Global Water Futures Inception Meeting

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Director, Global Water Futures Program

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Global Water Futures

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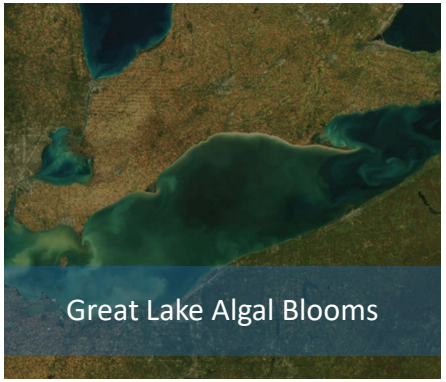
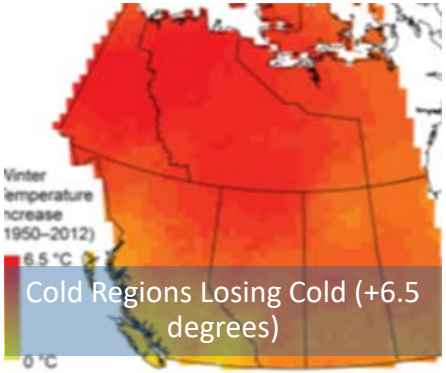
Water is essential for life and society

Our water is increasingly at risk


Toronto Flood (2013)


Great Lake Algal Blooms


Drought



Cold Regions Losing Cold (+6.5 degrees)


Permafrost Thaw


Unprecedented Prairie Summer Flooding


Extreme Wildfires

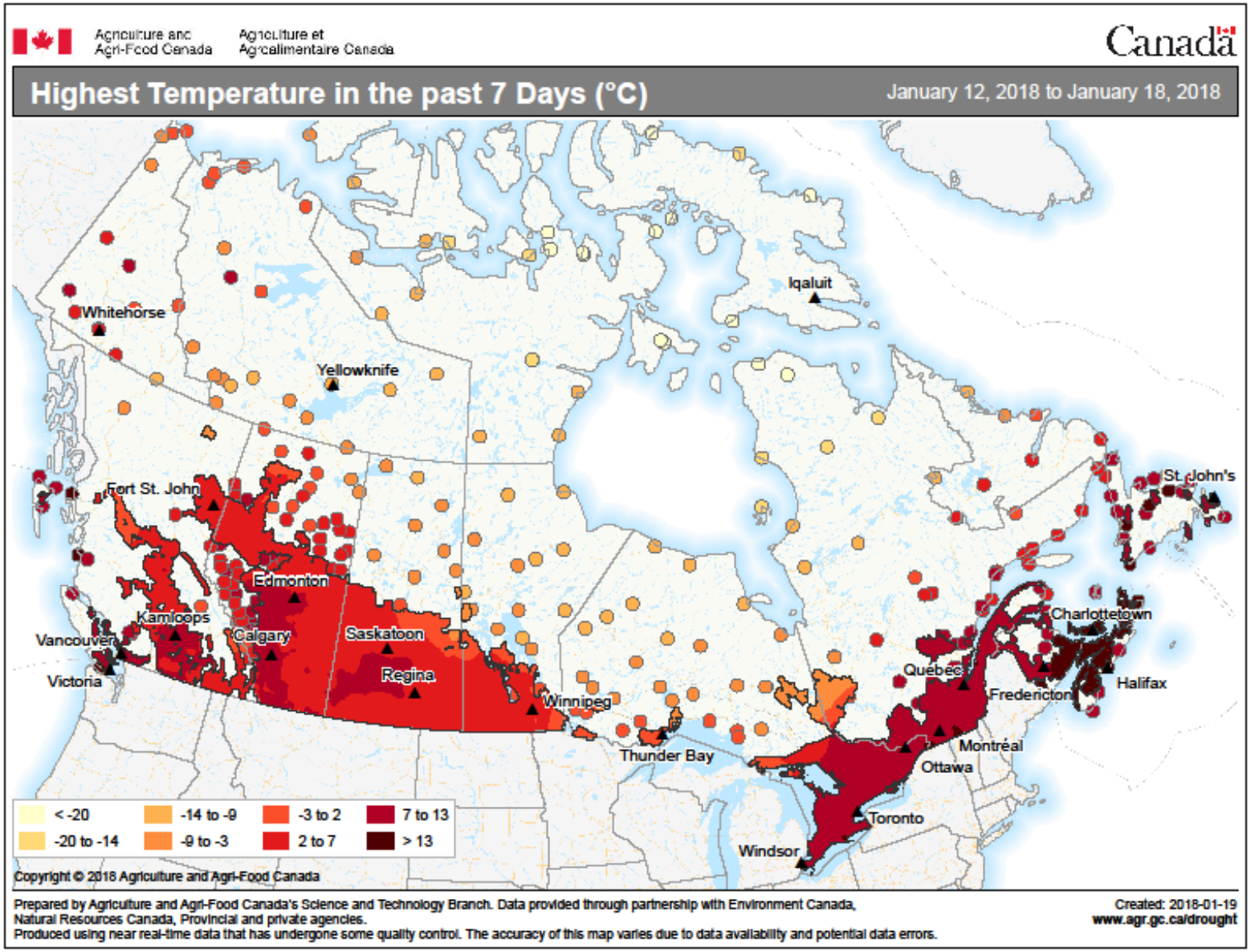

Yukon's Slims River Changes Flow Direction

Climate Change

Urban and Industrial Development

Agricultural Intensification

Canada in January???



Adaptation to change and threat mitigation requires

- **New science** to understand the changing Earth system
- **New modelling tools** to capture interconnected forces and their societal implications
- **New monitoring systems** to warn of critical environmental changes
- **More effective mechanisms to translate new scientific knowledge into societal action** e.g. computer apps, games, visualization tools

Grand Challenge

- How can we best prepare for and manage water futures in the face of dramatically increasing risks?

- Canada First Research Excellence Fund Competition $1.5B CDN

- **Global Water Futures**
  - **$78 M CDN grant**
  - **$143 M CDN initial program budget**
  - **2016-2023**

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

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GWF aims:

a) to **place Canada as a global leader in water science for cold regions**,

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: Solutions to Water Threats in an Era of Global Change

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

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

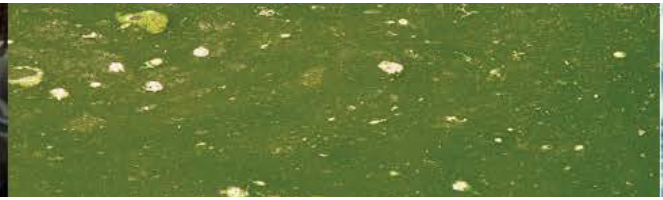
University of Victoria

Brock University

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

Yukon College





Global Water Futures - Mission

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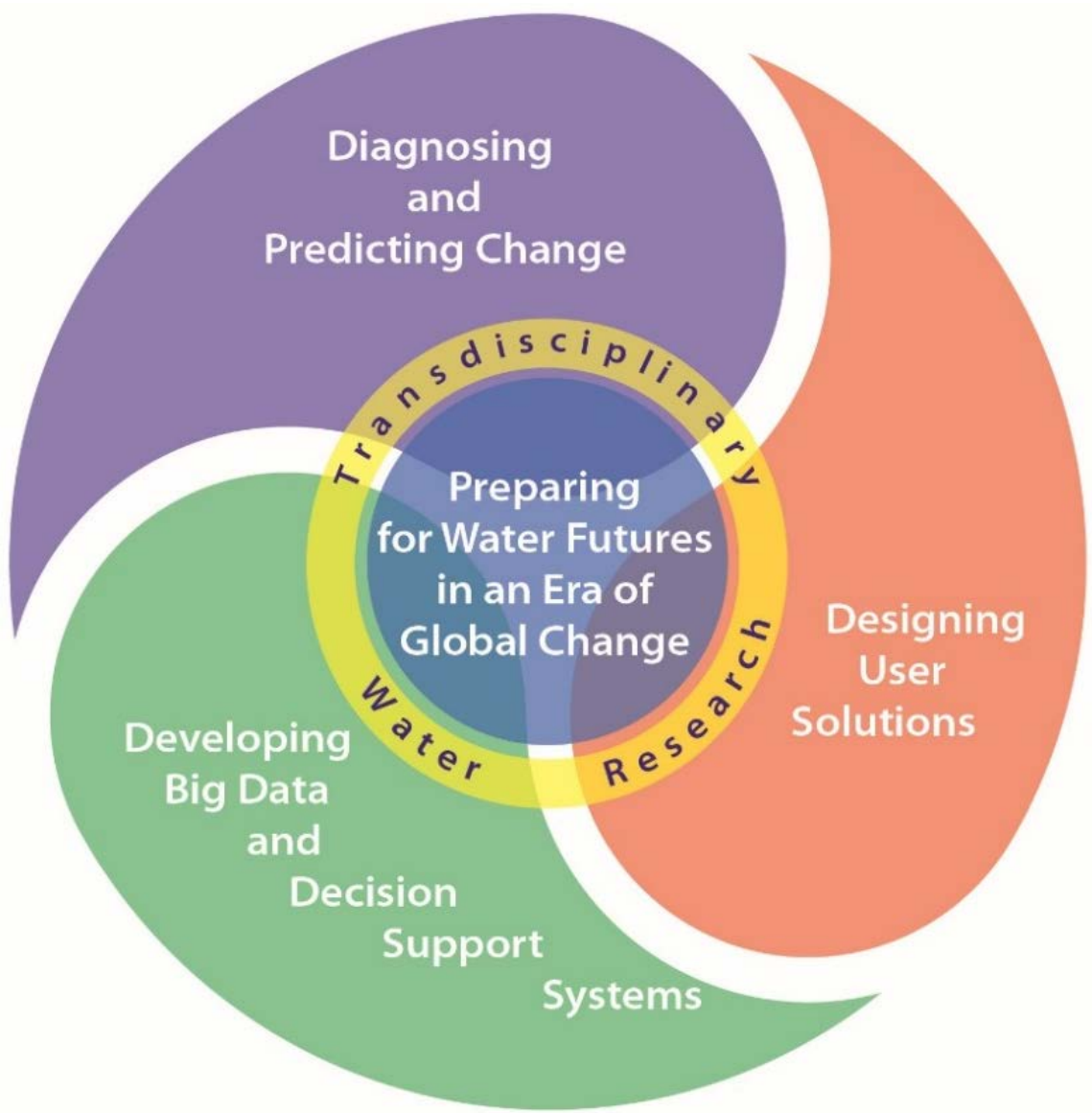
- **Improve disaster warning** – develop:
  - scientific knowledge, monitoring and modelling technologies,
  - national forecasting capacity to predict the risk and severity of extreme events
- **Predict water futures** –
  - use Big Data to make informed decisions,
  - Develop better models to assess change in human/natural land and water systems
- **Inform adaptation to change and risk management** – to reduce the risk of water threats, design adaptive strategies, and enhance economic opportunities, propose
  - governance mechanisms,
  - management strategies,
  - policy tools

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



Global Water Futures will position Canada as a:

- Global leader in water science
- Global partner of choice for water research
- Provider to Canada and the world of solutions to water threats

GWF National Water Observation and Prediction Strategy

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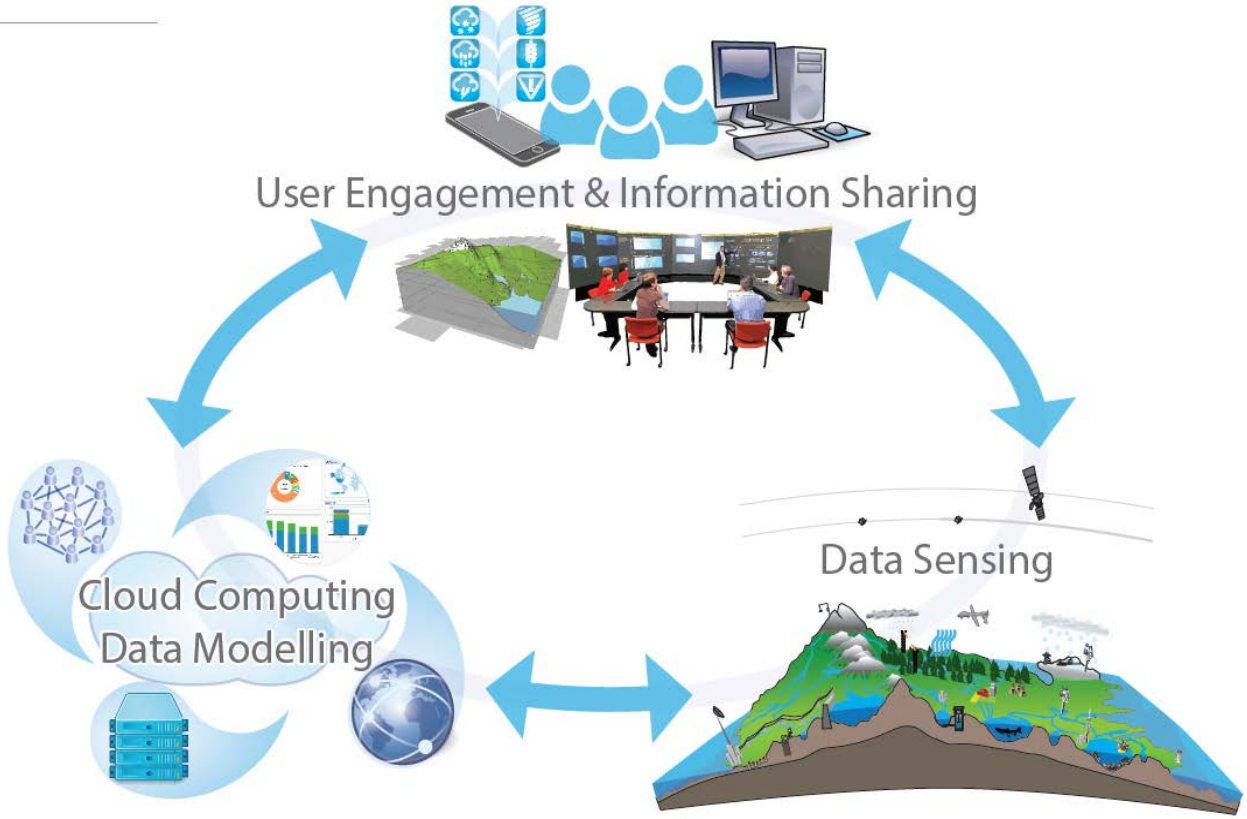
- **Core support teams to deliver national modelling capability, advanced computer science, new observational science and knowledge mobilization**
- **User-question led project-focussed funding**

- **Computer Science** – Human Computer Interface, Data & Re-engineering Codes
- **Technical Team**: Observatories & Observations
- **Data Management**
- **Modelling Core Team**
  - Hydrological & Water Quality Forecasting
  - Climate Change, Diagnostic Hydrological & Water Quality Modeling
  - Water Resources Modelling
- **Knowledge Mobilization**



Global Water Futures Governance & Organizational Structure

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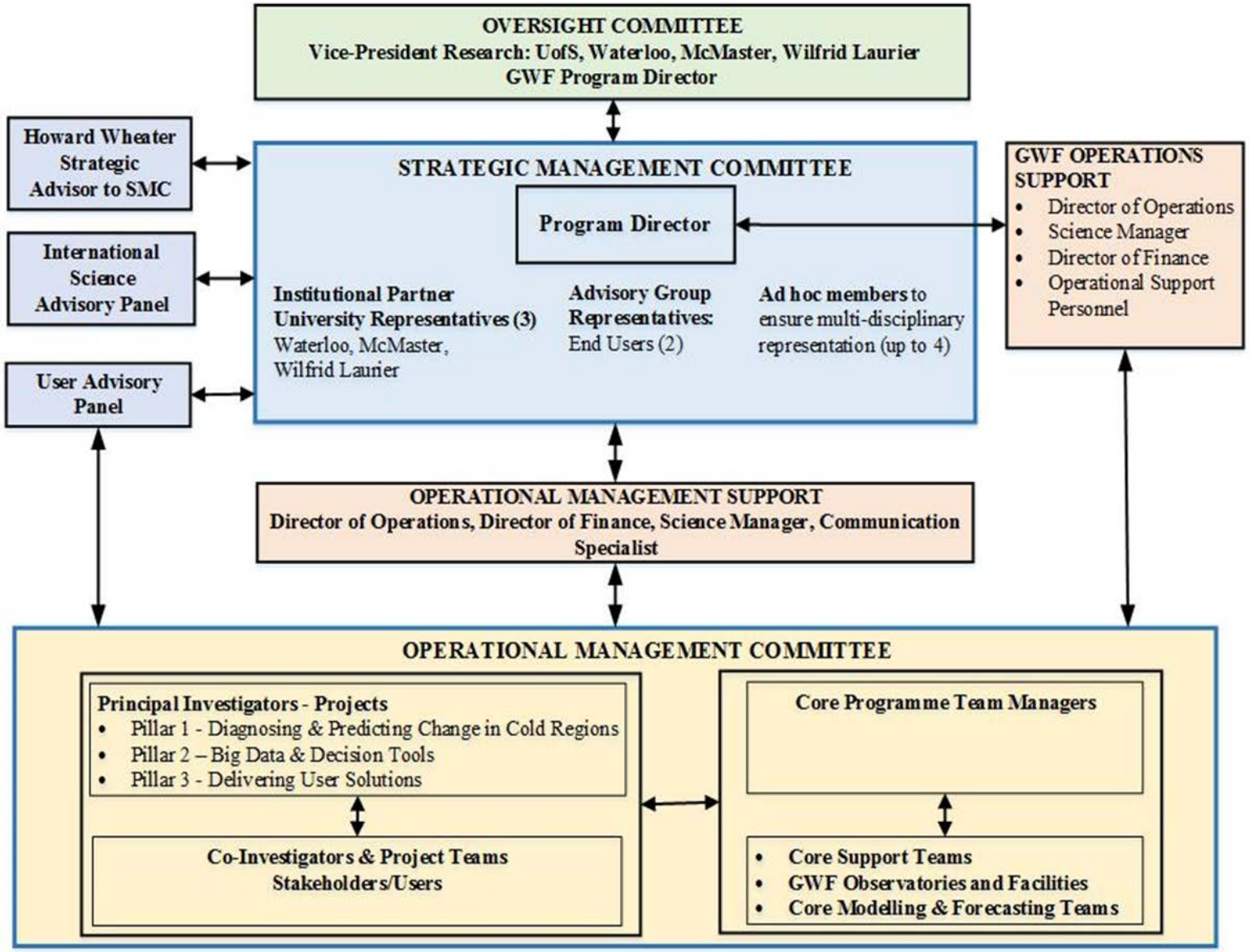

GWF Strategic Management Committee

- Program Director – **John Pomeroy**, UofS
- University of Waterloo lead – **Philippe van Cappellen**
- Wilfrid Laurier University lead – **Jennifer Baltzer**
- McMaster University lead – **Sean Carey**
- Socio-hydrology – **Patricia Gober**, UofS
- Water Environment – **Helen Baulch**, UofS
- Climate and Atmospheric Science – **Ronald Stewart**, University of Manitoba
- Big Data, Urban Communities, and Groundwater – **David Rudolph**, University of Waterloo
- Water Resources Management, Communities – **Lawrence Martz**, UofS
- Stakeholders/Users, Government, Measurements, Modelling and Forecasting – **Alain Pietroniro**, Environment and Climate Change Canada

GWF Advisory

- Strategic Advisors to the SMC
  - Howard Wheater
  - Merrel-Anne Phare
- International Science Advisory Panel
  - Anthony Jakeman, Australian National University, Australia
  - Blanca Jimenez Cisneros, Director of the Division of Water Science, UNESCO, Paris
  - Eric Kasischke, University of Maryland, USA
  - Dennis Lettenmaier, University of California at Los Angeles, USA
  - Xin Li, Director of Laboratory of Remote Sensing and Geospatial Science, CAREERI/Chinese Academy of Sciences
  - Claudia Pahl-Wostl, University of Osnabrück, Germany
  - Roy Rasmussen, National Center for Atmospheric Research, USA
- User Advisory Panel

GWF Secretariat

- Phani Adapa, Director of Operations
- Chris DeBeer, Science Manager
- Kelly McShane, Director of Finance
- Viet Truong, Financial Officer
- Stacey Dumanski, Outreach Coordinator
- Mark Ferguson, Communications Specialist
- Branko Zdravkovic, Data and IT Manager
- Michelle Martel-Andre, Human Resources and Facilities, UofS
- Sherry Olauson, Clerical Assistant Finance, UofS

GWF @ January 2018

- 33 Projects funded
  - 211 university faculty researchers
  - 15 universities across Canada
  - 444 HQP over the first three years
    - graduate students, post-doctoral fellows, scientists, engineers, technicians, and managers
  - 172 partners involved
    - federal & provincial government agencies, First Nations, industry, international institutions, NGOs, and communities
- 3 global programs supported
  - UNESCO, World Climate Research Programme, Future Earth
- $185 million in GWF project and core team funding for first three years
  - $23.5M GWF cash grant awarded to Projects
  - $14.6M GWF funding to operate Core Teams
  - $26.8M leveraged by Projects (cash)
  - $119.7M leveraged by Projects (in-kind support)

GWF Progress

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- 21 transformative research, big data and decision support tool projects approved for Pillars 1 & 2
  - Atmospheric science, Hydrology, Water Quality, Water Management & Governance, Health
  - Sensors, crowdsourcing, computing
- 12 user-question led projects funded for Pillar 3
  - Regional – e.g. Great Lakes, North, Prairies, Mountains, Boreal
  - Sectoral – e.g. Agriculture, Mining
  - Topical – e.g. First Nations co-development, modelling & prediction, algae, climate extremes
- 6 Core Teams Established
  - 32 core modellers
  - 9 computer scientists
  - 20 observatory technicians (Yukon, NWT, Rockies, Saskatchewan, Ontario)
  - 4 data managers
  - 3 knowledge mobilisation specialists
  - 9 communications specialists
- Observatories Staffed, Predictions Started
  - Flood forecasting system implemented for Yukon Territory
  - Mountain snow forecasting system for Bow River headwaters in Canadian Rockies
  - Smart Water Systems Laboratory (Western Economic Diversification, CFI)
- New offices/labs in Saskatoon, Saskatchewan, Yellowknife, NWT, Whitehorse, Yukon and Canmore, Alberta
- GWF Young Professionals Strategy
- GWF International Strategy
  - WCRP-GEWEX, UNESCO-IHP, Future Earth, UN Water Decade, MESH in India,
  - International Exchanges (China, Iran, Spain, France, Germany)
- Indigenous Communities Water Strategy -
  - Source water protection, Climate change impacts, Upstream industrial water impacts, Water rights, Governance

Next Steps

- GEWEX-INARCH Mountain Catchment Hydrology Workshop, Zugspitze, Germany 8-9 Feb 2018
- CCRN Finale and HW Symposium: Hydrology 2058, Saskatoon, 5-8 March 2018
- GWF Indigenous Communities Water Research Workshop, Saskatoon, TBD April, 2018
- 8th GEWEX International Science Conference, Canmore, Alberta, 6-11 May 2018
- GWF Annual Science Meeting, Hamilton, Ont., 4-6 June 2018
- International Conference on Water Security, Toronto, 17-20 June 2018

Inception Meeting

Purpose and Aims of Inception Meeting

- The purpose is:
  1. To review initiation of the Projects and core elements of GWF and assess progress of the program
  2. To identify synergies, linkages, gaps
  3. To discuss program needs and plans for the future

- This is a first opportunity for GWF PIs and Core Team leads (Operations Committee) to meet and see what is happening across the programme
- By the end, we hope to have a clearer vision and begin to develop strategic plans for operation and integration, with clear priorities and timelines

Some Other Objectives

- Build collaborative links across the GWF community
- Identify needs and opportunities for cross-cut activities
- Consider our data needs and data legacy

Meeting Structure

- Today
  - Series of brief overview presentations on all GWF projects and core teams, with time for Q & A
- Tomorrow
  - GWF Café. Focused break-away discussions on a variety of important topics and issues for GWF.
    - For each topic: What is occurring? What are we planning? What gaps are there to fill? What is the nature of engagement with users and stakeholders?
  - Final discussion on priorities and plans,

23 Jan GWF Café - Format

- 5 Questions to address:
  - What is occurring on these various topics?
  - What should be occurring?
  - What are we planning?
  - What gaps are there to fill (not occurring, not planned)?
  - What is the nature of engagement with users & stakeholders?
- Discussions should bring this information out. Leads will moderate the discussion and keep it flowing.
- Rapporteurs will record, synthesise, and provide a short summary overview of the discussion back to the group at the end.
- Will this make a good parallel session for the GWF Annual Science Meeting in June?

Example of DRAFT of Annual Science Meeting Programme

- ***Day-2 – June 5***
- Plenaries (8:30 am – 12:00 pm)
- Workshop day-2 opening (set tone for events and themes of day-2)
- Project overviews (For large projects 15 min each + 5 min for questions; for smaller projects 5 – 10 min each + 3 min for questions)
  - Include hooks for attending break-away sessions and advertise posters
- Break (30 min)
- Project overviews (continued)
- Lunch (12:00 – 1:30 pm)
- Afternoon oral sessions (1:30 – 3:30 pm)
- Parallel oral sessions organized by the 11 Café topics
  - All projects to contribute at least a few talks
  - User panels will contribute; one person from user panel will start each session with their perspectives, followed by science talks
- Break (3:30 – 4:00 pm)
- Afternoon poster sessions and side meetings (4:00 – 5:30 pm)
- Free-form with time for posters organized by sessions and break-away side meetings

GWF Café - Instructions

- Participants should visit each table over the course of the Café. This can be in any particular order. Discussion leads and rapporteurs will remain at their table.
- There will be 15 minutes for discussion at each table. A 3 minute warning will be provided before time is up and participants are asked to switch tables.
- There is about 3 or 4 minutes to make the transitions
- Rapporteurs have 5 minutes each to summarize at the end of the Café this afternoon

GWF Café – Topics & Issues

1. Modelling/computations – Flood/ drought forecasting (Discussion Lead – Al Pietroniro; Rapporteur – Saman Razavi)
2. Observations, sensors & remote sensing – Observatories and field campaigns (Discussion Lead – Dave Rudolph; Rapporteur – Claude Duguay)
3. Environment – conservation; ecological flow needs, etc. (Discussion Lead – Jennifer Baltzer; Rapporteur – Helen Baulch)
4. Agriculture and forestry – Land management (Discussion Lead – Bruce MacVicar; Rapporteur – Merrin Macrae)
5. Governance – Evolving governance, integrate adaptive governance into science (Discussion Lead – Phil Loring; Rapporteur – Howard Wheater)
6. Urban and rural communities – water quality and groundwater (Discussion Lead – Kevin Boehmer; Rapporteur – Philippe van Cappellen)
7. First Nations – source water protection (Discussion Lead – Merrell-Ann Phare; Rapporteur – Dawn Martin-Hill)
8. Industry – hydro-power, insurance, finance, etc (Discussion Lead – Julie Thériault; Rapporteur – Ronald Stewart)
9. Natural resources – mining legacy issues (Discussion Lead – Mike Waddington; Rapporteur – Sean Carey)
10. Knowledge mobilization – best practices (Discussion Lead – Kara Hearne; Rapporteur – Lawrence Martz)
11. Crowdsourcing and citizen science (Discussion Lead – Stephanie Merrill; Rapporteur – Graham Strickert)

GWF Inception Statement

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- GWF has identified a *Grand Challenge*: how can we best prepare for and manage water futures in the face of dramatically increasing risks from a changing climate, developing economy and changing society?
- GWF has thus initiated 33 projects addressing critical water research needs, big data and decision support tool development, sensors and user-questions, and 6 core teams addressing observations, data management, computer model-based prediction, communications and knowledge delivery.
- These projects and teams have exchanged best practices and have begun their research, observations, modelling and knowledge mobilisation activities and are engaging with over 170 partners/users whilst training over 440 HQP.
- GWF is engaging with all levels of government across Canada, with special interest in engagement with Indigenous communities and international UN-based science organisations.

GWF Inception Statement

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- GWF recognises the continued need to
  - design models to predict multiple outcomes from coupled climate and other impacts on water for non-traditional objectives,
  - enhance water, climate and terrestrial basin observations using new sensors and remote sensing,
  - further define ecological flow needs, basin-scale impacts and advise/inform the regulatory framework
  - consider a continuum of dynamic agricultural, urban and forestry land use interactions with changing water, climate, cultural and aquatic systems
  - appreciate that water quality impacts on and by urban and rural communities are profoundly important to water and health, and need decision-making based on enhanced observation and supported by the outcomes of integrated models.
  - engage effectively and appropriately with industry to address their needs for data, science information, model outputs, designs and assessment procedures, whilst noting differing interests and confidentiality issues,
  - examine the ubiquitous contaminant legacy, site mitigation, water needs and long-term catchment-functioning rehabilitation issues from mining,
  - develop innovative citizen science and crowdsourcing initiatives, including co-developed systems, that engage those who may generate water information, can be assimilated into enhanced observations and prediction systems and provide positive feedback to data originators,
  - share tools and develop best practices for knowledge mobilisation and communications from projects and core teams in a transdisciplinary framework to key audiences regionally, nationally and internationally that can sustain and inform GWF and benefit Canada and stakeholders
  - engage fully with Indigenous communities' knowledge, perspectives and needs – for all aspects of GWF. Knowledge exchange with Indigenous communities can take multiple forms and innovation in co-creation of knowledge can be a fundamental legacy.
  - work at the science-policy interface, inform and propose innovations in policy instruments and governance, including flood plain risk management as a first priority and including and supporting Indigenous communities in decision making.
- GWF continues to encourage leveraging, user-engagement and collaboration as ways to expand its science and interactions with users and stakeholders. It will work to ensure policy relevant science is advanced, engaged, made available and interpreted to inform decision making and decision support.

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