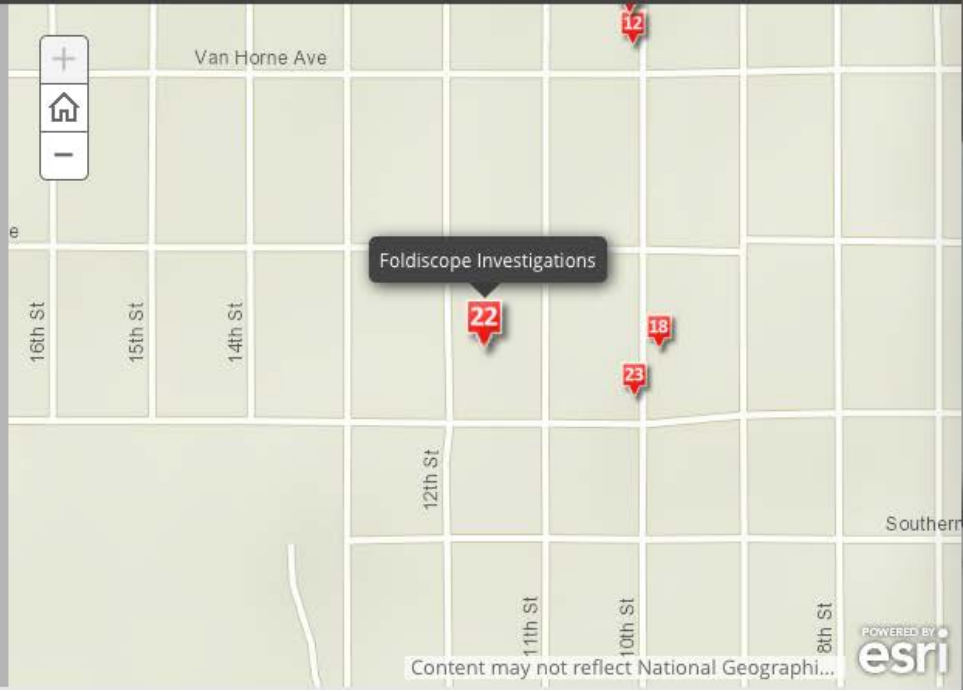
OPEN Water Project

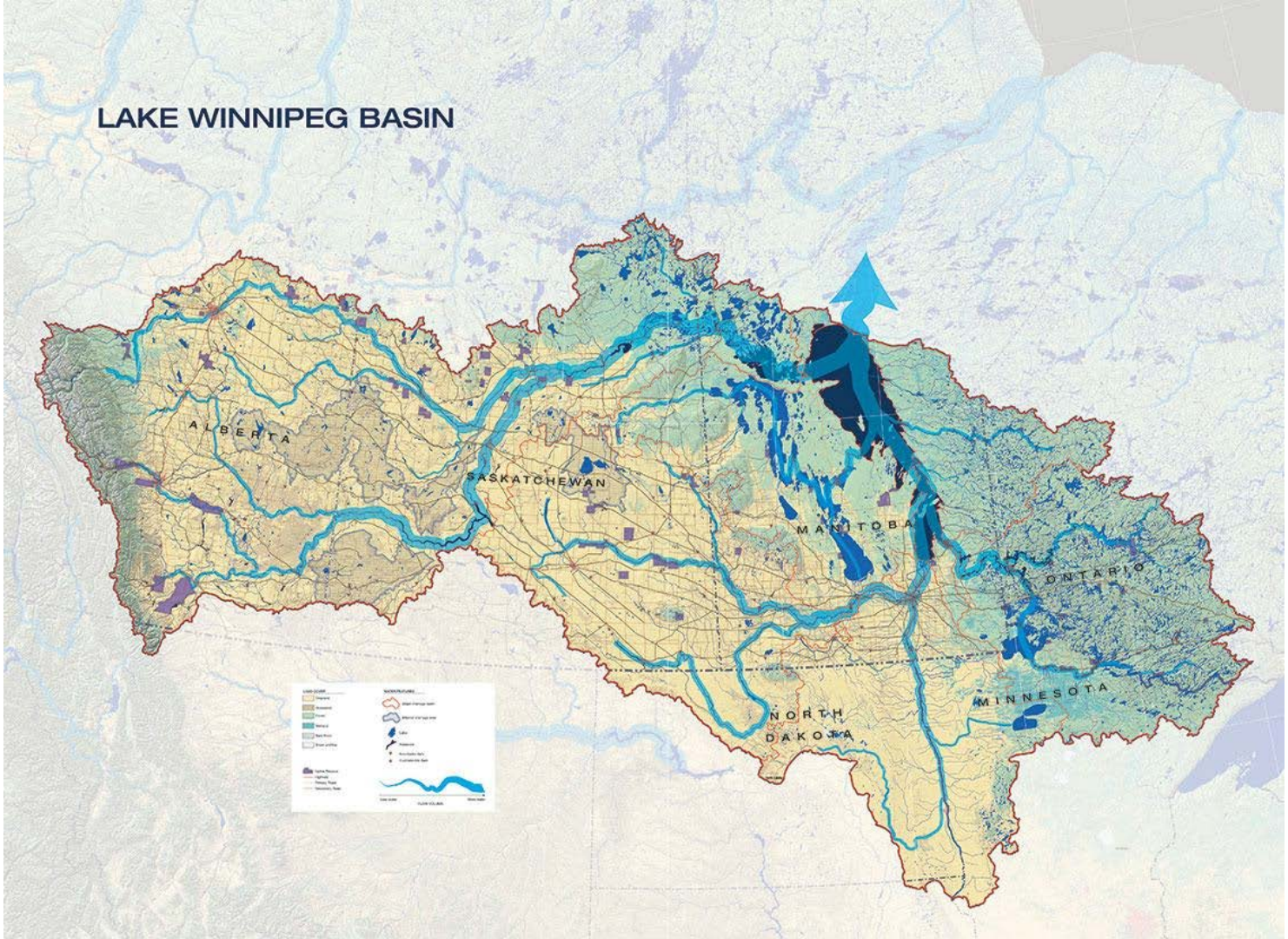
A story map

Foldiscope Investigations

We tested out some new technology called the foldiscope. It will help people to examine things in the field, without having to wait for lab results.



LAKE WINNIPEG BASIN



Technology

- iDip - The eXact iDip with Bluetooth technology is the first handheld photometer that pairs directly with a smartphone/tablet. It is recognized for its unique and inventive capabilities. The eXact iDip allows the ability to test over 35 water quality parameters through a simple 4-step process.
- Water Trapper - A cylindrical device used to obtain water samples from bodies of water.

iDip Parameters | Precision and Accuracy

Parameter	Range ppm	% Best Accuracy	# of Tests
Alkalinity, Total	11 - 200	7.5	100
Bromine, Total (DPD-1)	0.07 - 17.0	3	100
Chloride (as NaCl)	3 - 600	5	25
Chloride (as NaCl), High Range **	347 - 9975	8	25
Chlorine Dioxide (DPD-1) ***	0.04 - 15	5	100
Clorine, Free (DPD-1) ***	0.05 - 12.0	5	100
Chlorine, Combined (DPD-3) **	0.05 - 12.0	5	100
Chlorine, Total (DPD-4) ***	0.05 - 12.0	5	100
Chlorine, Total High	1 - 260	5	50
Chromium (Cr8)	0.01 - 2.00	8	50
Copper (as Cu2)	0.06 - 11.0	2	50
Cyanuric Acid	3 - 110	9	60
Hardness, Calcium (as CaCO3)	20 - 900	5	50
Hardness, Total High (as CaCO3)	60 - 600	12	50
Hardness, Total Low (as CaCO3)	1 - 80	15	100
Hydrogen Peroxide	1 - 130	5	50
Hydrogen Peroxide High (DPD-4)	16 - 4200	8	100
Hydrogen Peroxide Low	0.02 - 3.50	7	50
Iodine (DPD-1)	0.08 - 21.0	4	100
Iron, Total (TPTZ) **	0.03 - 8.00	8	50
Manganese (as Mn+2)	0.03 - 2.60	6	24
Metals	0.00 - 1.75	6	25
Molybdate **	0.02 - 5.00	10	50
Nitrate (as NO3)	0.25 - 32.0	6	50
Nitrite (as NO2)	0.02 - 4.00	3	50
Ozone (DPD-4)	0.01 - 2.00	10	100
Peracetic Acid (DPD-4)	0.05 - 11.0	4	100
Permanganate (DPD-1)	0.02 - 6.00	5	100
pH	6.0 - 8.5 pH	0.2 pH	100
pH, Acid	4.5 - 6.2 pH	0.3 pH	50
pH, Alkali	7.5 - 10.0 pH	0.3 pH	50
Phosphate (as PO4)	0.02 - 5	8	50
Sodium Bromide, Total (as NaBr)	19 - 400	5	25
Sulfate (as SO4)	1 - 270	5	50
Sulfide (as S2) **	0.11 - 5.30	12	50
Turbidity **	24 - 780 NTU	n/a	n/a

Our Experience

Traveling to a different country can be eye-opening and show you how different landscapes and cultures can be. Although mostly geographically similar to North Dakota; Brandon, Manitoba was a completely new world.

During our stay we were able to participate in citizen science experiments and create informational maps from our data. We collected water quality parameters from various rivers in the surrounding area and compiled them onto an interactive map to share our findings with anyone curious about them.


MHS
MHS
MHS

As a Student

A student certainly has a different perspective from educators and scientists, but it is nevertheless an important one. As a student, we were able to understand more about STEM fields from our experience and actually participate in scientific experiments. This learning adventure not only benefits the student but allows the teacher to gain insight into how to encourage and invite more students into STEM related fields. We can say for certain that our travels have pushed us further into our scientific ventures.

STEM Science, Technology, Engineering, Mathematics

River Watch

Our school participates in a biannual data collection of samples from the Souris River.

Multiple water quality indicators are recorded.

Students gain valuable scientific skills and learn about different procedures

Probes are used to collect physical properties of the river such as: temperature, percentage of oxygen, etc.

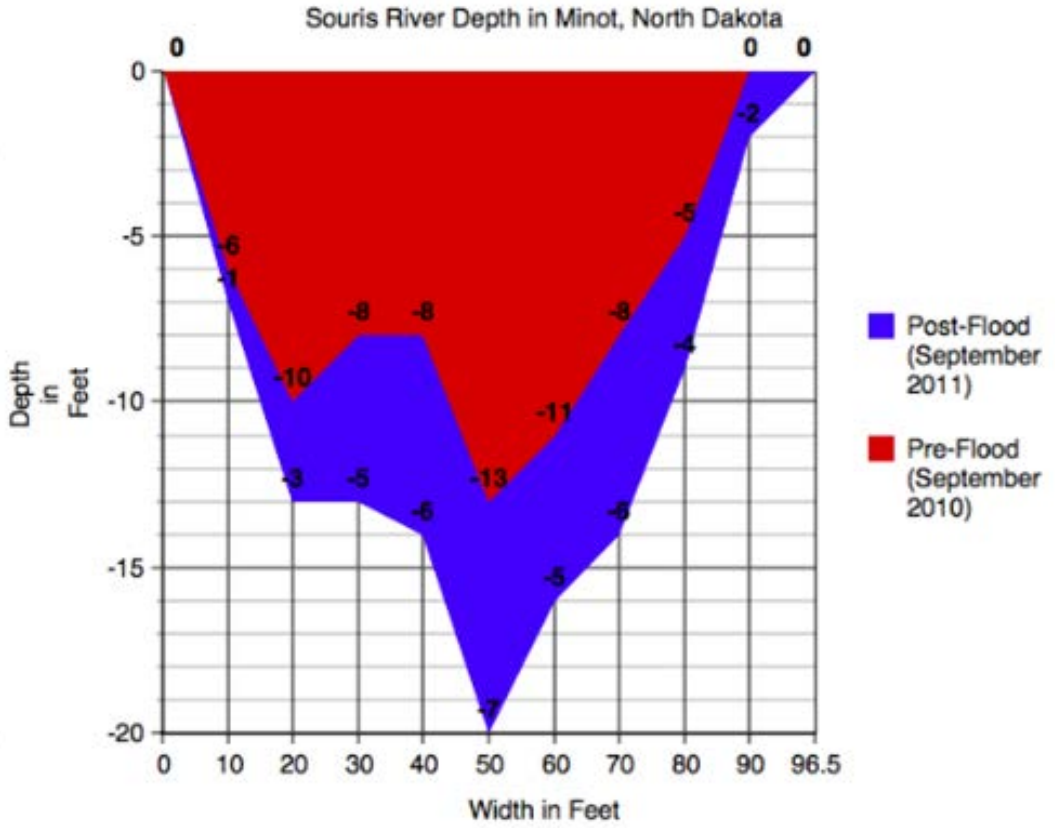
Chemical indicators provide data such as pH, and amounts of different

Student Data

Data for River Watch from 2010-2015

On the right, is a graph showing the change in depth of the Souris River post-flood.

GeoPortalGenie



Questions?

Thank you for coming to our presentation. We hope this has given you new ideas about students in science, and how you as professionals can help shape the future of America.

Does anyone have questions?