

National Freshwater Data Strategy Workshop

September 25–26, 2024

Canada Centre for Inland Waters
Burlington, Ontario



Canada
Water Agency

Agence de l'eau
du Canada

Canada 



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Executive Summary

Introduction

In engagements leading to the creation of the Canada Water Agency, Canadians stressed that the availability of and access to high-quality data is critical for effective decision making on all freshwater issues, and that Canada needs a coordinated approach to data collection, management and sharing. The 2024 National Freshwater Data Strategy Workshop was convened to lay the foundation for a collaborative approach to freshwater data management. The workshop gathered Indigenous rights holders and representatives, government officials, academics, non-government experts, industry, and community representatives to discuss the development of a National Freshwater Data Strategy.

Purpose and Vision for a National Freshwater Data Strategy

To understand Canada's complex freshwater landscape, we need to outline common approaches and actions. A National Freshwater Data Strategy will discuss ways to improve discoverability, quality, and interoperability, while respecting commitments to restoring Indigenous Data Sovereignty and enhancing long-term stewardship of data assets. The goal is to support evidence-based decisions and sustainable management of freshwater resources.

What we heard

A number of key challenges were identified at the workshop including:

- **Fragmentation & Accessibility:** Data is siloed across jurisdictions, sectors, and organizations making it hard to find and use.
- **Trust & Inclusion:** Building trust with Indigenous and local communities on how data is collected, managed, and shared is critical. Data sovereignty and respectful partnerships must be prioritized.

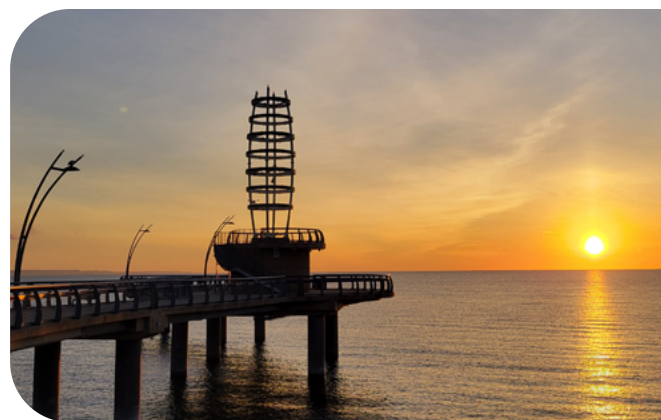


Figure 1 – National Freshwater Data Strategy Vision and Principles

- **Quality & Standards:** Inconsistent data standards hinder usability. Principles, guidelines, and standards are needed to make data work together to support watershed-scale decision-making.
- **Capacity Gaps:** Many organizations—particularly smaller groups and Indigenous communities—lack resources and training to effectively manage and share data.
- **Coordination:** Collaboration across governments, sectors, and regions is uneven and needs strengthening.

A number of recommendations were suggested by workshop participants including:

- **Data Governance:** Strengthen collaboration across jurisdictions—particularly between federal and provincial authorities—and develop a national Water Data Community of Practice where freshwater data practitioners can connect and collaborate.
- **Indigenous Communities and Knowledge:** Support Indigenous-led stewardship, promote and integrate Traditional Ecological Knowledge (TEK), and uphold nation-to-nation relationships.
- **Data Standards & Quality:** Adopt FAIR (Findable, Accessible, Interoperable, Reusable) principles, align with international standards, and improve metadata practices to understand complex water problems by combining multiple types of freshwater data.
- **Capacity Building & Tools:** Support the community with funding, training, and help desk services; improve management of existing models and portals; ensure long-term stewardship of freshwater data through archiving.
- **Collaboration & Outreach:** Build cross-sector partnerships and expand public engagement through plain-language data tools.



Breakout Session Highlights

Session #1: Working Together Within Our Communities

The first breakout sessions focused on clusters of water data producers, managers and users across Canada's regions and economy. Communities included First Nations, Inuit and Metis; non-governmental organizations; the public sector; academia; and industry.

Participants responded:

- Overall, participants highlighted the opportunity to strengthen freshwater data management through cross-sectoral collaboration.
- Indigenous participants emphasized the ongoing challenge of ensuring respect for data sovereignty, cultural protocols, and rights-based engagement.

- Some non-governmental organizations (NGOs) stressed they face challenges in obtaining financial and other forms of support for data collection and management, while also highlighting the importance of accessible and transparent public data disclosure.
- Public sector representatives noted the importance of creating or improving platforms to make it easier to find, access, and share freshwater data, and called for stronger coordination among governments and organizations.
- Academic participants highlighted challenges around metadata completeness, Tri-Council grant design, standard development and adoption, as well as structural challenges to preserving legacy data.
- Industry highlighted opportunities for data to support innovation, AI-driven modelling, and regulatory modernization. Participants noted that inconsistent funding may cause gaps in datasets, which undermine the data's value for long-term research and innovation.



Session #2: Solutions and Actions

The second session focused on how the strategy could address challenges identified through thematic areas, including process and tools; data stewardship and governance; finding and accessing data; appropriate data quality; and standardization.

Participants responded:

- Clearly communicate the quality of open public sector data and strengthen timely publication of data. Develop centralized inventories, portals, and certification systems to make data easier to find and use.
- Strengthen stewardship, retention, and data archiving practices to identify and manage the most important and valuable datasets to Canadians.
- Respect Indigenous sovereignty over data collected by and about communities which will strengthen local decision making, build trust and ultimately enhance data sharing.
- Create flexible, modular national standards that are easy for organizations to adopt and that prioritize interoperability so that it is easier to combine data from different sources to provide integrated advice to decision-makers.

Session #3: Building the Strategy and Moving Forward

The third session asked participants for guidance on how the strategy should be developed and approved; how the Canada Water Agency could seek advice and guidance; whether pillars and priorities were adequate; and how the capacity and talent needed to implement the strategy could be provided.

Participants responded:

- Leverage Canada’s data expertise through thematic advisory and technical working groups and ensure inclusive advisory structures.
- Build on core pillars to develop the strategy: Findability and Accessibility, Quality Data, Capacity Building, Data Stewardship, and Coordination and Leadership.
- Pursue “quick wins” in the strategy such as a centralized data inventory, federated search portal, and interoperability improvements.
- Enhance capacity and talent for data management through training, funding, and partnerships.
- Draft the strategy inclusively with input from all partners and stakeholders, including practical examples, plain language and actionable steps.

Closing Commitment

The workshop participants confirmed that Indigenous rights holders must be central to decision-making and that the CWA’s role is to act as a connector, facilitator, and catalyst. Progress relies on inclusivity, transparency, and collaboration across all jurisdictions and sectors. Moving forward, the CWA will:

- Continue engagement with freshwater data communities.
- Collaboratively draft a National Freshwater Data Strategy.
- Reconvene partners and stakeholders to refine and finalize the strategy.

The National Freshwater Data Strategy will chart the path in transforming Canada’s freshwater data landscape by driving toward more accessible and interoperable freshwater data. When data is easier to use, it enables better decisions, builds public trust, and respects Indigenous sovereignty.

For more information

Please visit the Canada Water Agency website for more information about the Agency’s work and links to federal freshwater information.





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Themes

Findable and Accessible Data



Data Integration and Accessibility



Innovation and Technology Integration



Long-Term Data Archival and Storage

Quality Data



Data Standardization and Quality

Data Stewardship



Strategic Leadership by the Canada Water Agency



Transparency and Accountability



Indigenous Perspectives and Data Sovereignty

Capacity Building and Mobilization



Collaboration and Engagement with Freshwater Data Communities



Community-Centric Approaches



Capacity Building and Resource Support

Introduction

The freshwater data landscape in Canada is fragmented, with data generated and held by numerous entities and for different purposes. This creates challenges in discoverability, accessibility, usability, and interoperability. The absence of standards or common approaches hinders effective data sharing and integration, limiting comprehensive understanding of freshwater resources in Canada. Additionally, governments and organizations have not consistently recognized sovereignty of data created by and about Indigenous communities, emphasizing the need for thoughtful stewardship in data management practices.

The Canada Water Agency is leading collaborative work to develop a National Freshwater Data Strategy that will address these challenges. The strategy will include principles for data management to improve the discoverability, accessibility, and usability of freshwater data in Canada. This, in turn, will help inform freshwater decisions and enhance understanding of water in Canada.

To initiate development of the strategy, the CWA brought together water management experts and community representatives from across Canada to discuss challenges and opportunities specific to freshwater data. The National Freshwater Data Strategy Workshop was held in person on September 25 and 26 at the Canada Centre for Inland Waters (CCIW) in Burlington, Ontario. This two-day event convened data experts, users, and representatives from Canada's water community to offer input and recommendations for the National Freshwater Data Strategy.

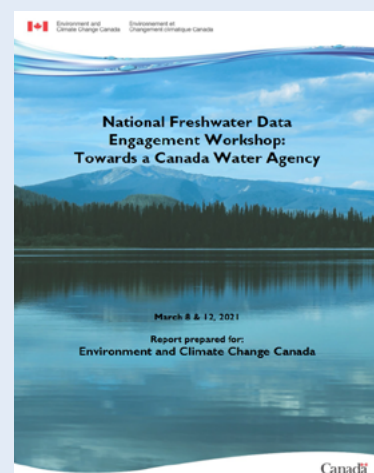
The workshop aimed to gather input and recommendations from data experts, producers, and users to inform the strategy and initiate action planning.

National Freshwater Data Engagement Workshop: Towards a Canada Water Agency

Environment and Climate Change Canada hosted the virtual National Freshwater Data Engagement Workshop on March 8 and 12, 2021. It was an extension of the 'Toward the Creation of a Canada Water Agency' Discussion Paper initiative. It focused on the freshwater data challenges and opportunities to support this new agency.

Participants spoke about their data access challenges and provided meaningful insights on how a Canada Water Agency could play a constructive role in freshwater data dissemination. In turn, it could more easily be used to inform decision-making, impact policies, and guide best practices pertaining to better freshwater management across the country.

Report link: [National Freshwater Data Engagement Workshop: Towards a Canada Water Agency](#)



Workshop Structure

This workshop featured two plenary sessions providing overarching information on freshwater data, coupled with three discussion sessions where participants provided input on the development of the strategy. This report focuses on summarizing the discussion sessions.

Day one's plenary session focused on why we need a National Freshwater Data Strategy and the broader context in which the strategy will be developed. The session introduced a way that Indigenous communities are asserting sovereignty over data by defining the appropriate use of data and artifacts through Local Contexts labels. Participants also heard how the Government of Canada is addressing data management, and how the Canada Water Agency plans to develop the strategy. Presenters included:

- **Stephany Runninghawk Johnson** (Founding Executive Director – Local Contexts)
- **Alexandra Dykes** (Director, Performance and Oversight, Office of the Chief Information Officer of Canada – Treasury Board of Canada Secretariat)
- **Jim M.C. Young** (Data Lead – Canada Water Agency)

Day two's plenary session showcased examples of how data is being used and managed to meet the needs of communities. Presenters included:

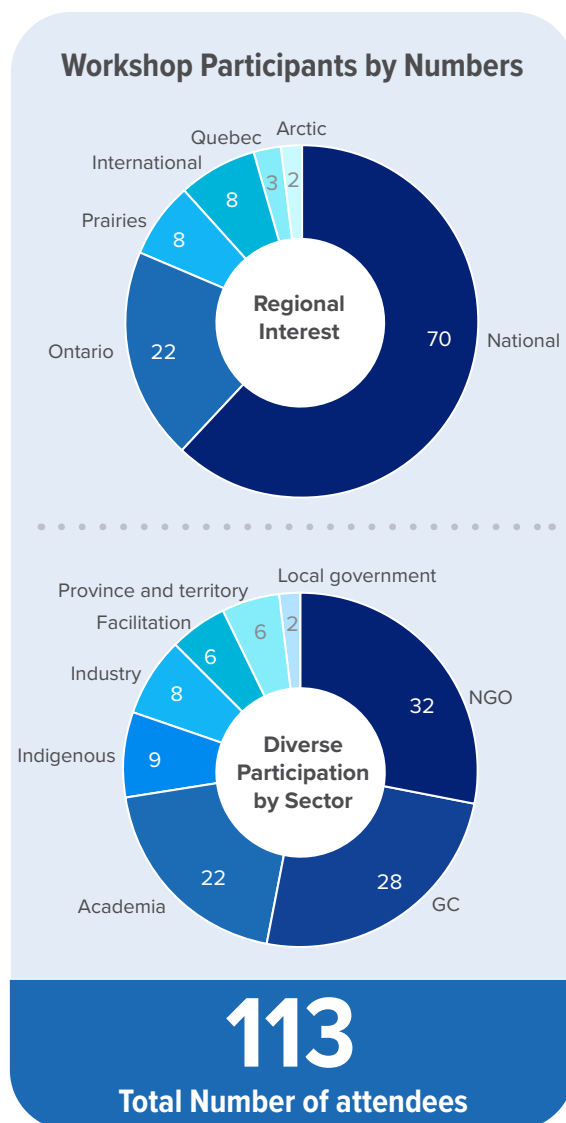
- **Kat Kavanagh** (Designer and Executive Director – Water Rangers)
- **Katherine Balpataky** (Executive Director – DataStream)

Water Rangers works to put scientifically validated tools in the hands of community members to conduct rigorous monitoring, and they recently took on the task of developing basin-health report cards for all of Canada. DataStream works across regions and basins to present standardized water quality data from a variety of contributors.

Following the morning plenary, breakout sessions convened to foster discussion on content in the strategy. Breakout sessions addressed these themes:

1. **Working together within our communities** (NGOs and civil society; First Nations, Inuit, and Métis; public sector; academia; and business and innovation);
2. **Solutions and actions (Processes and tools; Data stewardship; Findable and accessible data; Quality data; and Standards); and**
3. **Building the strategy and moving forward** (advisory structure; pillars and priorities; action plan; capacity and talent; and design and drafting).

Further details on workshop structure and plenary remarks are in the attached appendix.



Session 1 – Working Together Within our Communities



Session 1 – Working Together Within our Communities

The workshop brought together participants with interests across different sectors of society, each with unique interests and needs for freshwater data and information. The first breakout session, titled “Working Together Within our Communities,” focused on the distinct challenges and opportunities of these sectors as well as their interactions with each other. Discussion groups included::

1. First Nations, Inuit, and Métis Communities
2. NGOs and Civil Society
3. Public Sector
4. Academia
5. Business and Innovation

The session aimed to identify shared challenges and opportunities for strengthening freshwater data management through cross-sectoral collaboration.

“[...] strengthen connections with Indigenous communities by prioritizing personal and immersive experiences, including ceremonial gatherings or community-based events.”

First Nations, Inuit, and Métis Communities

The 2023–2026 Data Strategy for the Federal Public Service includes provisions for Indigenous Data Sovereignty. These provisions aim to establish a whole-of-government approach to support First Nation, Inuit, and Métis communities in realizing their unique visions for data sovereignty.

This breakout session discussion group included representatives of Indigenous organizations, data experts, and researchers. Their discussion was guided by the following questions:

1. What are the biggest challenges that you have seen in collecting, managing, and using data?
2. How could the GC build trust with communities and work better with water data?
3. How can improved sharing of water data build trust within and between communities?
4. What could the CWA do to recognize the value of local data, information, and knowledge?

The following are highlights from this discussion:

- **Data Collection Challenges:** Participants highlighted issues with data sustainability, particularly when individuals retire or leave. Many Indigenous communities have limited capacity to maintain long-term databases.
- **Data Privacy Concerns:** Privacy concerns impact data sharing, particularly when it involves culturally-sensitive or personal information. For example, some communities are reluctant to share data that might result in the overuse of traditional fishing spots.

- **Traditional Ecological Knowledge:** This knowledge is typically shared through oral traditions, such as storytelling, rather than formal databases, making it difficult to quantify and integrate with conventional data systems. This knowledge reflects generational observations of environmental changes and ecosystems.
- **Building Trust with Indigenous Communities:** Building trust requires respect for Indigenous customs, traditions, and ceremonies. Participants emphasized the importance of informal, relationship-based engagement tailored to each community's unique cultural practices.
- **Reciprocity and Accountability:** Indigenous communities expect data collection to involve a mutual exchange of benefits. Participants suggested that formal agreements outlining shared accountability could enhance trust and strengthen partnerships.
- **Representation and Accessibility:** Limited Indigenous representation at workshops remains a challenge — often due to logistical barriers such as travel costs and remote locations. Participants emphasized the need to address these obstacles to ensure meaningful participation in critical discussions.
- **Rights Holders vs. Stakeholders:** Indigenous Peoples emphasized their role as rights holders with inherent land and water rights, rather than stakeholders. This distinction must inform all future CWA interactions and policy discussions.
- **Capacity Building:** Increased funding and training for Indigenous community staff were raised as being essential for fostering meaningful, sustainable relationships and active engagement in water management initiatives.
- **Engagement Approaches:** Participants called on the CWA to strengthen connections with Indigenous communities by prioritizing personal and immersive experiences, including ceremonial gatherings or community-based events.
- **Distinction-Based Approaches:** Funding and resources must address the unique needs of First Nations, Inuit, and Métis communities. Participants noted that current funding models often favour First Nations, creating gaps for Inuit and Métis communities.

“[When working with communities,] find a way to give back equally or greater. What can you give of value in exchange for the data?”



NGOs and Civil Society

From grassroots community groups to global charities, NGOs reflect the strong commitment of Canadians to freshwater stewardship. These groups work as part of civil society to generate data, knowledge and information to participate in public discourse, provide community-scale services, and represent members to government decision makers.

Throughout the development of the CWA, NGOs have emphasized the importance community-based approaches to water monitoring, research, stewardship, and engagement. Opinions varied on whether to prioritize new GC data portals, enhance existing ones (e.g., Open Canada; Geo.ca), or support third-party platforms.

Elevating CBWM in Canada

In November of 2018, The Gordon Foundation, Living Lakes Canada and World Wildlife Fund-Canada convened a collaborative dialogue around federal government engagement and support for CBWM in Canada. This initiative highlighted the importance and value of freshwater data for decisions in Canadian communities.

Link: [Final Recommendations: Elevating Community-Based Water Monitoring in Canada](#)



Members of NGOs and civil society groups explored challenges and opportunities they see in freshwater data management. Their discussions were guided by these questions:

1. What are the biggest challenges in collecting, managing, and using freshwater data?
2. How can the CWA collaborate with government departments and agencies to integrate Community-Based Water Monitoring data into decision-making processes? How can quality be assured?
3. Should the CWA focus on developing a new water data portal or improving existing ones? What funding priorities could enhance data access and findability?
4. How can the CWA build trust and improve relationships with programs, agencies, and departments in the freshwater data space?

The following are highlights from this discussion:

- **Challenges in Data Collection and Access:** Participants highlighted significant challenges in accessing freshwater data, citing fragmentation, proprietary restrictions (particularly in industry), and the siloed nature of data held by governments and NGOs.
- **Community-Based Water Monitoring (CBWM):** CBWM was recognized as a valuable grassroots initiative supporting freshwater stewardship. However, participants noted the challenges in standardizing and integrating CBWM data into federal frameworks, which require careful consideration to balance community autonomy with national goals.

- **Data Standardization and Quality Assurance:**

Participants highlighted the need for data standardization to enhance compatibility and reliability across diverse organizations, in turn, improving quality assurance. However, some expressed concerns that overly rigid standards could limit the flexibility of local, community-driven methodologies.

- **Legal and Data Sovereignty Issues:** Participants discussed legal challenges, including industry reluctance to share data due to liability or proprietary concerns. The need to prioritize Indigenous Data Sovereignty, with calls for federal bodies to build trust and foster respectful data-sharing practices with Indigenous communities, was emphasized.

- **Federal Data Portals and Interoperability:** Participants debated the merits of creating a new freshwater data portal versus improving existing portals. The majority favoured integrating with established platforms, such as DataStream, and proposed a “repository of repositories” to streamline access and minimize redundancy.

- **Public Engagement and Accessibility:** Participants stressed that freshwater data must be accessible and engaging to maximize its impact on the public. Examples such as health dashboards used during COVID-19 were highlighted as models for presenting water quality data in ways that resonate with daily life.

- **Support for Under-Resourced Organizations:** Smaller watershed groups often lack the necessary resources to digitize and share data effectively. Participants advocated for increased funding mechanisms, improved access to equipment, and streamlined support to enhance these groups’ contributions to freshwater stewardship.

- **NGOs in Data Collection:** NGOs play a crucial role in collecting data that addresses critical gaps left by government agencies. Participants recommended fostering stronger collaboration and formal recognition of NGO contributions, including potential federal “certification” to validate their data.

- **Trust and Data Use Transparency:** Participants highlighted frustrations with the lack of transparency regarding federal agencies’ use of NGO-collected data. They called for clearer reporting mechanisms to help NGOs demonstrate their impact to funders and communities.

- **Data Licences and Attribution:** Participants emphasized the need to address licensing issues, advocating for Creative Commons licenses to ensure NGOs receive proper attribution when their data is used.

“Participants debated the merits of creating a new freshwater data portal versus improving existing portals [and] favoured integrating with established platforms, such as DataStream, and proposed a ‘repository of repositories; to streamline access and minimize redundancy.”

Public Sector

The CWA received strong feedback during its development emphasizing the need for Canada to prioritize freshwater data collection, management, and access. The public sector faces several persistent challenges when it comes to freshwater data. These include information silos within and across the public sector, uncertainty regarding data-sharing risks and challenges, and delays between data collection and its availability for use by professionals and the public.

This discussion was guided by the following questions:

1. What are the biggest challenges that you have seen in collecting, managing, and using freshwater data?
2. How can the CWA help you coordinate with other programs, departments and agencies regarding freshwater governance, standards, and tools?
3. In feedback to the CWA, many respondents connected data challenges to monitoring gaps. How could the GC assess gaps that may cross programs, departments, agencies, and services?
4. From your experience, how can the GC work internally and with provinces and territories to support Indigenous Data Sovereignty in the freshwater domain?
5. How can the CWA align and coordinate the numerous programs, services, priorities, and committees across the GC while respecting individual mandates and existing relationships with other governments and communities?

The following are highlights from this discussion:

- **Data Standardization Challenges:** Freshwater data from multiple sources often lacks standardization, complicating integration and comparison efforts. Data silos, inconsistent formats, and accessibility issues further hinder public communications.
- **Accessibility and Metadata:** Freshwater data is often difficult to access and lacks comprehensive metadata or descriptions, complicating efforts to locate and interpret it effectively.
- **Resource and Capacity Limitations:** Standardizing and managing data requires substantial time and resources. Limited capacity affects data quality and quantity, with new and emerging professionals often facing challenges due to inconsistent data from multiple sources.
- **Centralized Resource Hub:** The CWA could improve coordination by establishing a centralized hub featuring best practices, national standards, technical support, and tools for both federal and external partners.
- **Data Directory and Network:** Participants recommended developing a national data directory or network to connect researchers and data users, offering metadata, contact information, and a centralized catalogue of standardized data.
- **Automation and Support:** Automating data standardization practices significantly save time and resources. Participants suggested that CWA support in automation and quality control would support consistent, high-quality data collection and management.
- **Building Collaboration Across Government Levels:** The CWA could foster intergovernmental collaboration by offering incentives, creating working groups, and promoting a unified message to encourage buy-in for data sharing and standardization.
- **Incentivizing Private Sector Participation:** Collaboration with the private sector is often hindered by differing mandates. Participants recommended using incentives, providing resources, and highlighting successful models to encourage private sector involvement.

- **Pilot Projects and Community of Practice:** Pilot projects could test new standards and tools before nationwide implementation. Participants also suggested forming informal working groups or communities of practice to facilitate knowledge sharing and collaboration.
- **Long-Term Sustainability:** The CWA could play a pivotal role in maintaining standards and fostering collaboration to ensure the long-term integration and usability of freshwater data across Canada.

Academia

Canada's post-secondary research community play a vital role in advancing knowledge and addressing current and future challenges in fresh water across social, economic, and environmental domains. Academics are at the forefront of knowledge generation, contributing to historical understanding, present-day analysis, and future forecasting. Researchers collect both quantitative and qualitative data, produce critical information resources, and educate the next generations of water professionals.

Academic programs often lead data management efforts in the freshwater domain, highlighting the importance of collaboration between researchers, policymakers, and the public sector. Notable examples include the Polar Data Catalogue and the Canadian Watershed Information Network.

The discussion was guided by the following questions:

1. What are the biggest challenges that you have seen in collecting, managing, and using freshwater data?
2. How can data be collected and used by the GC to better support academic research, particularly for interdisciplinary research addressing social, economic, and environmental questions?
3. How can the CWA support data-intensive research in Canada that addresses complex challenges?
4. How could the GC better integrate data, information, and knowledge originating from academic sources? How could decisions be better informed from knowledge generated in Canada's post-secondary institutions?
5. How can the value of freshwater data produced by researchers be recognized by the CWA?

National Freshwater Science Agenda

Environment and Climate Change Canada (ECCC) is leading the development of a National Freshwater Science Agenda (NFSA). This agenda, informed by freshwater science experts, knowledge holders and science users from across Canada, will identify freshwater science priorities with the aim of focusing the attention of the freshwater science community in Canada, including science funders, and laying the groundwork to align and coordinate collective efforts to advance freshwater science on the most pressing freshwater challenges facing the country over the next ten years.

The agenda is national in scope and will weave western and Indigenous science and knowledge systems as well as recognize regional perspectives. The agenda will also highlight the important connections between freshwater science and freshwater data accessibility and interoperability (i.e. National Freshwater Data Strategy) for advancing science and effective decision-making.

Link: [National Freshwater Science Agenda](#)

“CWA could help find gaps in data and policy, and communicate the value of data.”

The following are highlights from this discussion:

- **Data Accessibility and End Users:** Academics face challenges in making research and data accessible to end users in understandable formats. Universities and researchers serve both as data providers and users, frequently relying on government data sources.
- **Standardization and Metadata Issues:** Variability in methods across labs leads to inconsistencies in academic data, compounded by insufficient documentation. Improved metadata, persistent identifiers, and standardized practices are essential for bridging these gaps.
- **Limited Resources:** Funding limitations hinder efforts to standardize data and provide adequate training for students, who often spend years acquiring technical skills before conducting research. Grants, such as those from the Natural Sciences and Engineering Research Council of Canada (NSERC), frequently overlook the time required to develop technical or collaborative expertise.
- **Data Usability:** Raw data alone is not useful for decision-making; its interpretation is crucial. While universities focus on extracting actionable insights, lengthy quality control processes often impede progress.
- **Legacy Data and Data Rescue:** Numerous academic datasets are poorly organized or exist in outdated formats. Short-term “data rescue” internships for students address this issue by recovering and organizing legacy data.
- **Potential CWA Roles:** The CWA can assist academia by creating best practices, maintaining a centralized data catalogue, offering clear guiding principles, and funding data science roles like data analysts, architects, and engineers to enhance data usability for external stakeholders.
- **Community Engagement and Data Transparency:** Community groups and data producers seek clarity on how their data is used, as this validation supports their work with funders. The CWA could serve as a vital connector between data producers, users, and funders.
- **International Collaboration:** Limited visibility of Canadian water data restricts international collaboration. The CWA can foster cross-border partnerships and integrate Canadian data into global databases.
- **Networking and Coordination:** The CWA can strengthen networking by connecting freshwater researchers, funders, and data users. These connections would encourage collaboration, direct researchers to priority data areas, and improve coordination with Indigenous partners.

Business and Innovation

Canadian businesses across multiple sectors collect and manage vast amounts of environmental data to manage operations, comply with regulations, and enhance sustainability. Canada is also seeing growth in water technology – businesses developing new technologies to support efficient and effective water use.

Participants in this breakout session explored the CWA’s potential in strengthening Canada’s economic and environmental performance. Participants exchanged ideas on how freshwater data can drive innovation, investment, and sustainability.

This discussion was prompted by the following questions:

1. What are the biggest challenges that you have seen in collecting, managing, and using freshwater data?
2. How could improving the GC's management of freshwater enhance Canadian innovation water technology? Are there barriers to commercialization that the CWA could help address?
3. How could the CWA better collaborate with industrial data collectors, creators, and users to inform regional and national water priorities and support sustainable investment?
4. What could the CWA do to interact with business- and innovation-focused funding programs to recognize the value of freshwater data, information, and knowledge originating from the private sector?

The following are highlights from this discussion:

- **Funding and Data Continuity:** Short-term, inconsistent funding disrupts the continuity of freshwater data, undermining long-term datasets critical for research and innovation.
- **Data Silos and Accessibility:** Freshwater data is frequently siloed (e.g., surface vs. groundwater) and regionally fragmented, complicating standardizing or broad accessibility.
- **Standardization and Planning:** The absence of standardized data collection creates inconsistencies. Clear planning – from data collection to end use – is essential to meet diverse user needs.
- **Artificial Intelligence (AI) and Virtual Sensors:** AI has the potential to address data gaps by generating “virtual sensors” that simulate environmental conditions based on similar parameters. However, these innovations must be validated with field data to ensure accuracy.
- **Community and NGO Partnerships:** NGOs, trusted by local communities, can collaborate with businesses and governments to expand monitoring efforts. However, ensuring data validation continues to be a significant challenge.
- **Role of the CWA:** The CWA could serve as a central data repository, improve access to geospatial data, and foster collaboration among stakeholders, including industrial data collectors, to address regional and national water priorities.
- **Data Protection and Accessibility Concerns:** Data ownership and protection remain a concern for stakeholders, particularly Indigenous communities and private sector participants who prioritize data privacy and retaining control.
- **Commercialization Barriers:** Restricted access to data on priority environmental issues stifles innovation. Businesses often struggle when federal funding ends before products reach the market, reducing opportunities to scale Canadian start-ups.
- **Incentivizing Data Sharing:** Incentives could motivate private entities, such as farmers, to share data. While privacy remains a concern, programs offering environmental recognition or financial rebates may foster participation.
- **International Data Sharing:** The extent of Canadian freshwater data sharing on an international scale remains uncertain, especially particularly given water's geopolitical significance.

“There is a lack of knowledge of who can do what on freshwater at local, regional, provincial, and federal scales.”

- **Streamlining Funding and Regulations:** Complex federal grant applications often delay funding. Introducing a pre-approval process and streamlined grant platform could simplify access. Outdated regulations also hinder new technology adoption, highlighting the need for updates.
- **Funding Collaboration and Transboundary Projects:** The CWA could promote cross-sector collaboration by funding grants that mandate partnerships among NGOs, industries, and governments to address critical water issues, particularly those spanning provincial or national boundaries.

Working Together – Summary

The breakout session “Working Together Within Our Communities” brought forward insights and challenges across various sectors involved in freshwater data management.

For **Indigenous communities**, participants underscored the importance of culturally sensitive data sharing, emphasizing that Indigenous communities are not just stakeholders but inherent land and water rights holders, necessitating a distinctions-based approach. Participants advocated for the CWA to prioritize relationship-building and provide distinction-based funding to address the specific needs of First Nations, Inuit, and Métis communities. Reciprocity, representation, and capacity building were seen as essential for meaningful, sustainable partnerships.

Participants from **NGOs and civil society** stressed the urgency of addressing data fragmentation and access issues, particularly through improved interoperability and shared standards. Many organizations collect essential CBWM data, which, despite its value for local stewardship, often fails to meet federal standards requirements, limiting its broader application. To foster better collaboration, participants recommended building trust with Indigenous communities, respecting TEK, and ensuring that the CWA plays a role in creating accessible, community-focused data solutions.

The **public sector** session highlighted issues with data standardization and accessibility, recommending that the CWA centralize best practices, metadata standards, and quality control guidelines. Participants recommended a national data directory and emphasized the value of automation to reduce resource strain. Building intergovernmental collaboration, incentivizing private sector participation, and fostering a long-term data sustainability strategy were identified as critical CWA roles in ensuring robust freshwater data management.

Academia's role in freshwater research faces similar issues with data usability and accessibility, hindered by inconsistent data standards, insufficient resources for data rescue and quality assurance. Academics urged the CWA to bridge the gap by establishing data management best practices, fostering cross-border collaboration, and linking data producers, users, and funders. Participants proposed that the CWA guide academic research toward areas of high data demand, which could amplify research impact and streamline efforts.

The **business and innovation sector** highlighted issues such as data silos, inconsistent funding, and regulatory hurdles that impede the scaling of water-related technological innovations. Participants see potential in using AI to address data gaps and encouraged partnerships with NGOs to expand community-based monitoring. They suggested that the CWA establish incentive programs and clarify data protection standards, particularly for private sector engagement. Streamlining funding processes and regulations, along with supporting transboundary collaboration, were seen as pathways to strengthen Canada's position in freshwater data management and innovation.

Overall, the discussions highlighted the CWA's unique role in unifying freshwater data efforts, calling for immediate action to foster collaboration, drive innovation, and strengthen community engagement to address Canada's evolving freshwater management needs.

Session 2 – Solutions and Actions



Session 2 – Solutions and Actions

The second session, titled “Solutions and Actions,” focused on actionable steps and included five discussion groups:

1. Processes and Tools
2. Data Stewardship
3. Findable and Accessible Data
4. Quality Data
5. Standards

Processes and Tools

Processes and tools form a foundational pillar of the Data Strategy for the Federal Public Service 2023–2026, providing practical and tangible support for data management across federal departments and agencies.

The category ‘Processes and Tools’ encompasses a wide range of elements, from guidelines and best practices—such as data-sharing agreement templates and protocols—to documented standards and requirements enforced by governance bodies (e.g., [ISO 8601 date format standard for the GC](#)).

This session focused on identifying steps the CWA could take to address the needs of data collectors, managers, and users in the freshwater data space—whether by adapting practices from mature domains (e.g., Water Quantity/Hydrometrics) or enhancing the documentation and communication of existing processes and protocols. Participants discussed ideas to maximize the return on investment in advancing knowledge about Canada’s fresh water.



A home for Canada’s geospatial data

GEO.ca is the result of collaborative effort between federal, provincial and territorial stakeholders, led by NRCan. The effort brought together authoritative geospatial data, leading-edge technology and applications, and open-source software, for a whole-of-government solution to geospatial data discovery and sharing.

Link: [GEO.ca](https://geo.ca)

This breakout session convened industry representatives from diverse sectors. The discussion was guided by the following questions:

1. How could the CWA improve processes involving freshwater data between the GC and external partners?
2. Are there tools that could support data stewardship, quality, collection, or management that are missing in Canada?
3. What tools should the CWA prioritize that would assist in the Agency’s mandate and are there similar examples from other jurisdictions?
4. What infrastructure—digital or otherwise—is needed to improve freshwater data in Canada?

Participants discussed the relationship between data and information regarding freshwater management. In many cases, tools are developed in Canada that have no path for broader adoption or dissemination. From the discussion, potential focus areas for CWA include:

- **Defining Data:** Participants stressed the importance of defining “data” within the National Freshwater Data Strategy, the relationship between data and information, and the role of data in informing understanding and decision making.
- **Improving Timeliness:** Manual quality assurance processes are seen to hinder timely responses to freshwater quality issues. Participants recommended adopting practices from industries such as healthcare and business to streamline data publication.
- **Decision-Support Tools:** Participants strongly supported a CWA-led decision-support program to foster collective action and facilitate collaborative data collection and sharing across government, NGOs, and the private sector.
- **Data Sovereignty and Protection:** Participants emphasized respecting data sovereignty—particularly for First Nations, Inuit, and Métis communities—and recommended that the CWA address legal frameworks, contracts, and data protection policies.
- **Certification and Peer Review:** Participants suggested that the CWA serve as a certifying and reviewing body for data and tools, promoting transparency, quality, and reproducibility in data practices.
- **Centralized Tool Development:** Participants encouraged the CWA to centralize tool development by creating a platform to share resources, tools, and best practices, thereby supporting collective data stewardship and management.
- **Community of Practice (COP):** Participants proposed establishing a freshwater data COP to foster collaboration, share best practices, and promote the use of verified tools across industries with the CWA acting as facilitator and coordinator.
- **Existing Infrastructure:** Participants recommended that the CWA prioritize investing in and leveraging existing frameworks and organizations with proven expertise instead of creating new infrastructure.
- **Standardized Data and Method Policies:** Participants suggested that the CWA develop and promote standards for data and methods policies to enhance consistency, transparency, and data sharing practices across sectors.
- **Incorporating Local Context:** Participants emphasized the importance of incorporating local context and adapting practices to meet specific community needs, particularly through partnerships with academic organizations and publishers for open data sharing.

Data Stewardship

‘Data stewardship’ is the accountability and responsibility for data itself and the processes that ensure its effective control and use. Stewardship improves the value of data by better connecting the needs and capabilities of producers, managers and users.

With a more complex data environment, directives regarding open data and transparent government, and growing recognition of the role of local and Indigenous data plays in freshwater decisions, defining and enabling data stewardship is critical to understanding freshwater systems.

The discussion was guided by the following questions:

1. How could the CWA support stewardship of freshwater data in Canada?
2. What support do communities need to assert stewardship and ownership of data, particularly if that data is used by others, including the GC?
3. Is there a need for data coordination tables within regions, drainage basins, or communities of practice?
4. How could the CWA facilitate data stewardship to improve services provided by the GC?

Participants discussed an important role for the CWA supporting collaboration and communication across the community. Participants suggested the CWA should focus on:

- **Definition of Data Stewardship:** Participants discussed the need for a clear and inclusive definition of data stewardship, focusing on long-term preservation, accountability, and continuity to prevent data loss during personnel transitions.
- **Data Retention and Archiving:** Participants called for standardized data retention rules across jurisdictions, emphasizing the need to preserve data for future generations and suggesting CWA guidance on archiving practices.
- **Indigenous Data Sovereignty and TEK:** Participants emphasized the critical importance of respecting Indigenous Data Sovereignty and called for the CWA to recognize and validate TEK alongside Western scientific methods.
- **Role of CWA in Data Stewardship:** Participants suggested that the CWA support and coordinate data stewardship efforts across federal, provincial, and territorial bodies by maintaining an inventory of available data sources and ensuring continuity and accessibility.
- **Inventory and Data Discoverability:** Participants proposed creating a centralized data inventory or “dataset index” to improve accessibility, particularly for regional and local decision-making. Discoverability and indexing were emphasized to prevent data from being lost and inaccessible.
- **Capacity Building and Support for Indigenous Communities:** Participants recommended funding, training, and capacity building programs to empower Indigenous communities and local groups in managing and stewarding their own data. Building trust was identified as essential for fostering data-sharing initiatives.
- **Multi-Scale Coordination:** Participants discussed the need for data coordination tables or working groups at various levels (e.g., watershed, treaty area) to facilitate collaboration and ensure representation of local stakeholders and/or rights holders.
- **Public Access and Transparency:** Participants encouraged the CWA to ensure public access to data, emphasizing that such information should belong to the public. They also stressed the need for a user-friendly system to facilitate public data requests and research.

“[We must acknowledge] the value of qualitative data, including storytelling, and observational knowledge, and [...]advocate for integrating these data types into policy and decision-making.”

- **Qualitative and Quantitative Data Integration:** Participants recommended acknowledging the value of qualitative data, including storytelling and observational knowledge, and suggested that the CWA advocate for integrating these data types into policy and decision-making.
- **Federal and Provincial Roles:** There were discussions on the complex jurisdictional landscape of water management in Canada, with suggestions that CWA act as a coordinator rather than a central authority, working across multiple jurisdictions to manage freshwater resources.

Findable and Accessible Data

The GC, alongside other governments, has committed to enhancing transparency, accountability, and citizen engagement in public sector operations while ensuring privacy and security of sensitive data. Improving access to data and information yields benefits such as advancing scientific knowledge, fostering social trust, and driving economic growth. This session explored strategies to enhance the findability and accessibility of water data in Canada.

The discussion was guided by the following questions:

1. What could be done to improve findability and accessibility of freshwater data in Canada?
2. How could data from inside the GC be better connected and contextualized to data from provinces, territories, Indigenous governments, and NGOs?
3. What type of freshwater data inventory is necessary to identify data collection gaps?

With broad agreement that improving findability and accessibility should be a priority of the National Freshwater Data Strategy, participants discussed solutions such as:

- **A Centralized Data Portal:** Participants endorsed the concept of a centralized Canadian freshwater data portal, functioning as an index of authoritative datasets with an emphasis on metadata cataloguing. The portal should include training resources and dedicated staff to support users.
- **Data Culture and Open Access:** Participants identified cultural barriers in Canada that hinder data sharing. They emphasized the need to foster openness and accessibility, drawing inspiration from successful U.S. models.
- **Data Sharing Challenges:** Government approval processes often delay data availability by two to three years, reducing its timeliness and usability. Participants suggested that the CWA serve as an intermediary to expedite access and facilitate data discovery.
- **People Networks and Interoperability:** Participants emphasized the importance of building networks and enhancing interoperability to improve the findability and usability of data from diverse sources.
- **Engaging Municipalities and Local Data Holders:** Participants noted that local government data is frequently difficult to access and often functions as a “black box.” They suggested that the CWA work with municipalities to improve accessibility and standardization of this data.

National Hydrological Service (NHS) Water Watch

Canada’s NHS delivers real-time and historical hydrometric data to Canadians with an online lookup tool, through the new NHS Water Watch mapping application. It also delivers the data to power-users with an application programming interface (API).

Link: [Real-Time Hydrometric Data](#)

- **Recognition and Attribution:** Participants proposed using a data catalogue approach to ensure data owners are properly recognized. Mechanisms such as Digital Object Identifiers (DOIs) could encourage data sharing by crediting contributors.
- **Equitable Access:** Marginalized groups encounter significant barriers to accessing data. Tackling these challenges could enhance the inclusivity of data findability and accessibility.
- **Standards and Guidelines:** Establishing clear data-sharing standards and timelines for public access, particularly for government-funded or consultant-collected data, could significantly improve transparency.
- **Indigenous Data and Privacy:** Special provisions must be implemented to respect the cultural sensitivities and privacy associated with Indigenous Knowledge, recognizing the protective stance Indigenous communities often adopt toward ecological knowledge.
- **Multiple Repositories:** The proliferation of data repositories can create confusion. Developing clear guidelines on repository usage could streamline data findability.
- **International Collaboration:** Improving data accessibility and advancing Canada's participation in global data efforts could elevate Canadian science on the international stage, amplifying its impact.
- **CWA Role in Promoting Science:** The CWA should go beyond facilitating data access by actively advocating for science, thereby strengthening Canada's contributions to global environmental research and data-sharing initiatives.

“Local government data is frequently difficult to access and often functions as a ‘black box.’”

Quality Data

Data quality refers to the extent to which information meets the specific requirements and expectations for its intended use.

Due to the cost and complexity of collecting freshwater data, many practitioners rely on data originally gathered for other purposes. The use of ‘secondary data’ is feasible when its quality is appropriate. For instance, data from monitoring studies may be repurposed for scientific research, citizen scientist data could inform legal proceedings, or public observations could trigger deeper investigations.

The discussion was guided by the following questions:

1. Have you experienced significant issues with data quality when using third-party data?
2. How could the CWA work to assess and improve data quality?
3. Is there a role for a body to review, assess, or audit data quality to improve trust and enhance the value of the data?

With participants from many different sectors and backgrounds, the discussion offered advice on how to ensure data quality is appropriate in the freshwater domain. Topics included:

- **Data Quality and Standards:** Participants highlighted the importance of consistency and standardization in data collection, particularly when collaborating with diverse partners. Varying methodologies across locations pose significant challenges to maintaining data quality and reliability.
- **Metadata and Context:** Comprehensive metadata and detailed documentation are essential for using a dataset, including its intended purpose, collection methods, and location. The absence of this context often undermines data interpretability and usability.
- **Purpose-Driven Data Quality:** Data quality is inherently subjective, varying according to its intended purpose. For example, weather warnings prioritize timeliness, whereas long-term datasets emphasize accuracy and completeness.
- **Adaptive Data Practices:** Data collection requirements evolve over time, driven by technological advancements and changing environmental conditions. Regular updates and corrections to datasets are crucial to maintaining their relevance and accuracy.
- **Data Integrity and Traceability:** Ensuring data integrity involves flagging and documenting outliers, preserving raw data, and establishing a traceable record of adjustments. This approach fosters data reliability and transparency.
- **Challenges in Community-Based Monitoring (CBM):** CBM programs enhance data collection but are frequently constrained by inconsistent funding and varying data quality, complicating long-term data comparability.
- **Integrating Traditional and Indigenous Knowledge:** Participants emphasized the need to broaden data quality criteria to include Indigenous Knowledge, encompassing observational and qualitative data that are invaluable for decision-making.
- **New Technologies and Future Considerations:** Emerging technologies, such as remote sensing and AI, offer potential to enhance data quality and address gaps. However, their effectiveness depends on well-curated datasets and robust, high-quality training data.

Measuring Data Quality

The GC has published Guidance on Data Quality, which recognizes nine dimensions to consider when assessing data quality. They are:

1. Access
2. Accuracy
3. Coherence
4. Completeness
5. Consistency
6. Interpretability
7. Relevance
8. Reliability
9. Timeliness

Link: [Guidance on Data Quality](#)

“Emerging technologies, such as remote sensing and AI, offer potential to enhance data.”

- **Data Access and Transparency:** Open data practices—such as accessible metadata and shared data codes—enhance product quality by enabling community validation and collaboration.
- **Barriers and Trust Issues:** Limited access to laboratory facilities and data validation support disproportionately affects Indigenous communities, farmers, and CBM initiatives. Building trust and ensuring transparency in data collection and interpretation are vital for these groups.
- **Role of the CWA:** Participants proposed that the CWA act as a central directory or data catalogue manager, bridging data producers and users while establishing a review body to audit data quality.
- **Long-Term Data Preservation:** Participants emphasized the need for sustained and traceable data stewardship. The CWA could play a pivotal role in maintaining and cataloguing data over time to ensure its accessibility and reliability.

Standards

Standardization and interoperability remain critical challenges in the freshwater data community. Whether managing water across community, inter-provincial, or international boundaries, or working across disciplines like engineering and natural sciences, inconsistent standards hinder the development of models, forecasts, and shared understanding.

This breakout session was guided by the following questions:

1. Is there a need for national-level standardization of freshwater data formats, methods, or standards?
2. Is there an inventory of freshwater data standards, or should one be developed for publication?
3. How should the CWA participate in the development of standardization solutions that address public policy needs?
4. Freshwater data needs to flow across jurisdictions regions, and even to international partners. How can existing governance and advisory bodies participate in standard development, quality controls and quality assurance?

Participants discussed the value of standards and how the CWA could support community efforts to develop and implement standards to enhance data interoperability and value:

- **Role of Standards:** Standards play a critical role in cross-border and cross-sector communication, particularly when working with diverse datasets. They establish a common language and framework for data usability, forming the foundation for improved data access.
- **Modular National Framework for Freshwater Data:** Participants endorsed a flexible, modular framework for national freshwater data standards, prioritizing interoperability for common parameters and ensuring all data is machine-readable across platforms.
- **Existing Standards and Environmental Scan:** Participants suggested that the CWA conduct a comprehensive environmental scan of current standards, identify the most widely used, and ensure their accessibility for data collectors.

- **Defining Data for Purpose:** It is crucial to tag datasets as “fit for purpose,” acknowledging that different data may serve distinct uses, such as machine learning versus observational studies. High-level tags and granular flags can help in quickly identifying data’s applicability.
- **Indigenous Data Sovereignty:** Indigenous communities should be actively involved in standard-setting from the outset, particularly for data on climate change and water. Building capacity for Indigenous-led data management and consulting with experts are essential.
- **Adaptable and Updatable Standards:** Standards need to be flexible and periodically updated to stay relevant. Collaboration with transboundary and international bodies could help ensure that Canadian standards align with global norms.
- **Providing Tools and Training:** Participants recommended that the CWA support communities by offering plain language documentation, programming tools, and transitioning from spreadsheets to more advanced data management tools.
- **Community of Practice:** Participants unanimously supported establishing a Water Data CoP to facilitate the exchange of best practices, tools, and standards among stakeholders.
- **Quality Assurance / Quality Control (QA/QC) Role for CWA:** Participants recommended that the CWA avoid directly managing QA/QC processes and instead focus on improving metadata clarity and implementing robust data tagging systems.
- **Complete, Machine-Readable Data:** Participants emphasized the importance of ensuring data completeness and machine-readability, supported by the adoption of open-source tools and replicable resources.
- **Cross-Walking Existing Standards:** Participants suggested facilitating conversion between formats and vocabularies to enhance interoperability, accompanied by a transparent evaluation of the strengths and limitations of each standard.
- **Know Your Data:** Participants stressed the importance of developing a comprehensive understanding of each dataset’s applicability and ensuring its proper use.

“It is crucial to tag datasets as ‘fit for purpose,’ acknowledging that different data may serve distinct uses.”

A Data Strategy for the Government of Canada

“To optimize the use of data in decision-making on issues that matter to Canadians, data must be stewarded with clear accountabilities, processes and common standards to support consistency, quality and sharing across the government. The 2023-2026 Data Strategy for the Federal Public Service prioritized the creation of GC Enterprise Data Reference Standards, supported by a community-based development and formal approval process.”

Link: [2023–2026 Data Strategy for the Federal Public Service](#)

Summary

The “Solutions and Actions” breakout session highlighted a role for the CWA in defining and supporting data processes, stewardship, accessibility, quality, and standards to enhance national freshwater data management.

Participants emphasized the importance of defining “data” and implementing a lifecycle approach that spans from sampling to insight generation. Timeliness was also identified as a priority, with recommendations to adopt efficient reporting practices inspired by other sectors to mitigate delays. Strong support was expressed for a CWA-led decision-support program to facilitate data collection and sharing across sectors. Participants proposed establishing a centralized development platform and a CoP to improve access to resources, share best practices, and create collaborative opportunities.

Regarding **data stewardship**, participants stressed the importance of defining retention and archiving practices to ensure long-term accessibility. Indigenous Data Sovereignty emerged as a central theme, with participants advocating for respectful integration of TEK through collaborative frameworks that include Indigenous communities in stewardship decisions. Participants also recommended that the CWA maintain a centralized inventory to improve data discoverability and support localized decision-making.

To improve **data findability and accessibility**, participants recommended the creation of a centralized data portal, emphasizing robust metadata cataloguing, training programs, and technical support. Acknowledging cultural barriers to data sharing in Canada, participants encouraged the CWA to promote open access and simplify approval processes to accelerate data availability. Addressing inequities in access and engaging local data holders, such as municipalities, were highlighted as critical steps toward inclusivity.

Regarding **data quality**, participants emphasized the need for consistency in data collection and highlighted the critical role of comprehensive metadata in ensuring interpretability. They recommended regular updates, clear quality standards, and the integration of both qualitative and quantitative data sources. Emerging technologies such as AI and remote sensing were recognized as valuable tools, provided they are trained on well-curated, high-quality datasets. Participants encouraged the CWA to establish a comprehensive data directory and create guidelines to ensure data reliability over time.

On the topic of **standards**, participants recommended a flexible, modular framework for freshwater data, prioritizing interoperability and machine-readability. They advocated for conducting an environmental scan of existing standards to ensure their accessibility for data collectors. Emphasizing Indigenous perspectives, participants stressed the importance of early involvement in standards development to uphold data sovereignty. A Water Data CoP was proposed as a critical resource-sharing platform. Additionally, participants advised the CWA to improve metadata clarity and data tagging while refraining from directly managing QA/QC processes.

Collectively, these recommendations provide a roadmap for the CWA to assume specific and unique roles, leveraging its national perspective and expertise in freshwater policy to address geographic and societal challenges. The CWA could collaborate with experts to develop standards, improve data findability and accessibility—starting with the GC—and promote standardized processes and tools. Furthermore, it could play a pivotal role in data stewardship to ensure accurate and accessible data informs decision-making and enhances the knowledge of Canadians.

Session 3 – Building the Strategy and Moving Forward



Session 3 – Building the Strategy and Moving Forward

The final breakout session was designed to give participants an opportunity to shape how the CWA would approach considerations in building the National Freshwater Data Strategy and cover critical considerations as well as practical details. Topics included:

1. Advisory Structure
2. Pillars and Priorities
3. Action Plan
4. Capacity and Talent
5. Design and Drafting

Advisory Structure

Feedback during the workshop highlighted strong support for an integrative National Freshwater Data Strategy — one that incorporates diverse input, leverages existing capacity, and actively engages with the broader community beyond the GC.

The session aimed to explore what a responsive advisory structure would look like:

- Who would be engaged to represent their communities?
- What level of detail of data expertise would be required?
- How would the structure ensure trustworthiness and responsiveness?

The discussion was guided by the following questions:

1. In building the National Freshwater Data Strategy, how would you like to be engaged? Will we need further regional workshops? Are there conferences we should target for working sessions?
2. If we built an advisory structure for the Strategy, who would be invited to represent their community? What level of data expertise is needed?

Participants recommended that the CWA incorporate:

- **Distinct Indigenous Engagement:** Effective engagement must involve tailored, individualized meetings with First Nations, Inuit, and Métis communities, rather than relying solely on broad group consultations. This approach respects the unique needs, governance structures, and cultural priorities of each group.
- **Regionalized and Thematic Advisory Approach:** Establishing regional advisory boards or workshops could address the specific challenges and opportunities of diverse watershed and regional governance structures. Pilot projects in specific regions, such as the Mackenzie River Basin, could help refine advisory mechanisms for broader implementation.
- **Managing Expectations:** Clear, consistent communication about the CWA's role, limitations, and objectives is critical to avoid unrealistic expectations-particularly during the early stages of the strategy's development.

- **Advisory Committees and Working Groups:** Participants supported the creation of smaller, focused advisory committees and technical working groups. Themes of working groups could include Indigenous Data Sovereignty, water quality, and interoperability standards.
- **User-Centric Approach:** Forming working groups based on user perspectives—such as data producers, managers, and consumers—could help test data standards, visualizations, and usability to address diverse stakeholder needs.
- **Data to Action:** Participants emphasized the importance of converting freshwater data into actionable insights, such as policy recommendations or environmental management strategies. They encouraged the CWA to serve as a facilitator in connecting data collection efforts to meaningful and impactful outcomes.
- **Industry and Provincial Engagement:** The CWA should engage strategically with provinces and territories, municipal, and industry stakeholders, as each region has distinct governance systems and data structures. Industry data, often collected under regulatory requirements, could become more accessible through facilitated partnerships.
- **Pilot Projects and Demonstration Areas:** Testing data strategies through pilot projects in selected regions or ecosystems can build trust, refine processes, and showcase the CWA's value.
- **Climate Resilience Lens:** Using climate resilience as a foundational framework for freshwater data management aligns with national priorities and resonates across stakeholder groups.
- **Memoranda of Understanding and Data-Sharing Agreements:** Developing MOUs with governmental and non-governmental entities would establish clear expectations and facilitate long-term, collaborative relationships.
- **Inclusion of Broader Data Sources:** Expanding collaboration to include data from health agencies and other, less obvious sources, could provide a more holistic understanding of water-related impacts on public health and ecosystems.
- **National Water Safety Inventory:** Participants proposed a cross-country inventory of water quality risks, assessing threats from source to tap. Such an initiative, led by the CWA, could enhance public safety, water governance, and resource management.

“[It is important to convert] freshwater data into actionable insights, such as policy recommendations or environmental management strategies.”

Pillars and Priorities

The Pillars and Priorities breakout session aimed to define the core pillars and strategic priorities of the National Freshwater Data Strategy.

Participants sought consensus on “no-regrets actions” — the high-impact steps the CWA could take to enhance the quality, accessibility, and value of Canada’s freshwater data.



The discussion was guided by the following questions:

1. We heard broad support for existing pillars (Findability and Accessibility, Quality Data, Capacity Building and Mobilization, Data Stewardship). Is there one pillar you would wish to see prioritized in the early phases of the National Freshwater Data Strategy?
2. How do you want to see the CWA balance coordination and capacity building against developing services and specific programs?
3. Briefly, what is one thing that you would advise the CWA to prioritize as soon as possible?

Participants agreed that the existing pillars (Findability and Accessibility; Quality Data; Capacity Building and Mobilization; Data Stewardship) are appropriate.

The discussion included suggestions for additional pillars such as coordination and leadership to ensure effective governance and implementation.

Additional considerations for the strategy included:

- **Accessibility and Inclusion:** Participants emphasized the importance of inclusive data practices that consider visual impairments and marginalized communities. Recommendations included:
 - Providing data in plain language and low-cost formats.
 - Enhancing awareness of data availability, particularly for Indigenous communities and local resource users.
- **Capacity Building and Mobilization:** Recognized as foundational to other pillars, capacity-building initiatives included:
 - Training programs for citizen scientists and community-based data collectors.
 - Funding support for continuous monitoring at CBM stations to ensure long-term sustainability.
- **Knowledge-Sharing and Community Engagement:** Participants stressed the need for:
 - Improved knowledge sharing agreements between municipalities and Indigenous communities.
 - Early, consistent engagement with First Nation, Inuit, and Métis communities, aligning with Canada's reconciliation commitments.
- **Clarity on Objectives and Success Metrics:** Defining clear success indicators was deemed essential for prioritization and progress measurement. Participants recommended:
 - Regular impact assessments and feedback mechanisms to adapt and define strategies over time.

“The government ... should enable and support existing initiatives rather than assume an implementer role as well as act as a facilitator, breaking down silos and fostering collaborative leadership.”

- **Data Prioritization and Historical Data:** Participants highlighted the importance of:
 - Prioritizing findability and accessibility in the strategy’s early phases.
 - Addressing the challenges of scattered, inconsistently formatted historical data.
 - Aligning data parameters with grassroots community priorities.
- **Cross-Boundary Data and Governance:** Participants recognized the importance of managing data that spans political boundaries, particularly for transboundary watersheds. Recommendations included:
 - Developing governance structures to account for shared resources (e.g., Ontario/Quebec watersheds).
- **Incentivizing Collaboration and Reducing Duplication:** The CWA should:
 - Incentivize data collection to address specific needs.
 - Reduce duplication by aligning efforts with existing initiatives.
- **Supporting Communities of Practice:** Participants advocated for supporting existing communities of practice to foster collaboration among data generators and users. Recommendations included:
 - Develop and maintain long-term partnerships.
 - Provide financial support to overcome barriers to participation.
- **Government’s Role in Data Projects:** Participants agreed that the government, particularly the CWA, should:
 - Enable and support existing initiatives rather than assume an implementer role.
 - Act as a facilitator, breaking down silos and fostering collaborative leadership.
- **Treaty Rights and Reconciliation:** Respect for treaty rights and fostering meaningful, funded partnerships with Indigenous communities must be prioritized, ensuring early engagement in the strategy’s development.
- **Collaboration Models:** The Grassland Monitoring Group was cited as a successful model, demonstrating how regular meetings can align and optimize data assets.
- **Balancing Coordination and Program Development:** Participants recommended that the CWA design programming to concurrently:
 - Coordinate efforts to streamline data initiatives.
 - Develop and deliver programs to address specific gaps and priorities.



Action Plan

A strategy requires a clear, actionable roadmap outlining steps to move from the current state to the desired outcomes. Small, achievable actions can help build momentum and demonstrate progress in Canada's freshwater data initiatives.

Participants were asked

1. What are some quick wins to build immediate impact?
2. How can CWA begin laying down foundational structures for long-term success?
3. How should CWA handle timelines and deliverables to maintain accountability and progress?

Participants suggested the following for inclusion in the action plan:

- **Accountability and Follow-Up:** The CWA should outline and share next steps with participants, demonstrating how their input has been considered, processed, and integrated into future plans.
- **Building Capacity:** Capacity-building measures include:
 - Providing funding for local initiatives and long-term data collection.
 - Organizing best practice workshops and creating guidance documents for effective data management.
 - Developing a freshwater data catalogue and map federal water data users and producers to enhance coordination and accessibility.
- **Quick Wins for Immediate Impact:** Participants proposed practical, high visibility actions, including:
 - Enhancing interoperability between water quality and water quantity data.
 - Developing a national inventory of water data to improve accessibility and coordination.
- **Interoperability and Data Access:** Connecting quality and quantity data across diverse sources is essential. Participants proposed:
 - Creating a federated search or portal to organize water data nationally.
 - Launching a pilot project in one province or territory to test and refine the approach.
- **Community of Practice:** Participants recommend establishing a CoP to:
 - Share best practices and expertise.
 - Offer short training on topics such as DOIs and repository management.

“[...] establishing a CoP to [share] best practices and expertise [and offer] short training on topics such as DOIs and repository management.”

- **National Freshwater Data Inventory:** A centralized data inventory could streamline access, reduce redundancy, and generate economic spinoffs. A community-driven approach to maintaining and refreshing data would ensure long-term stewardship.
- **Certified Data for Trust:** The CWA could provide data certification service, using QA/QC protocols that balance peer reviewing and a data auditing. This would enhance trust and provide credibility for external groups, provincial, and territorial entities.
- **Metadata Standardization:** Improving metadata documentation and standardization-aligned with existing government metadata standards-was identified as a priority to ensure data consistency and usability.
- **Communication and Public Awareness:** Participants highlighted the importance of improving public understanding of water quality issues through:
 - Targeted public advisories and awareness campaigns.
- **Indigenous Data Sovereignty and Capacity-Building:** Appropriate resources are essential to ensure First Nations, Inuit, and Métis communities can meaningfully participate in safety and stewardship of water. The CWA could:
 - Provide targeted funding and training for Indigenous communities to support meaningful engagement and knowledge integration.
- **CWA's Role in the Federal Framework:** Clear defining the CWA's role within the federal governance framework is critical. Recommendations include:
 - Establishing a transparent data-sharing plan across the 26 federal departments and agencies with water responsibilities.
- **NGOs and Community Trust:** Participants emphasized the role of NGOs as trust brokers in water data initiatives. Sustaining their involvement requires:
 - Funding and support for long-term participation and capacity building.

Capacity and Talent

Engagement with stakeholders and partners highlighted the need for the National Freshwater Data Strategy to prioritize developing capacity and talent to support water monitoring, data management, and collaboration.

In this discussion, capacity includes:

- **Financial capacity:** Expanding grants and contributions programs to support CBWM or data management.
- **System capacity:** Publishing standards, protocols, and operating procedures to streamline data processes.
- **In-kind support:** Providing access to laboratory space, analytical services, scientific oversight, and review mechanisms.



Talent focuses on equipping Canada's freshwater data community with the skills to collect, manage and leverage data to address modern challenges. Key actions include:

- **Youth programming:** Citizen science opportunities, youth engagement with scientists, and accessible educational materials.
- **Post-secondary collaborations:** Connecting academic training with real-world job opportunities (e.g., wastewater treatment facility managers).

The discussion was guided by the following questions:

1. How should capacity and talent be addressed in the National Freshwater Data Strategy?
2. Regarding capacity, are there examples of existing programs or services that have supported your organizational capacity?
3. How could the CWA encourage cross-sectoral partnerships to leverage existing capacity across water sectors or regions?
4. How could access to water data tools and training be improved?

Participants brought many ideas about how capacity and talent could be addressed, including:

- **Skill Building with Tools and Processes:** Capacity-building efforts must extend beyond skills training to include access to relevant tools and processes. Training opportunities should be made available across all levels and sectors to ensure sustainable use of water data.
- **Legacy Data Challenges:** A critical gap exists in the identification and use of legacy data. Currently, the focus on new data collection often leads to underutilization of existing data due to a lack of organization and cleaning processes.
- **Focus on Existing Tools:** Participants recommended improving existing tools instead of creating new ones. Many tools already exist but require enhancements in usability and accessibility.
- **CWA as a Boundary Agency:** The CWA can play a central role as hub or connector, facilitating partnerships, offering help desk support, and guiding organizations on accessing and using data repositories.
- **Funding Stability and Flexibility:** Participants emphasized the need for long-term, flexible funding mechanisms. Options such as annual grant renewals could reduce the burden of frequent reapplications.
- **Cross-Sector Partnerships:** The CWA should foster cross-sector partnerships, drawing on successful models such as the State of the Great Lakes Reporting program, which integrates collaboration across multiple levels of government and Indigenous groups.
- **Access to Tools and Training:** Improving access to data tools and training requires consideration of diverse learning methods, including online platforms (e.g., YouTube tutorials). CWA must also ensure accessibility and respect Indigenous Knowledge systems and cultural contexts.
- **Data Use and Misuse Concerns:** Understanding who uses the data is critical for tracking impact and ensuring intended use. However, this raises challenges related to open data principles and privacy, particularly in academic settings.

- **Support Programs and Examples:** Participants highlighted supportive models, including:
 - Canadian Climate Centre Services Support Desk
 - DataStream program
 - Pathfinder Program for Indigenous applicants
 - Living Labs initiatives.
- **Adaptable Support for Isolated Communities:** Flexible funding and support mechanisms are essential to address the unique needs of isolated communities, ensuring equitable access to water data resources.

Design and Drafting

One of the key objectives of the National Freshwater Data Strategy Workshop was to outline a preliminary structure for the Data Strategy. This session explored what a comprehensive Data Strategy should look like to address the diverse needs of Canada’s freshwater community. Would participants prefer a detailed, action-oriented report or a high-level framework? Should the strategy reflect a centralized program or a collaboratively supported effort? With these considerations in mind, the CWA invited participants to provide input on how to proceed with drafting the strategy.

Participants were asked the following questions:

1. What would be the most useful, most impactful, and most valuable form for the National Freshwater Data Strategy to take?
2. Who would you recommend working with CWA to draft the strategy?
3. How should we organize the core foundations, principles, and actions in the strategy? What does a framework look like?

Participants recommended:

- **Diverse Drafting Team:** Participants emphasized the need for a broadly inclusive drafting team to ensure diverse perspectives are reflected. Suggestions included forming sub-committees or holding online workshops to address specific components of the strategy.
- **Use Cases for Inclusivity:** Starting with use cases was recommended to reflect the diverse needs of stakeholders and ensure comprehensiveness. Use cases could also illustrate the value of the strategy to funders and decision-makers.
- **Data Tracking for Value:** Participants highlighted the importance of tracking data usage to:
 - Provide feedback to data contributors.
 - Demonstrate the data’s value in decision-making.
 - Motivating ongoing participation and data contributions.
- **Persistent Identifiers (PIDs):** The importance of PIDs was emphasized, with calls for more granular PIDs to improve data tracking, accessibility, and overall utility.

- **Challenges in Academic Data Collection:** Participants identified challenges in maintaining data continuity in academic settings, particularly during students' and researchers' transitions. Strategies are needed to ensure academic data retention and management.
- **Strategy Format Preferences:** Participants agreed that the strategy should be presented in multiple formats to meet varying stakeholder needs:
 - A one-pager for quick reference.
 - A detailed version with practical examples, plain language, and actionable steps.
- **Value of Practical Examples:** To enhance accessibility and relatability, participants recommended incorporating practical examples, stories, and sidebars. This approach helps stakeholders identify concerns and priorities within the strategy.

Summary

The “Building the Strategy and Moving Forward” breakout session provided critical insights, identifying key actions and structures for the CWA to create an impactful National Freshwater Data Strategy.

Advisory structure: Participants recommended the need for distinct engagement with First Nations, Inuit, and Métis communities to respect distinct governance systems and ensure their perspectives are integrated meaningfully in the strategy. Participants also recommended regional and thematic advisory boards, starting with pilot projects to address the specific needs of different regions and user groups. Clear communication of the CWA's role, objectives, and limitations was identified as essential to prevent misunderstandings and manage stakeholder expectations effectively. Participants supported forming smaller advisory committees and working groups, focused on key areas, including:

- Indigenous Data Sovereignty
- Water quality
- Interoperability

These groups should adopt a user-centered approach to address the diverse data needs of data producers and users.

Pillars and priorities: Participants endorsed the existing pillars:

- Findability and Accessibility
- Quality Data
- Capacity Building
- Data Stewardship

Additional pillars were suggested, including Coordination and Leadership, to strengthen governance and collaborative implementation. Accessibility considerations must prioritize marginalized communities and include efforts to provide data in plain language formats to ensure usability for all stakeholders. Capacity building efforts were deemed essential, with a focus on:

- Training programs to strengthen data collection and management skills.
- Funding support for CBM stations to sustain continuous, high-quality data collection.



Action plan: Participants highlighted the importance of accountability, recommending that the CWA share regular updates with stakeholders to demonstrate progress and build trust. Quick wins for immediate impact included:

- Improving interoperability between quality and quantity data.
- Creating a centralized water data inventory to improve accessibility and coordination.

Participants suggested developing a federated search or data portal to streamline access to water data nationwide, with a pilot project as a first step. Establishing a CoP was recommended to facilitate knowledge sharing, while a CWA-led data certification service could enhance trust through standardized QA/QC protocols.

Capacity and talent: Participants called for:

- Comprehensive training and tools to improve data utilization and management.
- Addressing legacy data challenges to ensure historical data is cleaned, organized, and utilized effectively.

Participants prioritized enhancing existing data tools over creating new ones, with a focus on accessibility and usability. The CWA was envisioned as a central hub to:

- Connect organizations and facilitate cross-sector partnerships.
- Provide a help desk for data support and navigation.

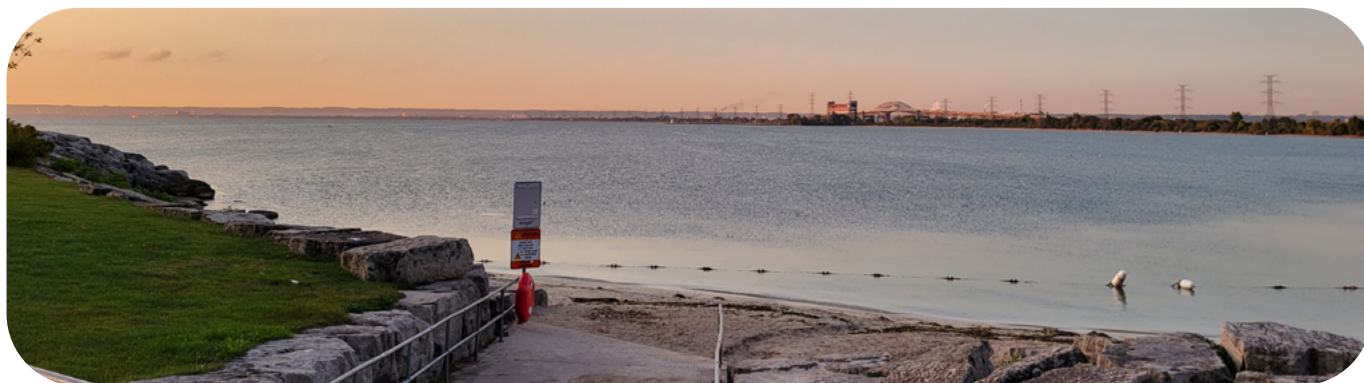
Flexible funding was also emphasized to reduce reapplication burdens and better support isolated communities.

Design and drafting: Participants highlighted the need for a diverse drafting team to ensure inclusivity and comprehensiveness. Starting with practical use cases was recommended to address real-world needs and demonstrate value. Participants suggested developing the strategy in multiple formats:

- A one-pager for quick reference.
- A detailed version featuring practical examples, plain language, and actionable steps to meet the needs of varied audiences.

Tracking data usage was recommended to provide feedback to contributors, demonstrate value, and motivate continued participation.

In summary, the discussions underscored inclusivity, collaboration, accessibility, and transparency as foundational principles for the National Freshwater Data Strategy. These priorities align with the diverse needs of stakeholders and partners across Canada and provide a clear path forward.





Closing Remarks

The workshop concluded with remarks from Daniel Wolfish (Acting Assistant Deputy Minister) and CWA Data Lead Jim M.C. Young, followed by a closing prayer offered by Elder Garry Sault of the Mississaugas of the Credit First Nation.

The closing remarks reflected key insights and commitments from the workshop, emphasizing the shared responsibility of advancing the National Freshwater Data Strategy. A central takeaway was the importance of engaging Indigenous communities as rights holders, recognizing their unique relationship to the lands and waters. This requires:

- Nation-to-nation dialogue to build meaningful partnerships.
- Respect for TEK.
- Ensuring data accessibility for all communities, with a particular focus on marginalized and Indigenous groups.

Another prominent theme was the need for purpose-driven data, emphasizing the question, “data for what?” to ensure freshwater data supports practical, impactful applications. CBM groups were recognized as essential partners in freshwater data collection. Participants emphasized the need for sustainable support to enable consistent, high-quality data collection. The CWA was encouraged to foster cross-sector partnerships by:

- Incorporating input from municipalities, NGOs, and academic groups.
- Providing tools, guidance, and best practices to support the standardization of freshwater data.

Participants emphasized the CWA’s role as a connector and catalyst, fostering collaboration and transparency while promoting proactive data use. Suggestions included:

- Establishing an advisory structure to facilitate ongoing stakeholder input.
- Developing an accessible, organized data repository to improve data discoverability and usability.

Participants called on the CWA to prioritize long-term planning ensuring data practices:

- Address immediate needs.
- Contribute to environmental sustainability.
- Promote community resilience for future generations.

In conclusion, the workshop emphasized partnerships, inclusivity, and shared purpose. All participants were invited to play an active role in developing a National Freshwater Data Strategy that reflects the diverse needs and values of Canada’s communities.

Appendices

Appendix A – Agenda



Day 1

08:00	Registration
08:30	Opening and Welcome Messages • Anton Holland (Facilitator) • Elder Garry Sault (Mississaugas of the Credit First Nation) • Council Representative Larry Sault (Mississaugas of the Credit First Nation) • Mayor Marianne Meed Ward (City of Burlington) • Parliamentary Secretary Terry Duguid (MP, Winnipeg South) • Acting Assistant Deputy Minister, Daniel Wolfish (Canada Water Agency)
09:45	Break and Networking
10:15	Plenary Speakers • Dr. Stephany Runninghawk Johnson, Local Contexts – Indigenous Data Sovereignty • Alexandra Dykes, Performance and Oversight, Treasury Board Secretariat – Data in the Government of Canada • Jim M.C. Young, Canada Water Agency – National Freshwater Data Strategy
12:00	Lunch and Networking
13:00	Breakout 1: Working together within our communities a) NGOs and civil society b) First Nations, Inuit, and Métis c) Public sector d) Academia e) Business and innovation

14:15	Break and Networking
14:45	Breakout 2: Solutions and actions a) Processes and tools b) Data stewardship c) Findable and accessible data d) Quality data e) Standards
15:45	Day 1 closing session • Summary, logistics and introduction to day 2

Day 2

08:30	Welcome • Objectives for the day
08:45	Opening and Welcome Messages • Kat Kavanagh, Water Rangers – Innovating community data • Katherine Balpataky, DataStream – Scaling-up community data
09:45	Break and networking
10:15	Breakout 3: Building the strategy and moving forward a) Advisory structure b) Pillars and priorities c) Action plan d) Capacity and talent e) Design and drafting
11:15	Day 2 closing session • Highlights and thank you – Daniel Wolfish • Summary and next steps – Jim M.C. Young • Ceremonial Closing – Elder Sault
11:45	Lunch and networking
Afternoon	Open networking, discussions, and side-meetings

Appendix B – Participating Organizations

*Organized alphabetically by affiliation

A

AquaAction

Aquanty

B

BC Hydro

C

Canada Water Agency

Canadian Institute of Ecology and Evolution

Canadian Water Network

Canadian Water Quality Association

Canadian Water Resources Association

Canadian Watershed Information Network

Chiefs of Ontario

City of Burlington

D

DataStream

Déᓄᓄᓄ Got'ᓄᓄ Government

Department of Fisheries and Oceans

Digital Research Alliance of Canada

Ducks Unlimited Canada

E

Environment and Climate Change Canada

F

Fertilizer Canada

Fondation Rivières

Forum for Leadership on Water

G

Groupe d'éducation et d'écosurveillance de l'eau (G3E)

Global Institute for Water Security

Global Water Futures

Global Water Futures Observatories

Government of New Brunswick

Government of Ontario

Grand River Conservation Authority

I

IndigenousTech.ai

International Institute for Sustainable Development

IISD – Experimental Lakes Area

International Joint Commission

Internet of Water

K

Kisters

L

Lake Winnipeg Foundation

Living Lakes Canada

Local Contexts

M

Manitoba Métis Federation

McMaster University

Métis Nation of Ontario

Métis National Council

Mississaugas of the Credit First Nation

N

NIVA Inc.

NORDIK Institute – Algoma University

Natural Resources Canada

O

Observatoire Nature

Ottawa Riverkeeper

Our Living Waters

R

Real-Time Aquatic Ecosystem Observation
Network (RAEON)

S

Shapiro & Company

Southern Chiefs' Organization Inc.

Standards Council of Canada

Statistics Canada

T

Toronto and Region Conservation Authority

Toronto Metropolitan University

Treasury Board of Canada Secretariat (TBS)

True Elements

U

United Nations University Institute for Water,
Environment and Health

University of Calgary

University of Guelph

University of Manitoba

University of Saskatchewan

University of Waterloo

W

Water Rangers

WaterShed Monitoring Inc.

WWF Canada

Y

York University



Appendix C – Plenary Sessions

Indigenous Data Sovereignty

Dr. Stephany RunningHawk Johnson, Local Contexts

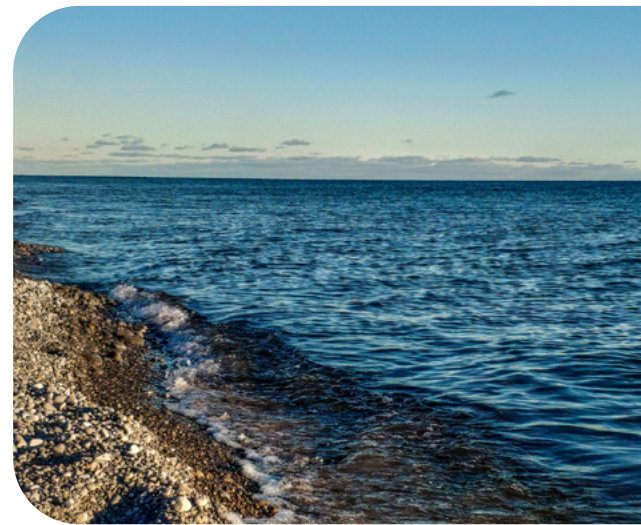
Colonization has led to the displacement of Indigenous artifacts and information from their communities into institutions, stripping Indigenous Peoples of their connections to these materials and knowledge. It is important to protect Indigenous Data Sovereignty and to recognize the challenges that Indigenous communities face in maintaining control over their data, knowledge, and cultural heritage.

Founded in 2010, Local Contexts initially focused on addressing the storage of Indigenous items in museums and libraries. Over time, the organization has expanded to include biocultural and data spaces, advocating for Indigenous communities' rights to control their data and knowledge collected from their lands and waters. Local Contexts has developed tools, such as “notices” and “labels,” which aim to reconnect Indigenous communities with their cultural heritage and data, ensuring they remain part of the decision-making process. Notices and Labels comprise of a title, a brief description, and a black and white icon.

Disclosure, Engagement, and Collections Care Notices: The notices are tools for institutions, repositories, and researchers to support the ethical use of data collected from Indigenous communities and reinforce relationships with Indigenous communities by guiding them to disclose Indigenous connections to the data they hold. They also work to educate the public about Indigenous rights and interests in historical and future collections of data. Examples of researchers/institutions that have implemented Local Contexts Notices include the Can-Peat Project at the University of Waterloo, Ocean Networks Canada, The Academy of Natural Sciences of Drexel University, and the Bilberry genome in the Genome Database for Vaccinium (GDV).

Traditional Knowledge and Biocultural Labels: Labels are for Indigenous communities, allowing them to assert ownership, usage rights, and protocols over their data. These tools support ethical data governance and foster collaboration between Indigenous communities and researchers/institutions. Traditional Knowledge (TK) and Biocultural (BC) Labels reinforce Indigenous cultural authority by adding metadata, protocols, and permissions for data access, use, and circulation. Examples of TK and BC Label us include Sq'ewlets First Nation website, Wilderlab eDNA project report, Manaaki Whenua collections database, Whakatōhea Moana plan at the University of Waikato, and plant markers at the Stockbridge-Munsee Band of Mohican Indians' Medicine Garden.

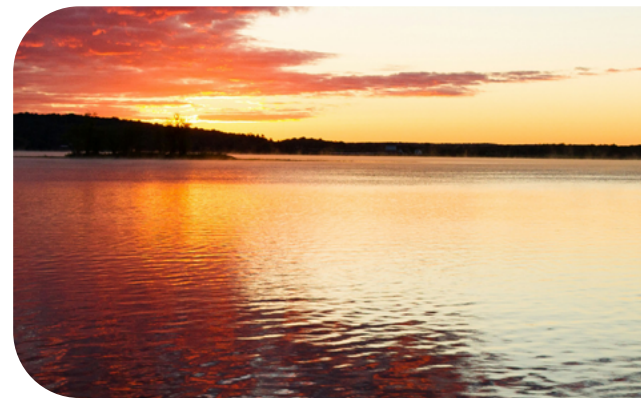
There is a need for long-term relationships between researchers and Indigenous communities, as opposed to extractive data collection practices where researchers gather information and disappear without sharing their findings or maintaining connections with that community. Greater awareness and implementation of ethical practices in data collection involving Indigenous communities is warranted. Local Contexts offers a platform to help both Indigenous communities and institutions bridge this gap and ensure that Indigenous Knowledge is respected, protected, and connected to its source.



Q&A

The following are highlights from the Q&A session of Dr. Johnson's presentation:

- A challenge lies in educating institutions and researchers on the importance of ethical collaboration with Indigenous communities. While many researchers aim to work ethically, they often lack the knowledge or tools to navigate the process effectively. Additionally, technical challenges, such as integrating Indigenous notices and labels into existing data systems, present significant barriers.
- Indigenous communities often lack the time and resources to create and apply labels. Securing the necessary resources for Indigenous communities to implement and manage label systems remains a persistent challenge.
- Through its website, Local Contexts enables institutions, researchers, and communities to create accounts and apply notices and labels. Local Contexts does not store data but provides tools to manage it ethically.
- Academic publishers, such as Springer, are increasingly interested in supporting the ethical use of Indigenous data through their platforms. Ongoing conversations with publishers aim to simplify the application of notices in academic and scientific publications. Local Contexts has also integrated with ORCID to support the process.
- Building relationships with Indigenous communities is crucial. Academic institutions are beginning to ensure researchers maintain connections and follow up after publishing studies involving Indigenous communities.
- Local Contexts is working on ensuring that both text and icons can be included in metadata systems. This is still a work in progress, depending on the system being used.
- Indigenous communities want to stay connected to their data and often wish to share it while preserving their role as stewards. Local Contexts prioritizes maintaining local connections to data as it circulates through global systems, ensuring community stewardship remains intact.
- In cases where multiple Indigenous communities are connected to the same data, multiple labels can be applied. Although rare, labelling conflicts are addressed through relationship-building and communication between Indigenous communities and stakeholders.
- Local Contexts works with Creative Commons licences, and both systems can be used together. It should be noted that the labels and notices from Local Contexts are not legally binding but are educational and relational tools.



Dr. Stephany Runninghawk Johnson (Oglala Lakota) was the Executive Director of Local Context. She collaborates with Indigenous communities, bringing skills and knowledge of decolonizing and Indigenizing work. Stephany translates for institutions how and why protecting Indigenous Data Sovereignty is crucial, giving them ways to meet their obligations through the Local Contexts Labels and Notices.

Data in the Government of Canada

Alexandra Dykes, Treasury Board Secretariat of Canada

Data is a vital asset that must be effectively managed to inform decision-making and enhance public services. The Data Strategy for the Federal Public Service 2023-2026 is designed to promote data governance, interoperability, and data-driven decision-making. The strategy aims to move from “data for data’s sake” to “knowledge for impact,” ensuring that data serves a purpose, namely driving positive societal change. There has been an evolution of the data strategy from its inception in 2018 and the renewed strategy released in 2024.

The renewed data strategy builds on the 2018 roadmap, which laid the groundwork for governance, tools, and talent but lacked a concrete implementation plan. The new strategy focuses on the following four missions:

- 1. Data by design:** Data needs are proactively considered when designing initiatives.
- 2. Data for decision-making:** Data is managed to ensure effective analysis and actionable insights.
- 3. Enabling data-driven services:** Securely shared data is needed, enhancing user experience and trust.
- 4. Empowering public service:** Teams are equipped and supported to effectively integrate the talent and tools they need.

The strategy emphasizes the importance of reflecting on what data is collected, its sources, and how it is managed and shared to address evolving challenges. The aim is to avoid redundant data collection, ensure repeatability, and respect privacy while sharing data effectively.

One of the central challenges in implementing the new data strategy is breaking down data silos within and across federal departments and agencies. Improved interoperability is essential to enable seamless integration and use of data from diverse sources. Furthermore, metadata and labelling standards are crucial to ensure that data can be reused and properly interpreted across departments and agencies. Effective governance is critical to ensure responsible management and ethical use of that data. Data stewardship is about responsible management, protection, and sharing of data. The goal is to streamline governance processes, empowering lower levels of decision-making while ensuring that data is shared with those who can use it effectively.

The renewed data strategy lays out a roadmap for 2026, with the first year focused on establishing sound governance and educating public servants about the value of data. The strategy also includes a commitment to produce annual reports, with the first having been published in August 2024, highlighting the progress made across departments and agencies.

One of the first achievements under the new strategy was the development of data reference standards, starting with standardized province and territory acronyms. The lack of such standards had previously led to inconsistencies, making data aggregation difficult.

Tools, guidance, and access to data are crucial for empowering public servants to use data effectively. Applying the FAIR principles – Findable, Accessible, Interoperable, Reusable – is vital for ensuring data is accessible, understandable, and practical for decision-making. It is important to regularly refine data governance processes, improve interoperability, and foster a data-driven culture within Canada’s federal public service. The long-term goal of the strategy is to ensure that data is not just collected but used effectively to create knowledge that benefits all Canadians. The success of the strategy depends on collaboration, education, and the continued development of standards and governance frameworks

Alexandra Dykes is the A/Executive Director of the Information and Data Governance team at the Treasury Board of Canada Secretariat (TBS). She and her team are responsible for leading the implementation of the Data Strategy for the Federal Public Service (2023-2026). Alexandra is passionate about “telling the data story” and has spent most of her public service career in the area of performance measurement.



Innovating Community Data

Kat Kavanagh, Water Rangers

Real-time data remains critical for effective community water monitoring, as delays in accessing lab reports often hinder timely responses to freshwater issues. Addressing this challenge through environmental technology led to the creation of Water Rangers.

Water Rangers provides user-friendly water quality test kits and an open data platform, validated through universities and conservation authorities. These tools ensure that water monitoring is accurate, affordable, and accessible to all. The open data platform allows communities to collect, understand, and share water data in a more accessible and responsive way.

CBWM initiatives are vital for bridging data gaps in national water quality assessments. Sustaining funding and capacity-building efforts are essential to support these grassroots programs. It is crucial to empower communities with educational resources and tools that foster confidence and enables them to take true ownership of their local water monitoring efforts. Data sharing and collaboration across platforms, like DataStream, is also important as it enables water data to be publicly accessible and usable. Water Rangers continues to make collaborative efforts with various organizations at regional, national, and international levels to make water data integration more efficient.

The presentation underscored the value of iterative design, learning from failure, and prototyping as pathways to improve and refine approaches — lessons that can guide the National Freshwater Data Strategy. Progress in freshwater data in Canada is only feasible through experimentation, humility, and shared goals in environmental stewardship.

Q&A

The following are highlights from the Q&A session of Kat Kavanagh’s presentation:

- Addressing transboundary data challenges is crucial for future Watershed Reports, with opportunities for expansion beyond Canadian borders.
- Water Rangers, a non-profit organization, provides water monitoring kits through grants, subsidies, or direct purchase. These kits range in cost from \$25 to \$600.
- A database of community needs was proposed as a centralized record that tracks specific community needs and funding requests to support water monitoring efforts.

- Water Rangers is actively developing a road salt monitoring kit to support community-led temperature and salt data monitoring in affected waterways.
- The importance of involving Indigenous communities and recognizing their deep knowledge of local ecosystems was highlighted.
- There is a role for community champions to continue spreading awareness of Water Rangers to further encourage accessible and affordable water monitoring in Canada.
- It was suggested that a feedback database to track actions taken in response to collected water data could promote actionable outcomes.
- While Water Rangers primarily focuses on surface water, they do support the idea of expanding into groundwater monitoring and would recommend that specific kits be developed for that.
- A new watershed report is planned for March 2025, including a call for community and expert involvement (especially in hydrology).

Kat Kavanagh is the Executive Director and founder of Water Rangers, a design-led non-profit organization building tools to lower barriers to community-led water monitoring. Kat's background blends user experience design with a master's degree from McGill in Integrated Water Resource Management to build bridges between the community and experts to achieve a meaningful transformation for waterways and those who care for them. Kat's leadership at the national and international levels includes Water Rangers publishing the next iteration of the Canadian Watershed Reports in 2025 (powered by AquaAction) and acting as the creative lead on the UK's national CaSTCo – Catchment Systems Thinking Cooperative project. Kat's innovative approach to water stewardship has been recognized and awarded a lifelong Ashoka Fellowship in 2023.

Scaling-up Community Data

Katherine Balpataky, DataStream

DataStream is an independent charity dedicated to freshwater protection, offering a collaborative, open access water data platform. Its mission is to promote knowledge-sharing and foster community involvement in water stewardship by offering an open data platform for Western scientific water quality data, community building mechanisms, and education and training. The platform is free to use and has been designed to reduce data sharing barriers by allowing a wide range of groups to contribute and use water quality data. Currently, the largest data contributors of data to DataStream are community groups (61%), followed by government (14.5%), academia (11.5%), Indigenous governments and organizations (9%), and consultants (4%). DataStream does not own the data, but provides a space where communities retain ownership, ensuring transparency and accessibility.

DataStream originated in the Northwest Territories through a partnership with local governments and the Gordon Foundation to support CBWM in the region. Over time, it expanded to five regional hubs across Canada (Lake Winnipeg, Great Lakes, Mackenzie, Atlantic, and Pacific regions), driven by community needs for accessible water data.

DataStream's ability to integrate data from diverse sources enhances its utility for research, policy, and local environmental action. Some examples of DataStream's impact include:

- DataStream continues to support the government-led Northwest Territories (NWT)-wide CBWM Program by providing a platform for data sharing, essential for trust and transparency.
- In the North Saskatchewan River, EPCOR, a private utility, uses DataStream to feed its river ecosystem model, benefiting from the platform's data integration for water quality assessments.

DataStream contributes to the National Freshwater Data Strategy by promoting a “data lifecycle” model where various organizations participate in data collection, standardization, and analysis. Collaboration between government, community groups, and industry are vital to effective water management.

DataStream aims to meet the increasing demands for data sharing, deepening partnerships, and continuing to evolve the platform based on local community feedback. DataStream supports the Canada Water Agency and a National Freshwater Data Strategy, aiming to integrate diverse datasets for improved decision-making. A National Freshwater Data Strategy must include the principles of transparency, collaboration, and informed action in response to environmental challenges.



Q&A

The following are highlights from the Q&A session of Katherine Balpataky's presentation:

- DataStream partners with many types of community-monitoring groups to provide hands-on data management training and offers a Water Quality Resource Guide to educate community groups on water quality monitoring. DataStream's team of data specialists will also provide hands-on support in standardizing data.
- There is a need to further engage and involve Indigenous communities, particularly those near rivers, in data collection.
- A formal economic analysis of DataStream's impact has not yet been conducted; however, such an evaluation would likely highlight its contributions to job creation and economic growth.
- DataStream currently tracks API usage but lacks a comprehensive method for identifying all data users. The team is exploring solutions to better understand and engage with its diverse user base.
- Researchers mainly access DataStream data for large-scale scientific studies, although tracking specific use cases remains challenging. DataStream aims to maintain communication with researchers to better understand their data applications.
- DataStream does not perform quality assurance on data to preserve contributor ownership, but it does provide basic tools to help groups identify anomalies in datasets. Multiple uploads of the same data (duplicate datasets) are retained to accommodate updates or corrections from data providers.

Katherine Balpataky is the Executive Director of DataStream where she leads a team focused on fostering water quality data sharing partnerships across Canada. DataStream aims to improve freshwater stewardship in regional hubs across Canada through community engagement and the use of the best available evidence.

Appendix D – Abbreviations

AI	Artificial Intelligence
BC	Biocultural
CBWM	Community-Based Water Monitoring (CBWM)
CCIW	Canada Centre for Inland Waters
CWA	Canada Water Agency
CEPA	Canadian Environmental Protection Act
CBM	Challenges in Community-Based Monitoring
CoP	Community of Practice
DOIs	Digital Object Identifiers
ECCC	Environment and Climate Change Canada
GDV	Genome Database for Vaccinium
GC	Government of Canada
HC	Health Canada
ISO	International Organization for Standardization

MOUs	Memoranda of Understanding
MCFN	Mississaugas of the Credit First Nation
NRCan	Natural Resources Canada
NSERC	Natural Sciences and Engineering Research Council of Canada
NGOs	Non-governmental organizations
NWT	Northwest Territories
PIDs	Persistent Identifiers
PCRs	Polymerase Chain Reactions
QA/QC	Quality Assurance / Quality Control
Q&A	Question and Answers
TEK	Traditional Ecological Knowledge
TBS	Treasury Board of Canada Secretariat
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples



Appendix E – Workshop Feedback

Following the workshop, participants were invited to complete a survey to help the CWA continually improve engagement.

Of the 113 attendees, 27 participants responded, sharing:

- 85%** Felt the workshop was productive
- 81%** Agree that CWA engages them in a meaningful way
- 85%** Would like to participate in technical working groups

In their words, participants appreciated:

- “The vision provided by leaders for a collaborative approach, including the important role of First Nations.”
- “There were many: insightful speakers, connected and knowledgeable participants and thoughtful attention to build in networking time during the workshop.”
- “Connecting with individuals across sectors and disciplines who were all motivated to improve the state of Canadian freshwater data.”
- “The general enthusiasm and positivity from all attendees. Everyone there was motivated and ready to collaborate.”

And participants shared what needs to happen to build the Freshwater Data Strategy:

- “...*First Nations weren’t equitably represented.*”
- “*Needs to engage with First Nations rights holders.*”
- “*We need to gain a better understanding of the CWA’s role, responsibilities and power within the current governments and what the CWAs means and objectives are in improving water resource management.*”
- “*The CWA could include a roadmap for the future of the strategy (i.e., what the next steps will be, and by when) with the report. A report on the workshop alone will likely not be impactful, but mapping the path ahead and getting feedback on that would be.*”

