



Geoffrey F. Bruce Fellowship in Canadian Freshwater Policy

Improving Water Quality in Private Wells: Recommendations to Address Challenges and Opportunities in Ontario

Policy Brief

by

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Executive Summary

Around 3 million people in Ontario rely on groundwater as a drinking source (Ontario Ground Water Association, 2024) and private wells provide drinking groundwater to approximately 1.5 million Ontarians (Statistics Canada, 2018). Under the Ontario Water Resources Act (1990), the Wells Regulation 903 stipulates requirements for constructing, maintaining and abandoning private water wells. It also states that well owners must maintain the well to prevent contamination. However, water quality of private wells water is not regulated under the Safe Drinking Water Act (2002), Ontario Clean Water Act (2006), or incorporated in source water protection plans. Therefore, water quality is unregulated for these systems, posing a threat to the population. *Escherichia coli* (*E. coli*) often contaminates groundwater due to improper land application or disposal of manure, septic systems leaks, and wastewater runoff or discharge worsened by weather events. Additionally, most groundwater contaminants associated with adverse health effects, like arsenic, cannot be detected visually by taste or odour. Consequently, it is advised to test the water regularly.

Public Health Ontario conducts water testing free of charge for bacterial indicators. Water test results might be free of bacterial contamination but still contain other substances that can pollute the water. If well owners want to test for different substances like naturally occurring contaminants, they must run with the cost of the analysis. Private well owners often fail to perceive any problems, which is a significant obstacle to routinely testing well water.

This policy brief highlights the urgent need for a comprehensive approach to addressing water quality in private wells in Ontario. This approach includes recommendations that could be adopted to reduce health risks, such as mandatory water testing and risk assessments, incorporating private wells in source water protection plans, and awareness and educational programs.

Introduction

Groundwater makes up 99% of the Earth's liquid freshwater (Shiklomanov & Rodda, 2003), yet only about 0.03% of groundwater resources are replenished annually as freshwater resources globally (FAO, 2015). Groundwater provides half of all drinking water and is the primary water source for 2.5 billion people globally. Dependence on groundwater is expected to rise further, primarily due to escalating water needs across all sectors coupled with changing rainfall patterns due to climate change (UN Water, 2022). Groundwater has not received significant attention in local, national, or global water policy discussions. Consequently, its management has not evolved to meet growing demands and technological advancements (Wijnen et al., 2012).

Groundwater in Canada is crucial in providing clean and safe water for various sectors, highlighting the importance of sustainable management practices to protect this essential resource for current and future generations. Almost 9 million Canadians depend on groundwater (E. and C. C. Canada, 2007). The reliance on groundwater varies from province to province and territories as well as the primary sources of groundwater and the different uses in Canada (E. and C. C. Canada, 2007). In Canada, 11% of the population (around 4 million) use private wells (Statistics Canada, 2018). Most provinces have regulations or guidelines for the construction, drilling, maintenance, disinfection, and abandonment of wells. However, there are no regulations or policies for water testing. Each province has directions and recommendations based on its aquifers and the most common contaminants. It is the well owner's responsibility to test and maintain the well after its construction to avoid health issues (H. Canada, 2019). Around 78,000 illnesses annually arise from

consuming untreated drinking water with microbial contaminants from private wells (Murphy et al., 2016).

Around 3 million people in Ontario rely on groundwater as a drinking source (Ontario Ground Water Association, 2024). Private wells provide drinking groundwater to around 1.5 million Ontarians (Statistics Canada, 2018). Groundwater management involves several government agencies operating at various levels, each contributing regulations, directives, guidelines, and overall supervision to regulate human activities that impact groundwater (Holysh & Gerber, 2014). However, private wells water quality is unregulated in Ontario (Office of the Auditor General Of Ontario, 2014).

This research aimed to review water quality concerns in private wells and generate recommendations that might help address water pollution in private wells in Ontario.

Policy and Governance Problem

Ontario has several pieces of water-related legislation. Water policies have evolved significantly over the past 20 years with several statutes being passed in the aftermath of the Walkerton Inquiry. The Walkerton tragedy water pollution and contamination incident in 2000 impacted approximately 2,300 individuals (de Loë & Kreutzwiser, 2005; Holysh & Gerber, 2014; Minnes, 2017), and the provincial inquiry resulted in some significant policy reforms in Ontario (Johns C, 2014).

However, private wells are not regulated under the Safe Drinking Water Act (2002), Ontario Clean Water Act (2006), or incorporated in source water protection plans (Office of the Auditor General Of Ontario, 2014). The Wells Regulation 903 under the Ontario Water Resources Act (1990) stipulates requirements for constructing, maintaining and abandoning private water wells. It also states that well owners must maintain the well to prevent contamination (Government of Ontario, 2022). Therefore, water quality is unregulated for these systems, posing a threat to the population (Latchmore et al., 2020).

Public Health Ontario conducts water testing free of charge for bacterial indicators such as *E. coli* and total coliforms but does not test for other contaminants like chemicals. If the owner wants to test for different substances, the owner must run with the cost of the analysis (Government of Ontario, 2022; Public Health Ontario, 2022). If water test results are free of bacterial contamination, the water can still contain other compounds. Consequently, it is advised to test the water regularly, at least once yearly, and after weather events (Government of Ontario, 2021; Public Health Ontario, 2022). With increasing risks of wet weather events related to climate change, water quality in private wells may be an increasing concern.

Groundwater from private wells is often contaminated by *E. coli* due to improper land application or disposal of manure, septic systems leaks, and wastewater runoff or discharge worsened by weather events (Murphy et al., 2017). *E. coli* detection differs significantly depending on the season, hydrogeological setting, well depth, location, construction, maintenance, testing, surveillance and reporting. The detection of *E. coli* in water suggests fecal contamination and the potential presence of enteric pathogens that can cause waterborne gastrointestinal infections (Murphy et al., 2016, 2017).

A study conducted in Ontario with data from 702,861 water samples between 2010-2017 suggested that private wells have a higher risk of *E. coli* contamination during warmer months and are more susceptible to water-borne illnesses (H. Canada, 2019; Latchmore et al., 2020). Most

groundwater contaminants associated with adverse health effects, like arsenic, cannot be detected visually by taste or odour (Imgrund et al., 2011). Therefore, they are undetectable to well owners who do not conduct regular water tests, putting them at risk (Drage, 2022).

Many jurisdictions in Canada advise well owners to regularly maintain and test their water for both chemical and microbial contaminants. Although the recommended testing frequency and parameters vary, it's often suggested that well water be tested annually or biennially (Colley et al., 2019). However, compliance with these recommendations remains voluntary, and many well owners rely on their perceptions to determine water quality. Well owners in Canada are motivated to test frequently if they have experienced health problems possibly related to the water they use, rather than the owners with no related experience (Kreutzwiser et al., 2011).

Moreover, Private well owners in Ontario often fail to perceive any problems, which acts as a significant obstacle to routinely testing their well water for bacteria (Imgrund et al., 2011). Additionally, testing rates are low; for instance, only 24% of private wells tested their water at least once in one year in 2015 (Statistics Canada, 2016). There is a significant concern about the behaviour of well owners that might be associated with a lack of information on the importance of regular water testing (Lavallee et al., 2021). A survey conducted in 2018 in Ontario suggests a low level of knowledge of waterborne pathogens; 50.8% were unaware of groundwater-related pathogens. Awareness and perception were associated with geographic location, gender, and well type (Lavallee et al., 2021).

Source water protection for groundwater primarily concentrates on safeguarding municipal groundwater wells using a technical process called wellhead protection planning. However, less emphasis has been placed on adopting a more comprehensive approach to protecting groundwater sources outside a municipal source water protection area, including private wells (Simpson & de Loë, 2014).

Recommendations

1. Mandatory water testing for private wells in Ontario

Mandatory testing should be included in the Wells Regulation 903 under the Ontario Water Resources Act (1990), which will help detect contaminants and potential health issues, enabling prompt intervention treatment. Routine testing emphasizes the significance of water quality monitoring, raising awareness among well owners about possible contaminants. It will offer valuable data on quality trends, which can inform public health policies and research. It will identify areas with widespread contamination and implement targeted solutions, as well as vulnerable areas that need specific attention. Testing after a weather event that could endanger the water source should also be mandatory.

The testing frequency should be analyzed by location, aquifer characterization, hydrogeology and nearby land use. However, a minimum of two times per year should be mandatory. Furthermore, mandatory water testing for land transfers and leases, like in New Jersey, US, could add an additional level of water quality to protect Ontario's public health. The Private Well Testing Act (PWTA) of New Jersey mandates well water testing prior to the sale or lease of a property; the test results must be reviewed before closing the sale or lease. Nonetheless, well owners might fear potential property value impacts if water quality is disclosed.

Additionally, chemical water testing should be free of charge, as bacteriological testing is done in Ontario. Some well owners might resist mandatory testing and frequency if it is not financed by

the local governments, leading to enforcement challenges. For instance, Prince Edward Island has free water testing (Government of Prince Edward Island, 2022). If water testing cannot be free due to financial capacity, it could be subsidized, or a tax credit could be applied to well owners.

The collected data could be analyzed to understand where contamination is coming from and promptly addressed with a centralized reporting system for better monitoring. Implementing and running a free testing program would require significant financial resources from the province, and allocating the budget could become an issue, as well as the sentiment of well owners that might not comply with the mandatory testing.

2. Incorporation of private wells in source water protection plans

Private wells should be incorporated into source water protection plans across the province. Ontario implemented a multibarrier approach to safeguarding drinking water. This approach includes protecting municipal surface and groundwater supplies by developing source water protection plans as part of their integrated watershed management. The drinking water protection framework was established after implementing the recommendations from the Walkerton Inquiry (Government of Ontario, 2014), which were incorporated into the Ontario Clean Water Act (2006). Including private wells in the water source protection plans will prevent pollution episodes and improve groundwater management.

3. Risk Assessments as part of Integrated Watershed Management

In England and Wales, Private Water Supplies (PWS) encompass any water supply not provided directly by a water undertaker or licensed water supplier. Supplies that offer less than 10 m³ per day or less than 50 people are called private water supplies. The Private Water Supplies (England) Regulations 2016 (UK, 2016) and the Private Water Supplies (Wales) Regulations 2017 (UK, 2017) require local authorities to conduct risk assessments for each private water supply in their jurisdiction, excluding those serving single dwellings unless specifically requested. These assessments include surveying the supply to pinpoint possible health risks and standards violations and to establish necessary actions to mitigate those risks. This approach could be implemented as part of the source water protection plans for private wells in Ontario. Even though risk assessments in England and Wales are not mandatory for single dwellings, if applied to the source water protection plans in private wells in Ontario, this could assist in addressing contamination early.

Implementing a risk assessment would address the risk of each locality to better understand the aquifer's vulnerabilities. Regular assessments (e.g., every five years) allow for early detection of emerging risks before they become serious health hazards. These assessments could guide well owners and authorities in prioritizing maintenance, upgrades, or treatment options. Data collection could provide information on groundwater quality trends and potential regional contamination sources. However, implementing this will entail capacity building, which could become a barrier.

Conducting regular risk assessments can impose financial burdens on well owners or local authorities, especially for smaller communities. Implementing and managing a risk assessment program requires time, expertise, and personnel from regulatory agencies. Some well owners might resist mandatory risk assessment requirements, leading to enforcement challenges. Well owners may be concerned about the privacy of their water quality data and property information collected during assessments. Risk assessments can be complex, requiring specialized knowledge that may not be readily available in all areas. Risk assessments may vary depending on the expertise and local resources.

4. Public Awareness and Educational Programs

Implementing an awareness and education program similar to the Working Well series implemented in Alberta (Government of Alberta, 2024) is an essential step that health units in Ontario could take in collaboration with non-governmental organizations. The program could be delivered online. However, it is essential to acknowledge that in-person sessions might be preferable to capture the community's attention in certain areas. The provincial government must analyze the capacity and budget for this initiative due to budget limitations of some localities and municipalities, but partnerships at the watershed and local levels have the potential to increase public awareness of this important water issue. A public awareness and educational program will build essential knowledge about groundwater and the risks associated with a lack of maintenance and regular water testing.

Conclusion

Groundwater is a vital resource for Ontario, providing drinking water to 3 million residents, including 1.5 million who rely on private wells. Despite its importance, private well water quality remains unregulated, leaving many at risk of contamination from bacteria, chemicals, and other pollutants. These vulnerabilities are exacerbated, particularly in the context of climate change and its impact on water systems.

Addressing this issue requires a multi-faceted approach, such as mandatory testing for chemical and bacteriological contaminants, which should be implemented and tailored to local risk factors, ensuring that testing frequency aligns with hydrogeological conditions and seasonal changes. This must be coupled with subsidies or tax credits to alleviate financial burdens for well owners, encouraging compliance. Incorporating private wells into Ontario's existing source water protection plans will enhance the prevention of contamination at its source. Additionally, adopting risk assessments similar to those in England and Wales can provide a localized understanding of the aquifers' vulnerabilities and guide targeted interventions.

Furthermore, equally important is the development of accessible awareness and education programs, such as the Working Well initiative in Alberta, to empower well owners with knowledge about water quality risks and the importance of regular testing and maintenance. Ensuring these programs are adequately funded and delivered effectively both online and in person will be vital for widespread community engagement. Collaborative action among policymakers, local authorities, and well owners is essential to achieving these goals.

By embracing these recommendations, Ontario can protect public health, improve water quality, and create a resilient framework for groundwater management. Investing in these solutions today will not only mitigate the immediate risks posed by private well contamination but also safeguard this indispensable resource for generations to come.

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