



**Groundwater Resource Management in Ontario:
Past, Present and Future**

October 29, 2010

Managing Groundwater Resources in Ontario

How does the Ontario government manage the groundwater resources in Ontario?

- Conduct or having the science conducted to understand the groundwater resource
- Creating, implementing, and enforcing Acts, Regulations, and Guidelines

Scientific Studies - Past

Start of the groundwater investigations by the Ontario Government:

1945: First groundwater survey by the Ontario Government

1946: Amendment to the Well Drillers' Act to require drillers to submit water well records (WWR)

1946: Start of Observation Well Program

1947 – '76: 28 Bulletins on Groundwater in Ontario

Federal groundwater resource investigations

1947 – '53: Water Supply Papers on the groundwater resources of townships in Ontario

In the 1960's, Canada had an international reputation as a leader in the field of hydrogeological research.

Scientific Studies - Past

Ontario Water Resource Commission / Start of Ontario Ministry of the Environment / International Hydrological Decade

- 1969 – '82: 21 Drainage Basin Reports in the Water Resources Series
- 1968 – '76: Groundwater Survey Reports to locate water supply aquifers
- 1969 – '86: 14 Groundwater Probability Map Series
- 1970: Ontario Bedrock Well Yield Map
- 1973: Ontario Overburden Well Yield Map
- 1976 – '78: Major Aquifers in Ontario Map Series
- 1981: Flowing Wells in Ontario 1946 - 1976
- 1981 – '86: 25 Susceptibility Maps

Scientific Studies - Past

Environment Canada

- 1970 – '78: Various groundwater reports by Inland Waters Branch, Ottawa
- 1988 – '95: A series of papers on Provincial Groundwater Quality.

Publications from National Water Research Institute (NWRI) and the National Hydrology Research Institute (NHRI)

- 1990: Expression of Interest in the Oak Ridges Moraine.
- 1992: Geology of Ontario
- 1994: Groundwater Resources of the Credit River basin
- 1994: Groundwater conditions in Ontario

Scientific Studies - Past

After 1995 the MOE focused more on managing hydrogeological studies than conducting them.

- 1997: Review of geologic and hydrogeologic studies conducted within the Grand River basin
- 1999 - 2002: Groundwater Resources in Severn Sound, East Holland, Hudson Bay, James Bay, and Upper Ottawa River basins
- 2002: An Assessment of the Groundwater Resources of Northern Ontario
- 2003: The Hydrogeology of Southern Ontario

Scientific Studies - Present

- Provincial Groundwater Monitoring Network (continuing and updating from the past)
- Groundwater Mapping Program conducted by the Ontario Geological Survey
- Site specific studies to support of the MOE District or Technical Support Initiatives
- Studies by consultants to support of applications or requests by the Ministry

Provincial Groundwater Monitoring Network (PGMN)

- Original monitoring network was started in 1946.
- Maintained and reported in Groundwater Bulletins from 1946 to 1981.
- After 1981 routine monitoring of stations were given to the MOE Regions and various levels of monitoring occurred.
- In 2000, MOE's Environmental Monitoring and Reporting Branch (EMRB) revitalized the PGMN and has partnered with 36 conservation authorities and 10 municipalities.

Provincial Groundwater Monitoring Network

The PGMN (groundwater) Program now monitors:

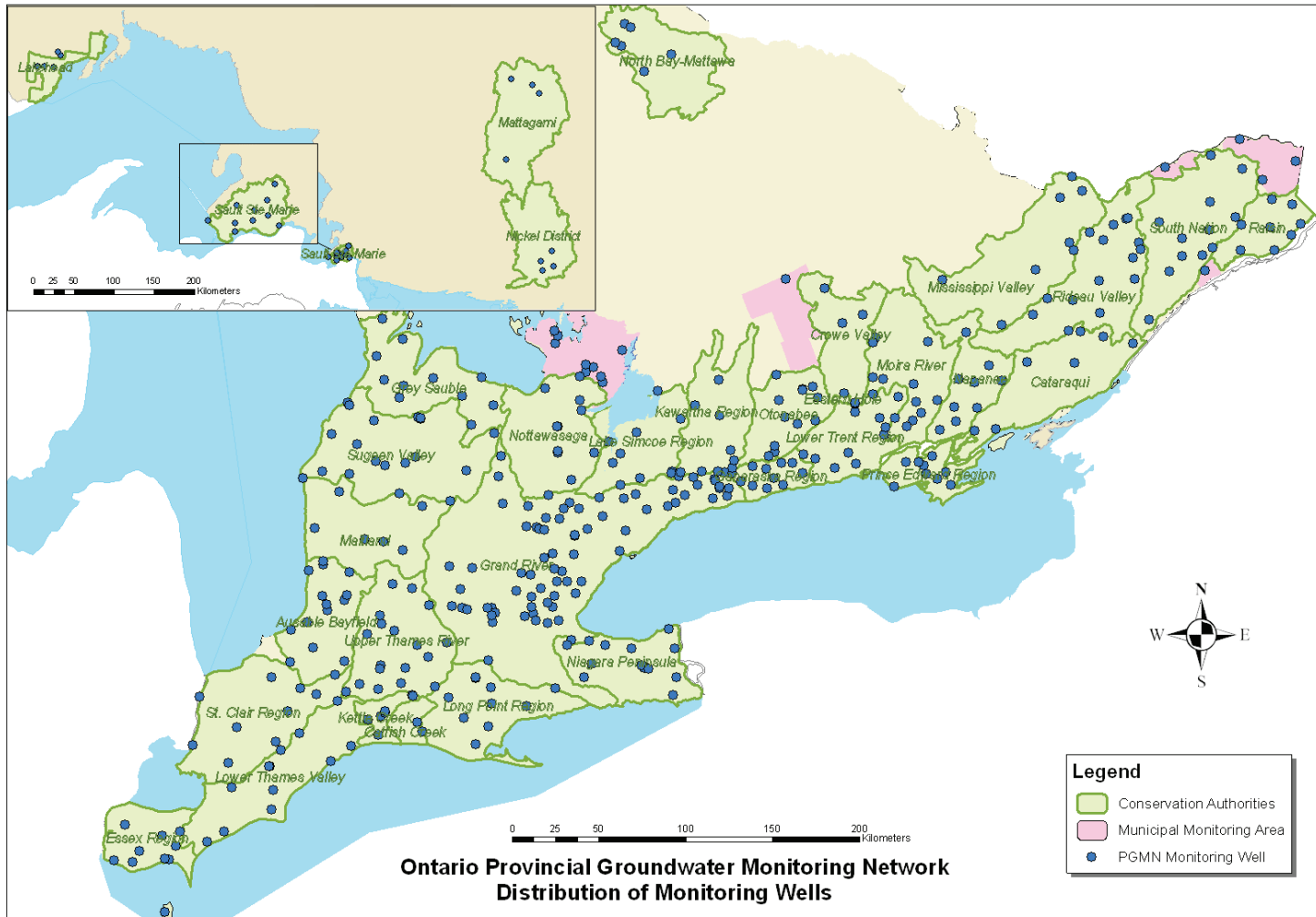
- ambient groundwater levels once per hour at 474 monitoring wells.
- ambient groundwater chemistry once per year at about 360 monitoring wells.
- precipitation at ~ 85 monitoring wells (in progress).
- barometric pressure once per hour at ~ 35 monitoring wells.
- continuous chemistry at 2 monitoring wells in high infiltration areas.

Information gathered through the PGMN is used to:

- support drought response decisions & groundwater management activities.
- identify trends and correlations.

Precipitation is monitored to better understand the relationship between precipitation, groundwater levels and groundwater chemistry.

Distribution of PGMN (Groundwater) Monitoring Wells





Provincial Groundwater Monitoring Network: Reporting & Enhancement

Reporting:

- Since 2005, the MOE has prepared and released 40 Hydrogeological Reports.
- The MOE is targeting to release an additional 9 Hydrogeological Reports this fiscal, including a Climate Change Assessment Report.

Future Enhancement:

- Improving the capability to detect indicators of Climate Change
- Ensuring monitoring coverage in Sensitive Areas
- Integrated / Real-time Monitoring
- Establishing indicator / trigger levels in select PGMN Monitoring wells for use in the Ministry of Natural Resources (MNR) Low Water Response Program

Ontario Geological Survey (OGS): Groundwater Mapping Program

- Development of GIS-based maps / databases
- Regional 3-D aquifer mapping, bedrock and sediments
- Characterization of ambient groundwater chemistry
- Thematic studies
 - buried valleys
 - esker and moraine studies
- Method/protocol development
 - geophysical applications, mapping and geochemical approaches
- Collaborative Studies
 - Conservation Authorities, Municipalities, other Ministries
- Product development
 - visualization tools, google earth (OGS EARTH)

OGS 3D Subsurface Sediment Mapping

Areas covered to date

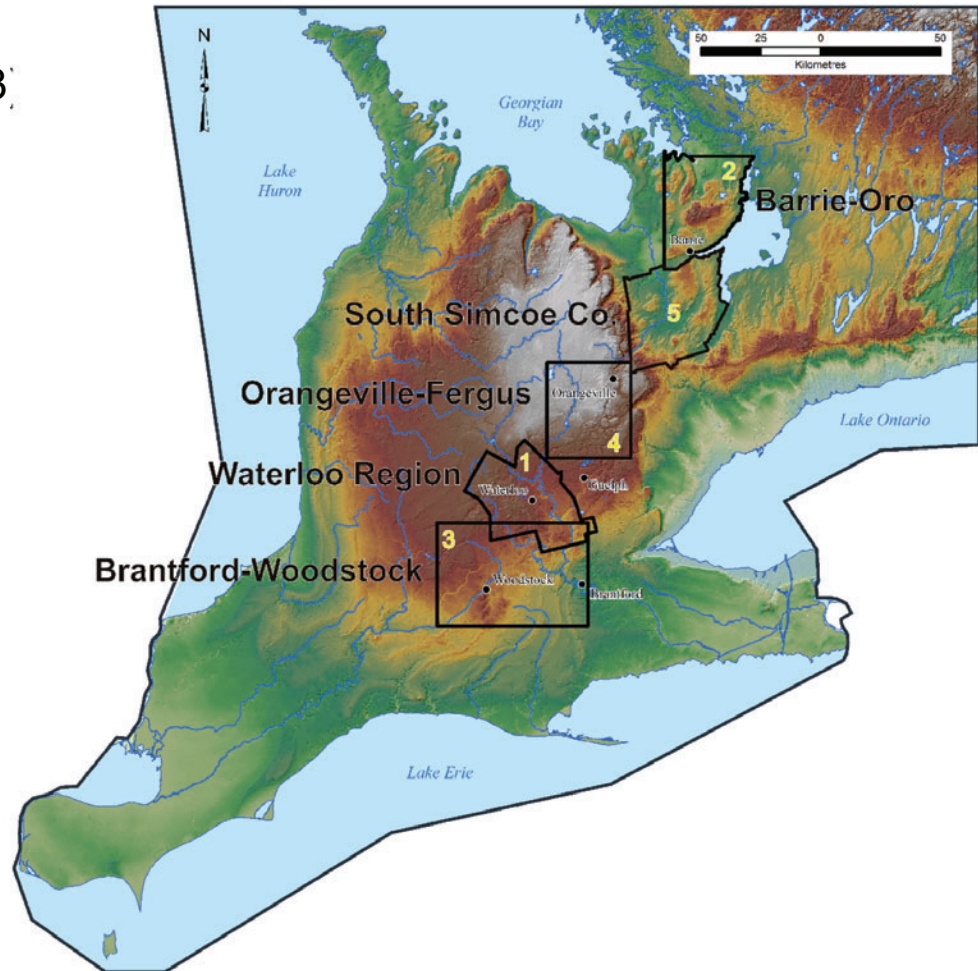
- Waterloo Region (published GRS 3)
- Barrie (report in prep, 2011 release)
- Brantford/Woodstock (model in prep, 2012 release)
- Orangeville/Fergus (2012 release)
- South Simcoe County (2013 release)

Current and Future Work

- Orangeville/Fergus (2012 release)
- South Simcoe County (2013 release)

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Ambient Groundwater Geochemistry Program

Areas covered to date

- Windsor to Milton, and Niagara Falls to Tobermory

Sample Density

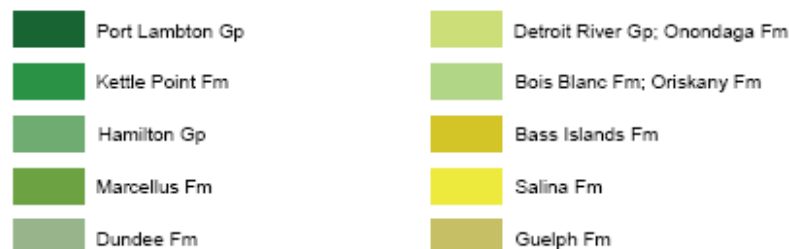
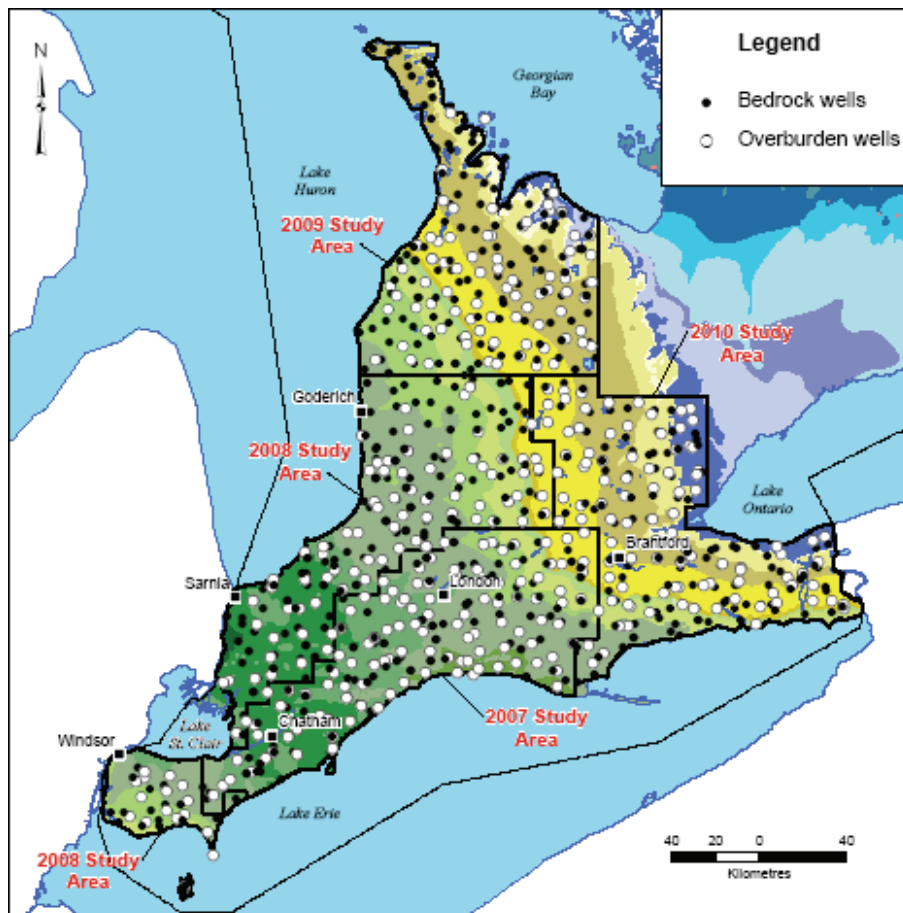
- 1 bedrock and 1 overburden well sampled in each 10x10 km node

Future work

- Study area to extend towards Ottawa in 2011 field season
- All accessible areas of Ontario will be sampled in the next 10 years

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Bedrock Aquifer Mapping

Study Area

- Within the Silurian carbonate strata of the Niagara escarpment from Niagara Falls to Tobermory

Future Work

- Field-tested protocols will be employed to map bedrock aquifers in younger Devonian-age carbonate strata along largely buried Onondaga Escarpment

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OGS Product Use

- Input to Source Water Protection Plans
- Input to Tier 2 & 3 water budget and water quantity risk assessment
- Baseline data for hydrogeologic investigations
- Studies dealing with the impacts of aggregate extraction on surface water and groundwater
- Studies aimed at better understanding sensitive ecosystems (surface-groundwater interaction)

<http://www.mndmf.gov.on.ca/mndm/mines>

Google Earth http://www.mndmf.gov.on.ca/mines/ogs_earth_e.asp

Scientific Studies - Future

The Ontario Geological Survey continues to expand their Groundwater Mapping Program.

The Ontario Ministry of Environment continues to monitor and expand their Provincial Groundwater Monitoring Network.

- Facilitate data sharing (MOE data dissemination)
- Capture information from non-government sources
- Create standards for data management

What Hydrogeological Studies do you think the Ontario Government should be conducting in the future?