DataStream
Evaluation

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July 2024

Table of contents

Executive summary

DataStream is a comprehensive initiative focused on freshwater protection. Its core programming includes:

- Providing a free, online platform for sharing water quality data

- Delivering resources and training on data management and water science

- Network building and advocacy to promote open access to environmental data and transparency in decision-making.

This report summarizes the findings of an evaluation of DataStream conducted by Jamie Gamble of Imprint Consulting Inc. in 2023. Based on results from key informant interviews and an anonymous survey it was possible to assess DataStream's success in achieving its goals in serving the freshwater community.

DataStream has surpassed its original goals: since 2018 its data holdings have grown to include data from over 48,000 monitoring locations in five regions across Canada collected by 257 organizations. This far exceeds its target of 100 organizations in three regions (set in 2018).

DataStream provides unique value to Canada's water sector. It reduces barriers to publishing and accessing data, provides consistency in how those data are reported, and fosters trust in the data's suitability for use. This frees up considerable time for water monitoring and

research organizations so they can focus on identifying actionable solutions to freshwater challenges.

DataStream makes monitoring groups' data more visible and gets data into the hands of decision makers. Organizations rely on DataStream's longevity to ensure the data remains accessible to communities and decision makers, now and into the future. There is high confidence that open data can influence policy change. And, DataStream is seen as having a role to play in advocating for open access to environmental data in Canada.

The evaluation identified the following strategic priorities to ensure DataStream's long-term contribution to freshwater protection:

Grow data holdings: Larger volumes of data will enable people to ask and answer the right questions about freshwater health.

Increase community supports: Continue to provide practical support to the DataStream community, primarily in the areas of data management training, resource development, and networking.

Achieve long-term sustainability: DataStream fills a vital gap in the water sector. It is essential to maintain DataStream's work over the long term, so that water monitoring organizations and data users can concentrate on their core priorities.

Introduction

This report summarizes the findings of an evaluation of DataStream conducted by Jamie Gamble of Imprint Consulting Inc. in 2023. The purpose of this evaluation was to inform DataStream's core programming and guide decisions about strategic priorities going forward.

This evaluation report answers two primary questions:

- What is the value and benefit of DataStream?
- What should DataStream prioritize moving forward?

Anonymized quotes from the interviews are included throughout this evaluation.

What is DataStream trying to achieve?

Starting in 2013, DataStream was developed and incubated within The Gordon Foundation, a philanthropic charity with a longstanding commitment to protecting Canada's freshwater. It officially launched in the Mackenzie Basin in 2016, where lack of access to data was identified as a major barrier to freshwater protection. Since then, DataStream has expanded across Canada in response to requests from water stewards experiencing similar challenges.

Today, DataStream is a comprehensive initiative focused on freshwater protection. Its core programming includes providing a free, online platform for sharing water quality data, delivering resources and training on data management and water science, network building, and advocacy to promote open access to environmental data and transparency in decision-making. DataStream's mission is to promote knowledge sharing and collaboration, so Canada's waters remain healthy for generations to come.

DataStream's reach: A snapshot

DataStream currently operates in five hub regions where it is used by an extensive and growing network of individuals and organizations. These hubs are high traffic sites, with over 110,000 unique visitors to all DataStream sites between 2020-2022.

At the time of writing, 257 organizations are using DataStream to publicly share their data, amounting to 36 million observations collected at over 48,000 locations. These organizations include federal, provincial/territorial, municipal and Indigenous governments, community groups, academic researchers and watershed organizations.

The data shared on DataStream is being viewed and downloaded. In 2022 alone, DataStream's explore tool (where data can be viewed) was visited by 5,447 unique visitors and datasets were downloaded over 300 times.

The data on DataStream is also being used. DataStream has been cited in 75 publications, including 18 citations of specific datasets. Data is also used in other ways, such as regulatory decision-making, journalism and reporting, and program planning.
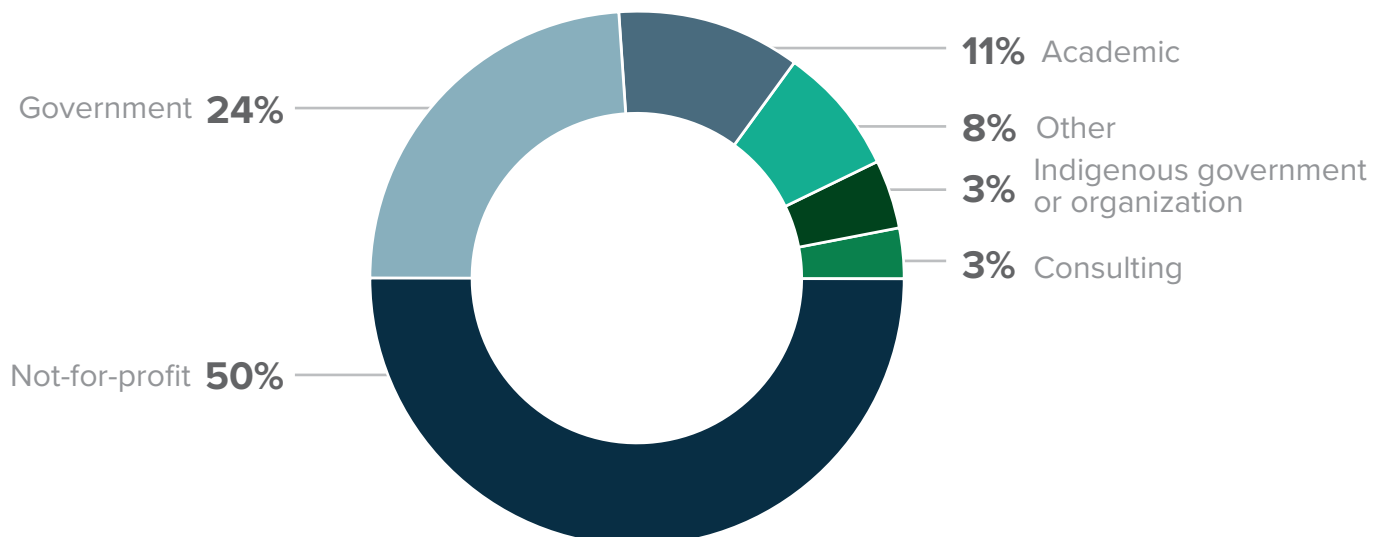
DataStream's educational materials are widely used. DataStream's most popular education resource – A Monitor's Guide to Water Quality – has been accessed over 80,000 times since it was released in 2021.

Profile of evaluation respondents

An electronic survey was distributed to DataStream contacts and made publicly available with a link on the DataStream website. The survey had 129 respondents from across all provinces and territories. In addition, 18 in-depth interviews were conducted with individuals from academia, government, watershed groups, funders, and intermediary organizations.

We heard from people across sectors:

N = 129

Government **24%**
Not-for-profit **50%**
11% Academic
8% Other
3% Indigenous government or organization
3% Consulting

We heard from people who engage in DataStream in a variety of ways:

N = 129 (Multiple responses possible)

We publish data on DataStream's open data platform 62%

We collaborate with the DataStream team 45%

We use data from DataStream's open data platform 43%

We attend DataStream events or workshops 29%

We use DataStream education and training resources 19%

We provide funding to DataStream 5%

We heard from people from all across Canada:

N = 128

Northwest Territories **5%**

Nunavut **3%**

Yukon **3%**

Quebec **7%**

Newfoundland and Labrador **4%**

Prince Edward Island **6%**

British Columbia **12%**

Nova Scotia **7%**

Alberta **12%**

Saskatchewan **3%**

Manitoba **7%**

Ontario **20%**

New Brunswick **10%**

Other **3%**
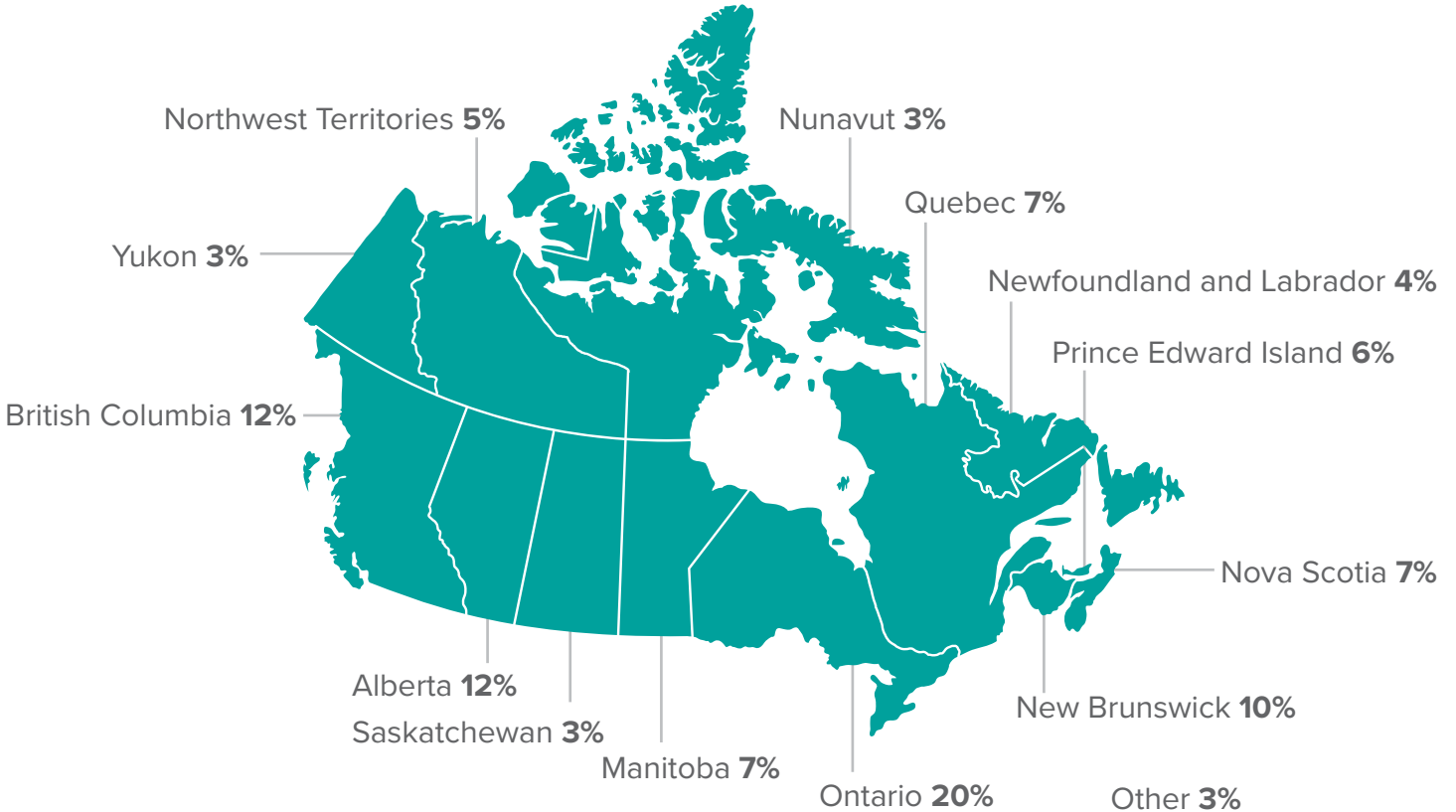
Survey and interview findings

Confidence in DataStream's open data platform

> " DataStream gives [our program] a reliable way to store our data, as well as the tools to make that data accessible and consistent across all groups "

People see DataStream as a trusted repository for sharing and accessing water data. Survey respondents indicated a high level of confidence in DataStream's open data platform: 88% are either completely (38%) or fairly (50%) confident.

Those publishing data on DataStream identified value in having a system that makes sharing their data easier, provides consistency in how those data are reported, and ensures that

their data will continue to be available for the long-term (protecting against data loss due to organizational changes or computer system failures, for example).

DataStream's role in making data more accessible and usable was also highlighted in the survey, for both lay-audiences as well as more technical applications.

> " [DataStream] provides our organization's data in a more accessible format including visualization and comparison to guidelines, [and] provides context and explanations on water quality parameters and what they mean. "

Usability of DataStream's open data platform

Overall, people find DataStream easy to use: 82% of survey respondents reported that DataStream's platform is either very easy (26%) or fairly easy (56%) to use.

Survey question: Which of the following best describes your experience using DataStream's open data platform?

N = 88

Very easy **26%**

11% Neutral

Fairly easy **56%**

7% Fairly difficult

0% Very difficult
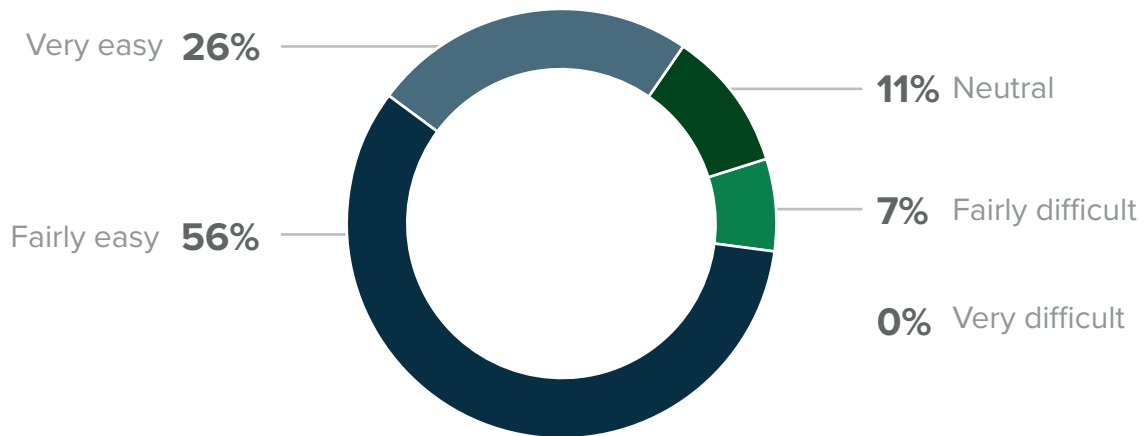
Respondents' perceptions of usability vary. For some, the platform is "clear," "accessible," "user-friendly," and "not glitchy." For others, there is an initial learning curve that could be flattened with tools and other supports. Respondents provided excellent suggestions for ways to improve DataStream's software.

A common theme from data contributors is the amount of upfront work required to prepare data for upload.

> " … the initial upload of historical data is a bit daunting, especially trying to contact labs to get analysis information that can be decades old. "

While some challenges related to uploading and editing past data, considerable appreciation was also expressed for the support that DataStream provides.

> " Support from DataStream staff is amazing! Very helpful in getting our data in order to upload to the platform! "

> Whenever I have needed help or feedback on data uploads, DataStream staff have responded quickly and took the time needed with me to solve the issue.

With the large volumes of data now available on DataStream, data users are looking for more ways to query the data and find what they're looking for.

> It would help me if [DataStream] adapted some of their search or filtering tools."

> For those doing regional analysis, it would be nice to be able to filter data by datasets with less than 5 years, more than 5 years, more than 10 years etc.

> There have been some issues with the speed of the API depending on the complexity of the query that's being made and the amount of data. But I wouldn't say it's extreme.

Though many users find DataStream's visualization features helpful, there is room for improvement.

> What would be really helpful for our volunteers who want to visualize our [high frequency] data but don't necessarily have the skills to download and plot them, would be to enable the data visualization/graph to display a greater range of data.

> Please improve online visualization tool to better visualize the vertical environment of lakes.

Perceived value of open data

67% of survey respondents publish data on DataStream's open data platform because they want to have it used by others.

> The work we do related to policy development and advocacy is rooted in science and data. The availability of this data through an open source is critical for supporting informed decision-making.

The survey queried perceptions of open data in general and its impact on policy. There is high confidence that open data can influence policy change among those who are engaged with DataStream, and that DataStream has a role to play in advocating for open data.

Extensive water monitoring and research are taking place in Canada. It is clear from survey and interview responses that people don't want to monitor for the sake of monitoring. They want to see their efforts translate into effective water stewardship and action.

Survey question: To what extent do you think open data improves policy development and decisions to protect freshwater?

N = 118

24% Somewhat

11% Not sure

3% A little

62% Significantly
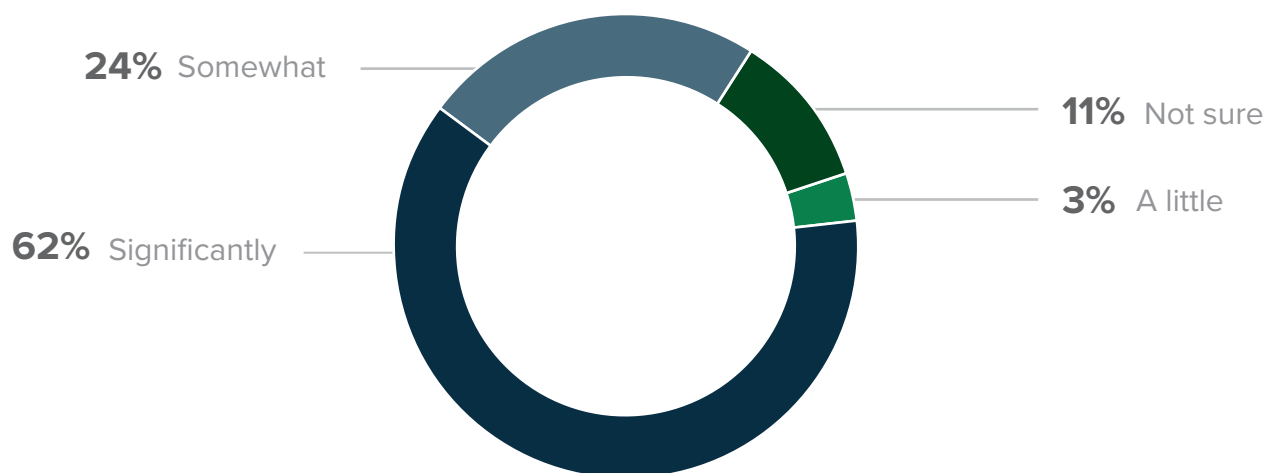
Survey question: What are your reasons for publishing data on DataStream's open data platform?

DataStream makes monitoring groups' data more visible and provides a means of getting it into the hands of decision makers.

> No one agency can do all the monitoring across the province, so having access to open data allows for more thorough analysis of the status of an area which can then lead to better informed policy responses.

Some respondents emphasized the need for similar infrastructure to share other types of environmental data.

> Consider branching out into managing biological data (eDNA relevant data, or phytoplankton, zooplankton, benthic invertebrate taxonomy), and continuous sensor data.

Use of data on DataStream

Website analytics and publication tracking indicate that data on DataStream is frequently viewed (5,447 unique visitors in 2022), downloaded (over 300 downloads in 2022) and cited in formal publications (75 formal citations). Survey responses and interviews gave a better understanding of how data are ultimately used. Respondents shared how they use DataStream to understand changes to freshwater health in response to climate and other stressors, and to make informed decisions at local, regional, and basin-wide scales.

We use data from DataStream's open data platform:

N = 88 (Multiple responses possible)

For research and analysis 62%

For our organization's education and outreach 46%

To inform our decision making 27%

For policy development or advocacy 18%

Survey respondents shared real-world examples of work being done with DataStream data:

Policy

- "**Fill gaps in federal and provincial water quality datasets** when analyzing regional water quality data for policy research."

- "We conducted a water inventory and used DataStream to quantify volume of datasets accessible to the public. **This analysis supports decision making on how to make national freshwater data more accessible and findable.**"

Watershed management and assessment

- "mapping levels of **contaminants in watersheds**"
- "collecting baseline information **in advance of large-scale development** in our watershed"
- "inform **drinking source water protection**"
- "**species at risk** habitat"
- "work on **nutrient management** across Canada"

Program design

- "comparing the initial data from our field work with nearby monitoring programs"
- "Through access to this data, we are able to identify where there are data gaps in our watershed more easily which has a **significant impact on how we select locations for our CBM** programs."
- "Understanding who is monitoring where and what so we can **prioritize better and not duplicate** ongoing efforts!"

Research

- "predictive water temperature model for **climate adaptation in the Maritimes**"
- "**thermal mapping**"
- "Use historical water quality data to assess **impacts of climate change on fish habitat**"
- "**Effects of road salt on juvenile salmon**"

Education and outreach

- "Educating students about community science initiatives—**what they do, why they do it, how to use the data**"
- "I found the **science explainers to be great background information** in communicating water quality metrics to non-experts."

A data use example is when West Point First Nation in the Northwest Territories was worried about arsenic. DataStream data was used to help show the community that levels of contaminants were below standards which helped to show the community that there was no arsenic risk.

Connecting and strengthening Canada's water sector

> " We like to showcase and teach our students how to use this online platform as we believe it will be an important component of water management currently and in the future. "

DataStream has helped break down information silos and connect those interested in and committed to water stewardship. These opportunities to connect have supported more collaboration on advocacy and information sharing, enabled people to learn from each other's practices, and advanced a wider view of what is going on around water quality and water data.

DataStream streamlines monitoring:

Beyond data sharing, DataStream is advancing collaboration in other ways. Organizations have used DataStream to optimize their resources and streamline monitoring activities. Being able to see what data already exists has enabled organizations to identify and fill data gaps and reduce duplication of efforts.

> " It's beneficial for us and our partners to see how DataStream users work on similar water quality issues throughout Canada. "

> " We have heard from newer groups that viewing data from other organizations on DataStream has helped them figure out what and where to monitor and to find nearby organizations. "

DataStream increases capacity for data management and sharing:

DataStream and its related resources (e.g., webinars, stories, and guides) help make education and communication more accessible, inform and enrich classroom-based learning, and help engage funders to build support for the work.

> " We regularly send our community partners to DataStream resources to help them with data management and sharing "

> " Every year since using DataStream, our non-profit organization shares our water monitoring data with local funders to emphasize the impact of our work. This helps to guarantee funding for years to come. "

Survey question: If you have accessed or used any of the following education resources, how useful have they been for you?

N = 31 (Multiple responses possible)

A Monitor's Guide to Water Quality science explainers

| 62% | 17% | 4% | 17% |

DataStream upload guidance documents

| 60% | 23% | 17% |

Data visualization tools

| 57% | 20% | 3% | 20% |

DataStream FAQ

| 50% | 11% | 3% | 36% |

DataStream how-to videos

| 39% | 18% | 43% |

Dive Into Data webinar series

| 32% | 18% | 50% |
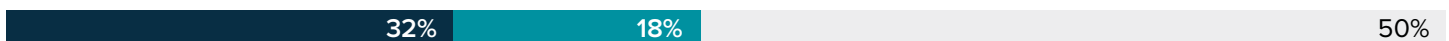
■ Very useful ■ Somewhat useful ■ Not very useful ☐ I haven't used this resource

Survey question: What education topics are you most interested in going forward?

N = 115 (Multiple responses possible)

Water data analysis

| 68% | 26% | 6% |

Freshwater science and water quality basics

| 61% | 32% | 7% |

Water data management

| 59% | 37% | 4% |

Viewing and visualizing data in DataStream's online platform

| 52% | 41% | 7% |

Designing a water monitoring program

| 48% | 39% | 13% |

Contributing data to DataStream's online platform

| 40% | 46% | 14% |

How to access data on DataStream's online platform

| 32% | 51% | 17% |

■ Very interested　　■ Somewhat interested　　■ Not interested

DataStream is a natural convener:

DataStream is seen as a natural connector because of its extensive network of contributors and collaborators, national profile and an established track record of convening through The Gordon Foundation. There is an appetite for DataStream to further facilitate knowledge exchange and informal networking both regionally and nationally.

Respondents expressed interest in convening around the following topics:

- Showcasing research outputs from DataStream data

- Connecting data users with data providers

- Understanding who is doing what in a region

- Convening to address specific data issues such as gaps, capacity building, and emerging trends in the data.

41% of survey respondents have connected with other individuals or organizations involved in water quality through the DataStream network.

" It has recently revealed new watershed stewardship groups in our watershed that we didn't know about! "

" [DataStream] helps First Nations and other community organizations understand how they can begin to start monitoring their water. "

The unique value of DataStream

The value that DataStream provides is unique in Canada. This value, as described by survey and interview respondents, can be summarized as follows:

Data Access
The open nature of DataStream reduces barriers to publishing and accessing data. This promotes more equitable access to data and as a result, more groups can openly publish their monitoring results in formats that support its use. And, with more groups participating there is more data. This results in better temporal and geographical coverage of important watershed health indicators.

Transparency and Trust
A key aspect of DataStream's value lies in its impartiality. Providing a neutral home for data – with transparent information on how it is managed and stored – fosters trust in the data's suitability for use. DataStream's neutrality makes it uniquely positioned to bridge regional differences and facilitate cross-sector collaboration within and between diverse groups of people collecting and using water data.

Longevity
For many data contributors, DataStream's open data platform is the sole repository used to store and share the results of their water quality monitoring. These organizations rely on DataStream being around for the long term to ensure the data remains accessible to communities and decision makers.

Efficiencies
DataStream frees up considerable time for data users. Because data formats are consistent, permissions are clear, and the platform includes comprehensive water quality data across a region, the time required to source, access, and integrate multiple data sources is removed. If this were done individually there would be substantial redundancy in effort, increased cost, and, as a result, less time, and fewer resources available for data analysis.

Improved data quality and comparability
By bringing data together in one place and format, DataStream helps to overcome common challenges related to data inconsistency, interoperability, and reproducibility that arise when working with multiple data sources, particularly at regional scales. DataStream's rigorous upload process and metadata requirements boost confidence in the quality of the data, increasing the potential for its use.

> " It makes data available that would otherwise be lost or unused "

Priorities moving forward

DataStream can continue to provide value to Canada's water sector by maintaining and strengthening existing activities and investing strategically in a few key areas:

Grow data holdings:
Providing access to larger volumes of data will enable people to ask and answer the right questions about freshwater health.

Increase community supports:
Continue to provide practical support to the DataStream community, primarily in the areas of data management training, resource development, and networking.

Achieve long-term sustainability:
DataStream fills a vital gap in the water sector. It is essential to maintain DataStream's work over the long term, so that water monitoring organizations and data users can concentrate on their core priorities.

Conclusion

" They have accomplished what
a lot of people thought was not
possible. "

DataStream has more than met the goals it set out to achieve seven years ago. And it has succeeded where other models fell short. The Gordon Foundation's early investments in DataStream have paid off, establishing it as Canada's largest independent and scientifically robust source of water quality data. Since 2018 its data holdings have grown by 3,500%, with hubs now active in five regions, supporting nearly 2.5 times the number of community-based monitoring programs it initially hoped to reach.

The widespread collaboration and data sharing among diverse organizations is a testament to people's trust in DataStream and the credibility of its open data platform and related programming. All of this results in clear benefits for water stewardship through open data, transparent decision making, and strengthened networks. Continued commitment and strategic investment to increase data availability and enhance support for the water monitoring community will maintain these benefits and ensure DataStream is around for the long term.

DataStream stemmed from the recognition that informed decision making and policy cannot be made without addressing a nationwide data access gap. It is clear from this evaluation that DataStream has made significant progress in closing this gap and is playing a fundamental role in freshwater protection efforts across the country.

Deninu Kų́ę́ First Nation, Northwest Territories. Credit: Lindsay Day.

Learn more and contact DataStream:

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