Introduction to Global Water Futures

Chris DeBeer, GWF Science Manager

Climate-Related Precipitation Extremes Project Meeting

November 29, 2017

UNIVERSITY OF SASKATCHEWAN
Global Water Futures
GWF.USASK.CA

Outline

- CFREF itself
- GWF overall goals and funding period
- components; director, secretariat, core, SMC
- pillars
- other funded groups
- KM
- inception report
- upcoming events..
- etc.

Opportunity - CFREF

GWF Partners

CANADA FIRST | APOGÉE CANADA
RESEARCH EXCELLENCE FUND | FONDS D'EXCELLENCE EN RECHERCHE

$144 million cash over 7 years 2016-2023

UNIVERSITY OF SASKATCHEWAN   UNIVERSITY OF WATERLOO   McMaster University   LAURIER Inspiring Lives!

University of Guelph

University of British Columbia

University of Northern British Columbia

University of Calgary

University of Laval

McGill University

University of Quebec at Montreal

University of Alberta
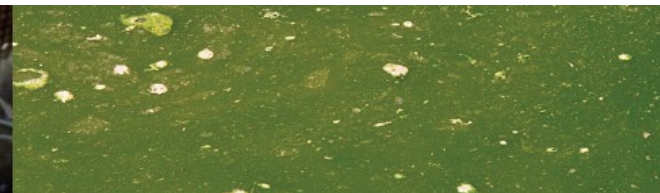
University de Montreal

University of Manitoba

University of Victoria

Brock University

Canadian Rivers Institute (University of New Brunswick & University of Prince Edward Island)

Yukon College

Global Water Futures: Solutions to Water Threats in an Era of Global Change

GWF aims:

a) to **place Canada as a global leader in water science for cold regions** such as Canada where snow, ice and frozen soils are major controls (such regions deliver water resources to half the world), and

b) to **address the strategic needs of the Canadian economy** in adapting to change and managing the risks of uncertain water futures and extreme events.
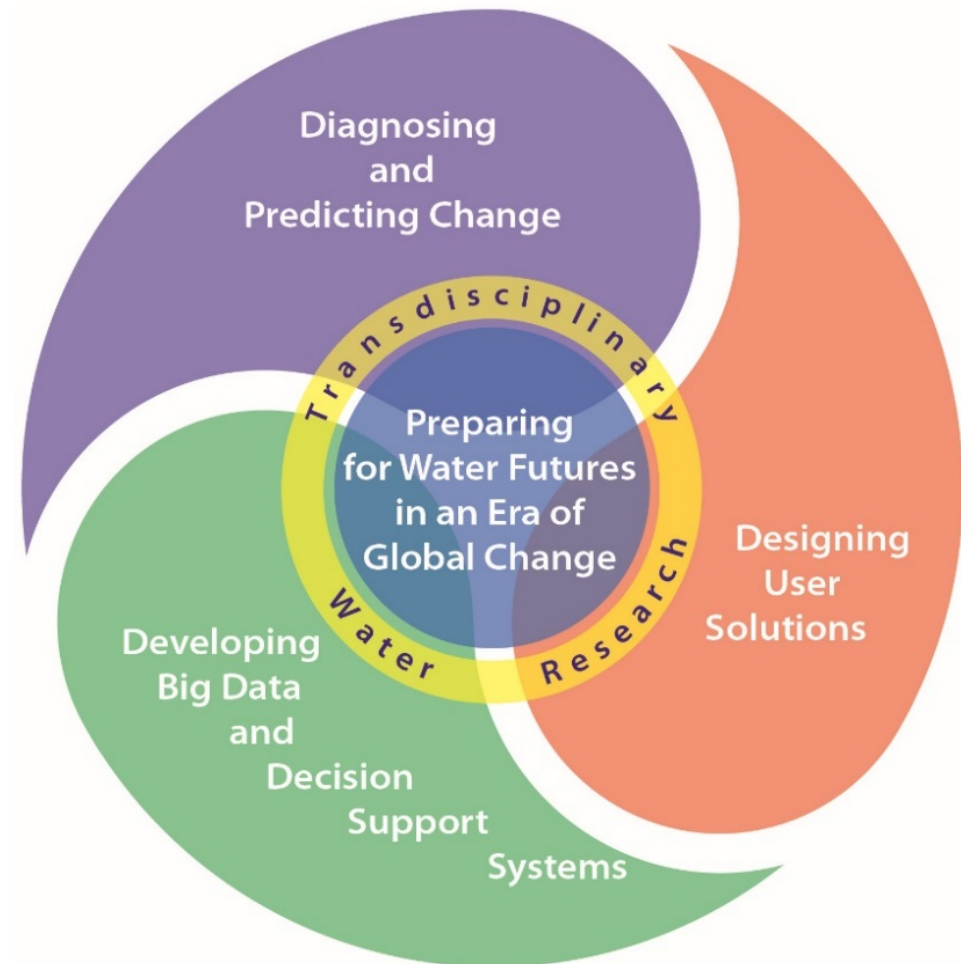
Global Water Futures - Mission

- **Improve disaster warning** – develop scientific knowledge, monitoring and modelling technologies, and national forecasting capacity to predict the risk and severity of extreme events

- **Predict water futures** – use Big Data to make informed decisions, better models to assess change in human/natural land and water systems

- **Inform adaptation to change and risk management** – propose governance mechanisms, management strategies, and policy tools to reduce the risk of water threats, design adaptive strategies, and enhance economic opportunities
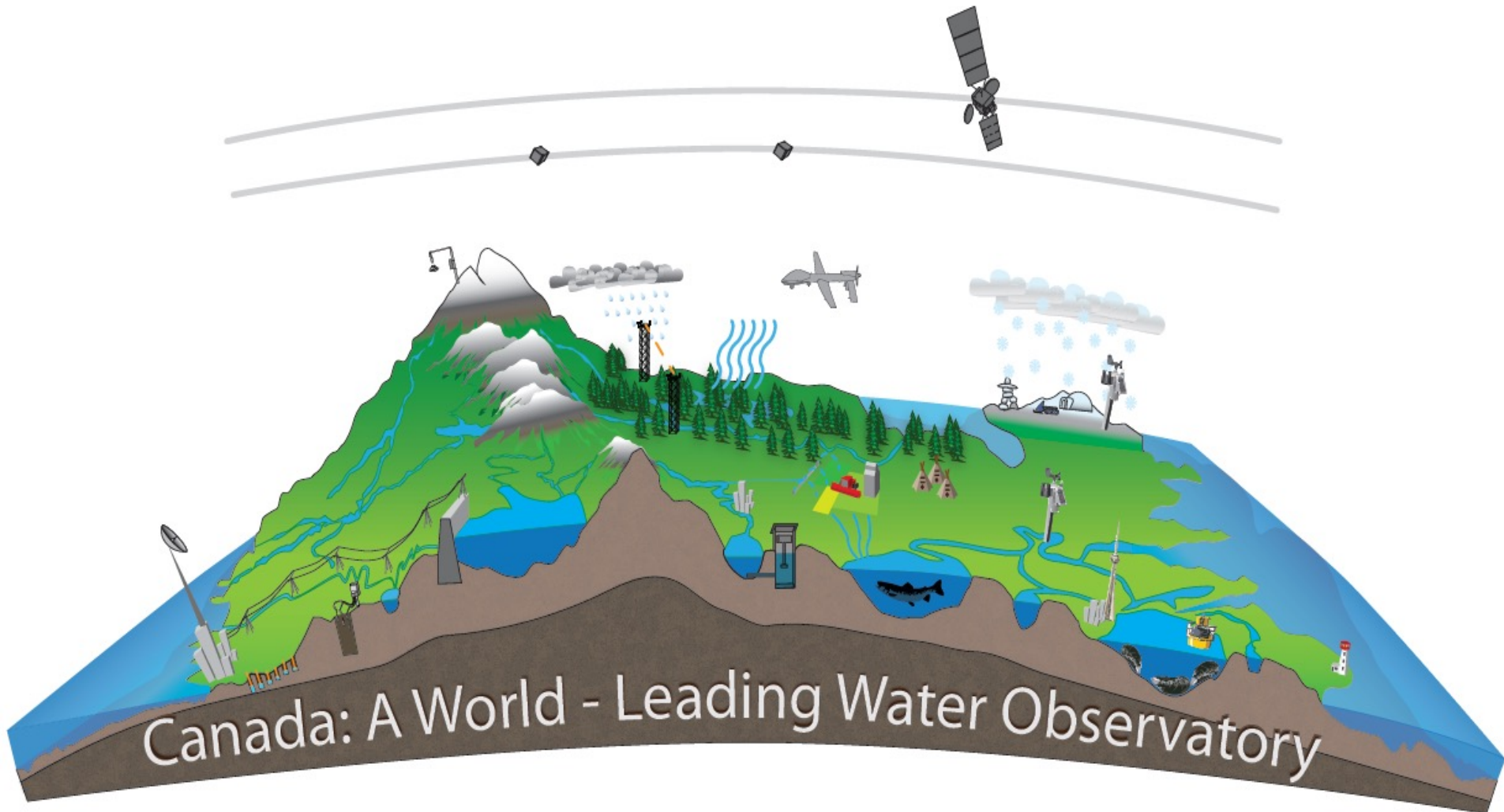
Transdisciplinary Science Pillars

- **Pillar 1** - Diagnosing and Predicting Change in Cold Regions

- **Pillar 2** - Developing Big Data and Decision Support Systems

- **Pillar 3** - Designing User Solutions
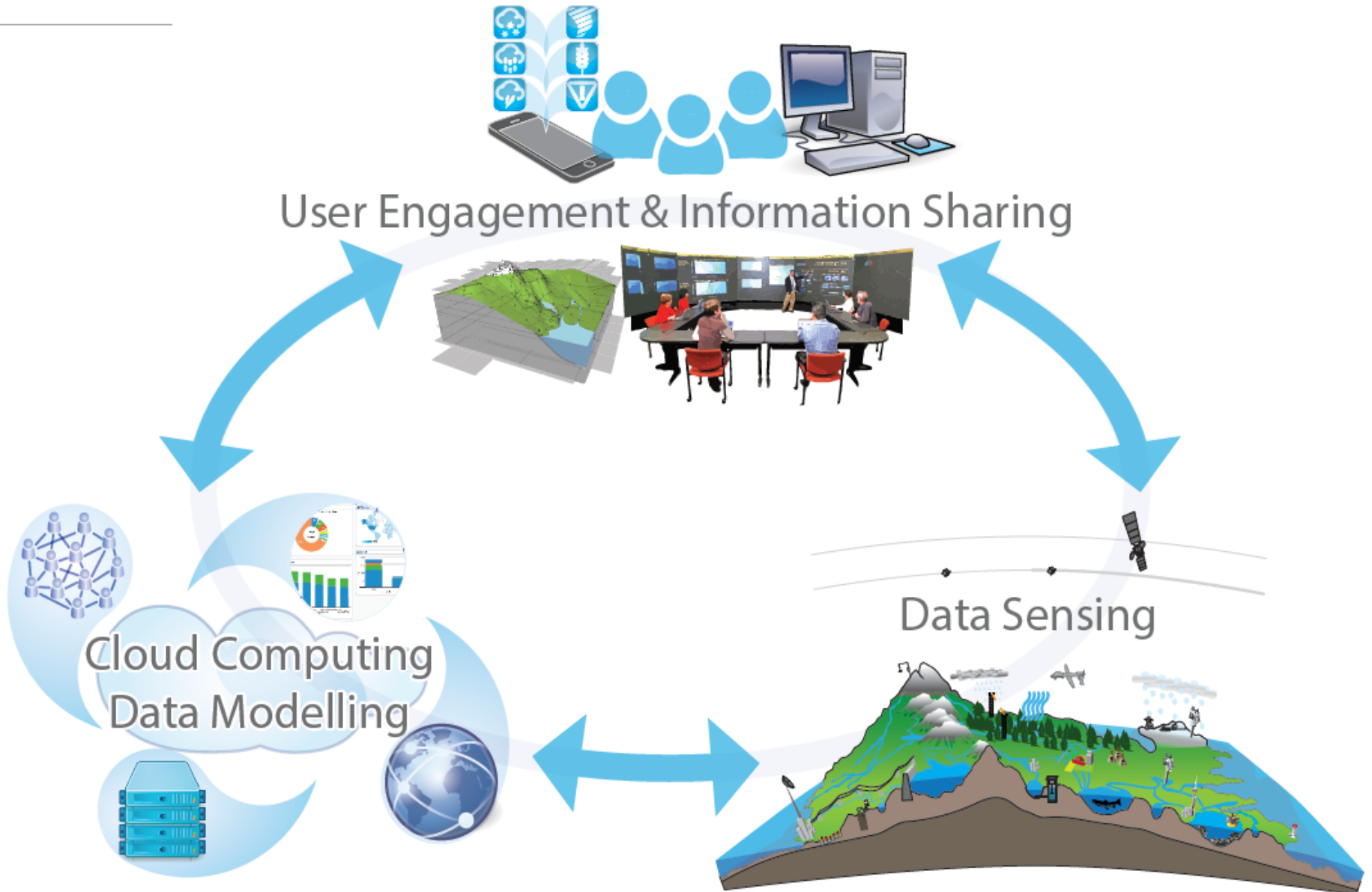
Canada as a Water Observatory

Canada: A World - Leading Water Observatory

New Data Sources: sensors, satellites, drones, crowd-sourcing, DNA analytics
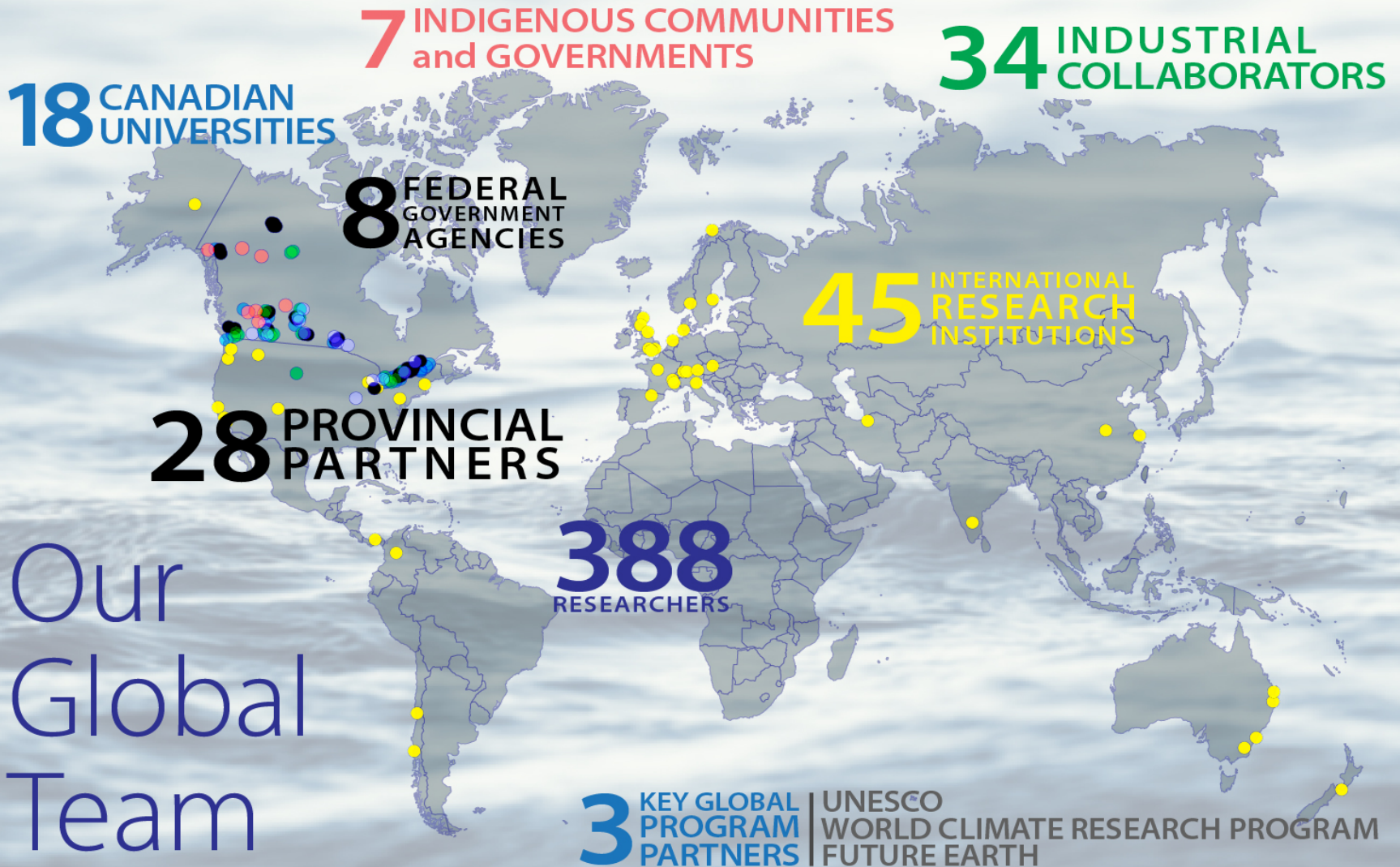Real Time Data Access: location-specific data and warning capability
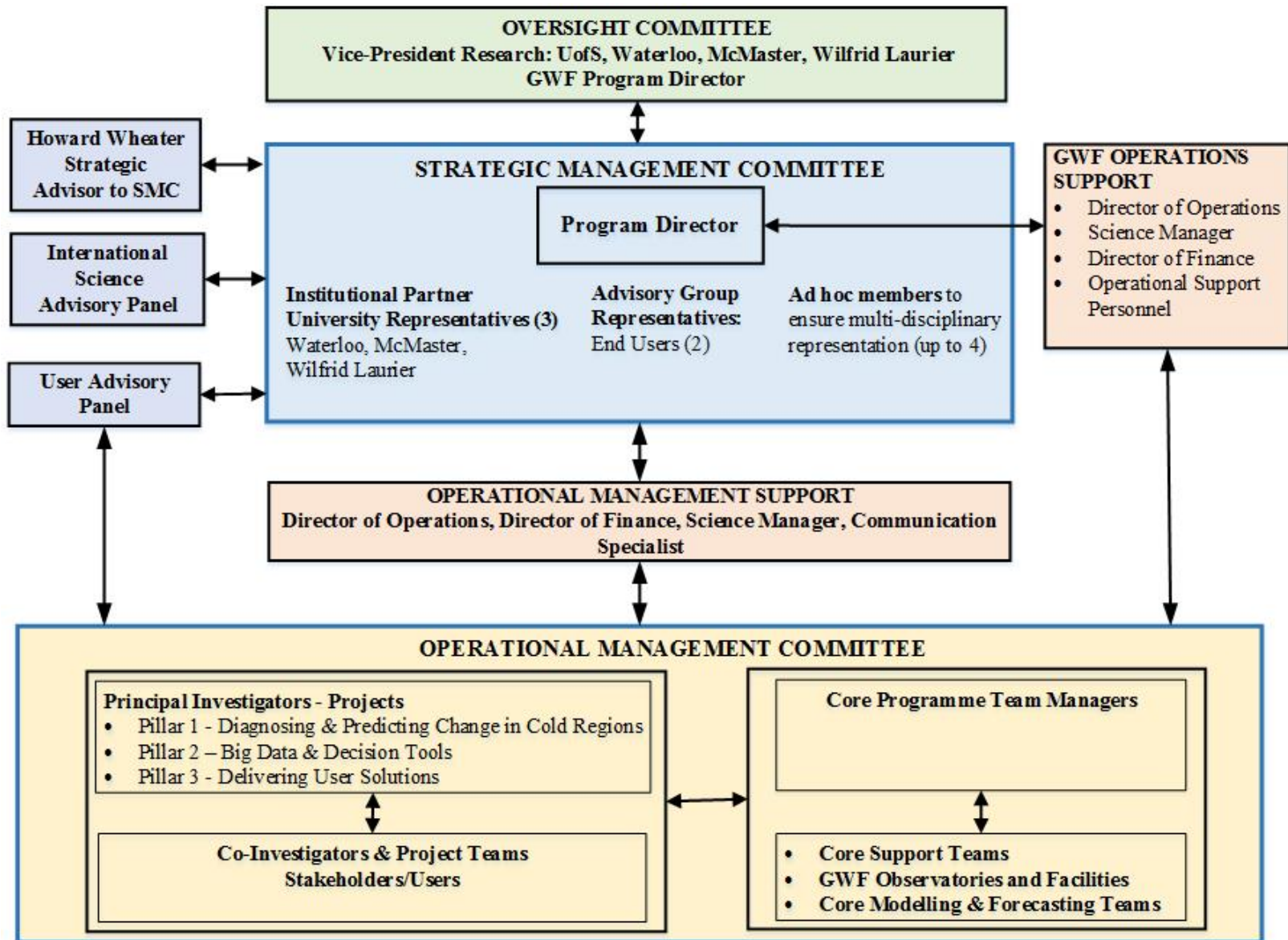
Big Data for Canada's Water

Global Water Futures: Management

OVERSIGHT COMMITTEE
Vice-President Research: UofS, Waterloo, McMaster, Wilfrid Laurier
GWF Program Director

Howard Wheater Strategic Advisor to SMC

International Science Advisory Panel

User Advisory Panel

STRATEGIC MANAGEMENT COMMITTEE

Program Director

Institutional Partner University Representatives (3)
Waterloo, McMaster, Wilfrid Laurier

Advisory Group Representatives:
End Users (2)

Ad hoc members to ensure multi-disciplinary representation (up to 4)

GWF OPERATIONS SUPPORT
- Director of Operations
- Science Manager
- Director of Finance
- Operational Support Personnel

OPERATIONAL MANAGEMENT SUPPORT
Director of Operations, Director of Finance, Science Manager, Communication Specialist

OPERATIONAL MANAGEMENT COMMITTEE

Principal Investigators - Projects
- Pillar 1 - Diagnosing & Predicting Change in Cold Regions
- Pillar 2 – Big Data & Decision Tools
- Pillar 3 - Delivering User Solutions

Co-Investigators & Project Teams Stakeholders/Users

Core Programme Team Managers

- **Core Support Teams**
- **GWF Observatories and Facilities**
- **Core Modelling & Forecasting Teams**

Global Water Futures: Projects

- 33 Projects
- 15 Universities
- 197 PIs &Co-Is
- 159 Partners/ Stakeholders
- Training 357 HQP over 3 years

- $23.5 million GWF grant funding
- $26.8 million cash support
- $119.7 million in-kind support

GWF User-Question Led Projects

- Climate-Related Precipitation Extremes, **Ronald Stewart**, University of Manitoba; **Francis Zwiers**, University of Victoria

- Northern Water Futures, **Jennifer Baltzer** and **William Quinton**, Wilfrid Laurier University

- Next Generation Solutions to Ensure Healthy Water Resources for Future Generations, **John Giesy**, University of Saskatchewan

- Forecasting Tools and Mitigation Options for Diverse Bloom-Affected Lakes, **Helen Baulch**, University of Saskatchewan

- Agricultural Water Futures in Canada: Stressors and Solutions, **Merrin Macrae**, University of Waterloo

- Canada's Boreal Wildlands-Society-Water Nexus, **Mike Waddington**, McMaster University

GWF User-Question Led Projects

- Prairie WATER: Sustainable Water Management for Civic and Provincial Policy Makers and Urban, Rural, and Indigenous Communities, **Jeff McDonnell** (**Chris Spence)**, University of Saskatchewan

- Integrated Modelling for Prediction and Management of Change in Canada's Major River Basins, **Saman Razavi**, University of Saskatchewan

- Mountain Water Futures, **Sean Carey**, McMaster University

- Lake Futures – Enhancing Adaptive Capacity and Resilience of Lakes and their Watersheds, **Nandita Basu**, University of Waterloo

- Transformative Technologies for Canadian Water Futures – Big Data Platform and "Smart" Watersheds, **Claude Duguay**, University of Waterloo

- Co-creating of Indigenous Water Quality Tools, **Dawn Martin-Hill**, McMaster University

GWF Projects - Basic Science, Big Data & Tools

- Southern Forests Water Futures, **Altaf Arain**, McMaster University

- Collaborative Modelling Framework for Water Futures and Holistic Human Health Effects, **Lalita Bharadwaj**, University of Saskatchewan

- Linking Water Governance in Canada to Global Economic, Social and Political Drivers, **Rob de Loe**, University of Waterloo

- Old Meets New: Subsurface Hydrogeological Connectivity and Groundwater Protection, **Grant Ferguson**, University of Saskatchewan

- Omic' and chemical fingerprinting methodologies using ultrahigh-resolution mass spectrometry for geochemistry and healthy waters, **Paul Jones**, University of Saskatchewan

- Evaluation of ice models in Large Lakes using Three Dimensional Coupled Hydrodynamic-Ice Models, **Kevin Lamb**, University of Waterloo

- Short-duration extreme precipitation in future climate, **Yanping Li**, University of Saskatchewan

GWF Projects - Basic Science, Big Data & Tools

- Diagnosing policy and governance effectiveness for agricultural water management during times of change, **Philip Loring**, University of Saskatchewan

- Linking stream network process models to robust data management systems for the purpose of land-use decision support, **Bruce MacVicar**, University of Waterloo

- Winter Soil Processes in Transition, **Fereidoun Rezanezhad**, University of Waterloo

- Global Water Citizenship - Integrating networked citizens, scientists and local decision makers, **Colin Robertson**, Wilfrid Laurier University

- Sensors and Sensing Systems for Water Quality Monitoring, **Ravi Selvaganapathy**, McMaster University

- Linking multiple stressors to adverse ecological responses across watersheds, **Mark Servos**, University of Waterloo

GWF Projects - Basic Science, Big Data & Tools

- SmartStorm: A crowdsourced data platform for enhanced situational awareness and weather observations, **Graham Strickert**, University of Saskatchewan

- Storms and Precipitation Across the continental Divide Experiment (SPADE), **Julie Theriault**, University of Quebec at Montreal

- SAMMS: Sub-Arctic Metal Mobility Study, **Brent Wolfe**, Wilfrid Laurier University

- Adaptation governance and policy changes in relation to a changing moisture regime across the southern Boreal Forest, **Colin Laroque**, University of Saskatchewan

- Significance of Groundwater Dynamics within Hydrologic Models, **Walter Illman**, University of Waterloo

- Diagnosing and mitigating hydrologic model uncertainty in high latitude Canadian watersheds, **Tricia Stadnyk**, University of Manitoba

GWF Projects - Basic Science, Big Data & Tools

- Land surface-atmosphere moisture feedbacks: the role of soil and wetland storage in the prairies, **Andrew Ireson**, University of Saskatchewan

- Improved understanding and prediction of water storage in the southern boreal forest, **Warren Helgason**, University of Saskatchewan

Core Support Teams

- **Knowledge Mobilization** – UofS-Steelman, WLU-Blay-Palmer, UW-Kevin Boehmer (UofS-RS-1, UW-RS-1, WLU-RS-1)

- **Computer Science** – UofS-Schneider, UW-Lin (UofS-RS-2, UW-RS-1)

- **Data Management** – UofS-Pomeroy, McM-Carey, WLU-Baltzer, UW-Lin (UofS-Tech-1, McM-Tech-1, WLU-Tech-1)

- **Research Technicians**
  - UofS – 6 (Airborne Cold Regions Observatory, Water Isotope Ecohydrology Laboratory, Boreal Forest and Prairies – 2, Canadian Rockies Hydrological Observatory – 2)

  - UW – 5 (Remote Sensing, Smart Sensors Network, Water Quality and Aquatic Ecosystem, Smart Watershed – 2)

  - WLU – 5 (Ecosystem Resilience, Hydrometeorological, Permafrost, Water Quality, Biomonitoring)

  - McM – 4 (Yukon Research Sites – 2, Northern Boreal Plains, Ontario Observatories)

Core Team – Modelling & Forecasting

- Hydrological and Water Quality Development

  - Flood Forecasting (UofS-RS-2*)

  - Seasonal and Drought Forecasting (UofS-PDF-1)

  - Floodplains (McM-PDF-1)

  - Data Assimilation (UofS-PDF-1, UofS-Eng-1*, UW-PDF-1)

  - River Ice Modelling (UofS-PDF-1)

  - Water Quality (UofS-PDF-1, UW-PDF-1)

- Climate Change and Diagnostic Applications

  - Climate - high resolution pan-Canadian (UofS=RS-1, UofS-PDF-2*, UofS-GS-1)

  - Hydrological Modelling (UofS-RS-1, UofS-PDF-2*, UW-PDF-1)

  - Next Generation Modelling (UofS-RS-1, UofS-PDF-1, UofS-RO-2*)

  - Catchment, River and Lake Water Quality (UofS-RS-1, UofS-PDF-1, UW-RS-1, UW-PDF-1, McM-PDF-1)

- Water Resources Systems

  - Water Resources (UofS-RS-1, UofS-PDF-1, UW-PDF-1)

*denotes UofS supplemental funding   currently a team of 30

GWF National Modelling Strategy
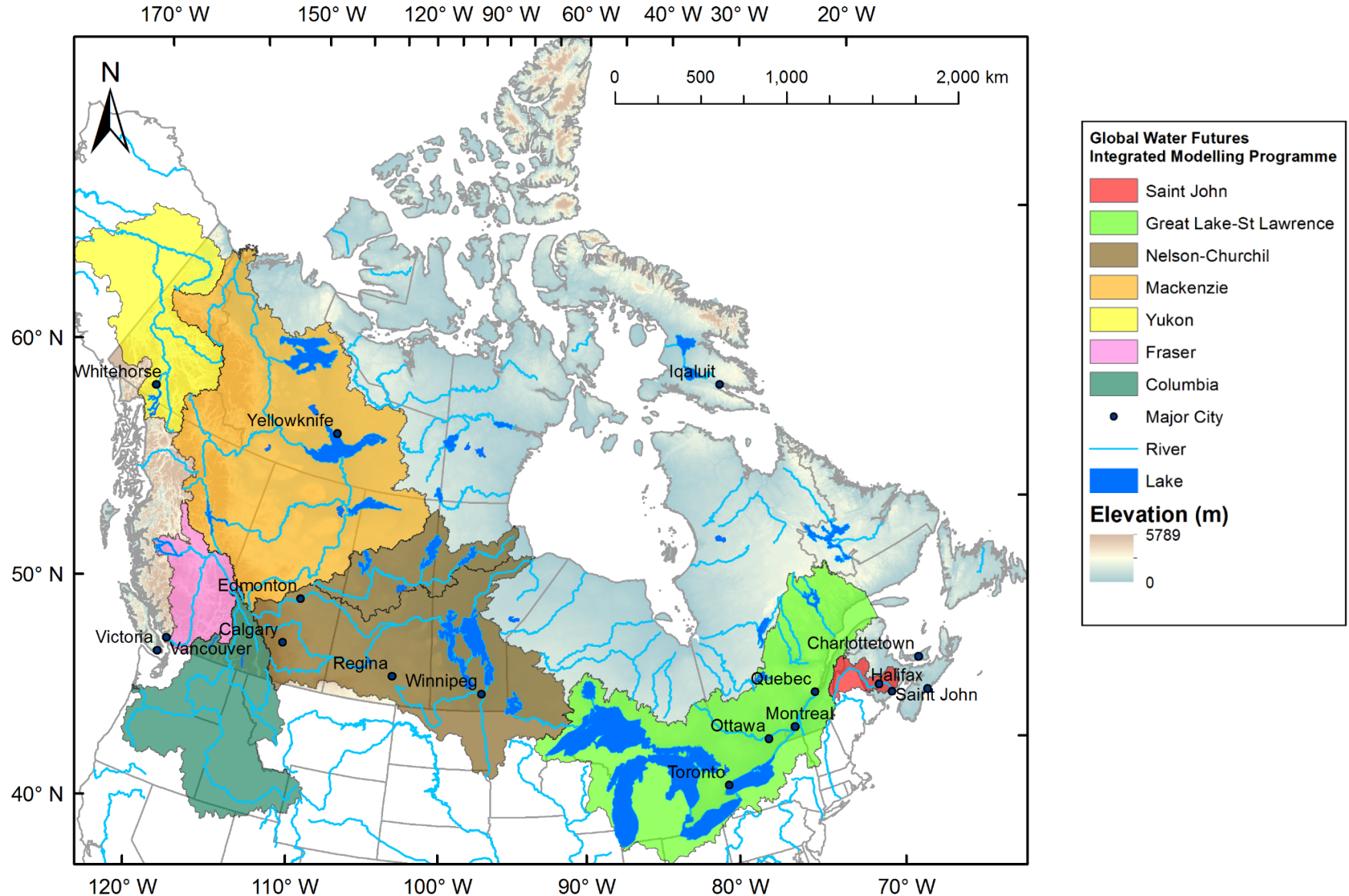
National Hydrology Research Centre, Saskatoon

Coldwater Laboratory, Canmore, Alberta

Canadian Centre for Water Forecasting and Prediction, Saskatoon

Inception Report – due April 30, 2018

Report Contents and Guidelines (Length—11-13 pages)**:**

- Introduction, including a brief summary of the project, background information and its overarching goals as it is currently conceived (1-2 pages)

- Plan for Reaching Goals (7 pages)
    - Goal/Objectives
    - Models (which models are being deployed, which models are being developed)
    - Data/sensors (creation, management)
    - Activities (field campaigns, laboratory studies, surveys, other)
    - Linkages to Other Projects
    - Milestones/timelines
    - Deliverables

- User Engagement and Knowledge Mobilisation Plan (1 page)

- Revised Budget – detail proposed expenditures by objective/goal, by investigator and by HQP (1-2 page)

- Strategic Analysis with direction on how issues and gaps will be resolved, what needs to be done to achieve the milestones and produce the stated deliverables, and how to coordinate and integrate planned activities (1 page)

Appendix:

- List of Personnel (investigators and HQP, who is doing what)

- List all major research sites and facilities along with brief description that are supporting your project in an Appendix. Please include relevant photographs, where applicable

Upcoming Events

- January 22–23, 2018: GWF Inception Meeting, Waterloo ON

- May 6–11, 2018: 8th GEWEX Science Conference, Extremes and Water on the Edge, Canmore AB

- June 4–6, 2018: GWF Open Science Meeting, McMaster University, Hamilton ON

Global Water Futures

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