DataStream

An open access hub for sharing water data

Cristina Cismasu, PhD
Spécialiste des données/Data Specialist
The Gordon Foundation

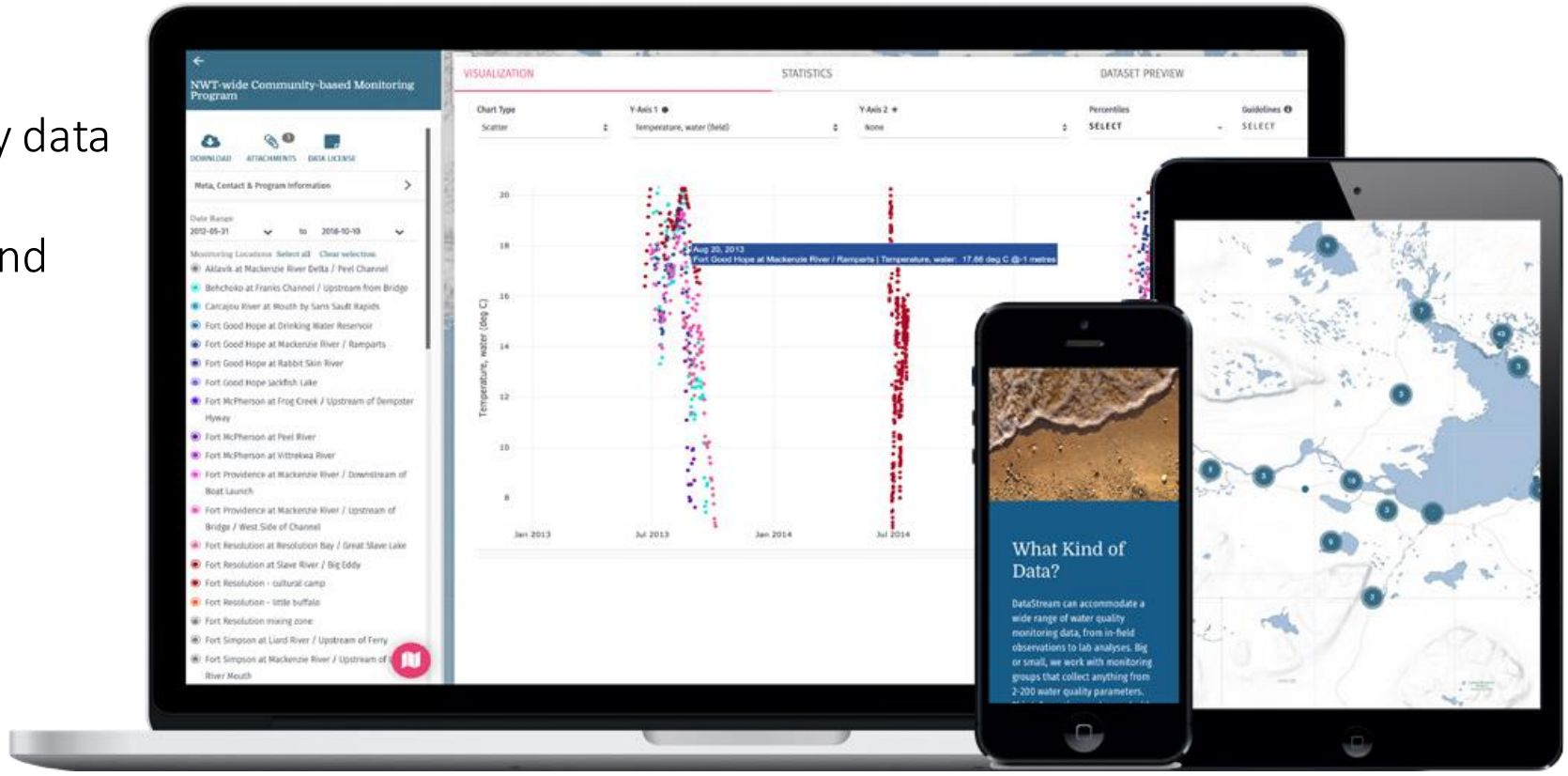
February 3, 2022

Today’s Session

- What DataStream is and why we built it
- A guided tour
- Case studies
- Questions and discussion

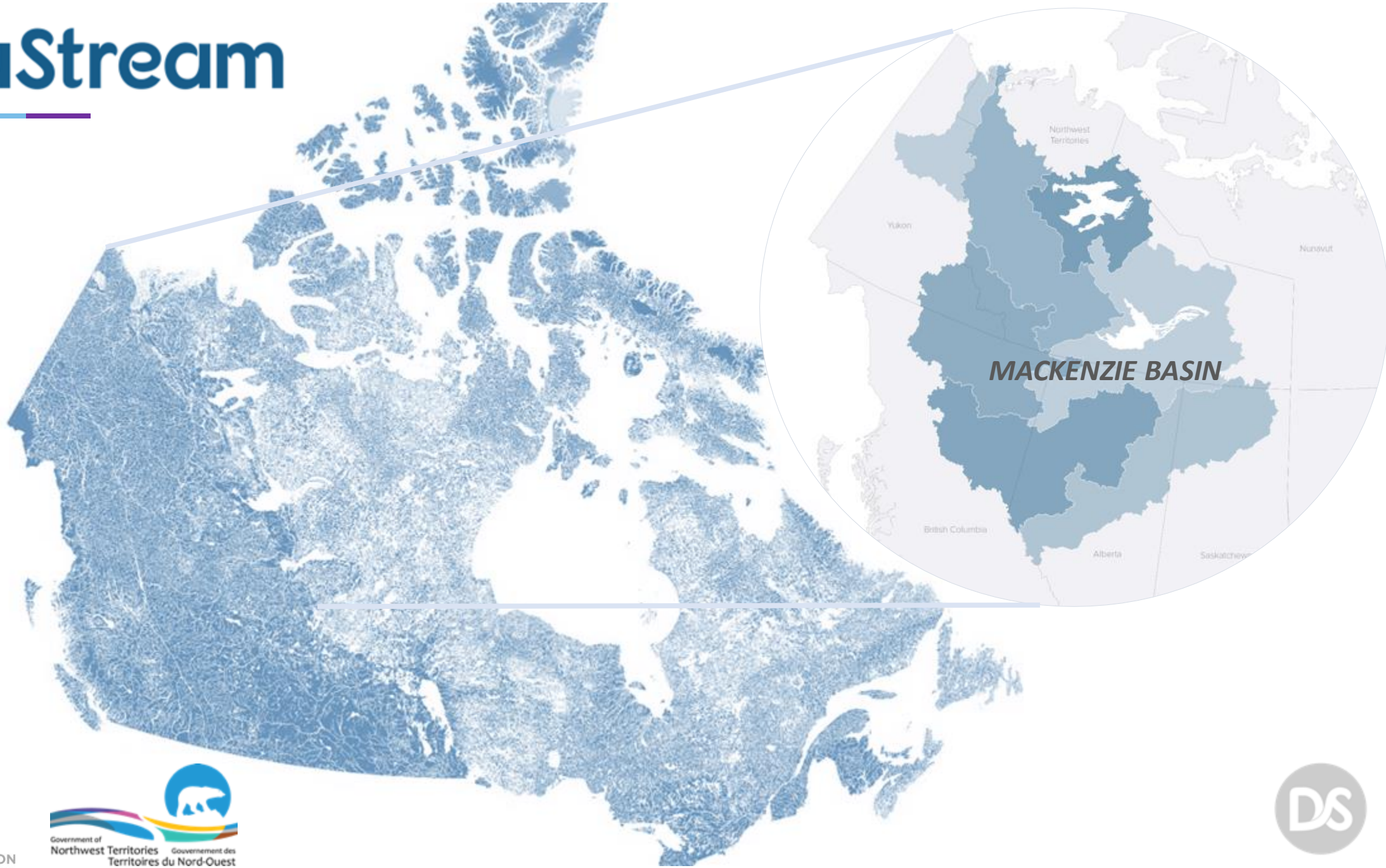
What is DataStream?

- Open access site for water quality data
- Minimizes barriers to accessing and sharing data
- User friendly visualization tools
- Map-based search



www.DataStream.org

DataStream



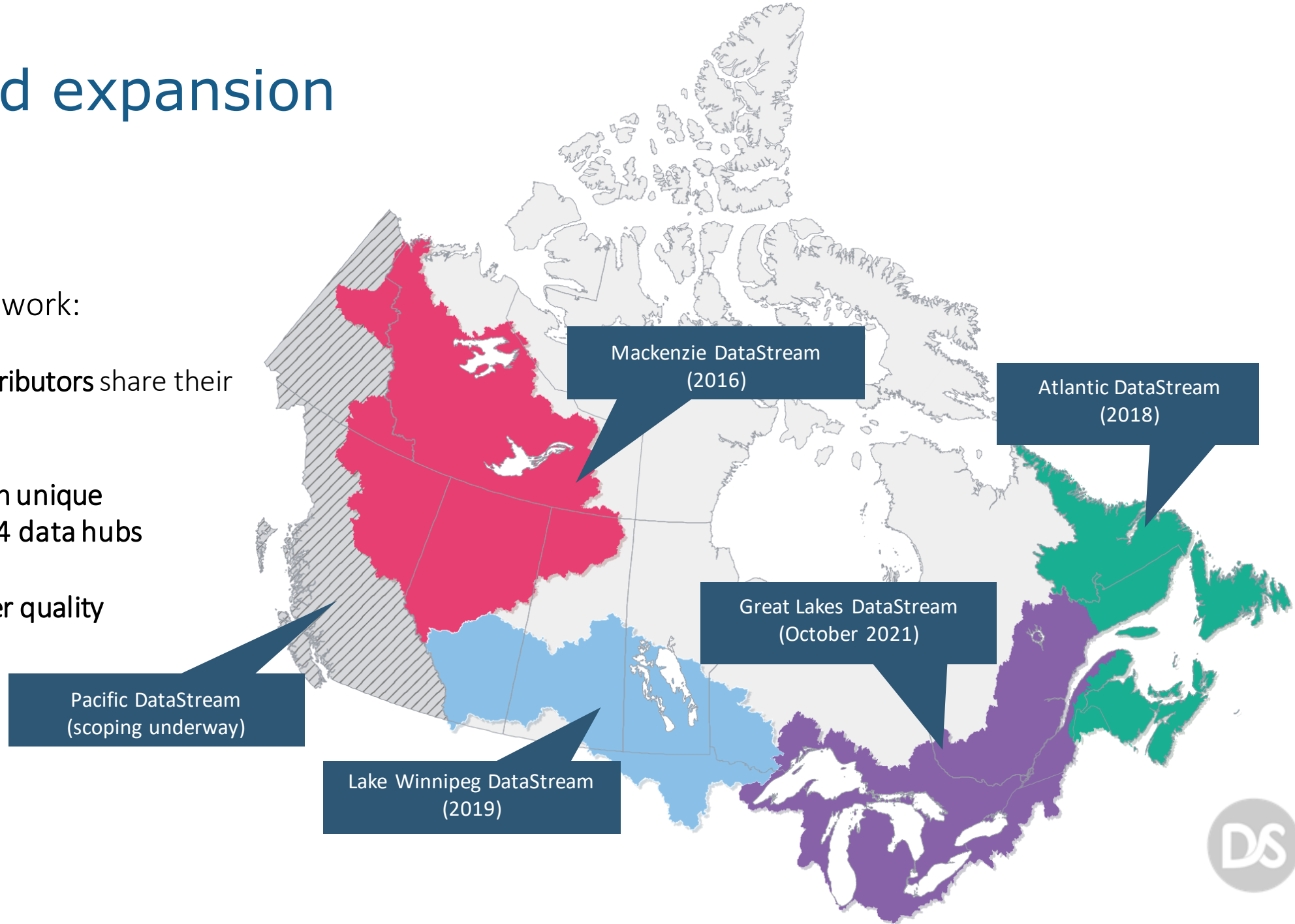
THE GORDON FOUNDATION

Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

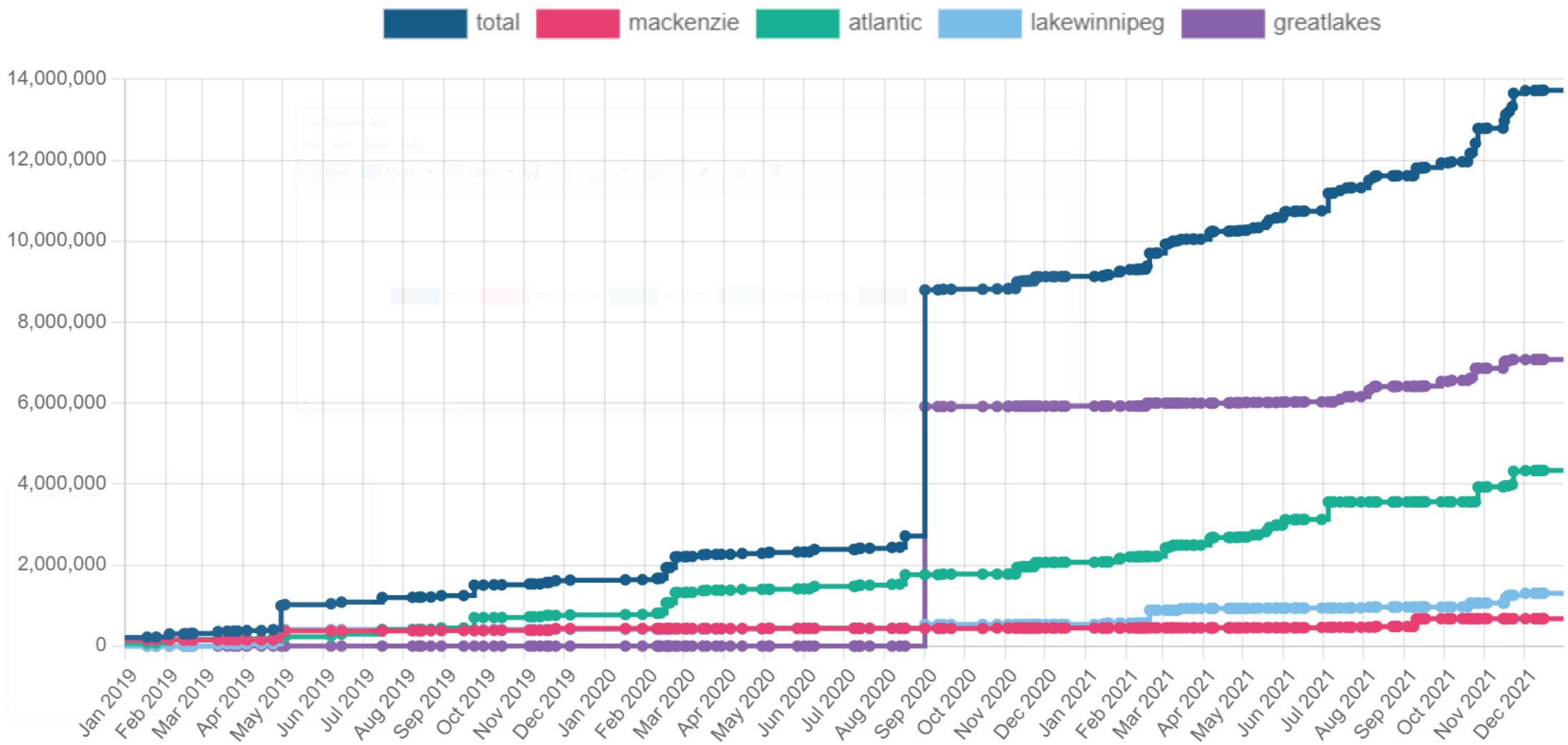
Growth and expansion

A rapidly growing network:

- More than **190 contributors** share their data on DataStream
- More than **13 million unique observations** across **4 data hubs**
- More than **300 water quality parameters**



Data holdings: 2019 to 2021



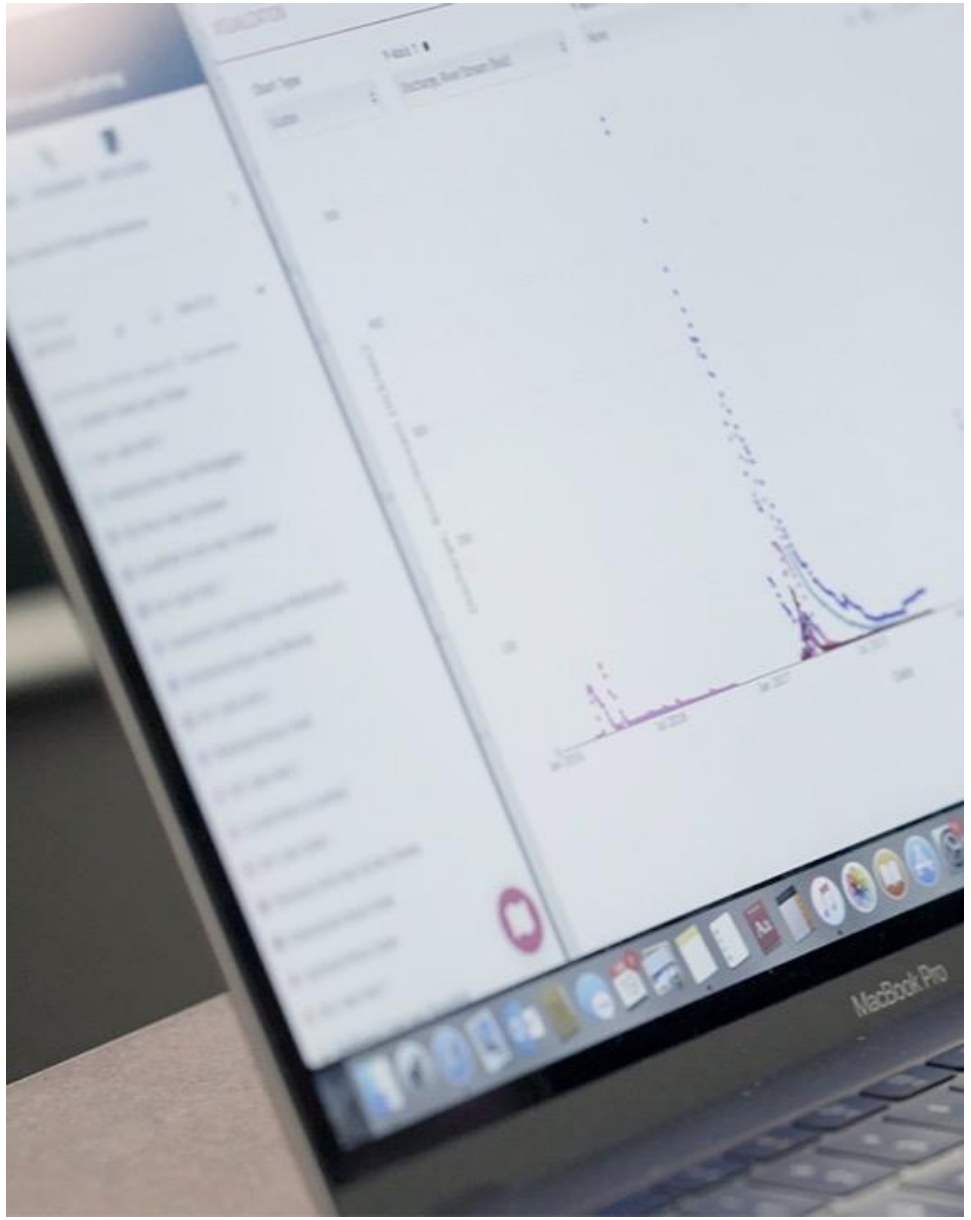
Who is sharing data on DataStream?

- Watershed organizations
- Academics
- Indigenous governments and organizations
- Provincial/Territorial Governments
- Federal Government

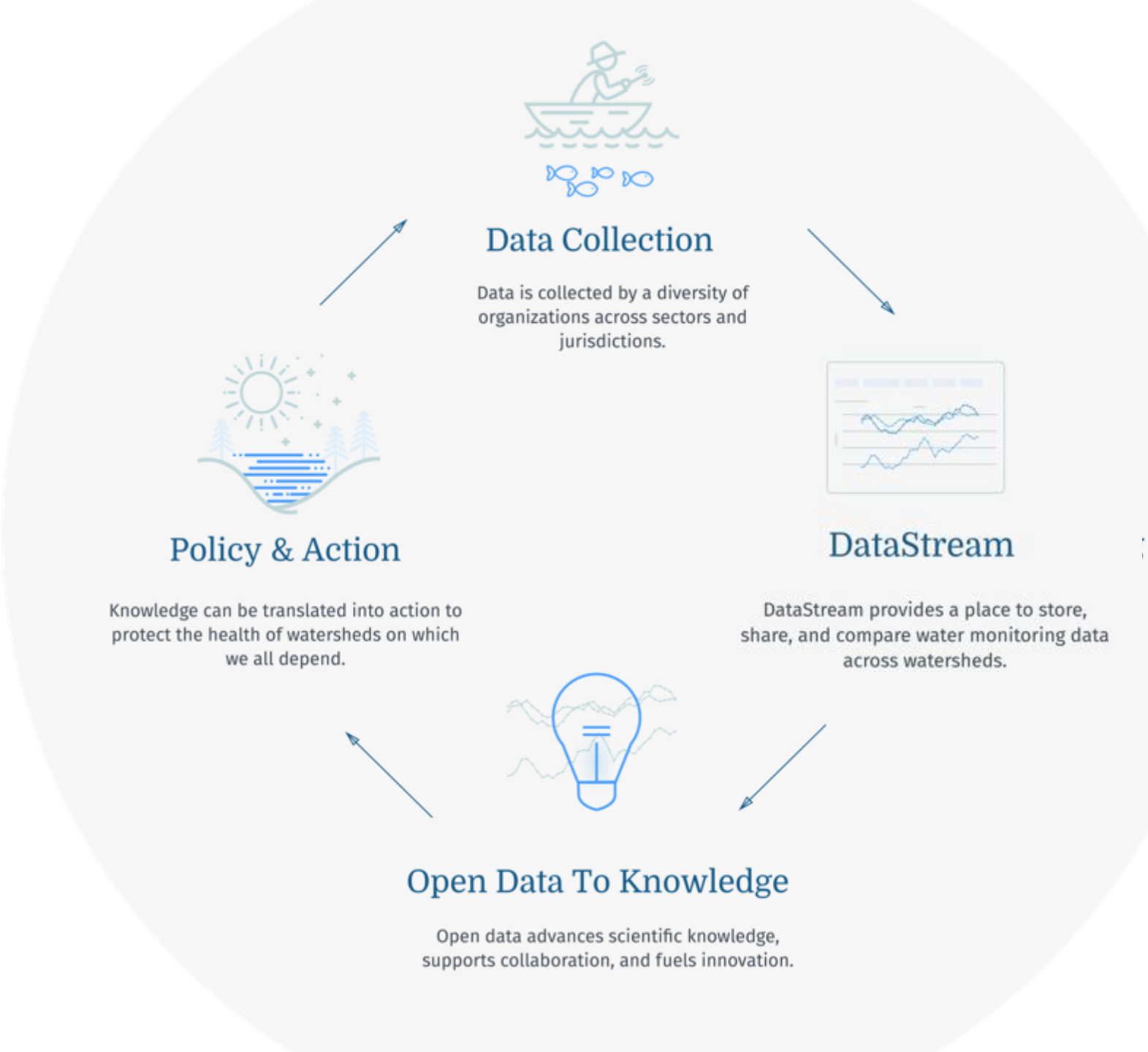
Data contributors maintain ownership of their data

DataStream positioning and approach

- **Connect** monitoring efforts **across sectors and regions**
- Overcome common barriers to **open sharing** (i.e., WQX, IP and licensing, DOIs and blockchain)
- Long-term program not a project: committed to **continuous improvement**
- **Independent** and **free to use**



Open data supports stronger science, fosters collaboration and enhances transparency and trust



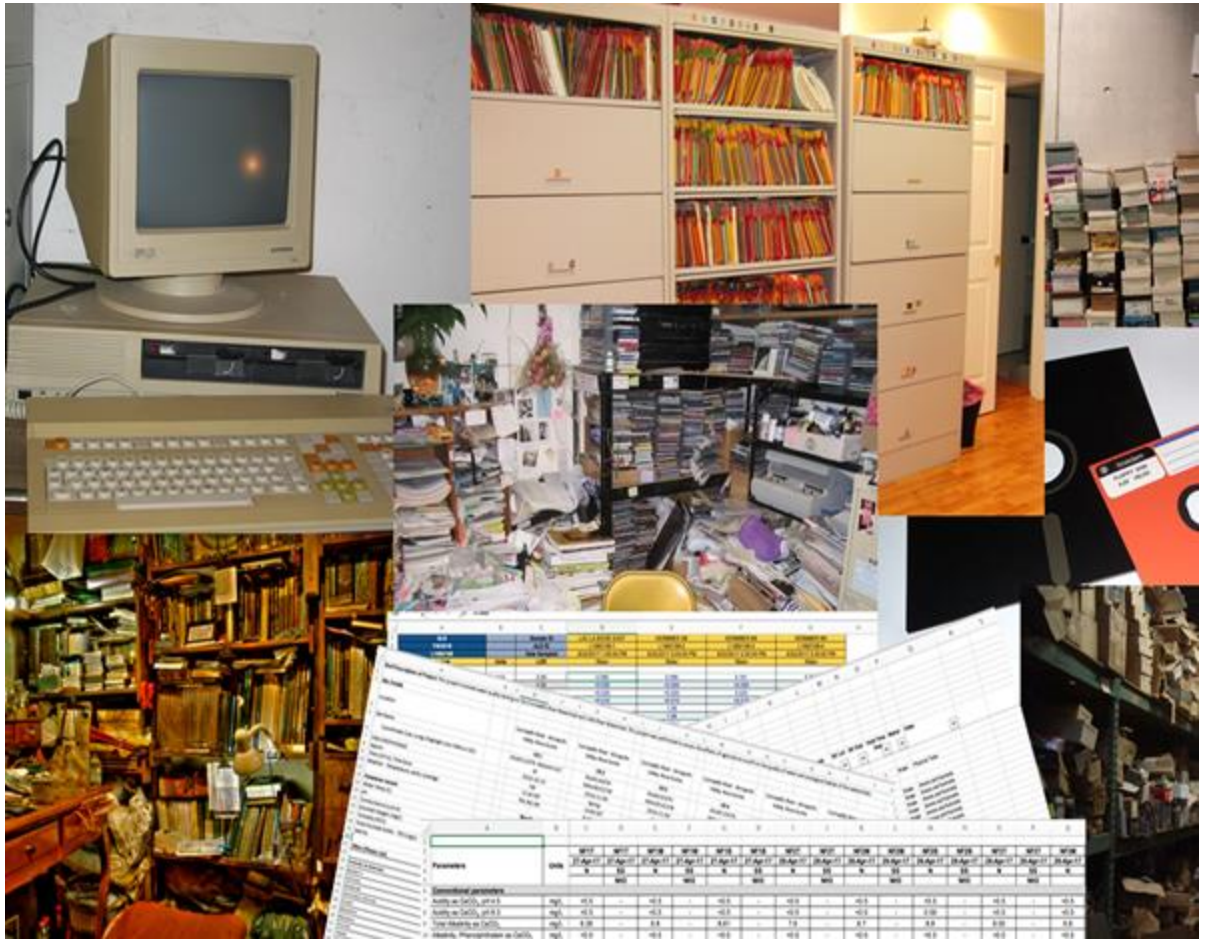
What is open data?

Open Data is data that can be freely used, reused and redistributed by anyone—subject at most to the requirement to attribute and share-alike.

What makes data usable?

- People can find and access it
- It has all the necessary metadata
- It is available in appropriate formats

AI, Machine Learning, Big Data, Advanced Modelling



Expectation **vs.** **Reality**

Structuring data

	A	B	C	D	E	F	G	H
1								
2	lake site May 29 2012						29-May	
3			Bug1	bug2			avr	SEM
4	1	T1	1	1	2	T1	2.6	0.51
5	2	T1	1	2	3	T2	0.2	0.2
6	3	T1	1	3	4	control	0.2	0.2
7	4	T1	1	0	1			
8	5	T1	0	3	3			
9	6	T2	1	0	1			
10	7	T2	0	0	0			
11	8	T2	0	0	0			
12	9	T2	0	0	0			
13	10	T2	0	0	0			
14	11	contro	0	0	0			
15	12	contro	0	0	0			
16	13	contro	0	0	0			
17	14	contro	0	0	0			
18	15	contro	1	0	1			
19								
20								
21	Barn site May 29. 2012							
22		plot	bug1	bug2	gen eral		29-May	
23	1	T1	3	3	6			
24	2	T1	1	4	5		avr	SEM
25	3	T1	0	0	0	T1	2.4	1.288
26	4	T1	0	0	0	T2	0.4	0.245
27	5	T1	0	1	1	control	1	0.316
28	6	T2	0	0	0			
29	7	T2	0	0	0			
30	8	T2	0	1	1			
31	9	T2	0	1	1			
32	10	T2	0	0	0			
33	11	contro	0	0	0			
34	12	contro	0	1	1			
35	13	contro	0	1	1			
36	14	contro	0	1	1			
37	15	contro	0	2	2			
38								
39								

	I	J	K	L	M	N	O	P
2	lake site Jun 12. 2012						12-Jun	
3		plot	bug1	bug 2			avr	SEM
4	1	T1	6	85	91	T1	30.4	15.47126
5	2	T1	8	13	21	T2	0.2	0.2
6	3	T1	11	0	11	control	0.6	0.6
7	4	T1	0	6	6			
8	5	T1	3	20	23			
9	6	T2	0	0	0			
10	7	T2	0	0	0			
11	8	T2	1	0	1			
12	9	T2	0	0	0			
13	10	T2	0	0	0			
14	11	contro	0	0	0			
15	12	contro	0	0	0			
16	13	contro	0	0	0			
17	14	contro	0	0	0			
18	15	contro	3	0	3			
21	Barn site Jun 12. 2012							
22		plot	bug1	bug2	gene ral		12-Jun	
23	1	T1	21	0	21			
24	2	T1	36	74	110		avr	SEM
25	3	T1	13	0	13	T1	30.6	20.10124
26	4	T1	7	0	7	T2	1	0.774597
27	5	T1	2	0	2	control	2.2	1.714643
28	6	T2	1	0	1			
29	7	T2	0	4	4			
30	8	T2	0	0	0			
31	9	T2	0	0	0			
32	10	T2	0	0	0			
33	11	contro	1	0	1			
34	12	contro	0	0	0			
35	13	contro	0	0	0			
36	14	contro	8	1	9			
37	15	contro	0	1	1			

	Q	R	S	T	U	V	W	X
2	lake site Jun 19. 2012						19-Jun	
3		plot	bug1	bug2	gene ral			
4	1	T1	17	80	97		avr	SEM
5	2	T1	44	136	180	T1	77.8	30.384865
6	3	T1	18	0	18	T2	1.8	1.5620499
7	4	T1	0	14	14	control	0.4	0.244949
8	5	T1	10	70	80			
9	6	T2	1	7	8			
10	7	T2	0	1	1			
11	8	T2	0	0	0			
12	9	T2	0	0	0			
13	10	T2	0	0	0			
14	11	control	0	0	0			
15	12	control	0	0	0			
16	13	control	0	0	0			
17	14	control	0	1	1			
18	15	control	0	1	1			
21	Barn site Jun 19 . 2012							
22		plot	bug1	bug2	gene ral		19-Jun	
23	1	T1	5	0	5			
24	2	T1	65	502	567		avr	SEM
25	3	T1	10	7	17	T1	119.4	111.92882
26	4	T1	0	6	6	T2	5	2.1908902
27	5	T1	0	2	2	control	2.8	0.969536
28	6	T2	0	8	8			
29	7	T2	0	12	12			
30	8	T2	0	0	0			
31	9	T2	3	0	3			
32	10	T2	2	0	2			
33	11	control	0	5	5			
34	12	control	1	1	2			
35	13	control	0	0	0			
36	14	control	0	5	5			
37	15	control	0	2	2			

	Y	Z	AA	AB	AC	AD	AE	AF
2	Lake site Jun 26. 2012						26-Jun	
3		plot	bug1	bug2	gener al			
4	1	T1	52	191	243		avr	SEM
5	2	T1	50	270	320	T1	141.6	60.313
6	3	T1	6	0	6	T2	0.2	0.2
7	4	T1	0	39	39	control	0	0
8	5	T1	4	96	100			
9	6	T2	0	1	1			
10	7	T2	0	0	0			
11	8	T2	0	0	0			
12	9	T2	0	0	0			
13	10	T2	0	0	0			
14	11	control	0	0	0			
15	12	control	0	0	0			
16	13	control	0	0	0			
17	14	control	0	0	0			
18	15	control	0	0	0			
21	Barn Site Jun 26 . 2012							
22		plot	bug1	bug2	gener al		26-Jun	
23	1	T1	0	0	0		avr	SEM
24	2	T1	44	2057	2101	T1	431.8	417.33
25	3	T1	12	20	32	T2	0.4	0.4
26	4	T1	0	16	16	control	1.2	0.5831
27	5	T1	0	10	10			
28	6	T2	0	0	0			
29	7	T2	0	0	0			
30	8	T2	0	0	0			
31	9	T2	0	0	0			
32	10	T2	0	2	2			
33	11	control	0	2	2			
34	12	control	1	0	1			
35	13	control	0	0	0			
36	14	control	0	3	3			
37	15	control	1	0	0			

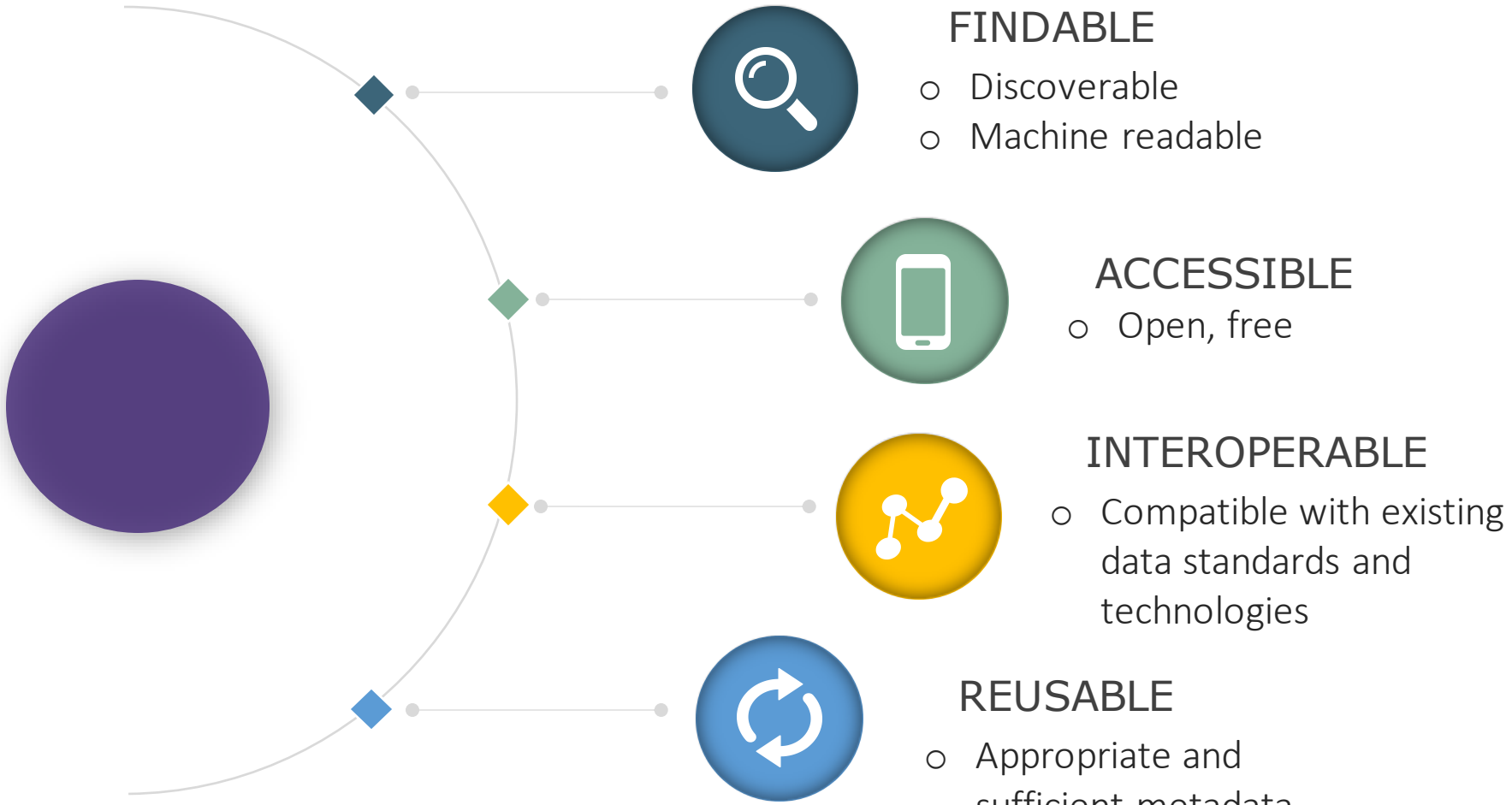
outcrop and core samples from phase 1, Shallow Unconventional Shale Gas Project, southwest Manitoba

			E	H	I	J	K	L	N
				Lithology descr	Formation	Member	MLC or Smectite [%]	Mica or Illite [%]	Gypsum (%)
			n	sh	Carlile	Boyne	0.04	0.04	1
			m	si	Carlile	Boyne	0.15	0.52	0
			m	g-si	Carlile	Boyne	0	0.21	2
			n	sh	Carlile	Boyne	0.02	0.03	1
			T	SHALE	Carlile	Boyne	0.03	0.03	0
			FT	SHALE	Carlile	Boyne	0.02	0.03	0
15	* sidewall core								
16									
17	62G8		Depth	Lithology descr	Formation	Member	MLC or Smectite [%]	Mica or Illite [%]	Gypsum (%)
18									
19	Site: 106-08-62G8-15								
20	106-08-62G8-15-1	outcrop	unknown	sh	Carlile	Boyne	0.01	4	0
21	106-08-62G8-15-2	outcrop	unknown	ss	Carlile	Boyne	0	6	0.01
22	106-08-62G8-15-3	outcrop	unknown	si	Carlile	Boyne	0		2
23	106-08-62G8-15-5	outcrop	unknwon	si	Carlile	Boyne	0		2
24									
25	Site: 106-08-62G8-16								
26	106-08-62G8-16-2	outcrop	0	sh	Carlile	Boyne	0	3	2
27	106-08-62G8-16-3	outcrop	0	sh	Carlile	Boyne	0	0.01	0.01
28	106-08-62G8-16-4	outcrop	0	sh	Carlile	Boyne	0	2	1
29	106-08-62G8-16-6	outcrop	0	sh	Carlile	Boyne	0.01	0.01	0.01

Standardizing data – WQX standard (USEPA & USGS)

DatasetName	MonitoringLocationID	MonitoringLocationName	MonitoringLocationLatitude	MonitoringLocationLongitude	MonitoringLocationHorizontalCoordinateReferenceSystem	MonitoringLocationType	Monitori
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S
North Shore - Gaspe Basin Long-term Water Quality Monitoring Data	NF02XA0001	LITTLE MECATINA RIVER ABOVE LAKE FOURMONT	52.2283	-61.3225	NAD83	River/Stream	NORTH S

FAIR Data Principles



FINDABLE

- Discoverable
- Machine readable

ACCESSIBLE

- Open, free

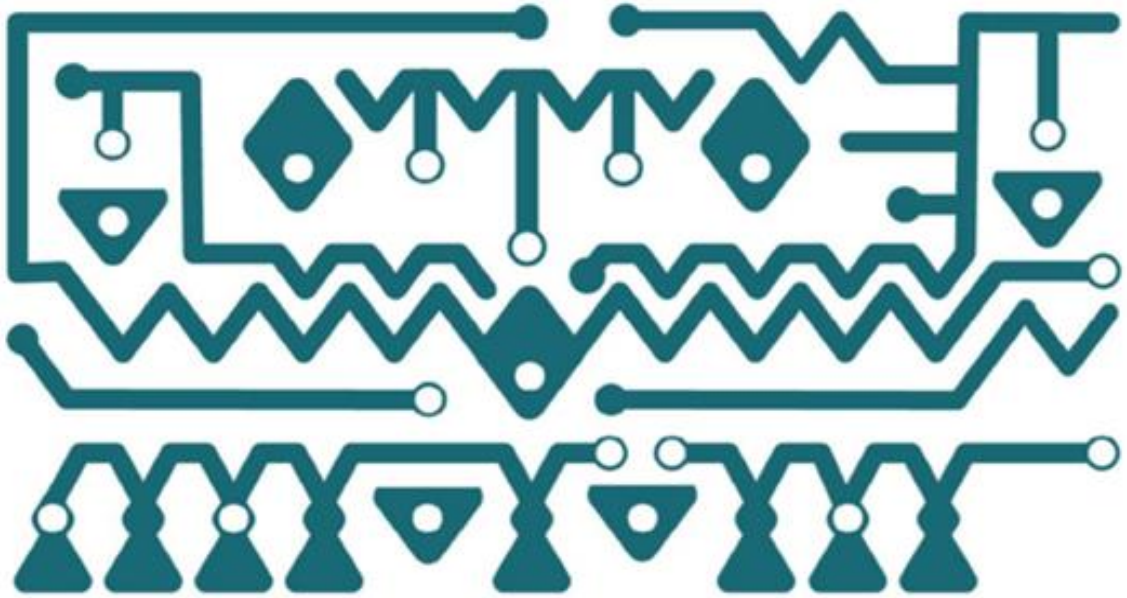
INTEROPERABLE

- Compatible with existing data standards and technologies

REUSABLE

- Appropriate and sufficient metadata

Mark D. Wilkinson et al. (2016). *Nature*.



CARE Principles for Indigenous Data Governance

Collective Benefit

- For inclusive development and innovation
- For improved government and citizen engagement
- For equitable outcomes

Authority to Control

- Recognizing rights and interests
- Data for governance
- Governance of data

Responsibility

- For positive relationships
- For expanding capability and capacity
- For Indigenous languages and worldviews

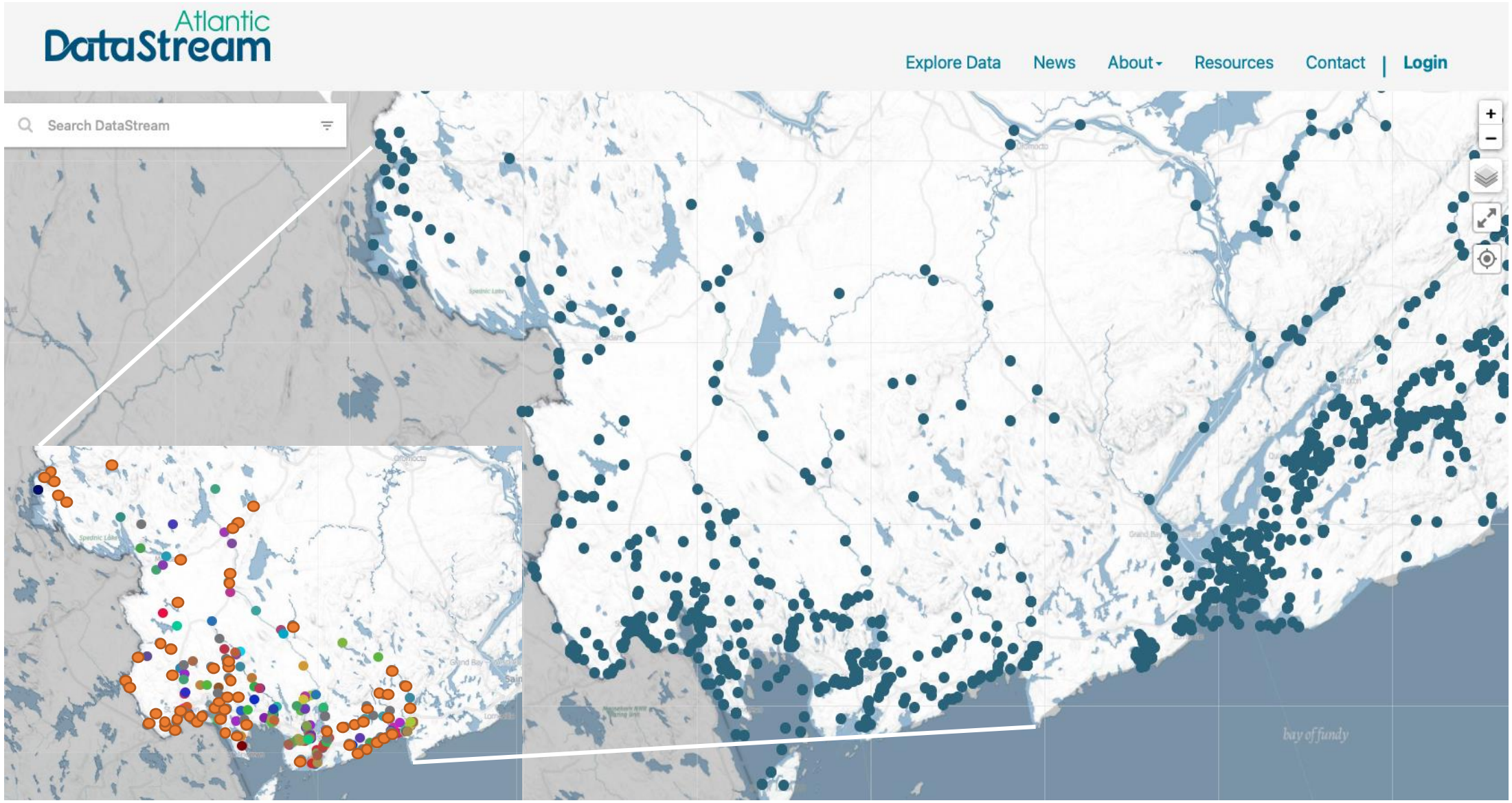
Ethics

- For minimizing harm and maximizing benefit
- For justice
- For future use

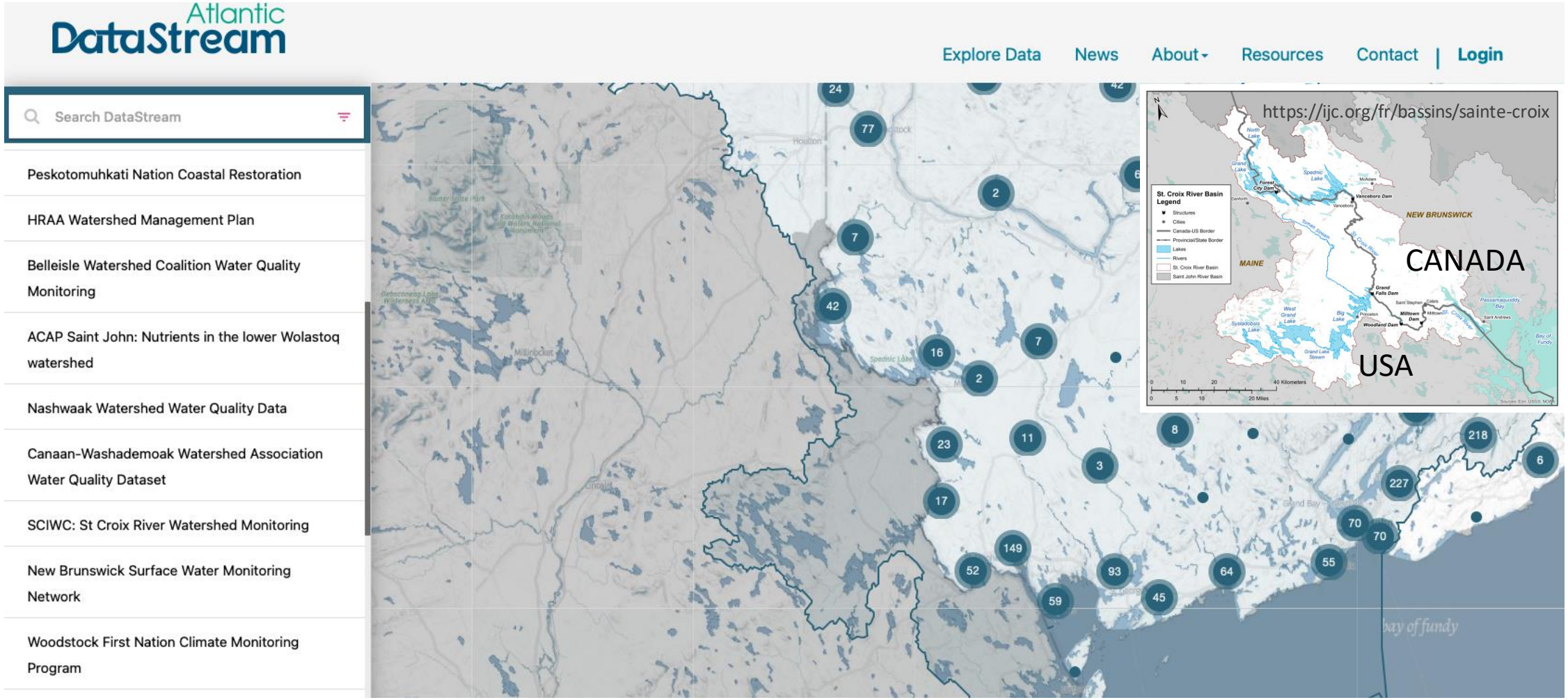
The Global Indigenous Data Alliance. GIDA-global.org

DataStream Demo

Case studies: Passamaquoddy Recognition Group Inc.



Case studies: St. Croix River Watershed



Case studies: Water Research

Dr. Nandita Basu, Canada Research Chair in Global Water Sustainability and Ecohydrology

University of Waterloo
Waterloo, Ontario

As a water researcher at the University of Waterloo, Dr. Nandita Basu creates models to help answer big questions. How well do wetlands protect against algal blooms? Where are the biggest hotspots for agricultural runoff? How is climate change affecting water quality? However, her models are only as good as the information she feeds into them. That's where a platform like DataStream can make all the difference – by bringing data together from across monitoring programs and jurisdictions, in a standard format. "Harmonizing these different datasets together is immensely valuable," explains Basu. This data can help researchers like Basu create insights into maintaining and improving water quality — insights that could help a municipality decide how big to build their water treatment plant. Or let farmers know the best time to apply fertilizer. Or pinpoint aquatic ecosystems that need added protection.

UNIVERSITY OF WATERLOO

Beyond the platform

- Supporting community-based water monitoring initiatives
- Science and data literacy (e.g., webinar series, science explainers)

Open data is a team sport, collaboration is key

Regional partners

Contributors/funders

Merci!
Thank you!

Cristina Cismasu
Data Specialist
cristina@gordonfn.org

www.DataStream.org

@DataStreamH2O

https://bit.ly/DataStreamNewsletter