ASSESSMENT AND MANAGEMENT OF ENVIRONMENTAL RISKS
ASSOCIATED WITH DECENTRALIZED RURAL WASTEWATER MANAGEMENT SYSTEMS

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KEY MESSAGES FOR DECISION MAKERS

- The On-site Wastewater System (OWS) design types examined provided treatment comparable to secondary wastewater treatment systems
- Effluent quality can be variable and influenced by both management (e.g. pumping method) and environmental factors (e.g. precipitation); Understanding these risks is important for protecting surface- and groundwater resources.
- Many watershed studies negate the contributions of OWS to phosphorus loading for long time periods (30+ years), and are potentially missing a significant source of this nutrient that can negatively impact surface water quality.

WHO IS THIS INFORMATION RELEVANT FOR?

- On-site wastewater system (OWS) designers, installers and professional associations
- Watershed managers and regulators (municipal and provincial government levels)
- Source water protection regulators
- Watershed community groups

WHAT WAS THE RESEARCH FOCUS?

Approximately 20% of the Canadian public rely on OWS to treat their domestic wastewater with some jurisdictions having even higher percentages (e.g. Nova Scotia ~50%). Many of these OWS are not properly maintained or are improperly designed and constructed, which may pose a significant risk to both surface- and groundwater resources.

This research investigates the treatment performance of various types of OWS under field conditions. Using the treatment performance results watershed modeling tools are developed to assess the environmental risks of these OWSs in mixed land use watersheds.

WHAT WAS THE RESEARCH METHOD?

Constructed and monitored a variety of field scale OWSs of various design types to evaluate their long-term treatment performance. The results of these field scale studies were used to develop watershed scale modeling tools to simulate potential risk to surface- and groundwater systems, and the relative contribution of the nutrient phosphorus from OWSs compared to other land uses, such as agriculture.

WHAT WERE THE RESEARCH RESULTS?

The OWS technologies investigated were capable of providing excellent treatment of wastewater that met current water quality regulations, particularly the lateral flow sand filter. The risk assessment modeling framework successfully determined at-risk areas in the Township of Huron-Kinloss, ON, and the OWS phosphorus load modeling tool found that OWS were a potentially significant and long-term (30+ years) source of phosphorus in the Thomas Brook Watershed, NS.

WHAT ARE THE IMPLICATIONS FOR DECISION MAKERS?

- One of the OWS technologies investigated was the lateral flow sand filter, which provided excellent wastewater treatment that met regulated water quality parameters. It was adopted by Nova Scotia Environment as an approved technology for new OWS installations. Since updating the technical guidelines the lateral flow sand filter is the 2nd most installed OWS in Nova Scotia.
- The simulation of phosphorus loading in a rural Nova Scotia watershed was improved for low flow periods when OWS were included as a potential phosphorus source. If OWS are a potential source of nutrient, bacteria or other type of contaminants in a watershed then assessing their relative contaminant loads and risk to the local surface- and groundwater systems is an important part of effective watershed management.
- The modeling tools developed in this research should be applied to other mixed land use watersheds throughout Canada to assist with evaluating the environmental risks posed by OWS from current residences and proposed residential developments. The tools will also help with developing management strategies to minimize those risks.

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