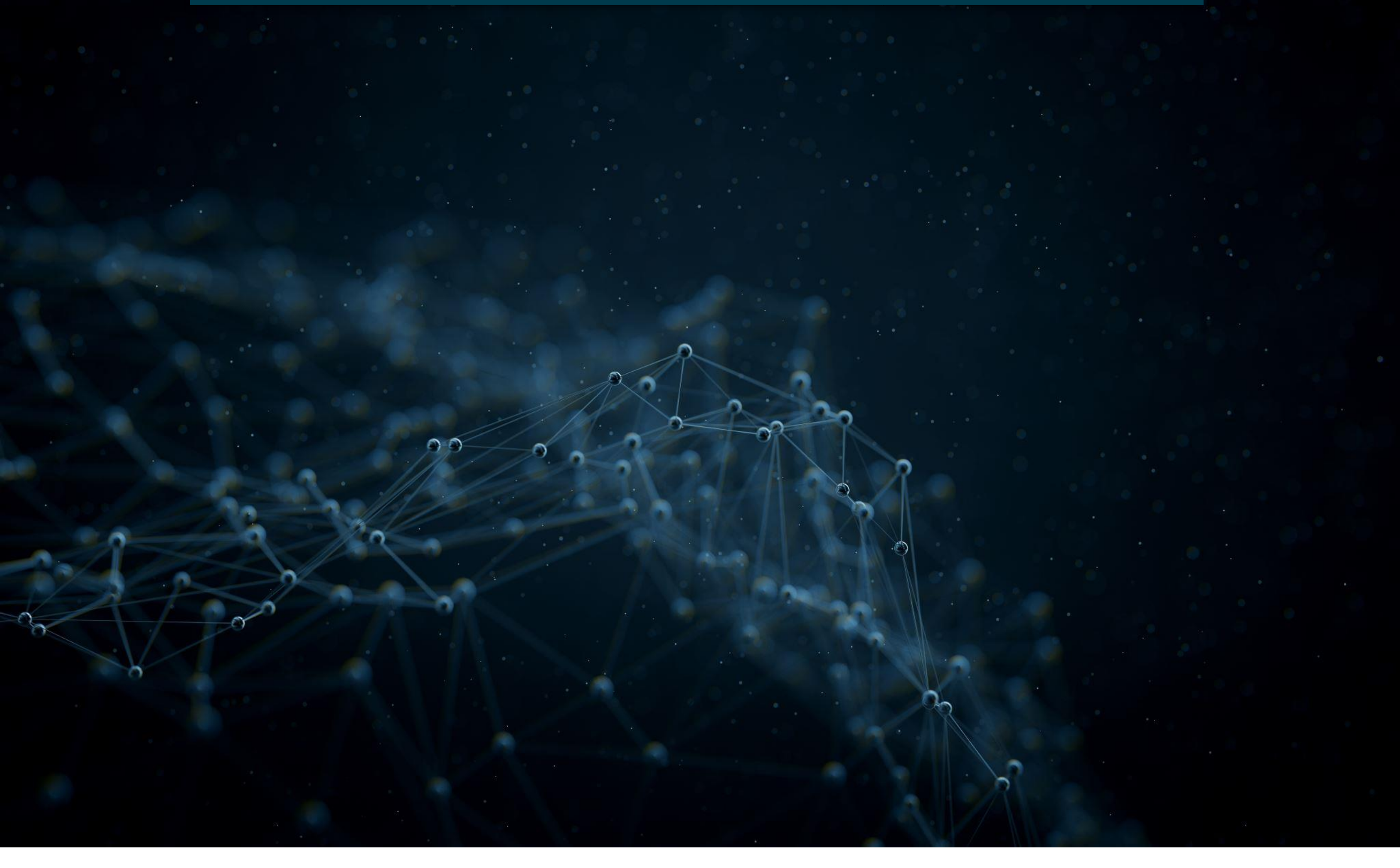
Canada Foundation for Innovation
Fondation canadienne pour l'innovation

2023–29 Major Science Initiatives Fund

Annual report

* *Global Water Futures Observatories* *

Submission date:
June 15, 2025



Cover letter

2023–29 Major Science Initiatives Fund
Annual report

CFI Project number: 42687
Name of the facility: Global Water Futures Observatories
Name of the administrative institution: University of Saskatchewan
Reporting period: 2024-25

By signing below, you acknowledge having received and read a copy of this report and further certify that all information incorporated in the document is true, accurate and complete, and that the facility's Board members have seen and approved the report.

Chair of the facility's Board	President or authorized signatory of the administrative institution
Name: Stephen Stanley Senior Vice President Strategic Initiatives, EPCOR GWFO Governance Board Chair	Name: Phani Adapa Director, Research Acceleration & Strategic Initiatives Office of the Vice-President Research University of Saskatchewan
Signature:	Signature:
Date:	Date:

The information collected through this report will be used and disclosed in accordance with the CFI's policy around the Access to Information and Privacy Acts. In sharing information with the CFI, you also consent to the sharing of your data and information contained therein with the CFI's provincial and federal funding partners.

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About the Major Science Initiatives Fund

The Canada Foundation for Innovation's (CFI) Major Science Initiatives Fund (MSIF) provides multi-year support toward the operating and maintenance needs of unique research facilities of national importance. These facilities are owned by one or more CFI-eligible institutions, and they enable researchers in Canada to undertake world-class research and technology development that will lead to social, health, economic or environmental benefits to Canada.

CFI support obtained through the 2023 MSIF competition is intended to:

- Promote responsible stewardship through the adoption of best practices in governance and management
- Enable facilities to operate at an optimal level to ensure the best use of their specialized equipment, services, resources, and technical and scientific personnel
- Enable pan-Canadian research communities to undertake world-class research and technology development that lead to social, health, economic or environmental benefits for Canadians.

About the annual report

Annual reports, accompanied by financial reports, will be shared with external reviewers to guide their assessment of the facility, per the 2023 Major Science Initiatives Fund Oversight Framework. The level of review is driven by the risk profile of the facility and will be conducted in accordance with the process outlined in Appendix 3. Additionally, the reports will be reviewed by CFI staff and key funding partners to guide risk assessment and performance monitoring. The reports also fulfill the CFI's reporting requirements laid out in its contribution agreement with the Government of Canada specific to the Major Science Initiatives Fund.

The release of funds for the subsequent CFI instalment will depend on the submission of satisfactory annual reports, financial reports and response to conditions (if any).

The data and information collected through this report will be used and disclosed in accordance with the CFI's policy around the Access to Information and Privacy Acts. It may be used for program evaluation or other analyses conducted by the CFI. Data from the report may be published in CFI material in aggregate. Information from the reports may also be used for communication purposes and help the CFI to showcase the accomplishments of the facilities. Any information that would be attributed to the facility and/or report would be published only after obtaining consent from the facility first. ***Information that cannot be shared publicly, such as information under embargo, should be explicitly identified as such in the report*.**

Facilities must submit to the CFI an annual report for the first five years of funding and a final report in the final year in order to meet the requirements in the 2023 Major Science Initiatives Fund Oversight Framework. The deadline for report submission is June 15 each year. The template for the final report will be shared closer to the end of the funding cycle.

Instructions and guidelines for completing the annual report

The annual report consists of two parts: this text document (Part A) and a spreadsheet that comprises the actual values and year-six target for each of the standard and facility-specific key indicators and expenditures and contributions (Part B).

How to complete Part A

The CFI is looking for **clear and concise** text that reflects on changes and progress over the past year and what is planned for the coming years. You may also use illustrations, tables and graphs.

In Part A, **integrate a discussion of the key indicators reported in Part B** to frame the progress and achievements of the facility. The discussion of the indicators should describe the facility's current position and the steps it will take to reach the aspirational goal for year six. Address any obstacles or setbacks encountered along the way. Year-to-year values, trends and major annual variabilities should be explained with context.

Appendix 1: Facility overview must be filled out in year one. In the following years, the information should not be modified unless there are changes. *Appendix 2: Additional information* is optional.

The maximum number of pages for Part A of the report is 15 pages, excluding images, tables and graphs. The 15-page limit also excludes the Part A appendices. Use Arial, 10-point font and single-line spacing for your report.

Avoid duplicating information across years to facilitate the reviewers' and CFI's assessment of the annual reports.

How to complete Part B

The **spreadsheet** is a cumulative document that will be added to by the facility each year and submitted with Part A of the annual report. Please add the following:

- Actual values for the current year for each key indicator
- The facility's expenditures and contributions, as submitted in the financial report.

The definition, methodology and year-six target for each indicator should be entered as agreed upon at award finalization. If you require changes to your indicator definitions or methodologies, please contact the facility's CFI Senior Programs Officer.

How to submit the report

Submit annual reports by email to the facility's CFI Senior Programs Officer using the templates for Part A and Part B provided.

The report must be approved by the facility's Board of Directors and include a cover letter confirming the accuracy and completeness of the information (see page 2 of this document). The cover letter must be signed by both the Chair of the facility's Board and by the president or authorized signatory of the administrative institution.

Annual report – Part A

Objective: Promote responsible stewardship through the adoption of best practices in governance and management

1. **Describe progress made toward meeting the facility's main strategic objectives, using the following format:**
   a. **Main strategic objective**
      i. **Progress made toward meeting the objective over the past year (refer to successes and challenges)**
      ii. **Key deliverables relating to the objective for the upcoming year.**

i. Progress made toward meeting the objective over the past year

GWFO is a national freshwater research facility that provides essential data to help researchers and other users develop sustainable water resource management solutions. GWFO supports transdisciplinary and transformative freshwater research, and is focussed on the following objectives:

- Objective 1: Provide unique and high-quality water data and analytical capabilities to characterize Canadian freshwater conditions and support world-leading water science
- Objective 2: Support water-related disaster warning and assessment of risks to water quality
- Objective 3: Meet the needs of a diverse range of users, partners, and communities

GWFO's vision and principles of operation are stated in *Appendix 1: Facility overview*.

The facility has made considerable progress In Year 2 towards meeting our objectives, realising our vision, and adhering to our principles of operation. Noteworthy activities include:

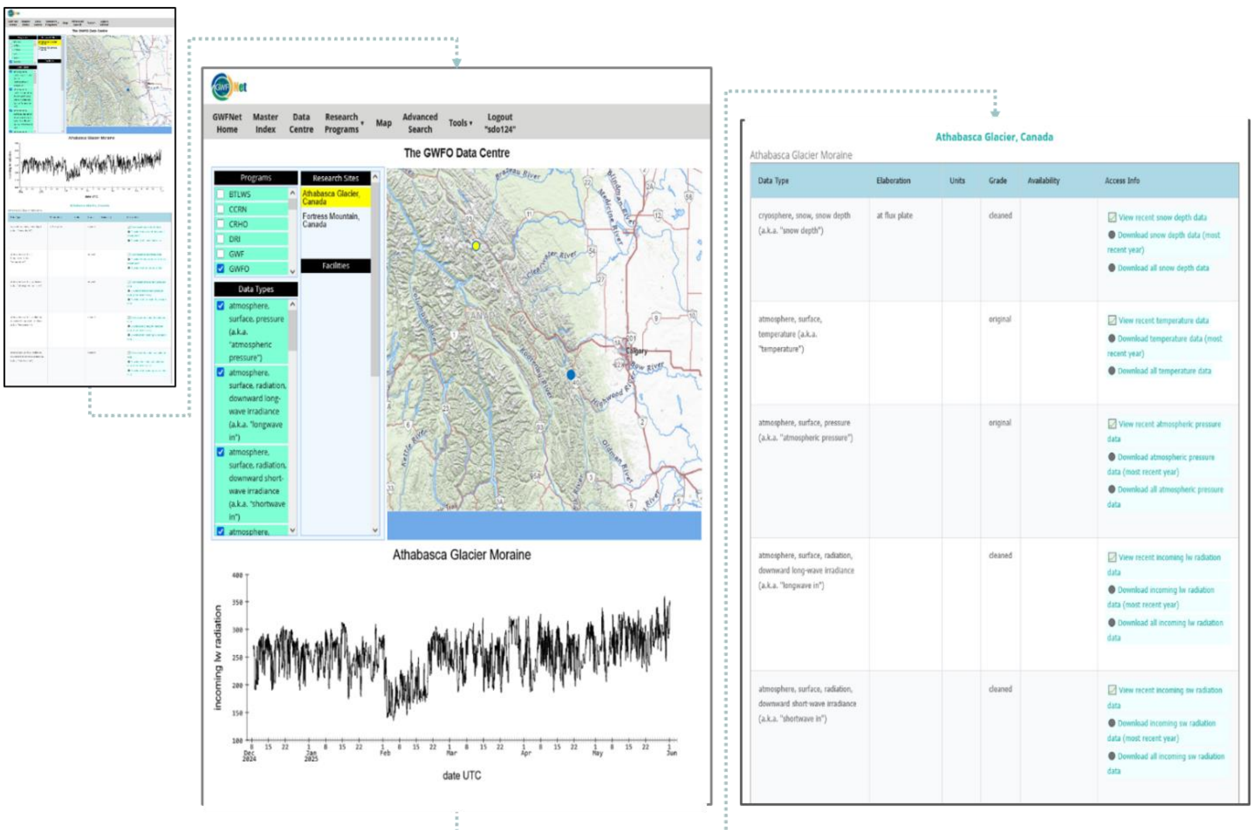
Establishment of Governance Board: The previous GWF/GWFO Oversight Committee has transitioned into an independent GWFO Governance Board (hereafter referred to as the Board). The Board provides meaningful oversight over GWFO management and is autonomous in its functioning. The Board reports up to the Vice President Research of the MSI host institution (USask), which assumes ultimate responsibility and liability for operational and financial aspects of GWFO. The Board's membership includes nine representatives from user organisations and prominent experts on freshwater data collection and management, along with the Associate Vice-President Research and Chief Financial Officer of University of Saskatchewan and one other Vice-President Research from amongst the partner institutions. The Board has met, agreed upon **Terms of Reference**, elected a Chair, reviewed and approved the GWFO Strategic Plan, and reviewed and approved this annual report. More on the Board can be found at https://gwfo.ca/about/management-and-advisory-committees.php.

Development of a Strategic Plan: In consultation with the Users Advisory Panel (UAP), the GWFO Strategic Management Committee (SMC), partner institutions and the Board, GWFO has developed its ***GWFO Strategic Plan, 2023–2029***, which outlines the vision and mission of GWFO and the approach to realize this vision. The Strategic Plan describes what GWFO aims to achieve and its priority research support directions along with the strategies that will be employed to deliver its overarching goals. It is thus a framework to establish a set of specific short-term plans and broader long-term plans, to guide activities and establish a pathway to functioning optimally as a national freshwater research facility. The Strategic Plan describes how GWFO measures success, how its operations, management, and governance function, and how it approaches knowledge mobilization, outreach, data management, and EDI.

The Strategic Plan was discussed, reviewed and approved by GWFO's Board after development by GWFO, with guidance, edits and direction from its SMC of institutional representatives and subject area experts and UAP that represents a diverse range of users. It has been informed through formal consultations with users, where GWFO actively sought user needs and priorities, advice on approaches and on the use and access of research facilities and data, and suggestions for further developing the facility and its components across Canada. Through this, GWFO defined the national scope, value proposition and unified research support mission that makes it unique as a national facility.

GWFO Data Management System: GWFO's 64 instrumented sites, 15 deployable systems, and 18 laboratories provide critical freshwater data for a vast range of users. Over the past year, significant effort has gone into developing the data management system, facilitation of data access, and the ***GWFO Data Policy***, https://gwfo.ca/data/data-policy.php. At its core, the Data Policy requires the open access and provision of all GWFO *Operational Data* (routine data collection) as part of the normal functioning of the instrumented site or deployable system, including, but not limited to hydrometeorological, cryospheric, water quality/quantity, ecological/biological, toxicological, and other water-related variables.

The data management and access system has significantly advanced this year using GWFO's proprietary GWFNet https://gwfnet.net/ software. ***GWFNet*** serves as a unique, advanced, centralized platform for managing and disseminating the diverse outputs of GWFO, distinguishing it from more general water databases. GWFNet plays a crucial role in managing and disseminating the vast amount of information by providing a centralized platform for the public sharing of well cross-referenced and integrated data, publications, and observatory site information. GWFNet supports the collaborative efforts of researchers consuming the GWFO outputs and helps to maximize their impact towards addressing water threats and developing solutions for water prediction and sustainable water management.



*Conceptual view of the **GWFNet Data Centre** dashboard. The user selects one or more divisions and data type(s) which updates the map and the lists (of sites and facilities) having data of the type(s) selected. The selection of any site (either from the map or from the list) or any facility updates the panel below giving information on data availability, and allows the user to download or view the data.*

A special dashboard called the GWFNet ***Data Centre*** resides within GWFNet software (**https://gwfnet.net/DataCentre**), and provides users with a single web portal to access all viewable/downloadable data in the system. It amalgamates and presents site data availability (selectable by data type, temporal extent, and/or geo point or region) and allows users to directly view and/or (batch-) download data from multiple research sites at once. The Data Access Centre consist of several interactive and integrated components, featuring a data type(s) selector, a selectable list of sites containing data, an interactive map displaying locations of sites containing the selected data, and an information panel graphing the temporal availability of data with associated links to view, download, or add to “batch cart” for *en masse* download. The Data Access Centre page materializes on-the-fly whenever it is referenced either directly or when its contents match GWFNet search results. The Data Centre's information panel provides links to all related information on a GWFO site to publications, models, research, and facility leads.

GWFO Operations and Coordination: An ***Operations Team*** has been formed for GWFO, consisting of facility leads, managers, technicians, data management staff, the Secretariat and the Strategic Management Committee (SMC). This team enhances interactions amongst all facilities and teams, identifies gaps, opportunities, and best practices, tracks progress, and enhances communication, knowledge mobilization, data management and data sharing. GWFO **recruited an *Operations Specialist***, Cuyler Onclin, as a member of the GWFO Secretariat to lead the coordination of activities and operations.

GWFO Workshop on Observations and Data (October 23 & 24, 2024): GWFO held an online workshop to bring together the GWFO Operations Team (facility leads and managers and the GWFO technical staff) to better understand GWFO's observation and data systems, what data GWFO is collecting, what QA/QC systems are in place, and to explore data management and storage issues at the various GWFO partner institutions. This was primarily aimed at updating the Operations Team and exploring improved and best practices that could be implemented. This was a very worthwhile and productive meeting to assess GWFO operations and to discuss how to move forward. More information, including a brief summary of the discussions and outcomes, and recordings of the Zoom presentations and discussions are found here https://gwfo.ca/news-events/events.php. The Workshop Report provided concrete near-term strategies and actions to advance and improve GWFO and direction for our Strategic Plan.

The **GWFO Strategic Plan** lists a number of important strategies and actions that the facility has been undertaking to fulfill its objectives.

I. Ensure ongoing and regular maintenance of GWFO instrumented sites, deployable systems, and water laboratories so that data is collected seamlessly and without interruption

This is a key GWFO operation. GWFO staff are very active maintaining the individual facilities so that they are kept operational and generating data streams and analytical services that feed into various user applications.

II. Develop a collective understanding of our field observatories and labs and what they do

The GWFO Operations Team held a Workshop on Observations and Data in October 2024 and the GWFO Secretariat has been visiting facilities across various institutions and meeting with local leads and technicians.

III. Coordinate activities and operations internally and strategize towards our common mission

The Observations and Data Workshop in October identified various thematic groupings to examine issues of compatibility, optimal approaches, and interoperability.

IV. Engage with users to understand their needs

GWFO has actively engaged our users, at GWFO sites and laboratories, where technicians and facility leads work closely with users in established relationships, at the UAP and specific engagements with key user groups, and nationally/internationally where the GWFO Director, SMC, Board and senior leadership represent GWFO and work with key institutions and organizations to meet their needs. GWFO has also implemented a user satisfaction form to help track and respond to user needs (Q5, Q6, Q11, and Q14).

V. Develop and maintain a centralised, responsive and efficient data and analytical service discovery and delivery system

GWFO has advanced its data management system and data search and access portal significantly and has conducted user testing to help guide in this effort (Q14, tech transfer).

VI. Build capacity in data discovery, management, visualisation, and use

GWFO has worked with its users and partners to understand their needs, identify new ways to improve operations, and build more capacity (Q5, Q6, Q11, and Q14).

VII. Communicate GWFO data, outcomes, and insights on Canadian water conditions and extreme events, and science advances supported by GWFO

GWFO has been very active at both the individual site and facility level in communicating observations, science outcomes, and expert opinion on water conditions across Canada and the world. This has involved significant media engagement, science dissemination, social media and sharing through various channels, and regular network communications (GWFO eNews) (Q6, outreach).

VIII. Expand the user base, expand the facility through collaboration, and ensure long-term sustainability of GWFO as a national research facility

GWFO identifies and categorises existing and potential users through updating its inventory of existing users and active outreach to new ones. It is expanding its network of observing sites through collaborative partnerships to cover more of Canada in order to expand the user base (Q10, new collaborations).

ii. Key deliverables relating to the objective for the upcoming year

Critical steps towards continued fulfillment of GWFO objectives include the **establishment of a Governance Board**, **development of the GWFO Strategic Plan, establishment of the GWFO Operations Team** with annual or more frequent meetings, and the **recruitment of an *Operations Specialist***. This provides the governance framework, strategic roadmap and capacity for centralised management and coordination of personnel and facilities to implement strategies and actions.

2. **With reference to how they may impact the facility's strategic direction or management plan, describe any major environmental shifts in the past year, such as new regulatory developments, rising competition, changes to the geopolitical landscape or funding challenges.**

Over the past year there have been major changes to the geopolitical landscape in Canada, North America, and the world, which have implications for GWFO. First, the US administration's threats to Canadian sovereignty have pushed the issues of Canadian water resource sustainability and joint management of transboundary waters with the US to the fore and made water a national security and sovereignty issue. GWFO observations and the science that these underpin are essential at this time and we have been actively sharing and using these to advise governments in Canada and help inform water policies. Water science and observation programs in the US have been subject to severe resource limitations and so GWFO is housing strategic transboundary data on our local servers to ensure its preservation, and encouraging continued US scientific involvement in international programs and initiatives such as the International Network for Alpine Research Catchment Hydrology (INARCH) which is led by GWFO— Q11). We continue to have strong collaborations with several provincial governments, ECCC and the Canada Water Agency.

3. **Describe any significant incidents (e.g., health and safety near miss, data breach) in the past year. Explain how these incidents were managed and mitigated. Refer to the facility's risk management strategy outlined in question 5 of Appendix 1.**

We are not aware of any significant incidents in the past year. Our operations have been smooth and successful.

Objective: Enable facilities to operate at an optimal level to ensure the best use of their specialized equipment, services, resources, and technical and scientific personnel

4. **Describe any changes to the facility's user community(ies) over the past year, including changes in user demand. Discuss measures taken to attain optimal use of the facility's resources, including changes to user access policies and selection processes. Refer to the Users, Optimal Use and**

Demand indicators.

Our baseline metric for distinct users is 4,660. This year, using the definitions provided to us by CFI, we identified 26,450 distinct users, including 1,513 on-site users, 243 remote users, 691 identifiable data users, and 24,003 non-identifiable users. This is well above our baseline, but down somewhat from the previous year when there were 29,688 distinct users identified. For example, we have found a significant drop in on-site usage at one of the University of Waterloo lab facilities. They noted that there was a drastic reduction in the usage and users for all their equipment this year compared to last year. The Covid-19 in wastewater surveillance program ended abruptly in July 2024. They had been doing this analysis for about 4 years, and it accounted for about 80% or more of the usage of all the equipment in one of the labs. This year we asked all the individual facility leads and technical staff to report on their key users so that we can document and better understand our key users at the institutional level and for individual GWFO facilities. See https://gwfo.ca/documents/gwfo-user-summary-june-2025.pdf for details.

The discrepancies between our baseline/target and current values are primarily due to our improved methodology and new rigorous procedure to track all users and usage of the facility. Now knowing that we provide data and access to our facilities to tens of thousands of users each year, it is reasonable to expect that a sustained target of 20,000 users per year can be met.

Demand and Optimal Use: GWFO has fulfilled almost all requests for access to facilities and data (99.9%), but in a few rare instances was unable to as the equipment was already in use or unavailable. For optimal use, the calculation method is explained in Part B. An error in the formula used last year for % deployable use has been corrected (the equipment downtime appeared in the denominator, and has now been changed to be %Deployable Use=[(A+B-X)/(180)]*100, where A is number of days generating baseline data, B is number of days used for fee-for-service, X is the number of days the system was down for planned maintenance/ repairs/ transportation). This is a best estimate of the % use of the facilities overall. In future, we will improve this by obtaining estimates of the optimal operational time for each individual laboratory and deployable system, rather than using fixed common values for all (i.e., 180 days for deployables, 234 days for laboratories). This is a part of the GWFO Strategic Plan (strategies and actions #2, *Develop a collective understanding of our field observatories and labs and what they do*)—many have differing purposes, operating periods, and approaches, so a one-size-fits-all calculation is not entirely appropriate.

5. **Explain any changes to user satisfaction over the past year. Discuss measures taken to address concerns and enhance user experience. Refer to the Satisfaction indicator.**

GWFO has implemented a User Satisfaction Form to gather feedback and provide guidance and direction to meet ongoing and new user needs (https://gwfo.gwfnet.net/Form/UserSatisfaction). The Secretariat, individual facility leads and technicians share this form with key user groups to obtain feedback, and going forward, this form will appear on our website for requests to access facilities and data and upon provision of services and data. The responses are monitored by our Secretariat and feedback is shared with the specific facilities that it pertains to and with the Strategic Management Committee. The form asks for additional comments that we can use to act on and provides an opportunity for users to share their experience so that we can develop testimonials or stories on the facility use and partnership amongst GWFO researchers, technicians, and external entities.

The questions are: 1) How satisfied were you with the responsiveness of the GWFO team? 2) How would you rate the ease of accessing the requested data, site, laboratories, or equipment? 3) How satisfied were you with the quality of the data, laboratories, or equipment provided? 4) Were the resources provided helpful in achieving your objectives? 5) How satisfied were you with the support and guidance from the GWFO staff? and 6) Would you recommend GWFO resources to others? Despite not using the same scale for each survey items, each score was converted to a 5-point result. GWFO shared the form with

395 of our key users and had responses from 74 (response rate of 19%). From these, the average ratings for the questions 1 through 6 were 4.9, 4.9, 5.0, 5.0, 5.0,and 5.0. In a few instances, responses of not applicable were recorded. Part B shows the specific results for the third survey question.

6. Describe key outreach and engagement activities conducted with both research and general communities in the past year to build awareness of the facility's evolving capabilities and services. Highlight the impact of these activities on attracting new users and stakeholders. Refer to the Outreach indicator.

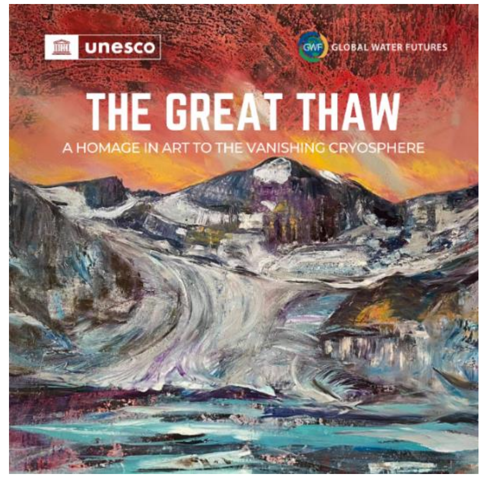
GWFO facility leads and personnel have been very active in outreach and engagement activities to promote the facilities and the science that is supported by GWFO. In this year (Year-2, Apr 2024–Mar 2025) there were 97 courses, workshops, training sessions and summer schools offered by GWFO or its individual facilities. There were 46 stakeholder or public events hosted by GWFO and there was substantial media engagement, with facility leads and other personnel involved in 107 media interviews, press conferences, broadcasts, podcasts and press conferences. GWFO facility leads and other personnel have participated in 32 stakeholder events (e.g., presentations to potential industry/government/community partners; booths at trade shows/conferences/conventions/exhibitions/fairs). This outreach has taken place across Canada in a wide variety of settings, from small gatherings in communities to large events in public venues, and in every region where our facilities are located and we take active measures to engage with the users and the public.

There was a decrease in outreach activities from Y1 (407 total) to Y2 (282). As with scientific outputs, this is as result of the wind-down of the GWF program. We have an outreach strategy, found in appendix B of our GWFO Strategic Plan (https://gwfo.ca/about/strategic-plan.php), which has various approaches to increasing publicity and outreach activities in GWFO.

The outcomes and impact of these outreach and engagement activities are difficult to quantify in the short term, but nonetheless have had tremendous benefit for both raising the profile of GWFO and for informing our users, other stakeholders, and the public with timely and important insights into Canadian and international water issues. As a qualitative example of the impact, GWFO's RAEON team reported: "*RAEON's presence with a booth at the International Association for Great Lakes Research (IAGLR) Annual Conference, Windsor, ON. May 20-24th, 2024 significantly contributed to promoting GWFO and our individual facilities. By showcasing our research and capabilities to the broader Great Lakes community, we raised awareness of our work. These outreach efforts led to several new connections with researchers, many of whom later borrowed RAEON equipment for their own project, helping expand our user base and increase collaboration across institutions*." The GWFO team operating Buffalo Pound Lake, SK reported: "*The buoys have not been extensively advertised for Saskatchewan public – but this year with the launch of new systems, we will initiate a 'story walk' in the provincial park to communicate their use, and importance. We have supported multiple presentations to varied audiences that relied upon different elements of GWFO infrastructure, helping increase exposure to the facility, raising profile and reputation, and potentially including facility and data users.*" There are many similar stories of GWFO engaging with users (Q4) and broader stakeholder communities.

Two major events took place last year in April and June, but were reported (and tracked once) and discussed in the Year-1 report: the **GWFO Launch Event** on April 17th, 2024 (https://gwfo.ca/news-events/events.php), and the **Canada Water Resources Association (CWRA) National Conference** in Saskatoon, SK, on June 16–19, 2024. We refer to our previous year's GWFO report for details.

GWFO User Advisory Panel (UAP) Individual Consultations and Meetings (April 22, 2024; September 9, 2024; March 11, 2025): The GWFO UAP has met online several times over the past year, and selected a Chair, Mr. Lakshmin Bachu, Principal Consultant with Tetra Tech Canada in Saskatoon. This panel is large, with 39 members representing a diverse set of users, and nevertheless functions quite smoothly to support us and provide guidance. There are distinct subsets of users represented on the UAP, including technical, data use, policy relevance, and individual and collective Indigenous connections to water. To accommodate different perspectives and needs we have engaged with smaller sub-groups of the UAP, down to the individual level. One-on-one interviews were held by GWFO's Knowledge Mobilization Specialist with 37 GWFO UAP members in December 2024 and January 2025. These produced valuable insights about technical issues and design for useability, partnerships with boundary organizations, and open access and policy influence. Findings from the survey, and processes for implementing recommendations were discussed at a UAP meeting on March 11, 2025. This process was key to informing and developing the GWFO Strategic Plan. It was agreed to explore with the UAP members the formation of several sub-groups that would make the best use of the members' varied backgrounds and experience.



The Great Thaw: A Homage in Art to the Vanishing Cryosphere is a freely available book published by UNESCO that brings GWFO science together with art to inspire knowledge sharing and promote practical strategies for cryospheric preservation and water adaptation. It features paintings of and describes many GWFO water observation sites. *The Great Thaw* grew out of an interdisciplinary collaboration between artist Gennadiy Ivanov and scientists Trevor Davies and John Pomeroy. This book captures both the emotional power of art and the scientific coherence needed to communicate urgent messages about our changing water world. See: https://gwf.usask.ca/outcomes/the-great-thaw.php.

Canada Water Agency National Freshwater Data Strategy Workshop (Burlington, ON; September 25 & 26, 2024): GWFO's Director and Secretariat members, SMC members, and several GWFO research data leads participated in the Canada Water Agency's (CWA) first National Freshwater Data Strategy Workshop at the Canada Centre for Inland Waters. In the leadup to the meeting, GWFO submitted comments on the draft National Freshwater Data Strategy, emphasizing the need for coordination of accurate and trustworthy water measurements and information, and of the value of high-quality research datasets, arguing that problem and context-oriented data collection and analysis increases the predictive capacity, relevance, and applicability of data to planning and management. The meeting was a timely opportunity to talk about these issues in the context of common challenges and collective priorities within the Canadian freshwater data ecosystem, as well as potential solutions, action plans, and structures. A highlight for the GWFO delegation was learning more about a range of water data stewardship work from across Canada, including successful community and citizen science efforts focused on river and lake conservation: this work is raising awareness across sectors of the importance of supporting monitoring data, and opening doors to potential partnerships. GWFO has since worked with CWA under contract to inform the development of their data management system (Tech transfer, Q7, Q14).

7. **Outline any major funding attracted by the facility over the past year and describe the impact of the new funding on the facility's operations. This may include funding that will contribute directly to the MSIF budget (i.e., "matching" funding) or other major funding attracted by the facility.**

GWFO received $70,000 matching funds from the Canada Water Agency for data management support (Q14), and $80,000 for the Saskatchewan Water Security Agency to support its data collection. Wilfrid Laurier University received a $3M grant for the Fire Ecology Network through the NRCan Wildfire Resilient Futures Initiative and an $8M SSHRC Alliance grant to support the Fire Ecology Network that increases the research use of GWFO's NWT data and. GWFO's Dehcho Lake sites received $210,000 over the last year (National Research Council, GNWT CIMP); this funding has supported installation of additional sensors and the addition of monitoring for algal toxins. We also counted $2.67M in additional leveraged funding and in-kind support reported from across our network of facilities that increases research use and efficiency of operations.

8. If applicable, describe any major infrastructure upgrades or additions made by the facility over the past year. If CFI-funded projects are identified, please provide the CFI project number.

No major infrastructure upgrades or additions have been made to the GWFO facility in this fiscal year.

9. Describe how the facility has maintained or enhanced the knowledge, skills and performance of its technical and scientific staff over the past year. Highlight efforts by the facility to attract and retain staff. Refer to the Staff indicator.

GWFO staff undertake regular professional development and training in their respective disciplines and areas of technical expertise, often through their home institutions and professional societies they belong to. Staff participate in conferences, outreach events, and other forms of engagement with users, improving their speaking and communication skills. Conferences attended in the last year include the Canadian Geophysical Union, Canadian Meteorological and Oceanographic Society, Canadian Water Resources Association, American Geophysical Union, European Geophysical Union, International Permafrost Association, International Association for Great Lakes Research, and many others.

An important internal event was the GWFO Operations Team Workshop on Observations and Data in the fall of 2024 that brought the entire Operations Team together to better understand our operations, systems, and data. We will have Operations Teams meetings on an annual basis given the good response to this meeting.

The GWFO Secretariat tracks our staff, noting turnover and changes, and aiming to clearly define roles and how they are supported by GWFO funds and in-kind support. In Year-2 we were slightly below our full staffing level with two vacant positions that since been filled. Our total staff level as approved by CFI is 49.25 full time equivalent (FTE) positions and we were at 47.13 FTE in Y2. Last year we mistakenly counted some individuals as 1.0 FTE even though they were <1.0 FTE, leading to what appeared to be exceedance of our staff level or double counting. **We note that we do not and have not exceeded our staff quota.** GWFO notes that issues of staff turnover, recruiting delays, and early departures cause variance from target from time to time. Here we report staff FTE according to the proportion of a full-time employee's salary and duties associated with GWFO and/or the proportion of the year that the employee worked for GWFO.

In last year's report we mentioned staff reclassifications for the Secretariat, and there was some uncertainty about this by the CFI administration. What we meant was that we revisited their specific roles as they transitioned from CFREF-GWF to MSI-GWFO and developed new job descriptions for their roles in GWFO.

10. Provide a short list of <u>new</u> collaborations and partnerships developed by the facility over the past year, including organizations involved and the objectives of collaborations. If applicable, highlight and describe collaborations and partnerships with the private sector and/or with international organizations.

Our baseline for partnerships (KPI FS1) is 531 which was based on GWF partnerships expressed in letters of support for that programme. Many of these partnerships continue. In Year-1 and Year-2 of GWFO, we report new or renewed partnerships identified by our facility leads that represent strong linkages with many national and international sectors. Our partnerships continue to grow in number and extent, and with close to 800 different partners this year, we are well beyond our Year-6 target of 398.

One of our strategic goals is to expand the GWFO facility on a no exchange of funds basis to cover more of Canada through formal collaboration with universities that have instrumented, long-term research sites. These are mutually beneficial partnerships; on one hand they expand GWFO observations and coverage with instrumented long-term freshwater research sites providing unique, high-quality water data in regions that are not currently represented by the GWFO network. These sites bring in additional water experts and researchers as collaborators and many more users to GWFO. On the other hand, the new partner institutions benefit from in-kind data management support and inclusion of these data in the www.gwfnet.net system, as well as from partnering with GWFO for outreach and knowledge mobilization. This does not impose substantive additional management, financial or technical burdens on GWFO as the sites are locally managed and maintained, and the GWFO data system is largely automated, and so easily scalable and able to ingest new metadata and data streams.

We have progressed in negotiating partnerships with the University of Northern British Columbia (UNBC), the Université du Québec à Montréal (UQAM), and the University of Calgary. Memoranda of understanding are under development and will be formalized soon. These will bring in a hydrometeorological observatory located in the Coast Mountains of B.C. called the “Monitoring Extreme Climate and Hydrometeorological Events” or MECHE observatory (https://web.unbc.ca/~sdery/irc/meche.php), a comprehensive water observation system supporting hydrometeorological and water isotope monitoring in the Canadian Rockies tied to existing instrumented sites in the Canadian Rockies Hydrological Observatory and adding Lake O’Hara Research Basin, BC, and a hydrometeorological observatory spanning much of eastern Canada (Quebec, New Brunswick, and Nova Scotia) that is part of the ongoing “Cloud to Aquifer Natural Observatories” or CANO project (https://chaire-eau.uqam.ca/projets/cloud-to-aquifer-natural-observatories-explorer-le-cycle-de-leau-de-lest-du-canada/).

Objective: Enable pan-Canadian research communities to undertake world-class research and technology development that lead to social, health, economic or environmental benefits for Canadians

11. Explain how the facility’s collaborations and partnerships have helped to deepen the impact of its activities over the past year.

GWFO has hundreds of formal collaborations and partnerships with users, as well as thousands of other users, across Canada and around the world. Q4, on our user communities, includes a detailed explanation of the nature of the interactions. This has had tremendous impact and benefits and truly made GWFO a national leader for water science and observation. Further, GWFO is an international leader across a wide range of sectors and disciplines, as discussed below. In Y2 our KPI for FS2 (international leadership) includes 87 prominent roles that are new or continuing from the previous year. Our researchers and technical staff lead many initiatives, in various capacities, and ensure that our observations and approaches have global influence. As examples, the GWO Director serves on the Statistics Canada Census of Environment External Advisory Committee to advise on data management and provenance. This provides service to the Government of Canada in developing and learning about best practices on priority data. The GWFO Director of Operations and Science is a member of the editorial board for the European Geoscience Union’s *Earth System Science Data* (ESSD), editing papers and special issues. GWFO is highly connected with national and international water data initiatives a variety of ways as detailed below.

International

Global Energy and Water Exchanges (GEWEX) Project: GWFO contributes as the GEWEX Regional Hydroclimate Project (RHP) for Canada. The GWFO Canadian RHP provides science and leadership to GEWEX and its parent organization, the World Climate Research Programme (WCRP). GWFO informs and support several modelling and science programs that coordinate through it to GEWEX.

GEWEX International Network for Alpine Research Catchment Hydrology (INARCH): GWFO provides leadership and directs INARCH, https://inarch.usask.ca/, which is a cross-cut project of the GEWEX Hydroclimatology Panel (GHP) to better understand alpine cold regions hydrological processes, improve their prediction, diagnose their sensitivities to global change, and find consistent measurement strategies. At its core is a global network of 38 highly-instrumented mountain observatories and experimental research sites in 18 countries and six continents, which are testbeds for detailed process studies on mountain hydrology and meteorology, developing and evaluating numerical simulation models, validating remotely sensed data, and observing, understanding, and predicting environmental change. INARCH represents a key international arm of GWFO, where we have strong international visibility, influence, and engagement. Further, we manage INARCH data through *Earth System Science Data* journal special issues (e.g., Hydrometeorological data from mountain and alpine research catchments and Water, ecosystem, cryosphere, and climate data from the interior of Western Canada and other cold regions) and within our GWFNet system.

World Meteorological Organization (WMO) and the UN Education, Scientific, and Cultural Organization (UNESCO): There are multiple points of entry and leadership from GWFO to these organizations. GWFO links to WMO through the Global Cryosphere Watch where we input data to that snow and ice data system. GWFO contributes to the UNESCO Chair in Mountain Water Sustainability between Canada, Nepal and Chile where data collaboration is a key component of Chair activities. We have several members on the Canadian National Committee for UNESCO and the Intergovernmental Hydrological Programme (IHP). Other major links and contributions to WMO and UNESCO include:

UN International Year for Glaciers' Preservation – 2025: the UN General Assembly declared 2025 to be the International Year for Glaciers' Preservation and each March 21st to be International Glacier Day. The GWFO Director was named Co-chair of the United Nations Advisory Board for IYGP and is coordinating activities on behalf of WMO and UNESCO on the Year's activities. The UN International Year of Glaciers' Preservation kicked off with the first World Glaciers Day held on March 21, 2025 at the UN General Assembly in New York City and UNESCO headquarters in Paris, where GWFO members contributed to discussions on open data sharing and the need for enhanced high mountain hydrometeorological monitoring (Q15, knowledge mobilization).

UN Decade of Action for Cryospheric Sciences, 2025–2034: Based on GWFO recommendations, France and Tajikistan proposed expanding the Glacier year to a decade and focussing on science rather than geographical regions, https://www.wcrp-climate.org/news/wcrp-news/2201-un-resolution. The resolution for this Decade was adopted by the UN General Assembly in August 2024. This Decade is now underway and addresses the challenges associated with changes to the cryosphere (snow, ice, permafrost) by advancing related scientific research and monitoring. The GWFO Director prepared an initial science plan for the Decade. UNESCO is the lead agency and it is hoped that this has the impact that the International Hydrological Decade had in the 1960s and 70s.

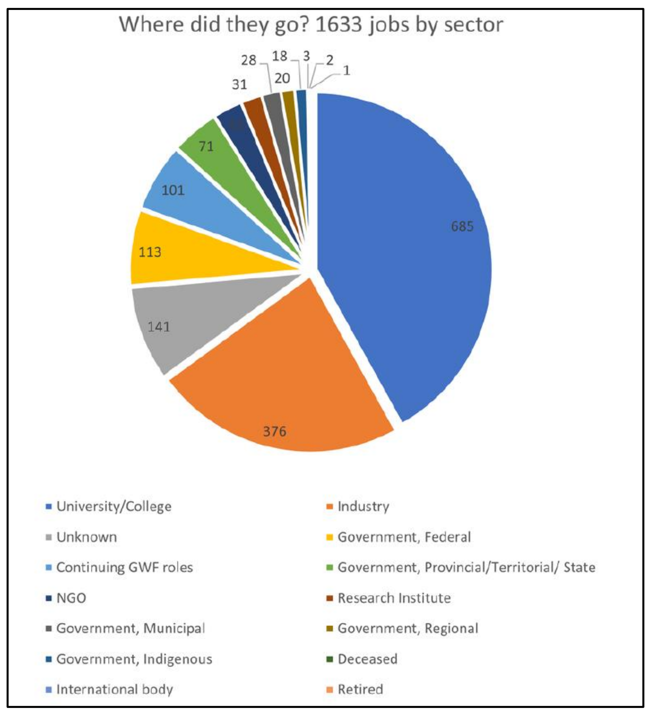
UNESCO Chair in Mountain Water Sustainability: This Chair includes co-chairs from GWFO (Professor Corinne Schuster-Wallace and Professor John Pomeroy), as well as from University of Calgary, Chile, and Nepal. It represents an important mechanism to convey GWFO data, and resultant scientific results to the global community through a transdisciplinary approach (https://research.ucalgary.ca/unesco-chair-mountain-water-sustainability). The Chair is currently leading a number of initiatives, and in particular, Chairholders have contributed to two chapters of the World Water Development Report (Changes in the Cryosphere and Impacts on Water; Knowledge and Capacity Building), which prominently feature outcomes from GWFO.

UNESCO Ecohydrology Demonstration Sites: Several GWFO instrumented sites are designated as new UNESCO Ecohydrology Demonstration Sites: Urban Ecohydrology Observatory – University of Waterloo, and Sibbald Fen – University of Saskatchewan. These sites aim to demonstrate how ecohydrological principles can be applied to achieve sustainable water management, biodiversity conservation, and ecosystem services enhancement. There are about 50 sites worldwide in about 33 countries, and GWFO engages in the network by exchanging best practices, mostly focusing on demonstrating nature-based solutions to water quality improvement and also greenhouse gas sequestration and reductions. GWFO exchanges information with some of the partners in the network that are also involved in these activities.

There are plans being developed to have a yearly virtual conference of all the people involved in the network. For urban sites, there is a conversation going with urban observatories being established in Switzerland and in China, so GWFO is able to show our capabilities and our approaches to running these observatories and then exchanging information with our partners. This UNESCO initiative is very active and provides two-way exchanges with demonstration sites all over the world dealing with similar issues but in very different climatic and socioeconomic conditions.

Standards for Data Access and Useability: GWFO Data Management and Knowledge Mobilization team members are actively participating in two international working groups that are developing recommendations for data management: the Data Repository Metadata Cohort, led by the World Data System, that is looking at ways to improve description and accessibility of data repositories, and the FORCE11 Working Group on Data Usage Typologies that is working on standardized ways to describe and measure how data is put to use. Both these efforts will help GWFO strengthen its understanding and relationships with partner repositories and its reporting of meaningful use statistics.

12. Describe the facility's contribution to the training of highly qualified personnel over the past year, including details on the high-level skills acquired and information about the career path of these personnel, highlighting challenges faced. Refer to the Training indicator.



In the last year (Apr 2024–Mar 2025), GWFO contributed to the training of 99 undergraduate students, 99 Masters students, 97 PhD students, and 41 Post-Doctoral Fellows, as well as 170 other scientific and technical personnel that are not employed in GWFO. These individuals have received exceptional training and learned valuable skills in water science, data use, computational hydrology and other related fields. These trainees are from across Canada and around the world, drawn in by the prestigious and high-quality programs and training offered at our partner institutions. We have implemented a tracking initiative for the training of HQP to look at the roles they played, institutions they trained at, projects and facilities they are/were involved with, theses and publications produced, aspects of diversity (e.g., gender balance, other self-identified traits), and the career paths they have embarked on. We have so far tracked 501 theses and 20 capstone projects since GWF began in 2016 and identified 1388 people who have filled 1633 roles (some had multiple roles, e.g., completing an MSc and then a PhD). Looking at where they went, we found that about 42% went on in academia (further training, technical/scientific, or faculty positions), 23% in industry, 13% in federal-provincial-territorial-municipal government, and the rest to a variety of other sectors. This represents a new generation of young water professionals and future leaders in Canada and around the world as many HQP return to their home countries or go elsewhere.

13. Research and technology development

- Describe the past year's key achievements in the main research programs (by discipline, theme, project or experiment). Highlight research outputs, which may include publications, presentations, science promotion activities, software or databases. **Refer to the Research Outputs indicator.**

GWFO supports world leading research and has enabled activities that have had tremendous impact and produced a wealth of new data and results, new policy and management solutions, and actionable scientific knowledge. In Year-2, GWFO has supported 636 scientific outputs (see Part B, #6. Outputs), including 162 peer-reviewed publications, 9 other publications such as newsletters and magazine articles, 4 conference proceedings, 345 presentations at conferences, 71 theses, and 4 books or chapters. There were 10 technical reports and 31 unique datasets or software (our Year-6 Outputs target has been increased by 40 to reflect this). In addition to the 910 research outputs reported last year, we are up to a cumulative total of 1,556 outputs, more than double our Year-6 target of 765. The reduction in outputs from Y1 to Y2 is, in part, due to the wind-down of the CFREF-funded GWF program and the end of most GWF projects during this reporting year. However, technical and scientific outputs continue to emerge from the work done in these projects and other GWFO-enabled research.

A major scientific outcome is the completion of modelling of future hydrological change across the major river basins of Canada using the Modélisation Environmentale Surface and Hydrology (MESH) model. This model was significantly improved using GWFO-supported data and science and it now includes essential physics and process representation for cold regions. MESH has been adopted as ECCC National Hydrological Service's National Water Model for the National Adaptation Strategy and has been applied across Canada and around the world. The results have been provided to a wide range of users, and presented nationally and internationally.

14. Technology transfer

- Describe the technology transfer enabled by the facility over the past year, including collaborations with industry, generation of intellectual property and supporting of startups. **Refer to the Technology Transfer indicator.**

In regard to the KPI number for GWFO on Technology Transfer, we had requested to CFI that the target be lowered to 2 in the category of patents, licenses, and spin-off companies, based on adherence to GWFO's Mission and Objectives. GWFO's focus is generating high-quality and unique scientific data, which is used for research and shared with user communities for their own purposes. While we innovate to accomplish this—sometimes our researchers develop new sensor systems, tools, software, methods, experimental designs, etc.—this is not what GWFO is funded to do. Thus, patents, licenses, and spin-off companies do not measure our functions. We work with users in the area of technology transfer, and put these new advances in their hands, but this is not tracked under the categories of patents and licenses. In the last year, there were instances where researchers had worked with new spatial software for analyzing digital surface with lidar data from drones in the Rocky Mountains, developed new methodologies and standard procedures for analyzing microplastics (UWaterloo), and made major advancements in our data management strategy and system. The patent filed is: Tricia Breen Carmichael, Sara S. Mechael. 2024. Patent Pending: https://patents.google.com/patent/US20240324107A1/en. This was reported by the RAEON group in GWFO, led by University of Windsor.

GWFO Data Management Contribution to the Canada Water Agency: GWFO has received matching funds ($70,000) from the Canada Water Agency to develop a Canada-wide freshwater data governance framework and data architecture for observations (Q7). The project informs the National Freshwater Data Strategy and strengthens partnerships and collaboration across the freshwater data-sharing community. The project highlights lessons learned from the eight key features of the www.gwfnet.net water data cataloguing framework, including a report documenting how GWFO has developed a Canada-wide freshwater data governance framework and data architecture, covering nationally distributed data sources, data sharing and transfer protocols, data management systems, data policies, and metadata requirements.

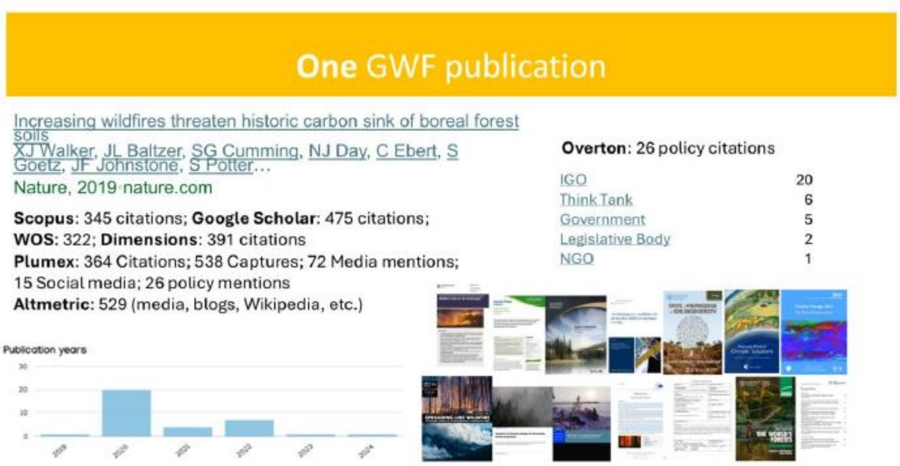
This project aligns with the goals, expected outcomes, and proposed four core pillars of the National Freshwater Data Strategy: 1. Quality Data, 2. Accessible Data, 3. Data Stewardship, 4. Capacity Building. Additionally, lessons learned from the GWFO program will inform and enhance the National Freshwater Data Strategy, ensuring it reflects best practices in data collection and management. A report was delivered to CWA in March 2025, documenting how GWFO has developed a Canada-wide freshwater data governance framework and data architecture, covering nationally distributed data sources, data sharing and transfer protocols, data management systems, data policies, and metadata requirements (see Building a National Catalogue for Water Data: A Report on Lessons Learned, and Global Water Futures Observatories Data Governance Framework and Architecture).

15. Knowledge translation or mobilization

- Outline the facility's knowledge translation and mobilization activities undertaken over the past year, extending beyond the research community to include the broader public, policymakers, clinicians and various stakeholders outside academia. Describe some of the major benefits arising from these activities.

GWFO members have been involved in a tremendous amount of knowledge mobilization through communications, media engagement, science dissemination, engagement with users and partners, collaborative activities, tours, events, and a range of other activities. We engaged in two-way dialogue and exchange of knowledge to both learn from and inform our users about their needs, best practices and approaches, new outcomes and advances, and ongoing priorities. Specific examples of the impact and benefit of this engagement have appeared throughout this report, while some further activities include:

Policy influence of scientific outputs using GWFO data: Tracking use of scientific datasets is a long-term activity, not suited to rapid reporting and challenged by the lag in scientific publishing citation practice. To help inform this process, GWFO used bibliometric approaches to shed light on how data supported by GWFO was being used in other scientific publications and in policy documents considered 'grey literature' -- documents not traditionally indexed and tracked by scientific publication databases. The Overton platform was used to discover citations of GWF and GWFO scientific publications in policy sources such as reports, white papers and legal documents produced by government bodies, NGOs, associations, and international bodies. This has shown tremendous influence and uptake of GWF and GWFO and there are a number of important statistics on our outcomes and scholarly work, showing that we have influenced policy at different levels up to international.



GWFO Datasets Used

ABoVE: Characterization of Carbon Dynamics in Burned Forest Plots, NWT, Canada, 2014

ABoVE: Landsat-derived Annual Dominant Land Cover Across ABoVE Core Domain, 1984-2014

ABoVE: Synthesis of Burned and Unburned Forest Site Data, AK and Canada, 1983-2016

ABoVE: Wildfire Carbon Emissions and Burned Plot Characteristics, NWT, CA, 2014-2016

PhenoCam Dataset v2.0: Vegetation Phenology from Digital Camera Imagery, 2000-2018
Findings from this work were presented to the University of Saskatchewan Research Facilitaors Forum in early 2025: https://hdl.handle.net/10388/16802.

UN International Year for Glaciers' Preservation – 2025, and the First World Glacier Day, March 21, 2025: The UN International Year of Glaciers' Preservation began with the first World Glaciers Day, held on March 21, 2025 at the UN General Assembly in New York City and UNESCO headquarters in Paris. John Pomeroy and Zoe Johnson (young researcher) participated in six main and side events at the World Day for Glaciers and World Water Day joint celebrations at UNESCO headquarters in Paris. Art from *The Great Thaw* publication was exhibited and two important reports that were contributed by GWFO were released (*The Great Thaw: A Homage in Art to Vanishing Glacier*, and the *United Nations World Water Development Report 2025*). https://sites.usask.ca/chnewsevents/2025/03/17/world-day-for-glaciers-and-world-water-day-celebrations-in-paris-and-online/?utm_source=rss&utm_medium=rss&utm_campaign=world-day-for-glaciers-and-world-water-day-celebrations-in-paris-and-online

Response to conditions

16. If applicable, briefly describe actions taken to address conditions of the CFI award agreement.

1. *The facility needs to evolve its governance model in order to be more reflective of a national research facility. The physical & human resources of the facility should be managed centrally. The services that the facility offers need to be well defined and transparent to users. Services should be accessible through a centralized entry point.*

Condition Fulfilled. We have taken extensive efforts to address CFI and the Standing Advisory Committee (SCA) requirements and recommendations. We have established an independent **Governance Board** and we manage the facility centrally through the SMC as documented in our Strategic Plan, with direct lines of communication to and between all leads and technical staff. This is an optimal way to manage this spatially distributed facility across nine institutions. We have developed an open-data policy and data management system, we have made our services well-defined and transparent on our website and through other channels, and we offer these through a central point of access.

2. *The facility needs to develop a strategic plan that defines the facility's vision and mission through a formal stakeholder consultation process.*

Condition Fulfilled. We have actively engaged our users, our Board, institutions and our team to develop the **GWFO Strategic Plan**. Through this we have deeply reflected on our vision, mission, and objectives, and the approach to realize these and measure our success. We have been actively implementing the plan.

3. *The facility needs to evolve its data management and data access policy to better define and justify embargo decisions and to eventually achieve open-access data availability through a centralized data platform. (Experts recommend that data should be owned by facility.)*

Condition Fulfilled. We have developed a clear **Data Policy** that specifies the open access of GWFO data. We have made extensive developments to our data management system, as documented above in this report (see Q1 and Q14), to achieve open access data through the **GWFO Data Centre**.

Appendix 1: Facility overview (maximum 3 pages)

After submitting the first annual report, do not update this section unless there are changes. Changes should be identified and explained.

1. Provide a brief overview of the facility, including the facility's mission or vision statements. Include a link to the facility's website.

We note that these have changed following the development of our Strategic Plan this past year.

Our Vision
To operate a national freshwater research facility that supports critical water research to safeguard Canadian water resources in an era of rapid change. GWFO consists of instrumented water observing sites, supported by deployable observing systems and major laboratories, which provides open access water data and the necessary infrastructure to collect supplementary data. This data informs the development and testing of water prediction models, monitors changes in water sources, underpins diagnosis of risks to water security and helps design solutions to ensure the long-term sustainability of Canadian water resources.

Our Principles of Operation

- provide unique water data (beyond what provincial, territorial, and federal governments routinely collect) of interest to characterizing and monitoring the water conditions of Canadian river basins
- contribute to a critical baseline of water data to the benefit of multiple users
- support the data collection from, and analysis of water from a pan-Canadian network of instrumented water observing sites
- adhere to the principles of open access

Our Mission
GWFO is a national freshwater research facility that provides essential data to help researchers and other users develop sustainable water resource management solutions. GWFO resources are deployed to generate, process, analyze, manage, and visualize exceptionally large quantities of data – "big data for water sustainability solutions"– to inform development of computer modelling and analytical tools for water-related disaster warning, to support prediction of future water flows and risks to water quality, and to provide the quantitative support for adaptation to climate change and associated risk management in users groups and communities across Canada. Data from GWFO's pan-Canadian observation sites and laboratories is managed together to inform and evaluate water models that are applied across Canada. The GWFNet web-based portal disseminates GWFO data to provincial, territorial, and federal government agencies, industry, agriculture, communities, and other researchers and is being further enhanced to support user needs. This leads to a sustainable business model for GWFO's big data, based on support from its large user base and strong support of solutions for user-defined questions that will help Canada achieve water sustainability.

Our Objectives
Objective 1: Provide unique and high-quality water data and analytical capabilities to characterize Canadian freshwater conditions and support world-leading water science
To monitor and help support the development of solutions for the impending water crisis that is facing Canadians and to provide the observational and analytical data (beyond routine provincial, territorial, and federal government observations) that underpins transformative science and advances the understanding of hydrological and ecological systems and their interconnections.

Objective 2: Support water-related disaster warning and assessment of risks to water quality

To act as an early warning system for the water disasters that increasingly afflict Canada and to provide quantitative support for adaptation to climate change and associated risk management in user groups and communities across Canada.

Objective 3: Meet the needs of a diverse range of users, partners, and communities

To provide the data, services, and expertise for developing decision support systems, monitoring and planning, and help in the design of solutions to allow water users, stakeholders, and rightsholders to adapt to the changing climate and achieve water sustainability.

Our Website: https://gwfo.ca/

2. **Describe how the facility approaches strategic planning. Provide a link to the facility's strategic plan.**

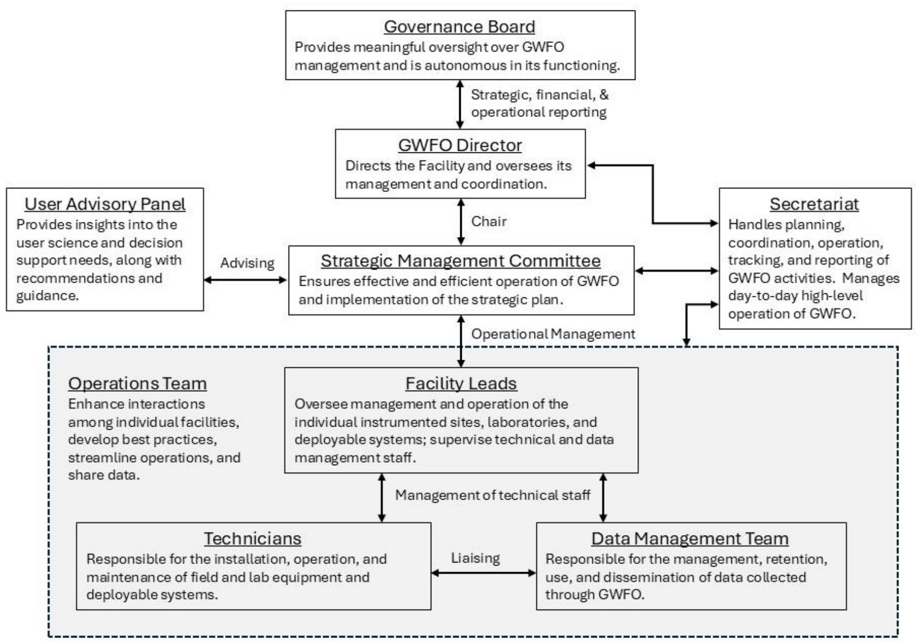
We note this has changed as we have developed a Strategic Plan for GWFO in the past year.

Our **Strategic Plan** outlines this in full detail. GWFO approaches its strategic planning by fully engaging with users (through individual points of contact and our User Advisory Panel), our Governance Board, and our network of facility leads and managers, technicians, data management staff, and other collaborators. A Strategic Management Committee (SMC) works hard to implement strategic initiatives.

3. **Provide an overview of the facility's governance and management structures, including their functions, the frequency of meetings and a list of members. Use charts or images where needed.**

We note this has changed since last year as we developed our Strategic Plan, formed a new Governance Board, and revisited our operational structure (although we mostly adhere to the original structure as proposed).

GWFO's operations and activities are managed and overseen using a tiered approach of three decision-making levels: governance, strategic management and operational management, supported by the Secretariat and guided by the User Advisory Panel (see below and https://gwfo.ca/about/management-and-advisory-committees.php and https://gwfo.ca/about/staff-and-personnel.php). Our governance and management structure is shown below and described in our **Strategic Plan**.



4. Outline any major infrastructure upgrades or additions planned for the facility aimed at maintaining or improving its international competitiveness.

Unchanged.
There are no current plans for major upgrades or additions, with the exception of the proposed no-cost expansion of the network to include sites operated by other universities.

5. Describe the facility's risk assessment and mitigation strategy. Include reference to the facility's key risks.

Unchanged.
The SMC identifies risks that have direct impact on GWFO operations and maintenance and is managing them on a proactive and case-by-case basis, including:
1. Environment Risks - Loss of instruments in extreme weather: Located at remote locations that experience extreme conditions, GWFO instruments are often subjected to harsh weather and events that make them non-functional or can impart irreversible damage. These instruments are not insured and replacement comes from operational funds and user-fee or in rare cases of large-scale loss, university self-insurance.
2. Technical Personnel - Work in extreme climate, in the North and large lakes: GWFO technical personnel require extensive wilderness safety, technical, programming and first aid training and knowledge of geography to function and maintain instruments at remote locations, (e.g. mountain and glacier locations, large water bodies,). Training of personnel is time intensive, and skilled personnel are difficult to replace.
3. Financial Risk: GWFO has implemented a cost-recovery user fee system and is pursuing major funding opportunities with the Federal and Provincial agencies to sustain long-term operations.
4. Reputational Risk: Without GWFO, Canada will be unable to sustain observations and data critical to understanding, diagnosing and predicting changing water, terrestrial processes and climate. Moreover, Canada may lose its status as a global leader in the water sciences, and its growing reputation as an international example for implementing science-driven water management and policy.
5. Interruption Risk: Without proper technical support and funding, important data will be lost and will need significant efforts to return these sites back to operational status. Some sites could not be recovered after a long interruption (e.g.one year).

6. Describe the facility's decommissioning plans.

Unchanged.
GWFO intends to keep its observing sites and laboratories operating in the future. Observations started at some of these sites in the 1960s and their value for environmental monitoring and documenting the impacts of climate change and development on water grow with time. GWFO observing sites can in general be decommissioned by removing instruments and towers. Since these sites have minimal environmental impact, removal and clean up can be accomplished by two technicians in one day per site. Should any of the sites need to be shut down, this can be accomplished within the existing budget. Deployable monitoring systems have no decommissioning costs. The major laboratories have minimal decommissioning costs as they typically occupy part of one room at a university campus or with a collaborating government (Whitehorse, Yellowknife). Removal and cleanup of these rooms can be accomplished within two days per facility for a team of four technicians. Should any of the major laboratories need to be shut down, this can be accomplished within the existing budget.

Appendix 2: Additional information (optional)

1. **List of select publications enabled by the facility in the past year (maximum two pages). Any citation style may be used.**

2. **List of select awards or recognitions received by the facility or facility staff in the past year (maximum two pages).**

3. **List of select conference presentations given by the facility or facility staff in the past year (maximum two pages).**

Appendix 3: Annual reports’ external review process

Oversight activities based on annual reports	**Risk level 1**	**Risk level 2**	**Risk level 3**	**Risk level 4**
Written external review	X			
Expert committee review		X	X (includes meeting with facility reps)	
Standing expert committee review				X (includes meeting with facility reps)
Site visit			X (once during funding period)	X
Review frequency	Once during funding period	Once during funding period	Once during funding period	Annual meetings
Annual reports (ARs) provided for review	All available ARs prior to review date	All available ARs prior to review date	All available ARs prior to review date	Provided on annual basis