



Presentation to Grey County Council

Highly Vulnerable Bedrock Aquifers and Private Water Wells

December 12, 2024

Dr. Hugh Simpson, Senior Research Scientist





Land Acknowledgement

I am visiting from the Grand River watershed - the traditional territory of the Neutral, Anishinaabe, and Haudenosaunee people. That land is also part of the Haldimand Tract of 1784 - lands granted to Six Nations of the Grand River for their use and posterity forever.

Morwick G360 Institute Principal Investigators



Beth Parker
Professor SOE,
Groundwater Flow Systems
& Contaminant Transport



Jana Levison
Associate Professor, SOE
Agriculture & Climate
Impacts to Groundwater



Jonathan Munn
Assistant Professor SOE,
Physical Hydrogeology



Ferdinando Manna
Assistant Professor SOE,
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Emmanuelle Arnaud
Associate Professor SES,
Glacial and Sedimentary
Geology



Erica Pensini
Assistant Professor SOE,
Environmental Engineering, Soil
Remediation



Kari Dunfield
Associate Professor SES,
Environmental
Microbiology



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Associate Professor One Health, PABI
Microbial Water Quality



John Cherry
Adjunct Professor, SOE



Colby Steelman
Adjunct Professor SOE
Environmental Geophysics



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Adjunct Professor SOE,
Environmental Geophysics



Ramon Aravena
Professor Emeritus
Isotope Hydrology
University of Waterloo



Hugh Simpson
Senior Research Scientist,
MG360, Groundwater
& Agriculture



Ryan Prosser
Associate Professor SES,
Ecotoxicology laboratory and
field studies



Bahram Gharabaghi
Professor SOE, Surface Water
Quantity and Quality Modelling



Diana Lewis
Assistant Professor GEG,
Indigenous Health,
Environmental Risk and Impact
Assessment



Sheri Longboat
Associate Professor
Water Security, Management
and Governance
Laurier University

Groundwater Provides Essential Services for Society and Ecosystems

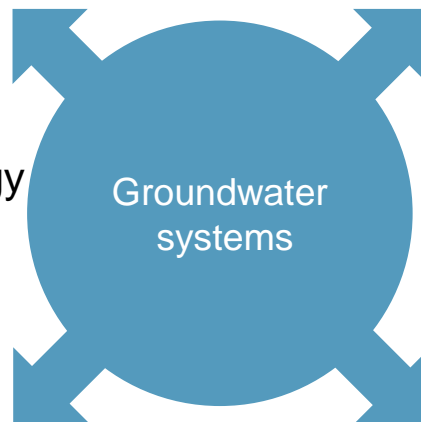


Provisioning Services

- Domestic Water
- Irrigation Water
- Industrial Water
- Geothermal Energy

Regulatory Services

- Buffering wet and dry periods
- Buffering climate change
- Reducing erosion and floods
- Buffering water chemistry and temperature
- Water purification (assimilation of pathogens and contaminants)

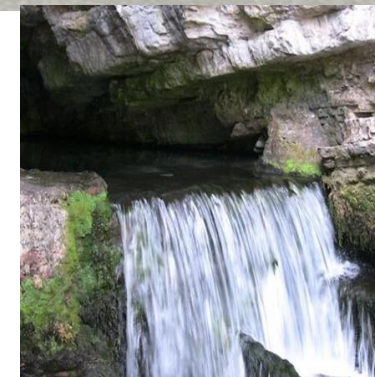


Supporting Services

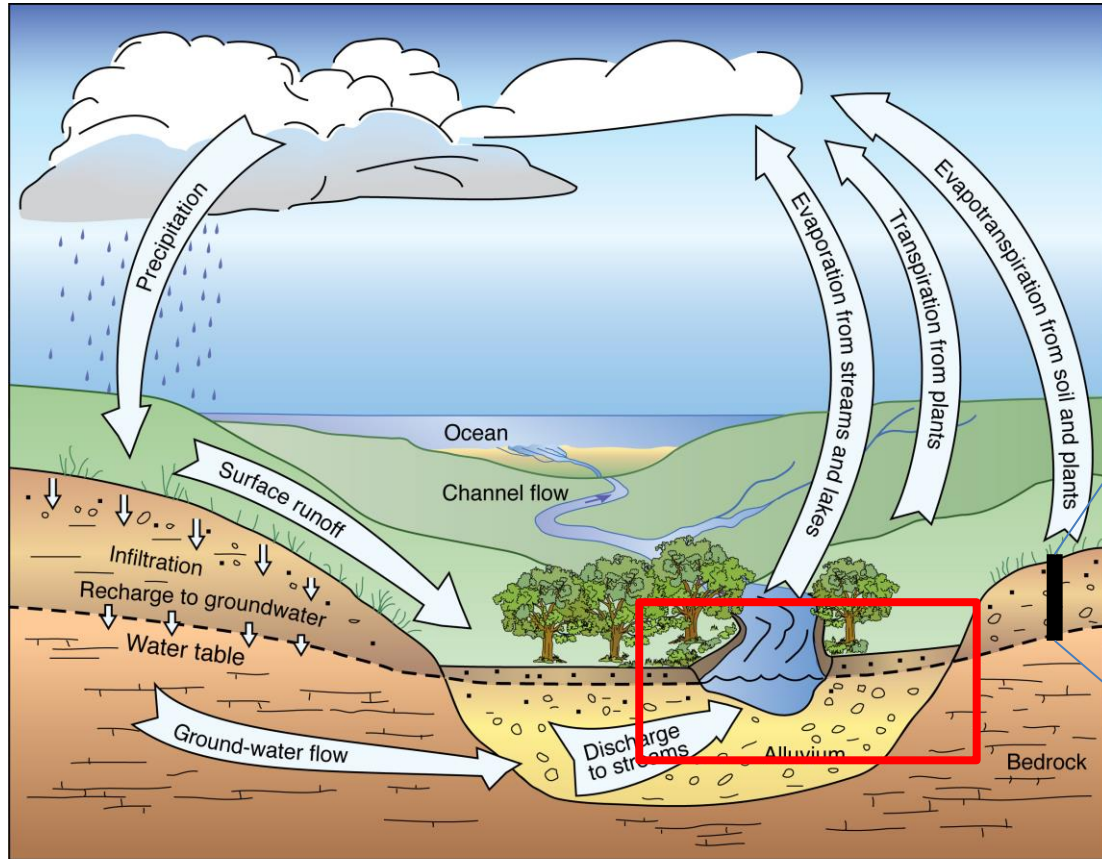
- Springs
- Baseflow of Streams
- Sustaining phreatophytes
- Geothermal energy
- Sustaining wetlands
- Sustaining subsurface microbial communities

Cultural Services

- Mineral water
- Hot springs
- Creating tourist caverns



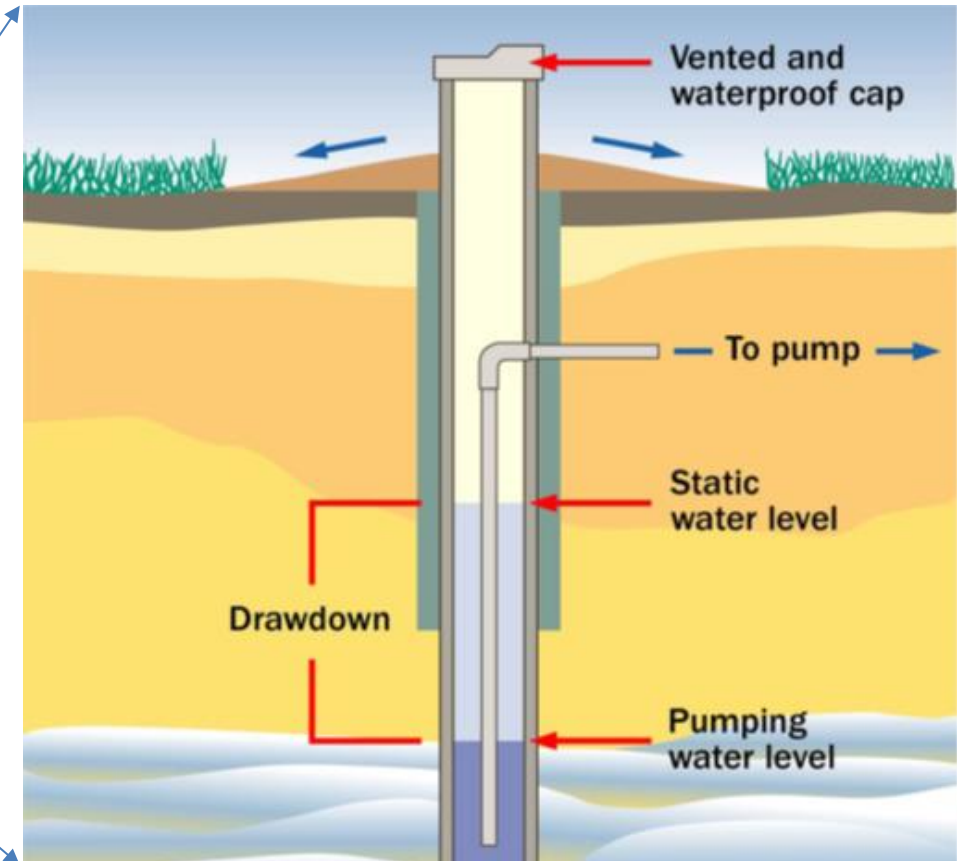
Complexity of the Hydrological Cycle and Private Water Well Function



THE HYDROLOGIC CYCLE

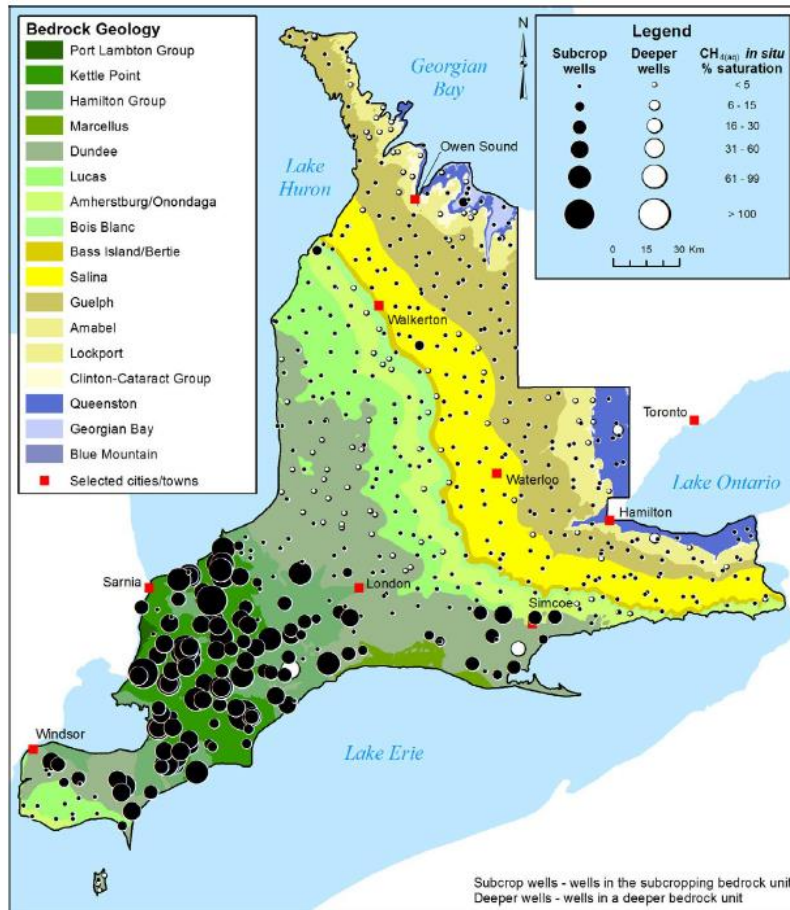
Whittemore and Schoneweis

Typical Drilled Well Construction

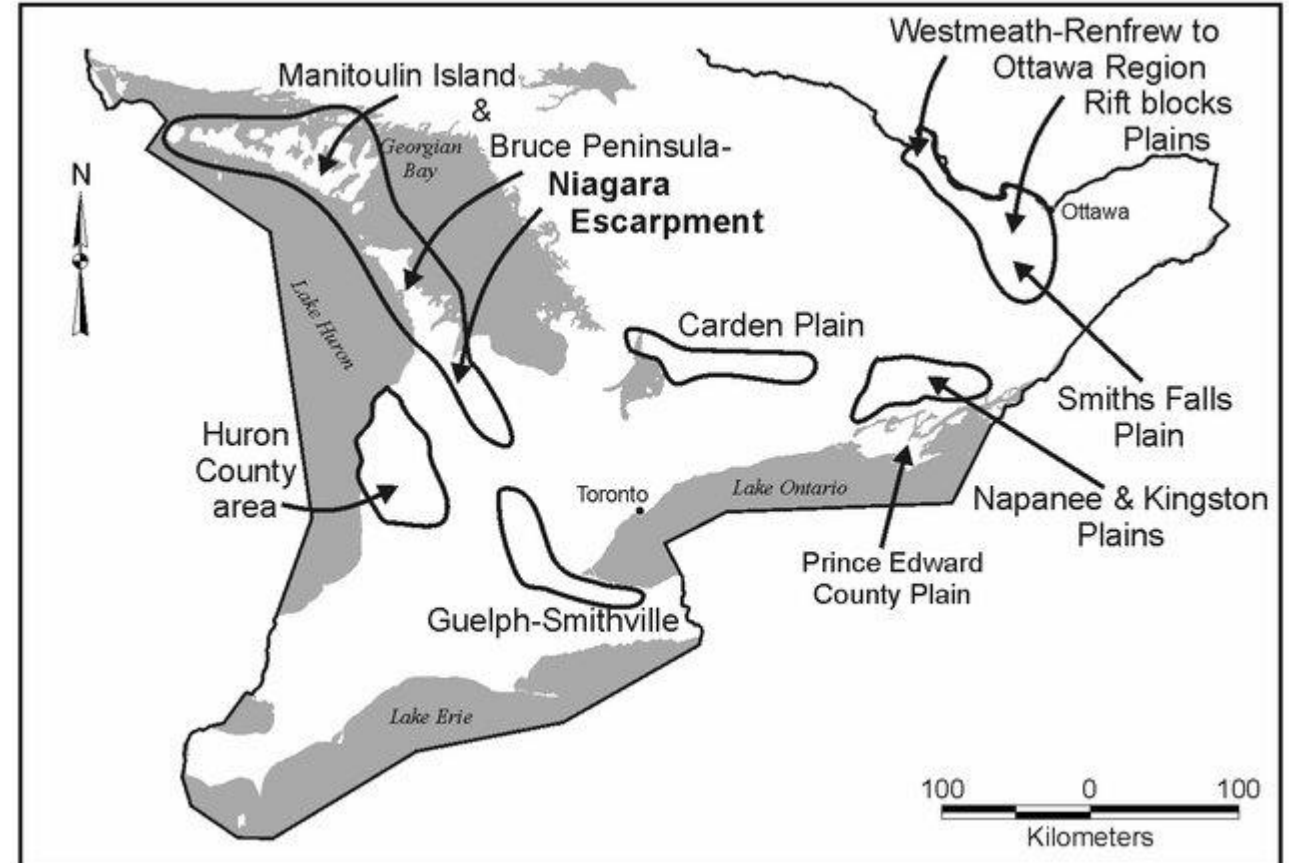


Some Locations of Highly Vulnerable Bedrock Aquifers

Bedrock Underlying Southwest Ontario



Key Karst Regions



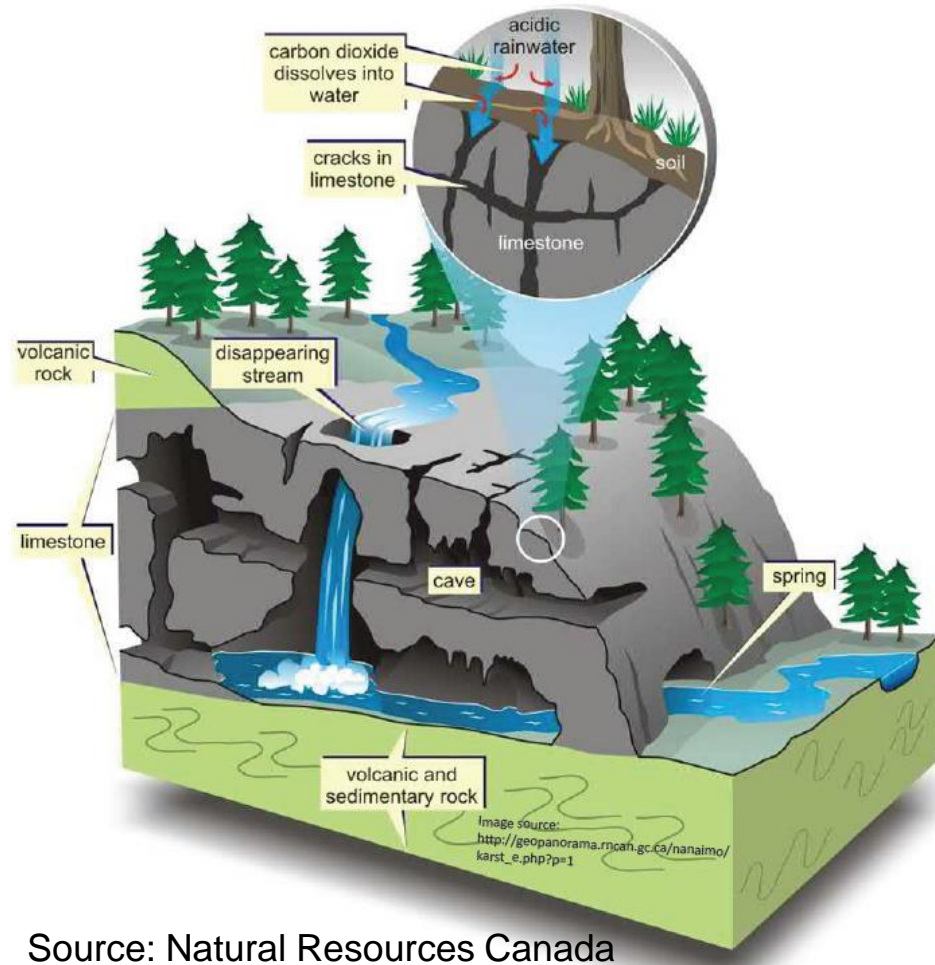
Source: Ryan *et al.*, 2015

Source: Brunton & Dodge, 2008

Complex Groundwater Flow Systems: Benefits and Challenges



Karst Formation and Examples



Source: Natural Resources Canada



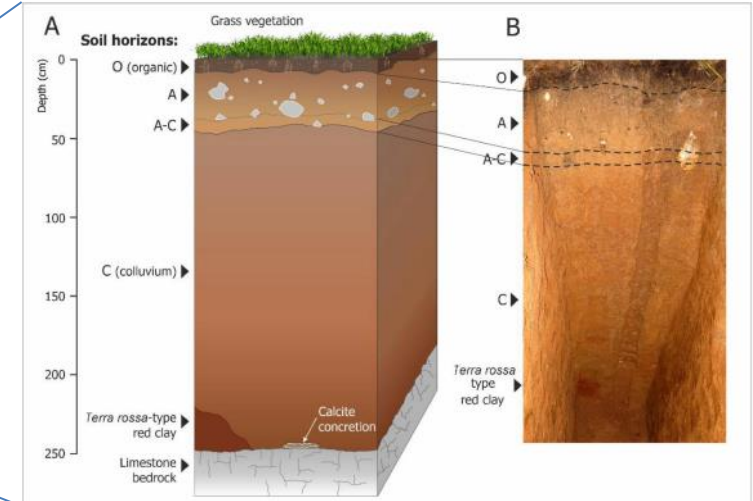
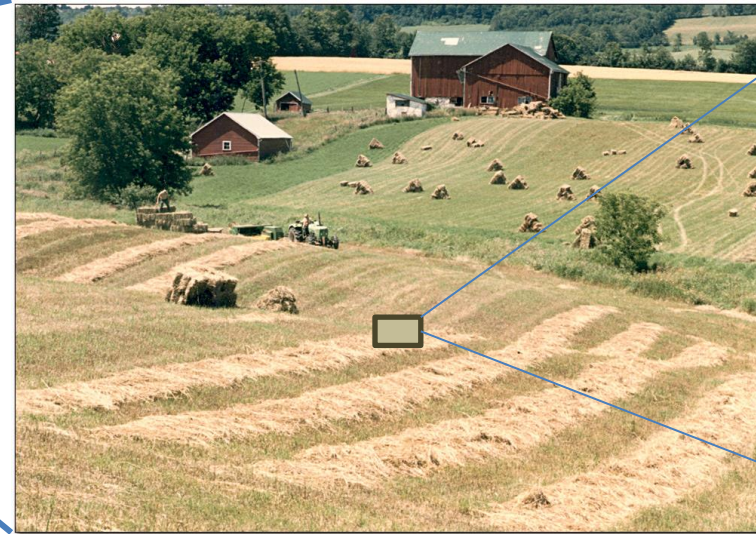
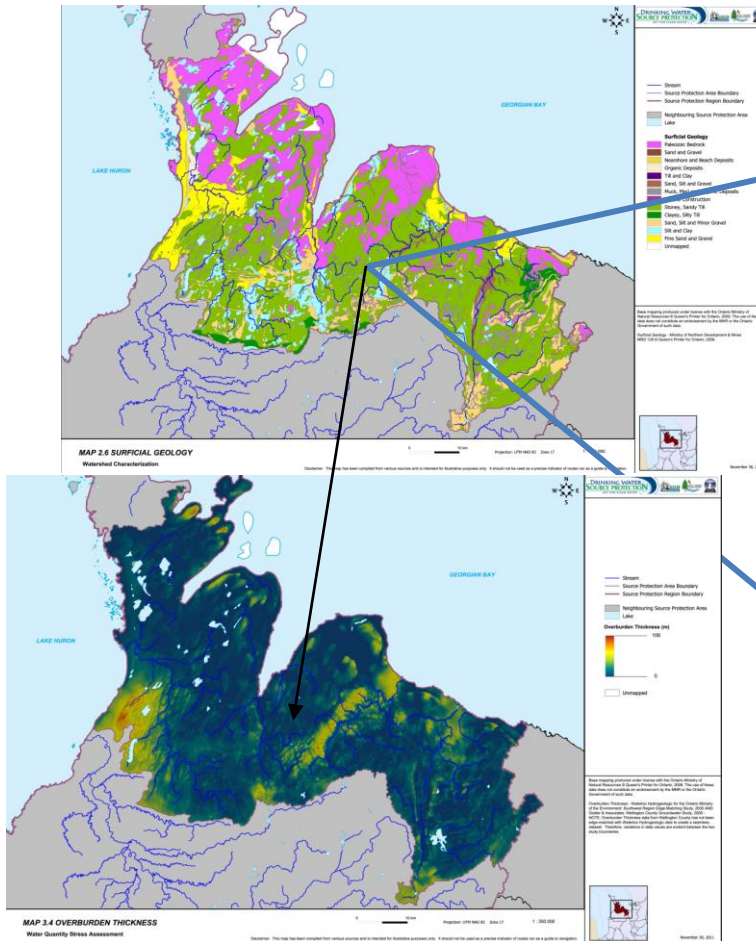
Owen Sound Example

Source: Saugeen, Grey Sauble, Northern Bruce Peninsula Source Protection Region

Tobermory Example



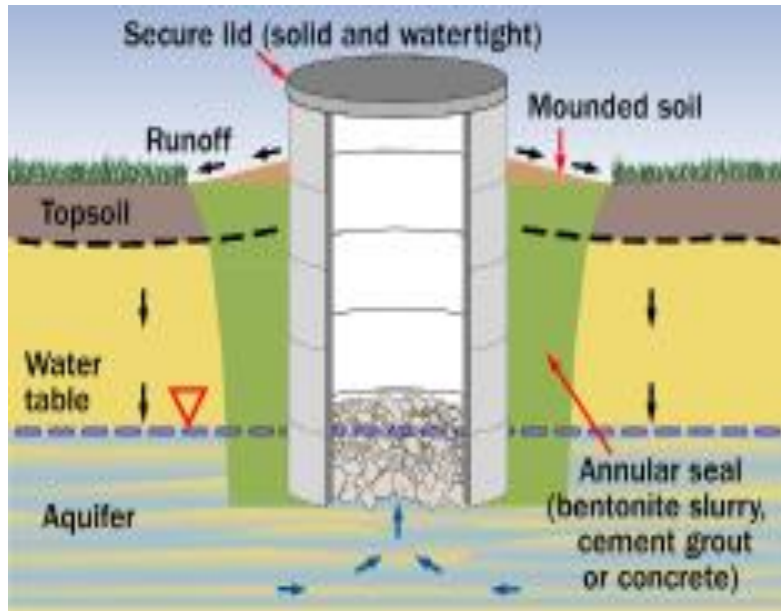
Is your property on a Highly Vulnerable Aquifer?



Existing Private Water Well Best Management Practices

Ongoing Process of Raising Awareness and Education about Private Water Wells Best Management Practices

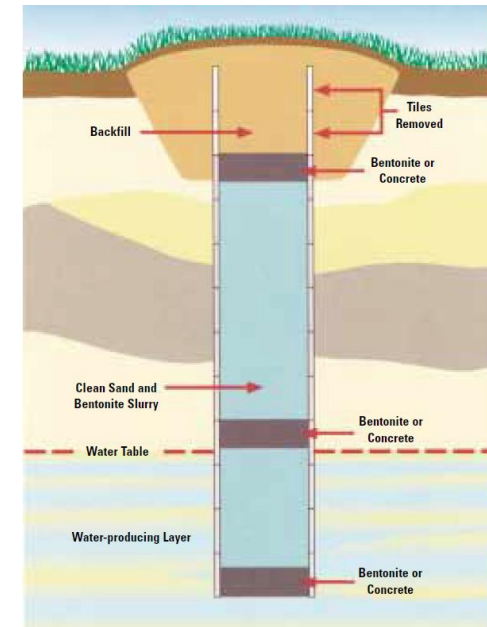
Inspect & Upgrade



Test, Disinfect and Treat

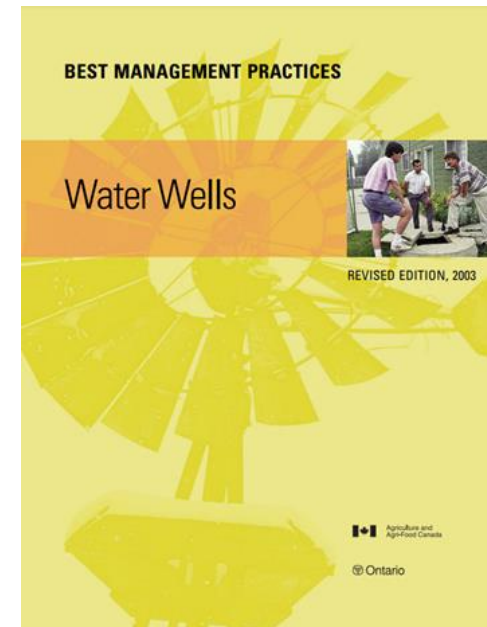


Decommission



Key Resources and Services include:

- Source Protection Region/Committee
 - Delivering programs to raising awareness and education rural community
 - Characterizing and mapping highly vulnerable groundwater resources
- Local Public Health Units
 - Distributing water sample test kits
 - Providing interpretation and advice related to water test results
- Province of Ontario (MECP, MOH, PHO, OMAFA)
 - Providing information on private water well best management practices and regulations
 - Free testing of water samples for indicator bacteria



Research Team

Dr. Sheri Longboat

Associate Professor
Department of Geography & Environmental
Studies
Wilfrid Laurier University



Research includes community-based water planning, management and governance and First Nations engagement and Indigenous knowledge systems

Dr. Jana Levison

Associate Professor
School of Engineering
University of Guelph



Research includes groundwater quality and quantity, and appropriate potable water for marginalized communities

Dr. Heather Murphy

Associate Professor
Department of Pathobiology
University of Guelph



Research includes understanding and addressing water and health challenges with groundwater and private wells

Dr. Hugh Simpson

Project Coordinator and Co-PI
Morwick G360 Groundwater Research
Institute
University of Guelph



Research includes collaboration with community-based organizations to better manage groundwater and private water wells

Research Objectives

1

Use a transdisciplinary community-based approach to better understand needs, incorporate diversity, and promote KTT

2

Understand and identify opportunities to overcome challenges CBOs experience in sharing KTT

3

Identify scientific and knowledge that should be incorporated into water well BMPs

4

Publish updated Water Wells BMP book – compliant, science, diversity

5

Document transdisciplinary research to advance KTT science and update

3-year project – July 2023 to June 2026

Research Contributors & Approach

Community-Based Organization	Technical Knowledge Holder Organization
First Nations <u>Agri</u> group of southern Ontario	Ontario Ministry of Agriculture, Food and Rural Affairs
Ontario First Nations Technical Services Corporation	Ministry of Environment, Conservation and Parks
First Nations Agriculture & Finance Ontario	Public Health Ontario/Queen's University
Ontario Federation of Agriculture	Public Health Ontario
Christian Farmers' Federation of Ontario	Agriculture and Agri-Food Canada
Farm and Food Care Ontario	Association of Local Public Health Agencies (<u>alPHA</u>)
OSCIA	Wellington-Dufferin-Guelph Public Health
Federation of Ontario Cottager's Associations	Simcoe Muskoka District Health Unit
Severn Sound Environmental Association	Ontario Ground Water Association
Rural Ontario Institute	Fleming College, Well Water Technician Program

Partner Organization	
Ontario Ministry of Agriculture, Food and Rural Affairs	The Groundwater Project

Sampling Selection Methodology

- Purposive, or purposeful, sampling involves the research team members identifying research contributors and information sources (Bennett et al., 2020)
- Snowball sampling involves research contributors identifying additional contributors and information sources that should be included in the research (Bennett et al., 2020)
- Purposive and snowball sampling are often combined as complementary methods (Parker et al., 2019)
- Mixed Methods Research Approach is suited for analysis of different types of information generated by complex research approaches such as TCBR (Leavy, 2011)

Thank you



MORWICK

G360

GROUNDWATER RESEARCH INSTITUTE



Current Research: Advancing the Science of Knowledge Translation and Transfer using a Community-Engagement Approach: Co-Developing Private Water Well Best Management Practice Awareness and Education Materials



Senior Research Scientist, Morwick G360 Groundwater Research Institute

Career:

- 2022 to present – Researcher, University of Guelph
- 2000 to 2022 – Program Analyst/Groundwater Specialist (OMAFRA)
- 1992 to 2000 – Hydrogeologist (Region of Waterloo)

Education:

- Doctorate, Geography (Waterloo)
- Masters, Hydrogeology & Water Resources Planning (Waterloo)
- Graduate Diploma, Waste Man. & Groundwater Contamination (McGill)
- Bachelor Honours, Geography (Victoria)

Expertise:

- Agri-environmental and rural groundwater science, including source water protection & private water well best management practices
- Collaborative and interdisciplinary groundwater research and practice
- Development and implementation of programs, projects and policies involving complex groundwater management problems
- Capacity building to help community organizations participate effectively in multi-stakeholder decision making forums