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Groundwater Geoscience Program

Mission and approach

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February 26th, 2018

NATURAL RESOURCES CANADA - INVENTIVE BY NATURE



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Research context at Natural Resources Canada

Strategic priorities of the Earth Science Sector

Canada's Natural Resource Sectors are Globally Competitive

- Geospatial Innovation
- Targeted Geoscience Initiative 5 (TGI5)
- Geo-Mapping for Energy and Minerals (GEM2)
- New Energy Supply

Natural Resource Sectors and Consumers are Environmentally Responsible

- **Groundwater Geoscience**
- Environmental Studies and Assessments
- Earth Observation for Responsible Resource Development

Canadians have Information to Manage their Lands and Natural Resources, and are Protected from Related Risks

- Climate Change Adaptation
- Geohazards and Public Safety
- Essential Geographic Information
- Canada's Legal Boundaries
- Polar Continental Shelf Logistics Support
- United Nations Convention on the Law of the Sea

Research context at Natural Resources Canada

Strategic priorities of the Lands and Minerals Sector

- Geoscience for the Sustainable Development of Natural Resources



Groundwater Geoscience Program



- Geol. Knowledge for On+offshore Lands

- Keeping Canada Safe

- Geoscience for Society

- Our People, Our Science

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Groundwater Geoscience Program Evolution over the years

Pre program phases (1992-2002)

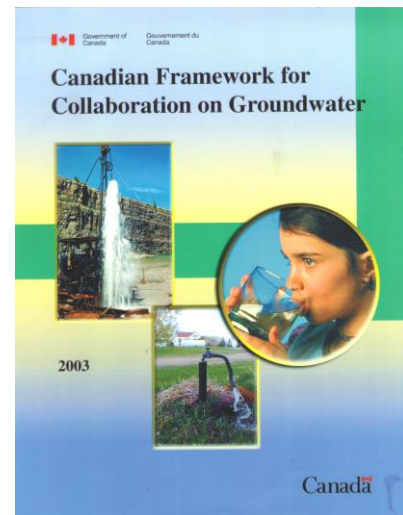
- Propose a step-by-step framework for aquifer characterization
- Assess characterization methods to proposed the cost-effective ones
- Develop technical guidelines for aquifers delineation in Canada (granular and fractured aquifers)
- Provide baseline information to answer questions like:
“How much GW is there in Canada”

Program phases I, II, III, IV (2003-2019)

- Provide scientific knowledge on GW resources for water management and protection targeted at drinking water source
- Assessment of (30) Regional Aquifers
- Assessment of trans-boundary aquifers in Canada
- Develop new tools to assess and characterize the GW resource

Future

- Continue National aquifer inventory at regional scale
- National assessment and GW accounting (GW sustainability indicators)
- Need to address climate change related issues on water.



Governance Framework

Standing Senate Committee on Energy, the Environment and Natural Resources - Fourth Interim Report

"Water in the West: Under Pressure" November 2005.

1. *major aquifers are mapped*
2. *national groundwater database*
3. *summary document*



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Other Governance drivers

Munk School (June 2013): (underground)

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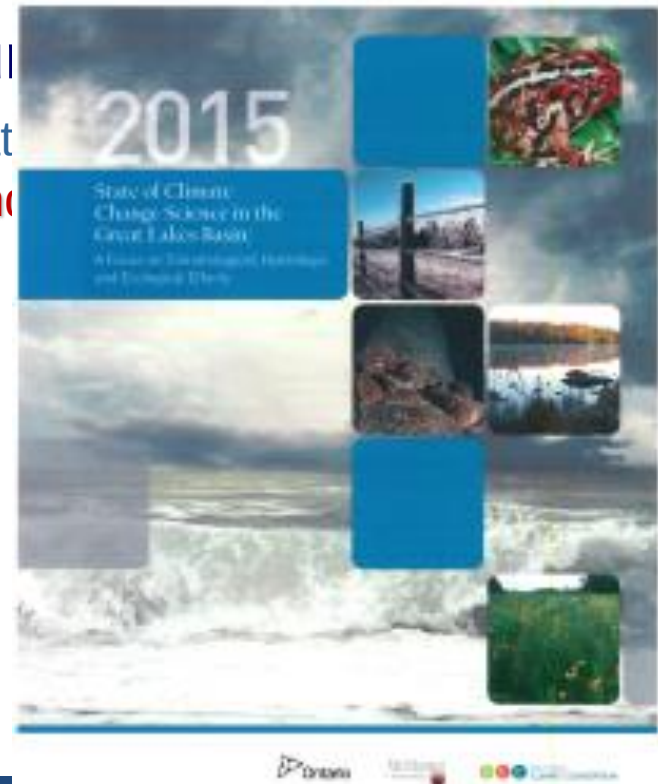
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ADÈLE HURLEY
Let's make groundwater an issue of national security

ADÈLE HURLEY
 Contributed to The Globe and Mail
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Taking stock of the last 20 years of the program

Program's goal

- The Groundwater Geoscience Program conducts GW mapping and assessment activities of key Canadian aquifers and makes data available through the Groundwater Information Network (GIN) in order to provide baseline information and scientific knowledge on GW resources for water management and protection.

...then, it was rephrased in 2013 in the GSC Strategic plan in:

- Understanding the dynamics of archetypical Canadian aquifers and developing methods to assess them.
- Acquire, manage and disseminate all geoscience data by using internationally accepted, web-enabled methods and standards for quality, authority, timeliness and accessibility.



GROUNDWATER GEOSCIENCE PROGRAM Logic Model

PAA 2014-15

Departmental Strategic

Outcome 2:

Natural Resource Sectors and
Consumers are
Environmentally Responsible

Program activity 2.3:

**Responsible Natural
Resource Development**

Program 2.3.2

Groundwater Geoscience

2014-2019

*Better management of
groundwater resources*

*More
effective/efficient
regulation & oversight*

*Greater understanding of
aquifer systems by
governments and users*

*Tools are used by
governments and users*

*OUTCOMES
Long term*

*Short
term*

Geoscience knowledge, tools and information

**Groundwater
inventories**

**Methods for assessing
groundwater**

**Methods for data
modelling and
dissemination**

Outputs

Activities



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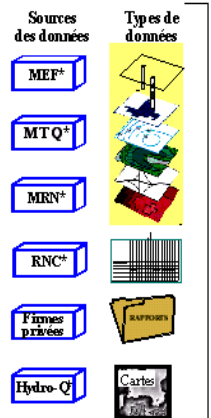
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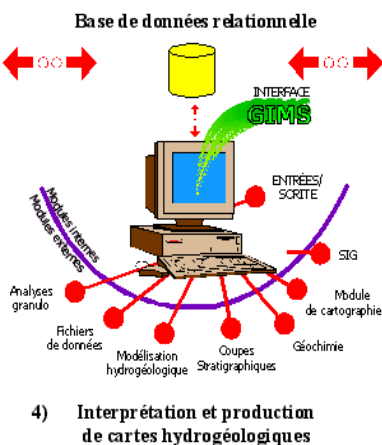
The Research Approaches

Aquifer mapping and assessment

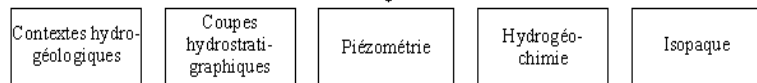
1) Compilation de l'information existante



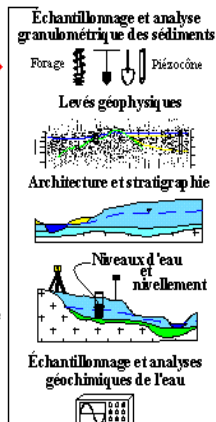
3) Intégration et analyse des données géoscientifiques



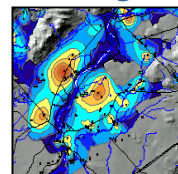
4) Interprétation et production de cartes hydrogéologiques



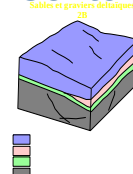
2) Travaux de terrain



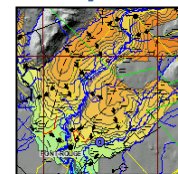
Geological



Context

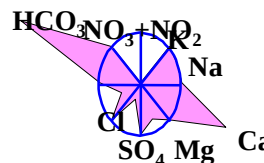


GW quantity

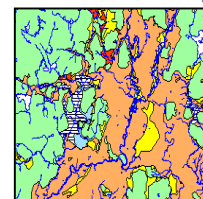


Availability and Suitability

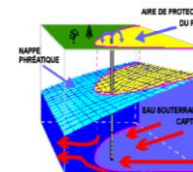
GW Quality Water types



Vulnerability



GW flow model



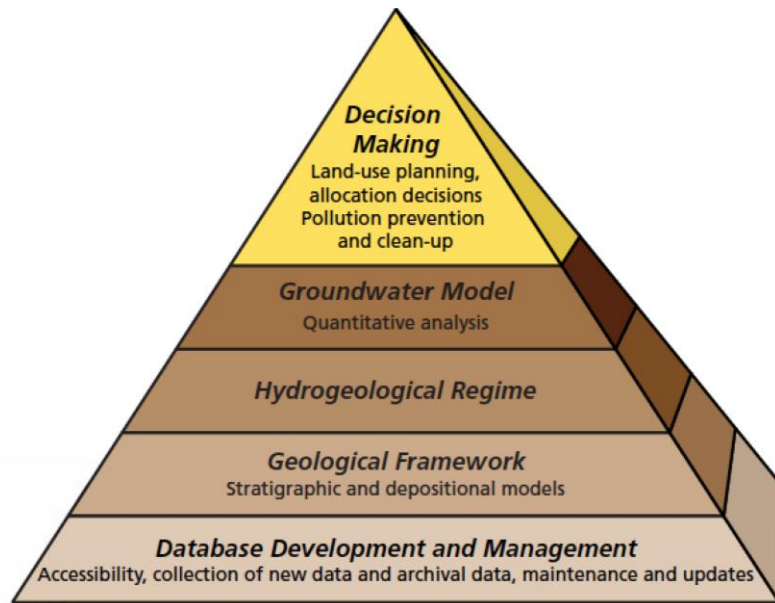
Vulnerability and Sustainability

Michaud et al. (2002)

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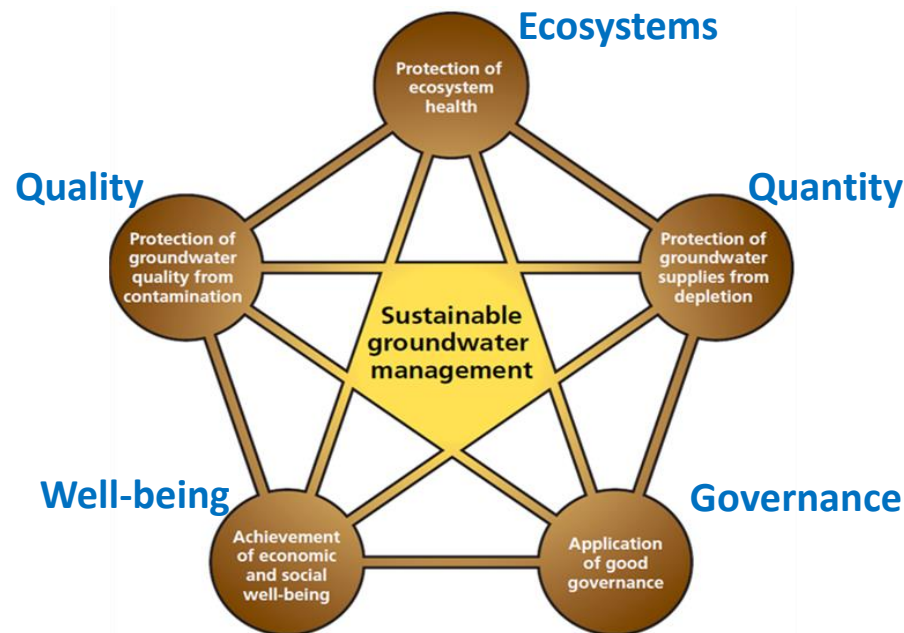
Approach for Groundwater management



(Council of Canadian Academies, 2009)

Figure 4.1
Science requirements for groundwater sustainability.

- Modified from Sharpe et al. 2002.



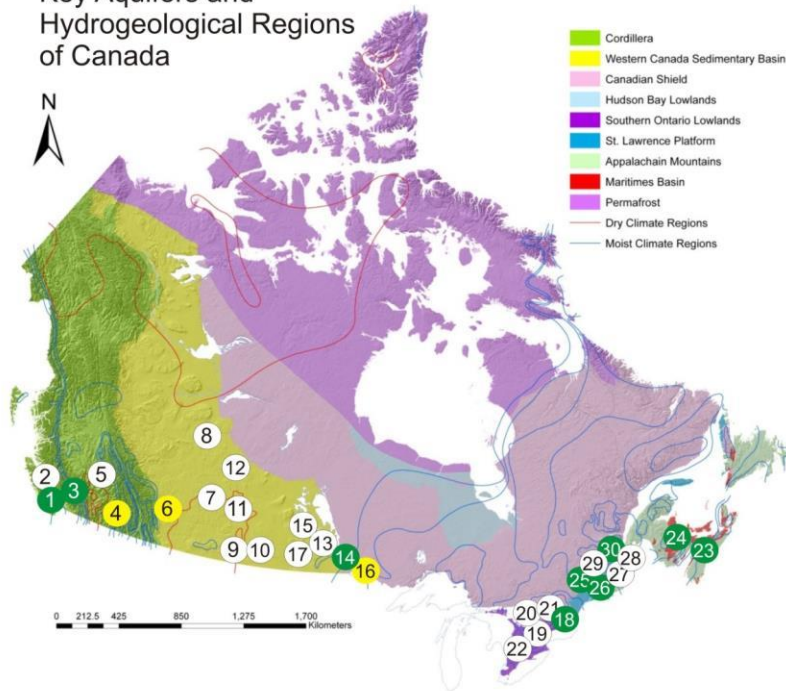
CCA (2009). Sustainable groundwater management in Canada.

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Hydrogeological regions in Canada

Key Aquifers and
Hydrogeological Regions
of Canada



PRIORITY CRITERIA FOR KEY AQUIFERS:

Socio-economic impact

- Important source of freshwater supply for people
- Important source for resource development

Federal, Provincial and Territories

- Trans-boundary aquifers
- Federal lands

Technical-scientific

- Specific geological context
- Represent an aquifer system
- Methods development

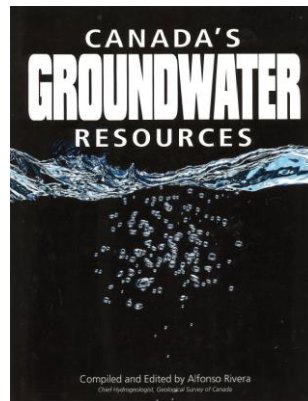
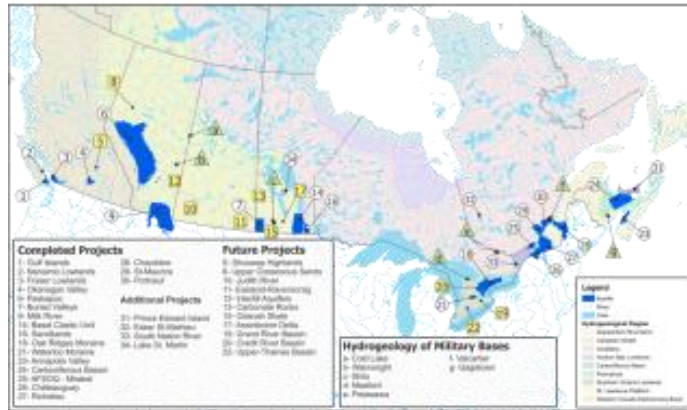
ESS implication

- Follows the Framework for collaboration
- Leverage from partnerships

Groundwater Geoscience Program

- Mapped and assessed **22** of the 30 Key Canadian aquifers
 - in **8** provinces and **6** of the 8 hydrogeological regions
 - covering **9** granular aquifers, **10** fractured aquifers and **3** G/F aquifers in **16** geological contexts
- Groundwater information Network
 - National database infrastructure, data model and web portal for data delivery...at the leading edge of intl. standards
- Generated a long list of innovations, thematic studies and collaborations

Key Canadian aquifer systems mapped by the Groundwater Geoscience Program



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From aquifer assessments to knowledge products for water managers

Phase IV activities (2014-19)

1. Enhance our information delivery to users (**Groundwater information Network**)
 - Develop tools and products more accessible to users
 - Enhance our technological transfer
2. Move to basin wide synthesis (Hydro regions + 3D models) (**NAGA, S-Ont and S-Qué projects**)
 - Southern-Ontario project...potential in QC, BC, AB
 - Move towards water availability and water accounting
3. Continue supporting the provinces on their aquifer mapping program providing overall guidance and thematic based research (Issue-based mapping) (**S-Ontario, BC-MoU**)

