

Policy brief

Groundwater in Agriculture: Policy and Practice in Ontario & beyond

Science-Policy Workshop at the Morwick Groundwater Research Centre, November 2025

Groundwater is a strategic resource that underpins agricultural productivity, food security, ecosystem health, and rural livelihoods. Despite its importance, groundwater remains underrepresented in agricultural policy, beyond nutrient management considerations. As climate change shifts precipitation patterns and increases the frequency of droughts (and floods), groundwater will become an increasingly important buffer against water scarcity.

Current governance frameworks remain largely reactive and continue to emphasize groundwater quality, while comparatively little attention is paid to groundwater quantity and long-term sustainability. The Groundwater Science-Policy Workshop brought together researchers, agricultural producers, policymakers, and practitioners to examine how groundwater science can better inform agricultural policy and practice.

Discussions highlighted that Ontario possesses strong scientific expertise and monitoring capabilities, but faces persistent challenges translating evidence into timely policy, integrating groundwater into agricultural decision-making, and supporting producers in adopting sustainable groundwater management practices.

KEY PRIORITIES

- **Establish a provincial groundwater science-policy advisory panel** to strengthen evidence-based agricultural decision-making.
- **Modernize groundwater monitoring** through continuous observation networks, advanced technologies, and open-access data systems.
- **Support producer-led groundwater stewardship** through demonstration farms, field schools, and extension programs.
- **Develop a provincial groundwater quantity strategy** with sustainability indicators, withdrawal thresholds, and drought planning.
- **Align financial incentives with groundwater conservation**, water-use efficiency, and agricultural resilience.

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Groundwater for Municipal Water Supplies and Community Environmental Health
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Key Policy Challenges and Recommendations

1. Deliver on transdisciplinary evidence-based policy

Ontario does not lack groundwater science; it lacks effective mechanisms for incorporating scientific evidence into policy. Permitting, agricultural planning, and land-use decisions are often out-of-sync with groundwater system responses and frequently rely on incomplete, fragmented, or outdated evidence.

Effective groundwater governance requires more than hydrogeological data. Scientific evidence should be integrated with economic analyses, producer knowledge, local experience, and social considerations to evaluate trade-offs between private agricultural benefits and broader public outcomes. Equally important is ensuring that research is translated into formats that are accessible and useful for decision-makers. Evidence-based policy depends not only on generating knowledge, but also on ensuring that knowledge is timely, transparent, and actionable.

Recommendation

Establish a standing Groundwater Science-Policy Advisory Panel, bringing together OMAFA, MECP, Conservation Authorities, NGOs, researchers, producers, and community/Indigenous representatives to annually review emerging science and adaptively translate it into practical guidance for permits, drought planning, and agricultural policy updates.

2. Manage groundwater and surface water as an inter-connected system

Groundwater and surface water remain governed largely through separate policy and regulatory frameworks despite functioning as a single transboundary hydrological system with continuous surface-groundwater flows. Fragmented responsibilities across ministries and agencies increase the risk that cumulative impacts of irrigation, land-use change, and water-taking decisions are overlooked.

As climate change increases reliance on groundwater during drought, this disconnect will become increasingly problematic - especially if we assume that a hydrological system under pressure will behave as it always has. Managing groundwater independently of connected streams, wetlands, and aquifers limits the effectiveness of watershed planning and may unintentionally transfer environmental impacts elsewhere in the system.

Recommendation

Conduct conjunctive groundwater-surface risk assessments of current and future agricultural systems (based on identified priority areas) at appropriate scales, including changing recharge-discharge relationships, and update regulatory programs to reflect cumulative and interconnected impacts of large water takings on groundwater and surface water resources.

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3. Modernize groundwater monitoring for adaptive management

Ontario possesses many of the scientific tools needed to characterize groundwater systems, yet monitoring programs have not evolved at the same pace as technology or a respective understanding of emerging water risks. Current monitoring remains constrained by limited continuous data collection, inconsistent reporting of agricultural water withdrawals, and insufficient assessment of cumulative impacts across sectors. Decision-makers often lack timely, accessible information needed to respond proactively to changing groundwater conditions.

Emerging technologies provide new opportunities to monitor groundwater quantity, quality, and movement across multiple spatial scales, including multi-levels borehole monitoring, sensor-based monitoring, and telemetry. Integrating these approaches with existing monitoring networks and implementing these at nested scales (mimicking the nested scales of a freshwater flow system - local to regional and basin scales) across jurisdictions would substantially strengthen (ground)water management.

Recommendation

Modernize Ontario's groundwater monitoring network by integrating multi-level monitoring wells, standardized and privacy-protected reporting of agricultural withdrawals, remote sensing technologies, incentivized peer-to-peer data sharing, and publicly accessible groundwater dashboards (see the Oak Ridges Moraine Groundwater Program as a regional example) that offer practical, localized irrigation feedback or stewardship incentives for participation produces.

4. Shift from consultation to producer-led groundwater stewardship

Agricultural producers are frontline managers of groundwater and possess valuable knowledge of local hydrological conditions. Effective groundwater governance depends not simply on consulting producers but on creating opportunities for producers, researchers, and policy-makers to jointly develop practical management solutions.

Trust is central to this process – and is often damaged. Scientific information that is technically public, but difficult to access or interpret, does little to support informed participation or behavior change. Knowledge mobilization, extension services, and peer-to-peer learning are therefore as important as scientific innovation. These efforts should be culturally grounded in the context-specific needs of groups and communities. Building groundwater literacy among producers and the broader public can improve both stewardship and confidence in evidence-based policy.

Recommendation

Expand producer-led groundwater demonstration farms, field schools, community water roundtables, and peer-to-peer learning networks through OMAFA extension programming (supported by field-based researchers and scientists) so groundwater management practices are co-developed, tested for scalability, and refined before being incorporated into provincial guidance. Where trust has broken down, engage neutral facilitators or mediators to rebuild relationships, foster mutual understanding, and establish the conditions for constructive dialogue and collaborative groundwater stewardship.



5. Elevate groundwater quantity alongside groundwater quality

Ontario's groundwater governance has historically focused on protecting groundwater quality through source water protection and nutrient management legislation. While these programs have generated important environmental benefits, groundwater quantity (declining water levels, reduced baseflow, recharge deficits, or increasing seasonal withdrawals) has received comparatively little policy attention despite increasing drought (and flood) risk, and growing irrigation demand. Groundwater plays a key role in mediating climate variability providing source water when other sources go dry and buffering high-intensity precipitation events to optimize seasonal recharge when extreme weather alternates between droughts and floods.

Groundwater should increasingly be recognized as strategic natural infrastructure that strengthens and protects rural economies. Proactive management is needed to avoid the long-term consequences associated with groundwater depletion and to reduce the economic risks of water scarcity before they emerge. Provincial regulatory processes should consider inter-connected hydrological systems when setting criteria for Permit To Take Water (PTTW) applications to ensure that cumulative impacts of large water takings are considered.

Recommendation

Develop a Provincial Groundwater Quantity Strategy with adaptive management provisions that establishes regional groundwater sustainability indicators, drought response triggers, cumulative withdrawal thresholds, and long-term groundwater management objectives alongside existing groundwater quality programs.

6. Reward groundwater stewardship alongside regulation

Groundwater conservation frequently generates public benefits, while imposing private costs on producers. Investments in efficient irrigation, improved soil health, enhanced groundwater recharge, and on-farm monitoring require time, capital, and management changes, even though the resulting benefits extend well beyond individual farms.

Sustainable groundwater policy should therefore recognize that environmental stewardship and agricultural prosperity are closely linked rather than per-se competing objectives. Policies that improve farm profitability can also increase producers' capacity to adopt conservation practices, while groundwater governance should ensure that costs and benefits are distributed fairly across economic sectors, regions, farm types, and communities, including Indigenous communities.

Recommendation

Expand agri-environment cost-share programs to explicitly support groundwater stewardship, including incentives for efficient irrigation technologies, soil health practices that enhance groundwater recharge, on-farm groundwater monitoring, and crop diversification in regions facing increasing groundwater stress.



Conclusion

Ontario's primary groundwater challenge is no longer the generation of scientific knowledge, but the translation of knowledge and fostering of partnerships for timely, coordinated, and practical policy. As climate change increases pressure on agricultural water supplies, groundwater quantity must receive the same strategic attention that groundwater quality has received over the past several decades.

Moving from reactive management toward proactive groundwater governance will require stronger integration of science into policy, investment in modern monitoring systems and data sharing, watershed-scale planning, producer-led stewardship, and incentive-based approaches that recognize groundwater as the foundation of a resilient agri-food system. Taken together, these actions provide a practical roadmap for safeguarding Ontario's groundwater resources while supporting productive, competitive, and climate-resilient agriculture.

The brief is an output of the workshop "Groundwater in Agriculture: Policy and Practice" held in Guelph, Canada, on November 13th, 2025, at the Morwick G360 Groundwater Research Institute, University of Guelph.

Authors: **Sophie Bhalla** (University of Guelph/MG360)**, Beth L. Parker** (University of Guelph/MG360)**, Becky Anderson** (University of Guelph/MG360), **Paule Bhérer-Breton** (University of Guelph/MG360), **Puvaanah Arrumugam** (University of Guelph/MG360), **Somayeh Asadi Shekafti** (University of Guelph/MG360), **Nandita Basu** (University of Waterloo), **Aaron Berg** (University of Guelph), **Md Bodruddoza** (University of Guelph), **Jessica Bowes** (University of Guelph/RIO), **Isabella Bowman** (University of Guelph/MG360), **Tian Boyao** (University of Waterloo), **Steve Chapman** (University of Guelph/MG360), **Hamidreza Dannak** (University of Guelph/MG360), **Brenda Dyack** (University of Canberra), **Jessica Flynn** (University of Guelph/MG360), **Dustin Garrick** (University of Waterloo), **Andrii Gusiev** (University of Guelph/MG360), **Kacper Halama** (University of Guelph/MG360), **Jennie Hansson** (University of Guelph/MG360), **Steve Holysh** (Oak Ridges Moraine Groundwater Program), **Valerie Hruska** (University of Guelph/RIO), **Isabel Jacklyn** (University of Guelph/MG360), **Jonathan Kennel** (University of Guelph/MG360), **Mohammad Khodabakhshi** (University of Guelph/RIO), **Merrik Kobarfard** (University of Guelph/MG360), **Susan Koswan** (The Record), **Ryan Kroeker** (University of Guelph/MG360), **Patrick Lagasca** (University of Guelph/MG360), **Stephane Lauzon** (University of Guelph/MG360), **Jana Levison** (University of Guelph), **Cindy Li** (University of Guelph/MG360), **Ying Lin** (EIT/Sustech), **Trish Luty** (Ontario Ground Water Association), **Melisa Luymes** (The Rural Voice), **Carlos Maldaner** (University of Guelph/MG360), **Ferdinando Manna** (University of Guelph/MG360), **Carlos Marques** (University of Guelph/MG360), **Meredith Marshall** (Agriculture and Agri-Food Canada), **Edward Morwick**, **Jonathan Munn** (City of Guelph/MG360), **Marina Nunes** (University of Guelph/MG360), **Felix Nyarko** (University of Guelph/MG360), **Tobiloba Onipe** (University of Guelph/MG360), **Dominique O'Rourke** (Member of Parliament), **Sonia Persaud** (Wellington Water Watcher/Sheridan College), **Amanda Pierce** (University of Guelph/MG360), **Mark Reusser** (Ontario Federation of Agriculture), **John Rodgers** (Bruce County Federation of Agriculture), **Fridah Silas** (University of Waterloo), **Hugh Simpson** (University of Guelph/MG360), **Reginald Somera** (City of Guelph), **Michelle Stringer** (University of Guelph), **Antonina Struminski-Bodden** (University of Guelph/IndigenERA), **Yuseph Sulieman** (University of Guelph/MG360), **Howard Summerhayes**, **Richard Taylor** (University College London), **Archana Uprety** (Ministry of the Environment, Conservation and Parks), **Zack Walker** (University of Guelph/MG360), **Ken Walton** (University of Guelph/MG360), **Rose Wanyonyi** (University of Guelph/MG360), **John Williamson** (Chair Cataraqui Source Protection Committee), **Xiao-Long Wu** (University of Guelph/MG360), **Lily Yu** (Corteva), **Chunmiao Zheng** (EIT/Sustech).

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