Introduction and Objectives

- Groundwater is a source of potable water for 30 percent of Ontario’s population.
- Intensification of agricultural activities and climatic changes pose threats to groundwater quality.
- Nutrient leaching below the root zone to aquifers in agricultural areas is a critical problem.
- Research to examine climate change impacts and agricultural activities on groundwater quality needs to be done pre-emptively rather than in a reactive manner in order to sustain water supplies.

The objective is to quantify the nutrients leaching from agricultural fields and their transport in the groundwater under different crop types, geological conditions, and variable weather scenarios to mitigate nutrient transport to sensitive groundwater bodies.

Methodology

Field Data Collection

Field Parameters (pH, ORP, TDS, EC, DO, etc), Nitrate, DOC, Dissolved elements, δ15N, δ18O, Iodide, Total Iodine

Infiltration Rate, Soil Moisture and Evapotranspiration, Hydrogeological Settings, Land Use, and Cropping Patterns

Fieldwork Team

Preliminary Results

Norfolk County

Acton, Halton Region

Expected Outcomes

- Comprehensive literature review of nutrient impacts on sensitive aquifers including climate-related research.
- New methodologies to investigate how Ontario nutrient and climate changes may affect groundwater quality.
- Local-scale groundwater models to represent various hydrogeological settings across Ontario.

Conclusions

- Deeper wells appear to be less vulnerable to seasonal variations and surface activities.
- Aquifers with thin overburden & high water table (Acton, Arkell) & shallow sandy aquifers more likely to be vulnerable from surface activities.
- More data like age of groundwater, nitrate source from isotopes analysis, other will improve the interpretation in near future.

Future Work - Modelling

Crop Type

Amount of Nitrogen to Groundwater

Soil Type, Topography

Recharge

NMAN, LEACRN

Aquifer Characteristics

Groundwater Modeling

Nitrification, Adsorption, Immobilization

Climate Model

Plant Uptake

Model Predictions

Future Directions

Expected Outcomes

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