
Hazen A.J. Russell and Andy Bajc

This Senate report made substantial recommendations to government.

Recommendation 1: The Government of Canada should take the necessary steps to ensure that all of Canada’s major aquifers are mapped by 2010. This data should be made available in the national groundwater database and supported by a summary document assessing the risks to groundwater quality and quantity.
Future Aquifer Studies

Completed Projects
1. Gulf Islands
2. Nanaimo Lowlands
3. Fraser Lowlands
4. Okanagan Valley
5. Paskapoo
6. Buried Valleys
7. Milk River
8. Basal Clastic Unit
9. Sandlands
10. Oak Ridges Moraine
11.-Witmer Moraine
12. Annapolis Valley
13. Carboniferous Basin
14. AFSDQ - Mirabel
15. Châteauguay
16. Richelieu

Future Projects
5. Shuswap Highlands
8. Upper Cretaceous Sands
10. Judith River
11. Eastend-Ravenscrag
12. Intertill Aquifers
13. Carbonate Rocks
15. Odanah Shale
17. Assiniboine Delta
19. Grand River Basin
20. Credit River Basin
22. Upper-Thanes Basin

Additional Projects
28. Chaudière
29. St-Maurice
30. Portneuf
31. Prince Edward Island
32. Esker St-Mathieu
33. South Nation River
34. Lake St. Martin

Legend
- Aquifer
- River
- Lake

Hydrogeological Region
- Appalachian Mountains
- Canadian Shield
- Cordillera
- Hudson Bay Lowlands
- Carboniferous Basin
- Permafrost
- Southern Ontario Lowlands
- St. Lawrence Platform
- Western Canada Sedimentary Basin

N = 11
Issues: Southern Ontario

- Drought
- Growth
- Multiple Land Use
- Source Protection
- Sustainable Water Supply
- Great Lakes Water Quality
- Ecological Function
Framing Documents / Agencies

- Interprovincial Geoscience Accord
  - Ontario Geological Survey
- IJC (Great Lakes water quality)
- Ontario / Canada Agreement
  - Contribution of groundwater – surface water
- Clean Water Act
  - Source Water Protection
- Place to Grow Act
Southern Ontario: Hierarchical Study Area Definition

Illustrative Studies
- Key Aquifer
  GW-surface water
- Priority
  water cycle work
  recharge
  closed depressions
  soil moisture (radar)

Regional
- open data access
- model
- 3-D models
- Paleozoic
- Surficial
- special publication
- chemostratigraphy
- support OGS

Conservation Authorities of Ontario

Canada’s Natural Resources – Now and for the Future
Aquifer Studies: Methodologies / Workflows

- Basin Analysis
  - Data collection to understand the geological history of the basin
  - Predictive Framework
  - Requires high quality data

Sharpe et al. 2002
Highlevel Framework

1. Framework for Sustainable Groundwater Use

2. Supporting Great Lakes Water Accord

3. Methods Development for Regional Groundwater Studies

4. Case Studies

5. Science & Technology Exchange
1. Framework for Sustainable Groundwater Use

- How is data managed over the long term?
- Provide baseline data access required to understand groundwater flow, quality, etc.
  - Stratigraphic database etc.
  - Attribute datasets to framework
  - One central portal for data access
- Geological Framework 3D model for southwestern Ontario
  - sediment
  - bedrock.
To Support Regional Modelling

- Need for a Southern Ontario Groundwater data Framework for
  - Storage of data (*distributed, shared*)
  - Classification of data (*interoperability*)
  - Accessibility to data (*searchable*)
  - Delivery of data (*web standards, common portal*)
  - Open software solutions

- Ontario has some examples ([Open Data](#))
  - [Geology Ontario](#)
  - [LIO](#) / (Ontario Geospatial Data Exchange)
  - [Ontario Groundwater](#)

*Groundwater Information Network ([GIN](#)): A model for advancement*
2. Supporting Great Lakes Water Accord

- Water quality (highlight results of Ambient Groundwater project)
- Investigate surface water/groundwater interaction
- Map discharge and base flow to Great Lakes
Surface Water – Groundwater Study

Funding Dependent
Upper Thames Watershed
- Emerging collaboration (Nicks, L.)
- Water quality (non point source)
- Nitrate and Phosphorus

- Thames River watershed is one of the largest watersheds in the Lake Erie basin
- Priority watershed for successful management of phosphorus loads to lake.
- Contributes 30% of the phosphorus coming from Ontario.
- Lake Erie Action Plan
3. Methods Development for Regional Groundwater Studies

- Conceptual model development and testing
- Collaborative work on AEM
- Seismic data in Simcoe and Niagara
- Down-hole geophysics methods
- Chemostratigraphy
- Soil moisture radar studies

4. Case Studies

5. Science & Technology Exchange
Methods Development

- Airborne Electromagnetic
Methods Development

Source: Minvib I

- High resolution 3c seismic reflection
- Borehole geophysics

Source: Microvibe

**Landstreamer:** geophones

Pugin et al. 20##
Methods Development

- pXrf chemostratigraphy
4. Case Studies

- Closed depression recharge?
- Norfolk sand plain subsurface?
- Upper Thames P loading (integrated with OGS phosphorous work)
- Characterization and investigation of Niagara groundwater “anomaly” OGS study
- Newmarket Till Petrophysics

5. Science & Technology Exchange
5. Science & Technology Exchange

- CJES special volume
- Workshops and information transfer
- Field Trips
- Summary of fieldwork articles
- Maps, data releases, groundwater studies
- Co-publication of some releases

4. Case Studies
CJES Special Issue

Special Publication submission: 2016- January.


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Questions
  - hazen.russell@nrcan.gc.ca
Collaboration

- Federal Agencies
- **Provincial Ministries**
  - Ontario Geological Survey
  - Natural Resources (MNR)
  - Environment (MOE)
  - Agriculture (OMFRA)
- Conservation Ontario
  - Conservation Authorities
- Universities
- Ontario Petroleum Library
Summary

- Pan south-western Ontario project
- Framework for sustainable groundwater management
- Interested in advancing methods for regional hydrogeology
- Investigative methods and data framework to support sustainable water use