

2026

A Defining Moment to Safeguard Water Resources for Every Generation to Come

Cryosphere = Earth's Frozen Water

Peyto Glacier Ice Caves in Banff National Park Alberta
(Photo by Phillip Harder, University of Saskatchewan)

"Humanity is on thin ice - and that ice is melting fast."

~ António Guterres
Secretary-General of the
United Nations

The Cryosphere

The cryosphere encompasses parts of the Earth where frozen water is present. It's crucially important because it..

- Stores 70% of the world's freshwater
- Regulates earth's climate
- Supports billions of people through water supply and coastal ecosystem protection

"A declining cryosphere is a deeply human crisis. This is a global problem, as cryosphere loss has worldwide socioeconomic impacts."

The cryosphere, including glaciers, ice sheets, permafrost, sea ice and snow, is the most sensitive environment to a warming climate and it is melting at an unprecedented pace. **Cryosphere loss already affects water security, ecosystem health, infrastructure, and disaster risks worldwide** (un-cryosphere.org). Urgent action is needed to safeguard these vital frozen areas on which billions of people rely on for freshwater and climate stability.

Global Water Futures Observatories (GWFO) is Canada's premier freshwater research facility with a nationally-distributed network of **observation sites, deployable measurement systems, and laboratories**. This environmental intelligence infrastructure allows for close **monitoring** of freshwater resources, including the cryosphere, and supports **informed decision** making, critical regional **preparedness**, and climate **adaptation**.



The Decade of Action for Cryospheric Sciences

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has unveiled a sweeping **plan to confront the world's rapidly shrinking cryosphere**, warning that accelerating ice loss is already reducing global climate stability. Spanning 2025-2034 - The UN plan lays out a coordinated **global effort to monitor and predict glaciers, sea ice, permafrost, and snow** - and to inform policy, risk management, and adaptation efforts with up to date scientific insight.

UNESCO launches global push to confront accelerating cryosphere collapse - with Canadian scientists leading the charge

The Decade of Action represents a **shift from simply observing cryosphere loss to actively responding**—using science, education, and cooperation to reduce risks and protect communities and ecosystems in a changing climate. The designation of a UN decade is significant as it is the most effective tool available to actively promote **cooperation** amongst nations, encourage member states to take **action**, mobilize **resources**, and raise broad **awareness**.

Canada has a strong legacy of contributing to UN decades of action through sustained **leadership in cold regions water science**, long-term monitoring, and training generations of highly qualified personnel. Building on this foundation, **GWFO plays a key role** in advancing the objectives of the UN Decade of Action for Cryospheric Sciences by generating critical data, fostering collaboration, and delivering the knowledge needed to better understand and respond to rapid cryospheric change, in Canada, and globally. Through its coordinated national observatory network and support from the **Canada Foundation for Innovation**, GWFO is the first Major Science Initiative in Canada to receive this level of global attention and commitment to action.

For the Canadian cold region water scientists and technicians who have spent decades studying snow and ice from the Rockies to Great Lakes and north to the Arctic, the shift from observing to responding is reflective of the data reported across the country. This group has watched the cryosphere's transformation unfold in real time: **earlier snowmelt, thinning glaciers, permafrost thaw, and mountain watersheds shifting**, in ways that once seemed unthinkable.



Marmot Creek Instrumented Site
(Photo by Kieran Lehan, University of Saskatchewan)

Monitoring Canada's Cold Regions

GWFO data collection sites provide real-time insight into the changing cryosphere, documenting the emergence of earlier snow melts, thinning glaciers, and evolving mountain watershed dynamics. This data feeds into accurate water prediction models which can:

- Forecast drought and flood patterns in real time.
- Inform conservation and restoration projects of major aquatic ecosystems.
- Provide early warning for community preparedness.
- Support research into water flows, risks to water quality, and analytical tools.
- Inform climate adaptation strategies related to water and food security.

Global Water Futures Observatories is a partnership amongst a growing network of Canadian academic institutions

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OPEN ACCESS

Data intended for use.

Free, unrestricted, open access data can be easily discovered, shared, and reused by anyone. It promotes transparency, accountability, and enables collaboration across disciplines, regions, and communities.

Open Access Water Data

By combining long-term monitoring and high-resolution records with real-time observations and water prediction modeling across cold regions - **GWFO produces transparent, interoperable datasets on snow, ice, permafrost, and hydrology that are openly accessible to the public.**

This enables broad collaboration, strengthening collective understanding and capacities to predict cryosphere-driven water changes. This data, painstakingly gathered from remote alpine passes and northern river basins—combines satellite data, automated sensors, and community-based observations to capture rapid changes that traditional systems often miss.

This type of global coordination of data sharing is **a model for the kind of integrated, open-access monitoring system Canada, and the world, need** to bridge knowledge gaps and support integrated planning.

INFORMED ACTION



Boreal Ecosystem Research and Monitoring Site
(Photo by Cody David, University of Saskatchewan)

Informed Policy and Practice

"We cannot adapt to what we do not understand" ~ UNESCO

UNESCO warns that many high-mountain and polar regions still lack even basic measurements, **leaving governments, community leaders, farmers/ranchers, and the general public without the information needed to prepare for the effects of rising hazards** such as glacial lake outburst floods, permafrost thaw, and shifting river regimes.

The decade-long plan calls for a unified global observation inventory, major advances in predictive modelling, and digital platforms that can **translate scientific data into real-time decision tools**. Through GWFO, Canadian decision-makers, practitioners, and planners are equipped with the reliable, research-quality data they need to do just that.

Rusting Rivers

Rivers throughout cold regions worldwide are turning orange and white. "Thawing permafrost exposes rock to acid-generating geochemical reactions that degrade stream water quality." ~ Dr. Sean Carey (McMaster University).

In the Yukon Territory, GWFO data-collection sites are tracking this phenomenon to document rapid water quality degradation, keep local stakeholders informed, and raise awareness on the implications for water security. "GWFO support has been crucial for us to capture and understand these abrupt transitions in water quality resulting from permafrost degradation."
~ Elliott Skierszkan (Carleton University)



Engineer Creek Yukon - clear to rusty water
(Photo courtesy of Elliott Skierszkan, Carleton University)



Equipping Communities to Respond

UNESCO's commitment to the Decade of Action for Cryospheric Sciences details how these insights reflect both scientific evidence and the lived experience of northern and Indigenous communities. For those aware of the current effects on both natural and human environments, the Decade prioritizes informed climate adaptation and mitigation strategies - equipping communities to respond with their own water management plans.

"These systems are rapidly changing with major implications for freshwater systems, hazard risk, and social wellbeing around the world."
~ Zoë Johnson (University of Saskatchewan PhD Candidate)

GWFO's collective research on snow hydrology and cold-region water security are essential for communities designing strategies around the cascading impacts of cryosphere decline— supporting the self-determination of community leaders with updated data on streamflow timing and the destabilization of northern infrastructure to spring flooding, changes in water quality, and off-season drought.



Fortress Mountain in Kananaskis Alberta
(Photo courtesy of Alistair Wallace, University of Saskatchewan)

National Relevance

"The new decade aligns with Canada's strategic interests, including northern infrastructure, freshwater security, Indigenous community sustainability, the preservation of UNESCO World Heritage sites, and the impacts on coastal communities."

~ Dr. John Pomeroy
GWFO Director

We are All Downstream of the Cryosphere

"A declining cryosphere is a deeply human crisis. This is a global problem, as cryosphere loss has worldwide socioeconomic impacts" ~UNESCO Synthesis of the Decade of Action for Cryospheric Sciences

This is the defining moment: The Decade of Action for Cryospheric Sciences is a once-in-a lifetime opportunity to safeguard the cryosphere for every generation to come. Cryosphere issues remain severely underfunded despite their global consequences. UNESCO frames this as **a rare chance to close the gap between scientific knowledge and collective action.** A resilient future relies on linking data to decision making and insisting on informed community action.

GWFO continues to invest in observation, shares data openly, and is committed to work across borders and disciplines to safeguard the cryosphere's vital role in water security, ecosystems, and human wellbeing.



GLOBAL WATER FUTURES
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Learn more [GWFO.ca](https://www.gwfo.ca)

