



Natural Resources
Canada

Ressources naturelles
Canada

National Dialogue on Groundwater (NDGW) - January 18, 2023

Dialogue national sur les eaux souterraines (DNES) - 18 janvier, 2023



Geological Survey of Canada
/ Commission géologique du Canada

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Overview

Part 1

1. Greetings
2. News/updates

Part 2

Presentations:

- “*Using a python microservice to collect provincial data on groundwater levels in order to create a unified national dataset*” by **Simon Gagnon**
- “*Thirty years of groundwater work at the Geological Survey of Canada (1993-2023)*” by **Hazen Russell, Eric Boisvert and David Sharpe**

Part 3

3. Questions
4. Wrap-up, next meeting on **April 19, 2023**, from 1 to 2 p.m. (EST)





Using a python microservice to collect provincial data on groundwater levels in order to create a unified national dataset

Simon Gagnon – GIN development Team

Contact us : gin-ries@nrcan-rncan.gc.ca

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Groundwater levels monitoring

- Anticipate problems that could affect the long-term water supply.
- Increase knowledge on groundwater science for citizens and collaborators.



Provincial and territorial monitoring status

	Ns	On	Ab	Nl	Pe	Nb	Qc	Mb	Sk	Bc	Yt	Nt	Nu
Monitoring network	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Public data access	✓	✓	✓	✓	✓		✓			✓			
All Stations	50	511	1149	10	16	9	252		73	486	24		
Data type	csv	zip/csv	xls/csv	csv	txt		xls			csv			
Monitoring frequency	D	H	H/D	D	D		D		D	H			
Data update	M		D	D	D		D		D				
Find new stations	✓	✓	✓	✓	✓		✓						
Open data license	license		license	license									

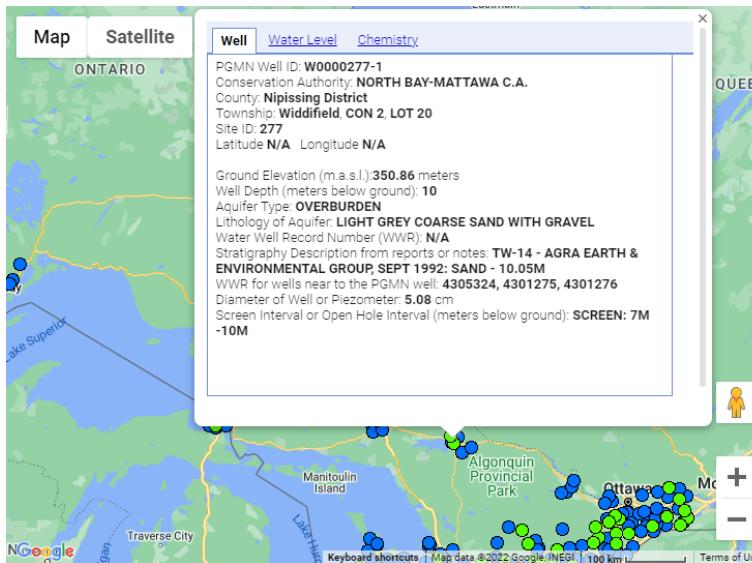
Legend: Monthly : M, Daily : D , Hourly = H



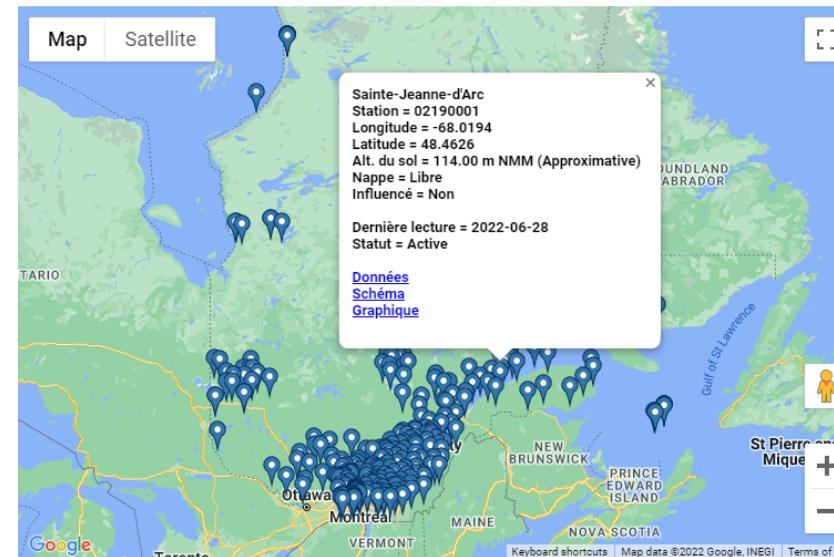
Available services

Most provinces and territories developed an open access for groundwater levels data.

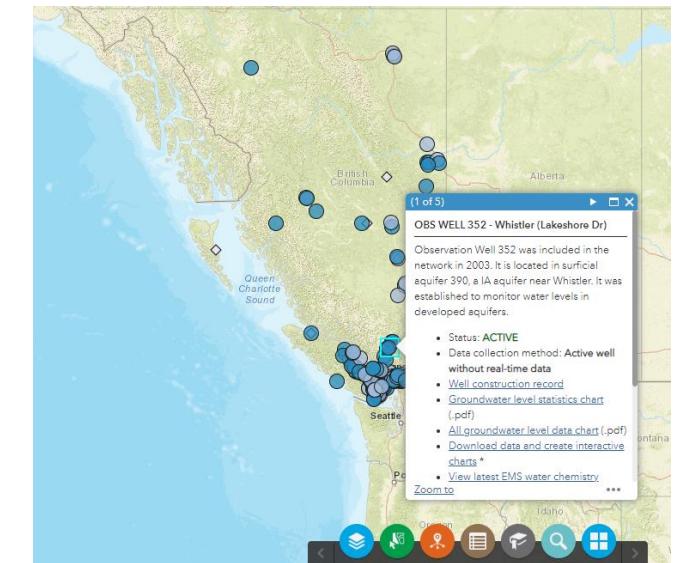
PGMN – Ontario



RSESQ – Quebec



Observation Well Network – BC



Raw data are heterogeneous

format: .txt, .xls, .csv, .zip

Units : a.s.l.m., imperial/metric

Time zones

	Municipalité :	Sainte-Jeanne-d'Arc
	Numéro de la station :	02190001
	Latitude (degrés) :	48.4626
	Longitude (degrés) :	-68.0194
	Altitude du sol (m NMM) :	114.00 (Approximative)
Date du relevé	Altitude du niveau d'eau (m NMM)	Température de l'eau (°C)
2014-10-17	112.66	5.74
2014-10-18	112.72	5.62
2014-10-19	112.69	5.58
2014-10-20	112.73	5.60
2014-10-21	112.70	5.64
2014-10-22	112.71	5.59
2014-10-23	112.69	5.60
2014-10-24	112.68	5.62
2014-10-25	112.67	5.62
2014-10-26	112.68	5.64
2014-10-27	112.68	5.66

```
CASING_ID", "READING_DTTM", "Water_Level_Elevation_meter_above_sea_level", "Confid_Level"
"W0000292-1",2003/3/25 10:00:00,198.03,2
"W0000292-1",2003/3/25 11:00:00,198.03,2
"W0000292-1",2003/3/25 12:00:00,198.03,2
"W0000292-1",2003/3/25 13:00:00,198.04,2
"W0000292-1",2003/3/25 14:00:00,198.04,2
"W0000292-1",2003/3/25 15:00:00,198.05,2
"W0000292-1",2003/3/25 16:00:00,198.05,2
"W0000292-1",2003/3/25 17:00:00,198.07,2
"W0000292-1",2003/3/25 18:00:00,198.07,2
"W0000292-1",2003/3/25 19:00:00,198.08,2
"W0000292-1",2003/3/25 20:00:00,198.09,2
"W0000292-1",2003/3/25 21:00:00,198.08,2
"W0000292-1",2003/3/25 22:00:00,198.08,2
"W0000292-1",2003/3/25 23:00:00,198.10,2
"W0000292-1",2003/3/26 0:00:00,198.10,2
"W0000292-1",2003/3/26 1:00:00,198.10,2
"W0000292-1",2003/3/26 2:00:00,198.11,2
"W0000292-1",2003/3/26 3:00:00,198.12,2
"W0000292-1",2003/3/26 4:00:00,198.12,2
"W0000292-1",2003/3/26 5:00:00,198.12,2
"W0000292-1",2003/3/26 6:00:00,198.13,2
"W0000292-1",2003/3/26 7:00:00,198.14,2
"W0000292-1",2003/3/26 8:00:00,198.14,2
"W0000292-1",2003/3/26 9:00:00,198.15,2
```

```
#Data Set Export - Discharge.Field Visits@5BMC018
GRADEDESCRIPTIONS-3=GAP, -2=UNUSABLE, -1=UNSPECIFIED, 0=UNDEF, 11=POOR, 21=ESTIMATED, 25=BEST PRACTICE, 31=GOOD, 41=VERYGOOD, 51=EXCELLENT, APPROVALDESCRIPTIONS 800=WORKING, 900=IN REVIEW, 1200=APPROVED
Timestamp (UTC-08: Value (m^3/s)
1977-05-23 00:00 0.223
```



Could we unify these data?

YES, But it's a tedious task without automated treatment...

Why ?

Harmonized all data from collaborating provinces and territories to add value and build a global scale dataset

How ?

GIN team is currently working on this issue with a mixture of **web clients** and **web scraper**



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Python Web harvester

Web scraping

From Wikipedia, the free encyclopedia

For broader coverage of this topic, see [Data scraping](#).

Web scraping, **web harvesting**, or **web data extraction** is data scraping used for extracting data from websites.^[1] Web scraping software may directly access the World Wide Web using the Hypertext Transfer Protocol or a web browser. While web scraping can be done manually by a software user, the term typically refers to automated processes implemented using a bot or web crawler. It is a form of copying in which specific data is gathered and copied from the web, typically into a central local database or spreadsheet, for later retrieval or analysis.

What are we collecting?

- Monitoring stations name, geolocation and status
- Water level time series
- Geodesic elevations
- Hyperlink to provincial information

Use common python libraries such as **pandas** and **Psycopg2**



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Harvesting monthly

Logging information's

Is the provincial endpoint accessible?

How many new entries for each station?

Is there any missing station or new stations?

```

1 03/31/2021 07:33:55 DATA HAVERSTING : NEWFOUNDLAND AND LABRADOR -----
2
3 03/31/2021 07:33:55 SEARCHING: Latest observation timestamptz...
4 03/31/2021 07:34:59 DONE: Latest observation timestamptz updated
5 03/31/2021 07:34:59 Getting pairing for nl...
6 03/31/2021 07:35:04 DONE: pairing acquired
7 03/31/2021 07:35:05 PROCESSING Well nl.mon.NF02Y00193
8 03/31/2021 07:35:05 LAST UPDATE: 2021-03-31 10:30:00
9 03/31/2021 07:35:11 SUCCESS : 0 data inserted for well nl.mon.NF02Y00193
10 03/31/2021 07:35:11 PROCESSING Well nl.mon.NF02ZK0029
11 03/31/2021 07:35:11 LAST UPDATE: 2021-03-31 10:30:00
12 03/31/2021 07:35:16 SUCCESS : 0 data inserted for well nl.mon.NF02ZK0029
13 03/31/2021 07:35:16 PROCESSING Well nl.mon.NF02ZK0031
14 03/31/2021 07:35:16 LAST UPDATE: 2021-03-31 10:30:00
15 03/31/2021 07:35:22 SUCCESS : 0 data inserted for well nl.mon.NF02ZK0031
16 03/31/2021 07:35:22 PROCESSING Well nl.mon.NF02ZK0032
17 03/31/2021 07:35:22 LAST UPDATE: 2021-03-31 10:30:00
18 03/31/2021 07:35:27 SUCCESS : 0 data inserted for well nl.mon.NF02ZK0032
19 03/31/2021 07:35:27 PROCESSING Well nl.mon.NF02ZK0028
20 03/31/2021 07:35:27 LAST UPDATE: 2021-03-31 10:30:00
21 03/31/2021 07:35:33 SUCCESS : 0 data inserted for well nl.mon.NF02ZK0028
22 03/31/2021 07:35:33 PROCESSING Well nl.mon.NF02ZK0030
23 03/31/2021 07:35:33 LAST UPDATE: 2021-03-31 10:30:00
24 03/31/2021 07:35:35 SUCCESS : 0 data inserted for well nl.mon.NF02ZK0030
25 03/31/2021 07:35:35 PROCESSING Well nl.mon.NLGWFMW10
26 03/31/2021 07:35:35 LAST UPDATE: 2021-03-31 10:30:00
27 03/31/2021 07:35:41 SUCCESS : 0 data inserted for well nl.mon.NLGWFMW10
28 03/31/2021 07:35:41 PROCESSING Well nl.mon.NLGWFMW12
29 03/31/2021 07:35:41 LAST UPDATE: 2021-03-31 10:30:00
30 03/31/2021 07:35:46 SUCCESS : 0 data inserted for well nl.mon.NLGWFMW12
31 03/31/2021 07:35:46 PROCESSING Well nl.mon.NLGWGA01
32 03/31/2021 07:35:46 LAST UPDATE: 2021-03-31 10:30:00
33 03/31/2021 07:35:52 SUCCESS : 0 data inserted for well nl.mon.NLGWGA01
34 03/31/2021 07:35:52 PROCESSING Well nl.mon.NLGWMW56
35 03/31/2021 07:35:52 LAST UPDATE: 2021-03-31 10:30:00
36 03/31/2021 07:35:57 SUCCESS : 0 data inserted for well nl.mon.NLGWMW56
37 03/31/2021 07:35:57 SEARCHING: Latest observation timestamptz...
38 03/31/2021 07:36:51 DONE: Latest observation timestamptz updated
39 03/31/2021 07:36:51 --- 3.0 minutes ---

```



Database structure

prov	
123	prov_id
ABC	prov_name_fr varchar(30)
ABC	prov_name_en varchar(30)

pairing	
123	pair_id
ABC	local_identifier varchar(120)
ABC	feature_of_interest_id varchar(120)
ABC	frequency text
⌚	last_update timestamp
ABC	info varchar(120)
ABC	geoconnex varchar(250)

feature_of_interest	
ABC	feature_of_interest_id varchar(120)
ABC	feature_of_interest_name varchar(120)
ABC	feature_of_interest_description varchar(200)
Ἑ	geom geometry
ABC	feature_type text
ABC	schema_link text
123	prov int4
123	key_postgis serial
ABC	stratigap varchar
123	has_well int4
123	tz float8

observation	
123	observation_id serial
⌚	time_stamp timestampz
ABC	procedure_id varchar(100)
ABC	feature_of_interest_id varchar(100)
ABC	phenomenon_id varchar(100)
ABC	offering_id varchar(100)
ABC	text_value text
123	numeric_value numeric
Ἑ	spatial_value geometry
ABC	mime_type varchar(100)
ABC	time_est varchar(1)



API SensorThings (Test service)

<https://www.opengeospatial.org/standards/sensorthings>

Monitoring station (/Things)

```
{
  - {
    @iot.selfLink: "http://w-stf-a128913:8090/FROST-Server/v1.1/Things('on.mon.W0000132-1')",
    @iot.id: "on.mon.W0000132-1",
    name: "on.mon.W0000132-1",
    description: "Groundwater monitoring station",
    - properties: {
      @uri: "https://geoconnex.ca/id/MonitoringSite/on.mon.W0000132-1",
      info: null,
      prov: "Ontario",
      local id: "W0000132-1",
      last update: "2012-08-09T15:00:00",
      measure frequency: "daily"
    },
    Locations@iot.navigationLink: "http://w-stf-a128913:8090/FROST-Server/v1.1/Things('on.mon.W0000132-1')/Locations",
    HistoricalLocations@iot.navigationLink: "http://w-stf-a128913:8090/FROST-Server/v1.1/Things('on.mon.W0000132-1')/HistoricalLocations",
    Datastreams@iot.navigationLink: "http://w-stf-a128913:8090/FROST-Server/v1.1/Things('on.mon.W0000132-1')/Datastreams"
  }
},
```

GW level (/Observations)

```
{
  - value: [
    - {
      @iot.selfLink: "http://w-stf-a128913:8090/FROST-Server/v1.1/observations('151288564')",
      @iot.id: "151288564",
      phenomenonTime: "2010-12-30T01:00:00Z",
      resultTime: "2010-12-30T01:00:00Z",
      result: 119.64,
      validTime: "2010-12-30T01:00:00Z/2010-12-30T01:00:00Z",
      Datastream@iot.navigationLink: "http://w-stf-a128913:8090/FROST-Server/v1.1/observations('151288564')/DataStream",
      FeatureOfInterest@iot.navigationLink: "http://w-stf-a128913:8090/FROST-Server/v1.1/observations('151288564')/FeatureOfInterest"
    }
  ]
},
```

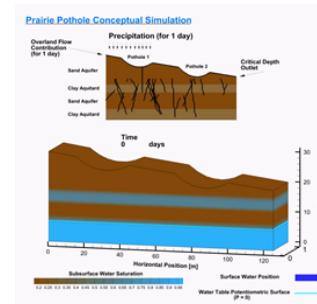
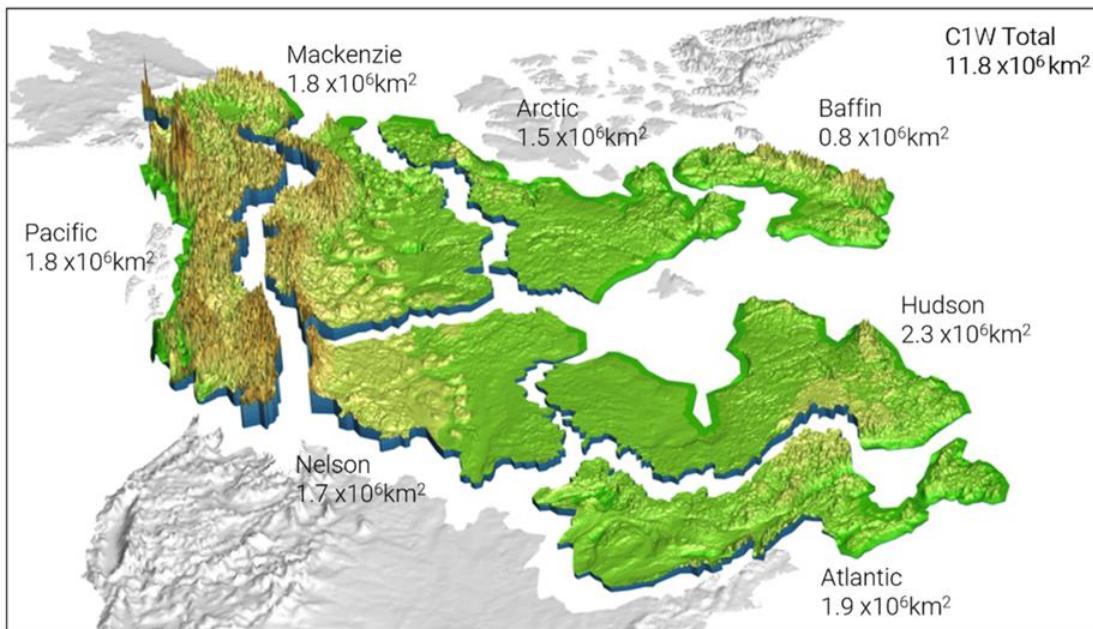


Canada1Water : application



Data needed for calibration and modelling

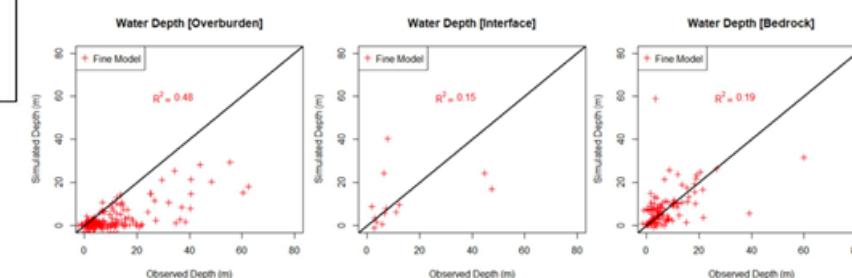
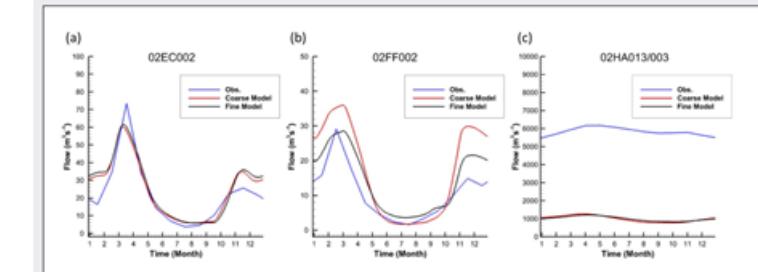
<https://www.canada1water.ca/>



Groundwater – Surface-water modelling

1 to 5 km resolution

Integrated groundwater • Surface water
HydroGeoSphere



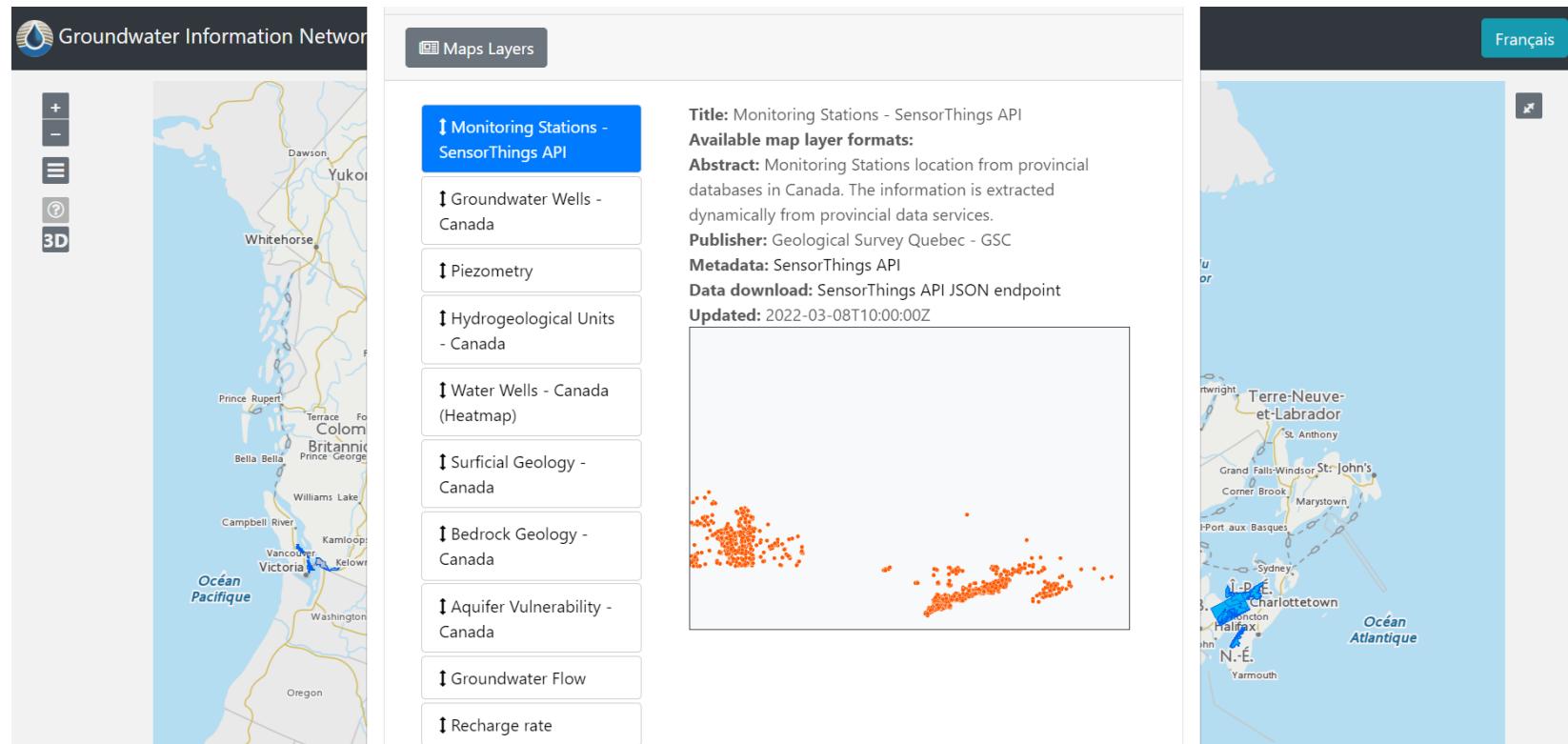
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GIN Web Portal (in development)

Groundwater levels datasets will be accessible on the incoming new GIN portal



Help us complete the table

	Ns	On	Ab	NI	Pe	Nb	Qc	Mb	Sk	Bc	Yt	Nt	Nu
Monitoring network	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Public data access	✓	✓	✓	✓	✓		✓			✓			
All Stations	50	511	1149	10	16	9	252		73	486	24		
Data type	CSV	zip/csv	xls/csv	CSV	txt		xls			CSV			
Monitoring frequency	D	H	H/D	D	D		D		D	H			
Data update	M		D	D	D		D		D				
Find new stations	✓	✓	✓	✓	✓		✓						
Open data license	license		license	license									



Thanks!

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© Sa Majesté le Roi du chef du Canada, représenté par le ministre des Ressources naturelles, 2023



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A review of groundwater geoscience at the GSC 1993 to 2023

Hazen A.J. Russell, Eric Boisvert, and David Sharpe
Geological Survey of Canada





Research Colleagues

- Alpay, S.
- Benoit, N.
- Bolduc, A.
- Boisvert, E.
- Brennand, T.
- Brodaric, B.
- Bunn, M.
- Crow, H.
- Crowley, J.
- Cummings, D.
- Desbarats, A.
- Dietiker, B.
- Dyke, L.
- Fernandez, R.
- Grasby, S.
- Hamblin, T.
- Hinton, M.
- Huang, J.
- Hunter, J.
- Journey, M.
- Knight, K.
- Larmagntan, S.
- Li, J.
- Logan, C.
- Medioli, B.
- Michaud, Y.
- Miroslav, N.
- Paradis, D.
- Paradis, S.
- Parent, M.
- Pullan, S.
- Oldenborger, G
- Pugin, A.
- Rivard, C.
- Rivera, A.
- Savard, M.
- Sharpe, D.
- Smirnoff, V.
- Thorleifson, H.
- Todd, B.
- Wang, S.



Outline

1. Responsibilities
2. Water in the News / Developments
3. Influential Reports
4. Groundwater Committee 1993-2002
5. Groundwater Geoscience Program 2002-
6. Summary



Responsibilities

- **Federal**

- jurisdiction related to fisheries, navigation, federal lands, and international
- responsibilities for agriculture, health and the environment

Environment and Climate Change Canada works closely with other federal departments to develop a more strategic approach to addressing nationally significant freshwater issues.

- **Provincial**

Provinces have direct responsibility for managing groundwater.

Canada Water Act: <https://laws-lois.justice.gc.ca/eng/acts/c-11/index.html>



Natural Resources Canada Roll

- Resources and Technical Surveys Act[1985]

NRCan ... to “make a full and scientific examination and survey of the geological structure and mineralogy of Canada”, ...

- Canada Water Act [1985 Section 5]

Minister of Environment Canada (EC) mandate,
which includes the establishment and maintenance of an inventory of waters of significant national interest, as well as the collection, processing, and provision of data on the quality, quantity, distribution and use of those waters.



Water in the News

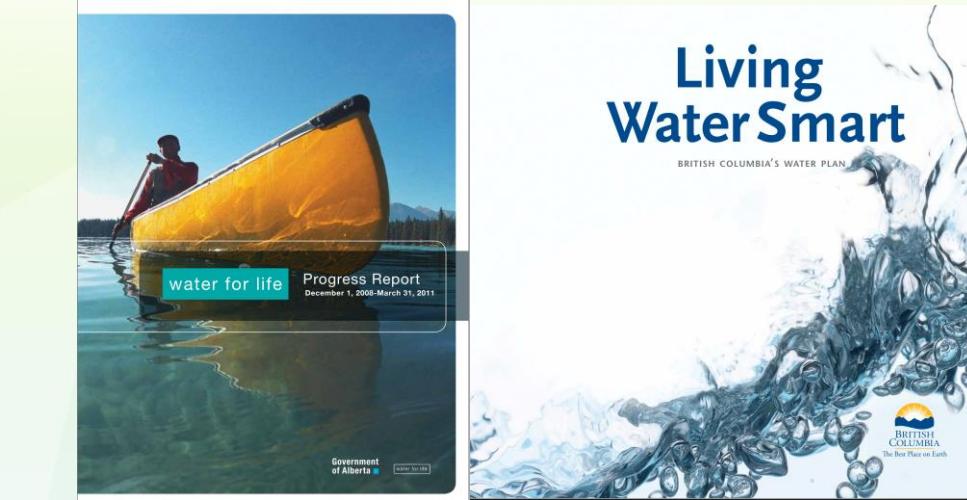
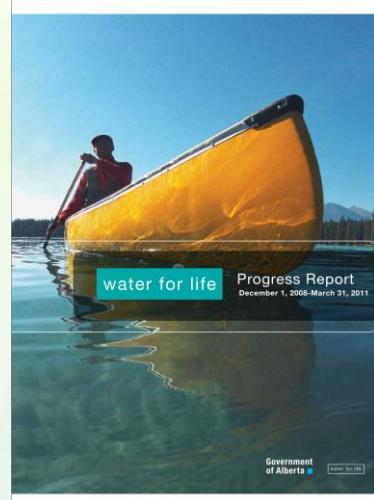
- 2000. ON. Walkerton 7 dead, 100's ill,
- 2009 Prairie Farm Rehabilitation Administration dissolution of 78 year old agency
- 2014. BC. Water Sustainability Act – updates 105 year old act
- 2019. Announcement of Canadian Water Agency





Provincial Developments

- 1995. ON. Common Sense Revolution
- 2002 Québec Water Policy
- 2006. Alberta – Water for Life
- 2006. Ontario's Clean Water Act
- 2008. Quebec – PACES (Projets d'acquisition de connaissances sur les eaux souterraines)
- 2008 BC Living Water Smart
- 2009 NT Water Stewardship Strategy
- 2010 NS Water Strategy



Stratégie québécoise de l'eau 2018-2030





Influential Reports

1995

2001

2009

2012

Canada



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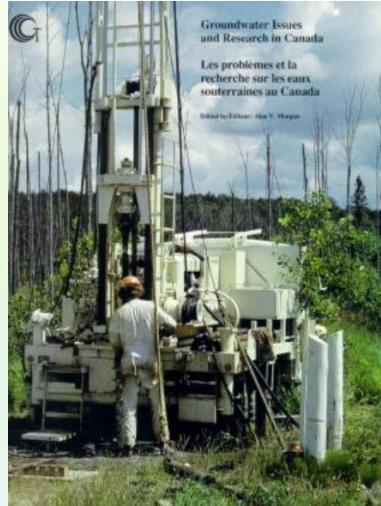


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Canadian Geoscience Council



- 2 goals
- 3 strategies
 - Develop improved management and *a framework of partnerships*
 - implementation of programs for *ground water protection* (goal 1), *inventory* (goal 2), and *management* (goals 1 & 2).
 - Identify *priorities* for federally sponsored research.
- 22 recommendations



Select Recommendations

Establishing an Effective Framework for Ground Water Problem Identification and Research in Canada

1. Establishment of Linkages, Partnerships and External Review ★
2. Establishment of Regional Centres for Ground Water Studies ★
3. Education of Ground Water Professionals ★
4. Ground Water and the Canadian Mining Industry

Access for Canadians to Safe Ground Water

9. National Standards for Ground Water Information Storage and Retrieval ★
10. Aquifer Delineation and Ground Water Resource Characterization ★

Direct Enhancement of the Competitiveness of the Canadian Ground Water Industry

11. A Ground Water Information System for Land Use Planning and Ground Water Protection ★
13. Priorities for Internal and External Federal Research

Federal Priorities for Ground Water Research

15. Ground Water and Agriculture ★
16. Ground Water and the Great Lakes ★
17. Ground Water and Heavier-Than-Water Industrial Liquids

GSC- GGP is involved in responding to 11 of the 22 recommendations to a meaningful degree

1, 3, 4, 9, 10, 11, 15, 16 are (or have been) addressed by the program in a substantive manner



Groundwater Program

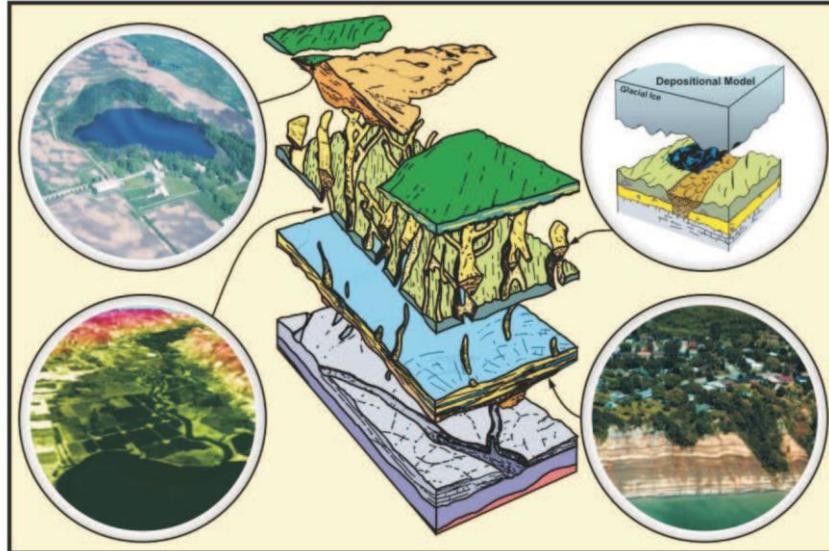
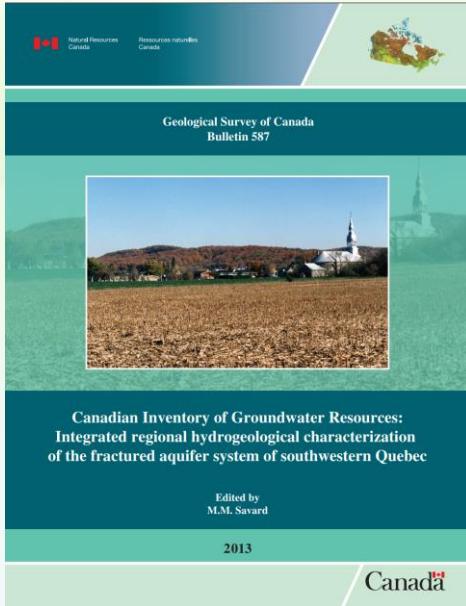
- 1993: ORM and Fraser valley projects start
- 1995: Four Natural Resources Departments MOU on S&T in Sustainable Development
- Groundwater Committee
- 1999 Chief hydrogeologist
- 2000 & 2001 National GW workshops
- 2002 Program established
- 2003 Framework for Collaboration
- 2005 Water in the West Senate Committee
- 2009 Council of Canadian Academies
- 2014 Canada's Groundwater Resources
- 2019 Canada Water Agency





Groundwater Committee (1995 – 2002)

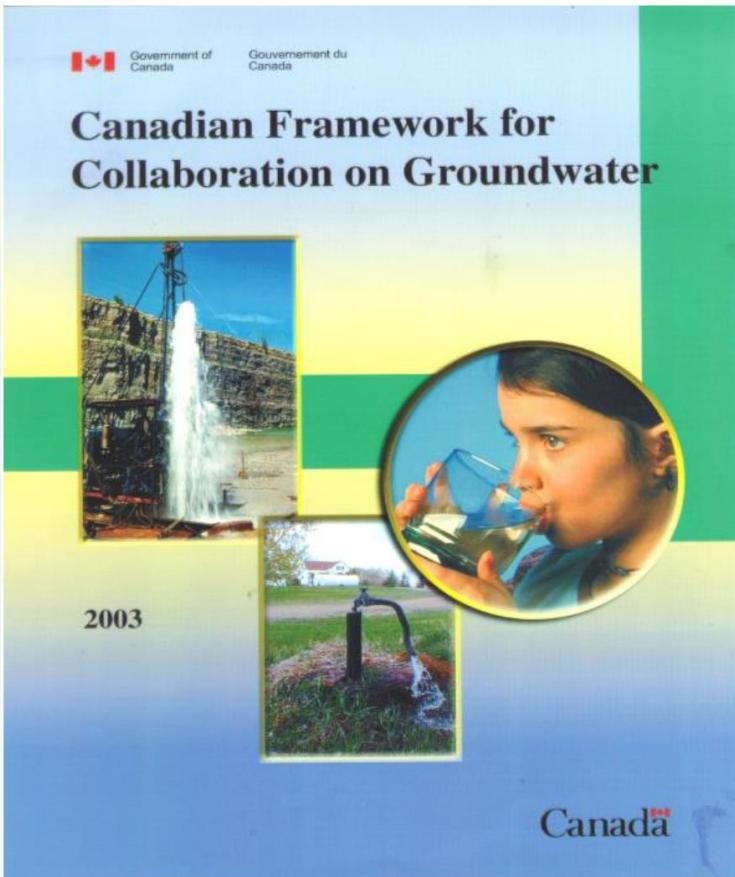
- Projects
 - Fraser
 - Winnipeg
 - St Martins
 - Sandilands
 - Oak Ridges Moraine
 - Mirabel
 - Portneuf



Basin Analysis, three-dimensional geological models, groundwater modelling, ambient hydrochemistry



2003 Framework



2000 and 2001 National workshops

Summary Recommendation

- four main headings
- 14 points
- Most recommendations beyond scope of response of GGP

Significantly

- Undertake an assessment and inventory
- Establish a groundwater monitoring network, network of networks - e.g. GIN
- develop and promote an electronic national GW forum



2002 Program

- Phase I (2002–2006) understanding the quantity and quality of Canada's groundwater resources
- Phase II (2006–2009) provide decision-makers with access to sound scientific advice
- Phase III (2009–2014) provide defensible and useful scientific data ... responsible for managing groundwater resources
- Phase IV (2014–2019)
- Phase V (2019–2024)

Additional information:

Evaluation of the
Groundwater
Geoscience
Program
(2014)
online



2005 Senate

Senate



Sénat

Canada

Water in the West: Under Pressure

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

The Honourable Tommy Banks, Chair
The Honourable Ethel Cochrane, Deputy Chair

November 2005

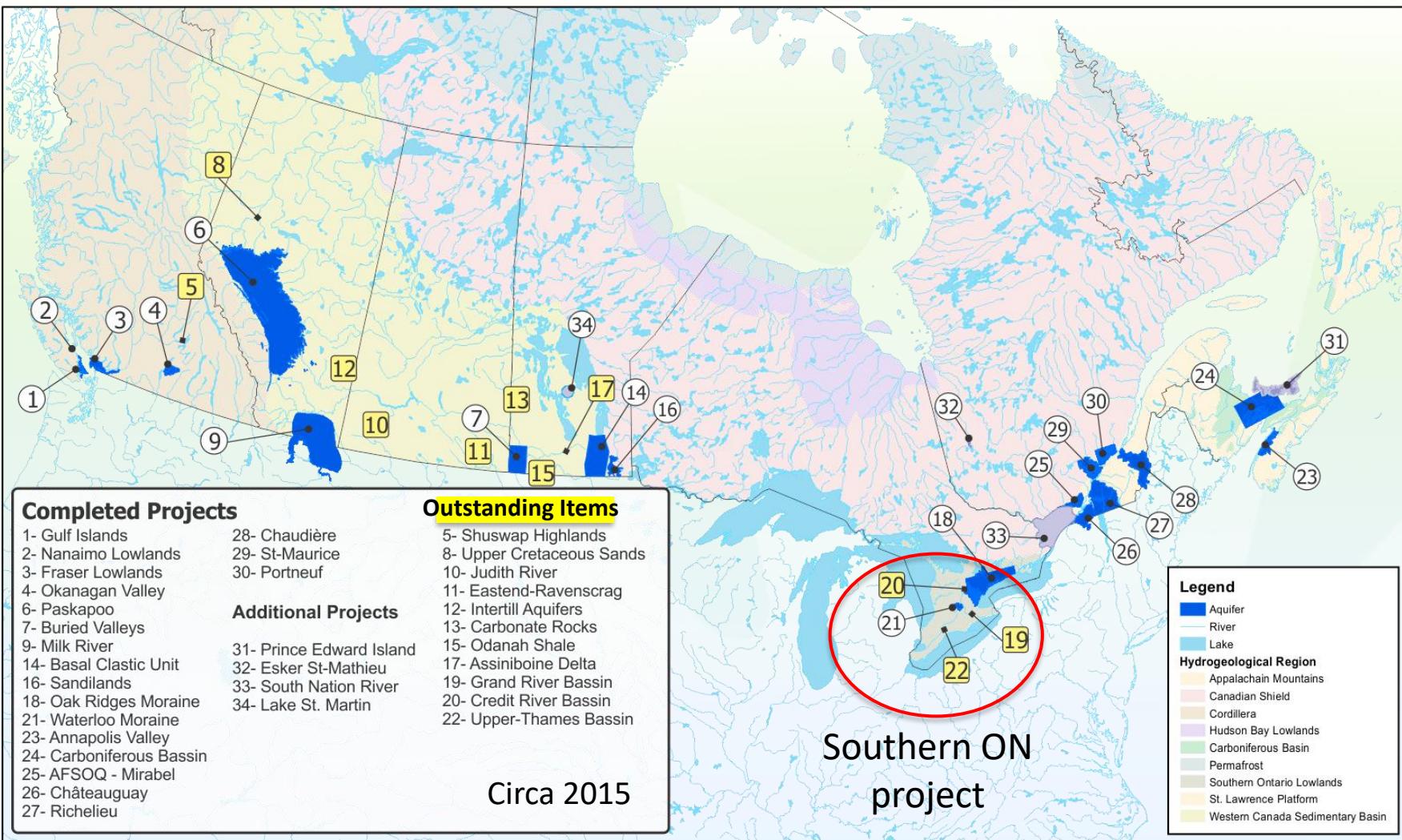
- Water under pressure in the west
- 5 recommendations

The Government of Canada should take the necessary steps to ensure that all of

- Canada's major aquifers are mapped by 2010.
- A national groundwater database
- supported by a summary document ...



Key Aquifers



2005: Key aquifer list

2015: Shift to

- mix of aquifer / watershed
- regional studies

- 22 plus 4 additional completed



Aquifer mapping and assessment: "*the approach*"

1) Aquifer characterization

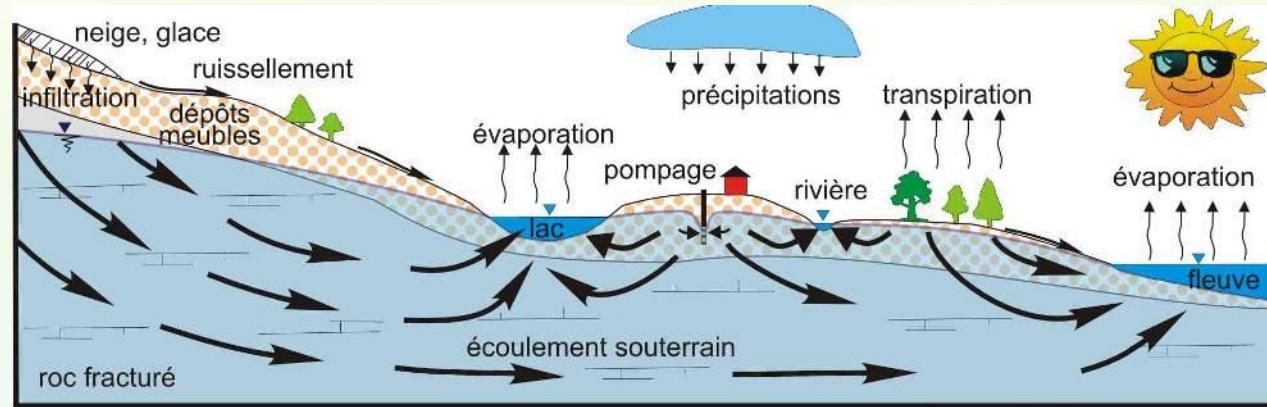
- Delineate aquifer systems
- Geological models
- Define hydrostratigraphic facies
- Test aquifer properties
- Characterize the GW quantity
- Delineate recharge zones
- Characterize Assess GW quality
- Vulnerability (e.g. DRASTIC)

2) GW flow dynamics

- Water budget / GW flow rates and regime / Estimate GW storage

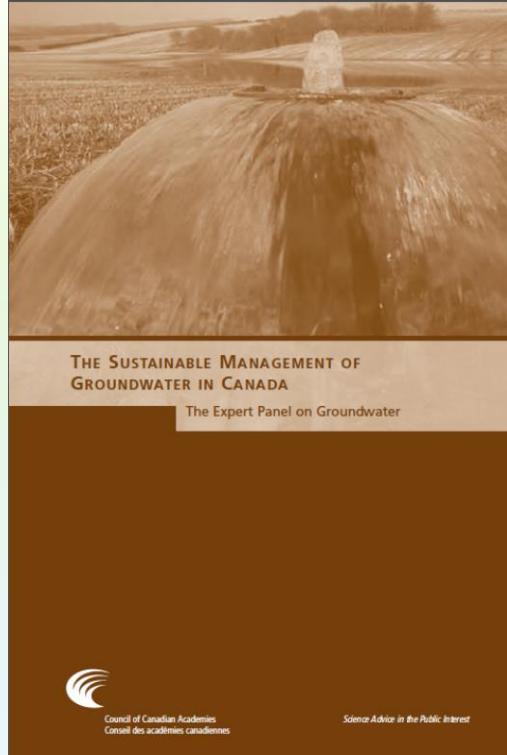
3) Resource assessment

- Hydrodynamic model / Calculate the sustainable yield



From Michaud

2009 Sustainable Groundwater Management



Charge to the Authors: What is needed to achieve sustainable management of Canada's groundwater resources, from a science perspective?

- Response provided by 4 sub-questions and 20 points
 - Framework for analysis
 - Integrated resource management
 - Decision support
 - Communication
 - Open access

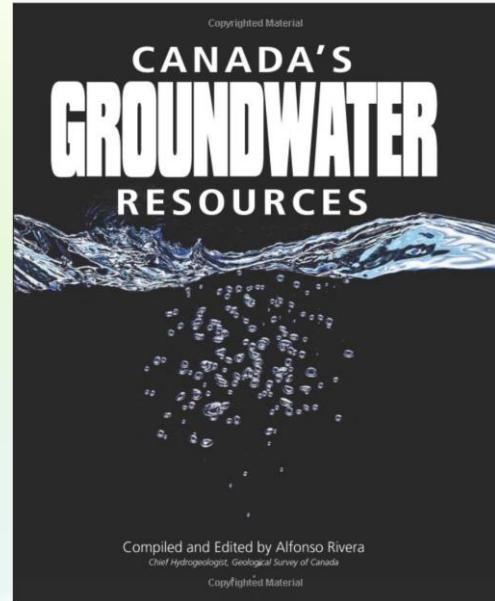
Commissioned by
NRCan

Appendix 3: Major Recommendations of Canadian Reports on Groundwater Resources



1967 – 2014

47 years



A landmark achievement

Response to 2005 Senate report

Next update 2064!!

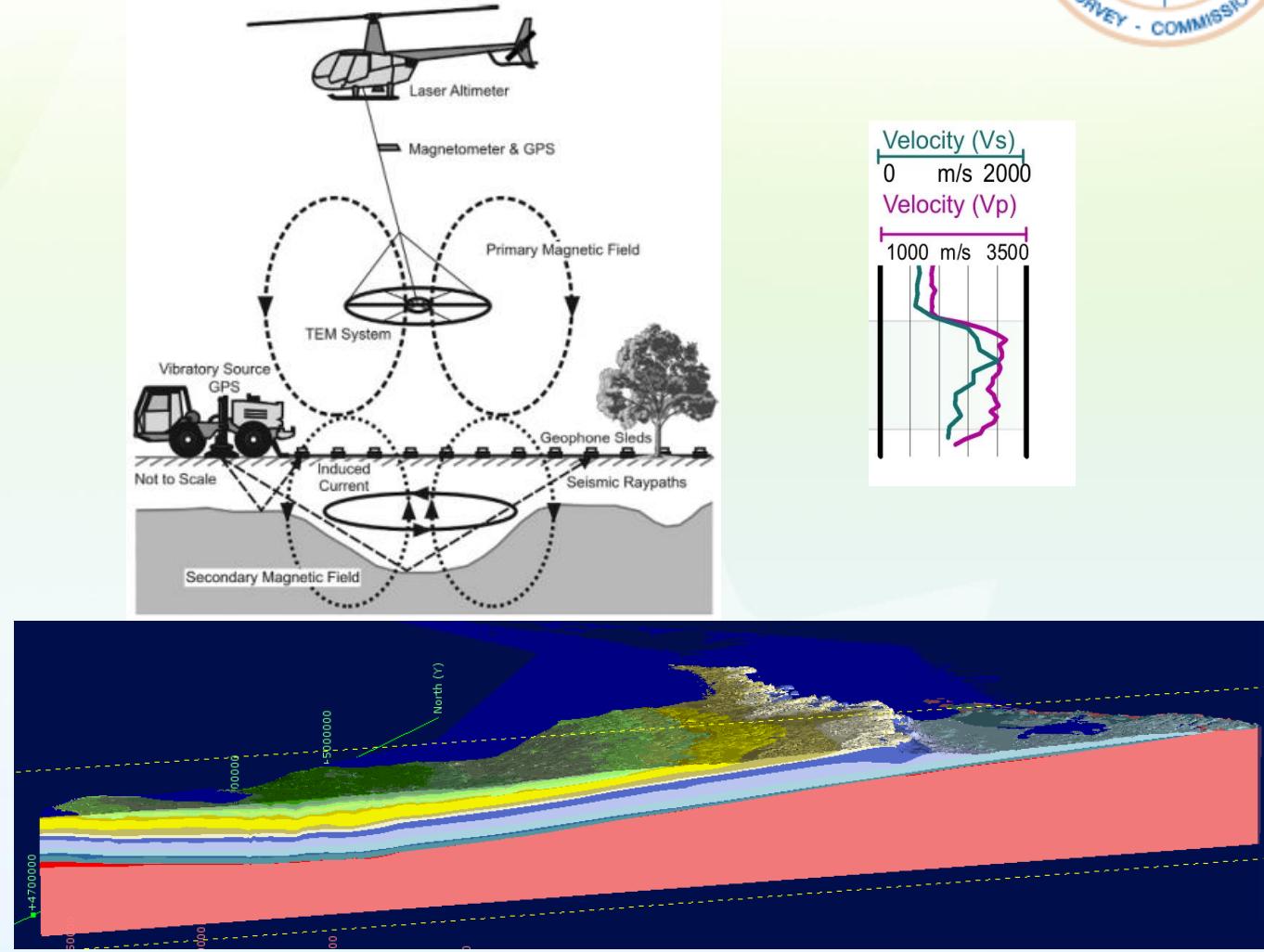
Edited by A. Rivera

Available online (PDF from Geoscan) or hardcopy from the GGP program office



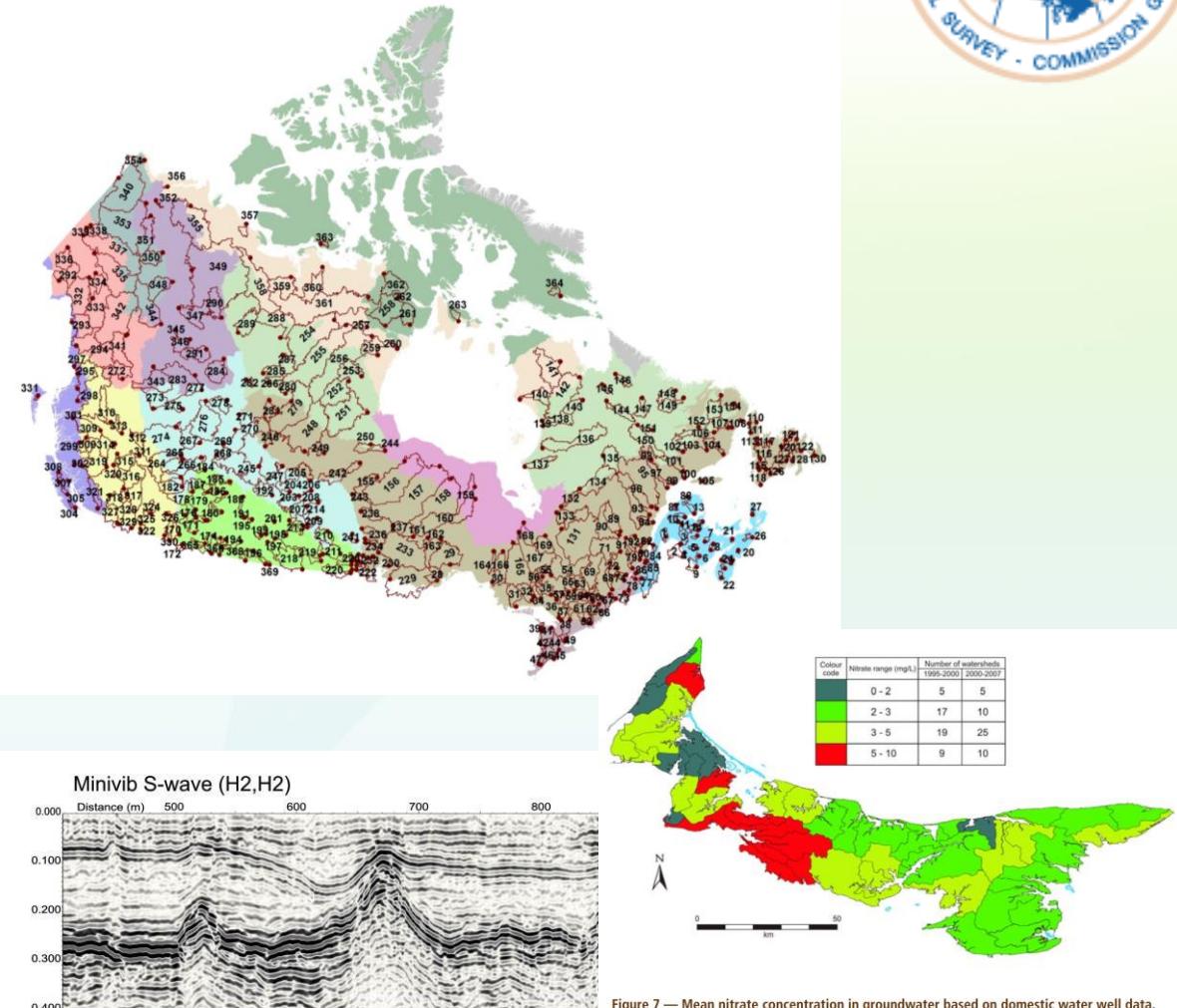
Methods Development

- Seismic Reflection
- Airborne AEM
- Downhole geophysics
- Baseflow measurements
- Geological modelling
- Basin geochemistry
- Analytical methods
- Aquifer assessment
- approach



Science Achievements

- Wang: EO analysis – 360 watersheds closed water balance
- Savard / Paradis: Nitrate PEI
- Paradis: tomography
- Brodaric /Boisvert: GWML v2. adoption WMO.
- Sharpe et al. Basin Analysis
- Pugin / Pullan : Sesmic Reflection



Policy / S&T Transfer Achievements



- Framework on Groundwater
- OMB hearing ORM development
- Source protection
- PACES involvement
- Basin Analysis / Aquifer assessment
- Low streamflow methodology ON

Impact on land use policy and groundwater management



Groundwater Information Network

Motivations



Findings

- 1. Data is hard to find & use**
- 2. Data gaps & poor quality**

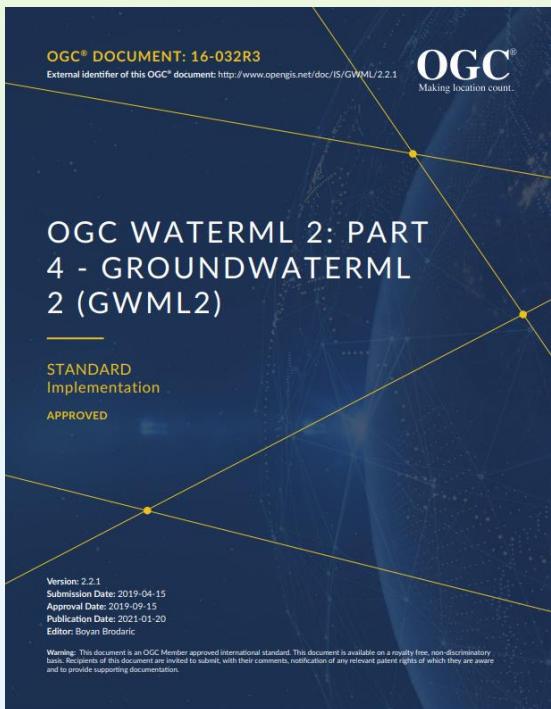
Recommendations

- 1. More online access**
Consolidate data
- 2. More data (use, monitoring)**
Better data quality



GIN Standards

- Adoption and integration of existing standards
- Participation in national – international standard development for groundwater (and geoscience) specific standards



CHy-15 Pre-Session

WORLD METEOROLOGICAL ORGANIZATION

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Standardized Data Sharing in Hydrology

Introduction

At its fourteenth session in 2012, the Commission for Hydrology requested its Advisory Working Group "to commence a process, including testing, that could potentially see WaterML 2.0 become a WMO standard for information exchange managed by WMO" (CHy-14, Res. 3). This request put in motion an effort that precipitated several data and data-sharing activities that need to be addressed at CHy-15. Specifically, the Commission will need to make decisions on three items:

1. [Whether or not to endorse the WMO Hydrological Observing System](#);
2. Whether or not to recommend to the WMO Executive Council that WaterML 2.0:[Part 1](#) and [part 2](#) be adopted as WMO standards for information exchange for use by National Hydrological Services; and
3. Whether or not to support ongoing adoption by WMO of [further WaterML 2.0 standards](#).

WaterML 2: Part 4 – GroundWaterML 2 (GWML2) Data Exchange for Groundwater Features

WORLD METEOROLOGICAL ORGANIZATION

WMO HydroHub

Enhancing water monitoring systems worldwide

Home / News & Events / WMO-OGC Workshop "GroundWaterML2 standard"

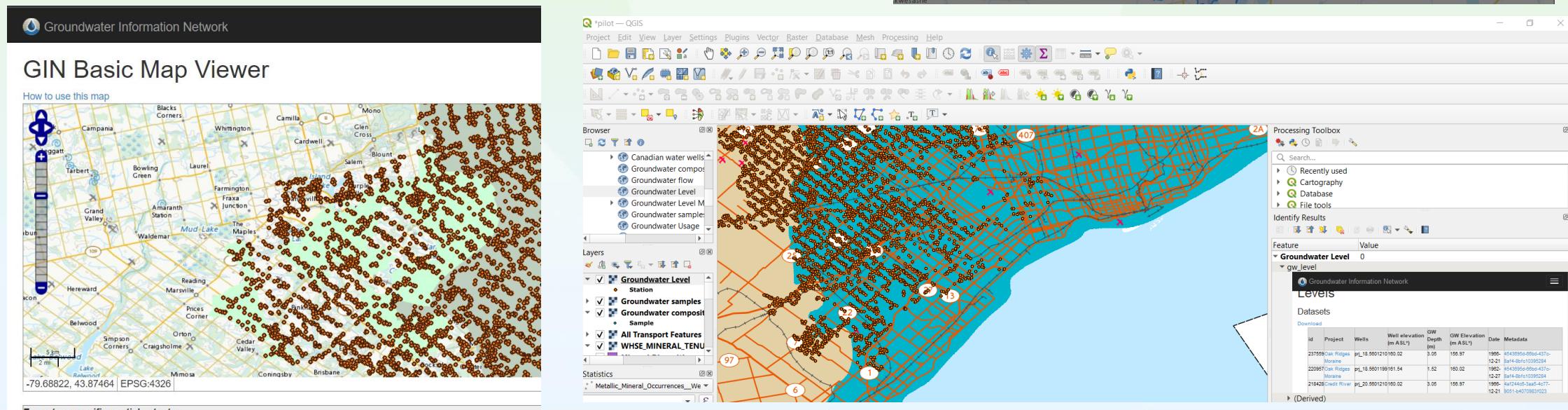
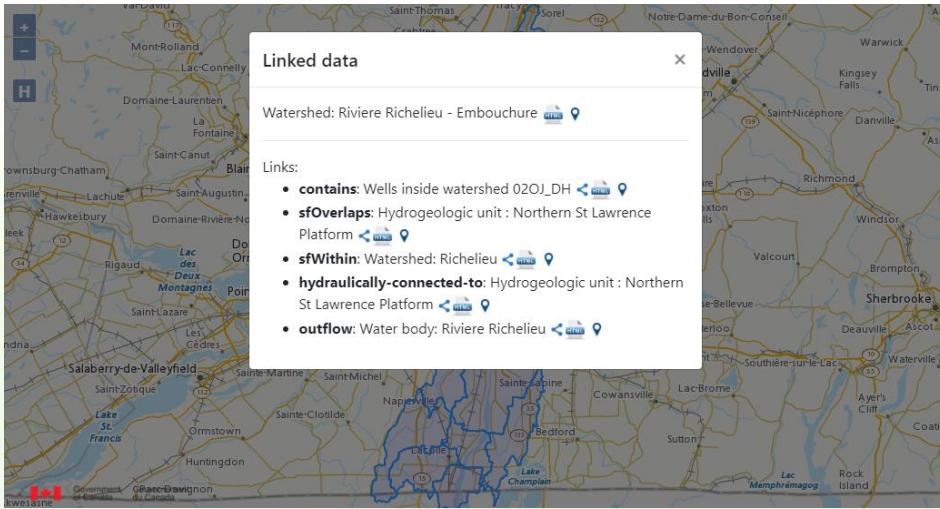
WMO-OGC Workshop "GroundWaterML2 standard"

10 March 2022, 12:00 – 16:00 (UTC), Online

The workshop introduced the GroundWaterML2 (GWML2) standard and demonstrated its recent implementations. Presenters included core developers of the standard as well as developers of related implementations from their respective organizations.

GIN: Infrastructure

- **Infrastructure**
 - Portal
 - Web services
 - Databases
- **Data**
 - Compilation activities (NRCan data, metadata)
 - Data mapping and harmonization



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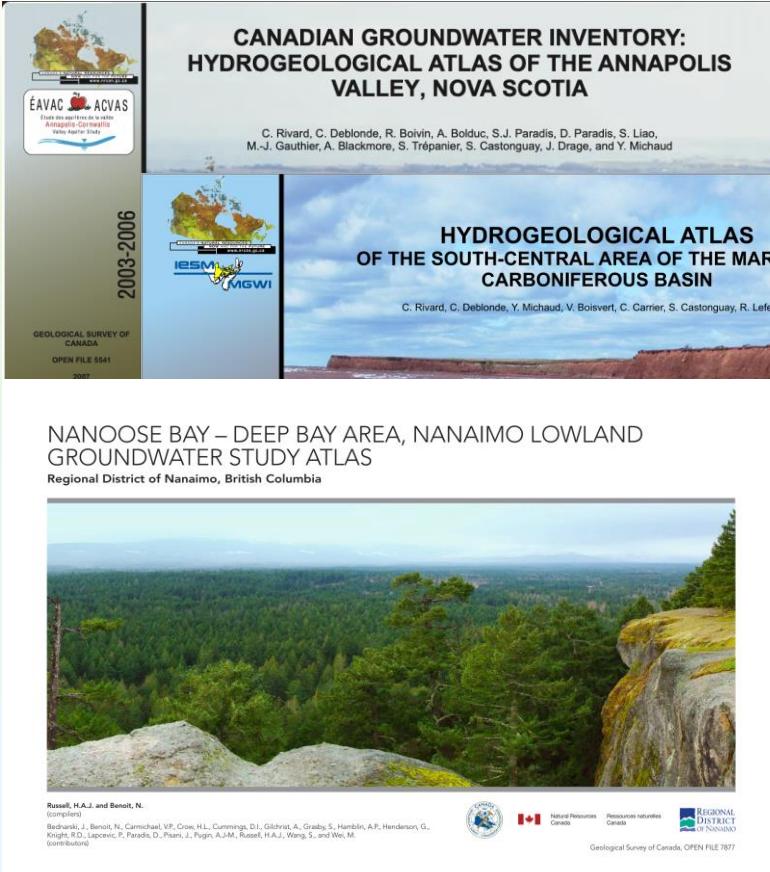
Ressources naturelles
Canada

Canada



Publications

Atlases



Bulletins



Summaries





Summary

- Has responded to priority recommendations
- Adapted to changes in funding and capacity
- Developed and maintained Groundwater Information Network
- Sustained spirit of Framework for Collaboration on Groundwater
- Sustained focused activity for 30 years



Lesson from multiple reports

- Groundwater lacks vocal constituents
- Governments respond to concerns and interests of constituents



Contact Info

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- Geological Survey Publications
 - Geoscan: <https://geoscan.nrcan.gc.ca>
 - GIN: <https://gin.gw-info.net>

**Thank you and see you all at the next meeting:
April 19, 2023 from 1 to 2 p.m. (ET)**

