BACK TO BASICS

Clean Water
Purposes of the Environmental Bill of Rights include:

1. The prevention, reduction and elimination of the use, generation and release of pollutants that are an unreasonable threat to the integrity of the environment.

2. The protection and conservation of biological, ecological and genetic diversity.

3. The protection and conservation of natural resources, including plant life, animal life and ecological systems.

4. The encouragement of the wise management of our natural resources, including plant life, animal life and ecological systems.

5. The identification, protection and conservation of ecologically sensitive areas or processes.
Clean Water

Water is the most important element to all life. Seventy-one percent of the earth is covered in water, but clean fresh water is uncommon and precious. In Ontario, we are lucky to have an abundance of freshwater, but we still pollute much of it. This can have potentially catastrophic impacts for human health and well-being, as well as for the countless other species that depend on our lakes and rivers.

This volume discusses two key aspects of water pollution in Ontario.

In Chapter 1 of this volume, the ECO examines the effectiveness of the Clean Water Act in protecting sources of municipal drinking water from pollution that threatens human health. The Clean Water Act was adopted after the Walkerton tragedy in 2000 drove home the vulnerability of Ontario’s drinking water. This law has done much to safeguard the drinking water sources of most Ontarians. Source protection committees have successfully identified hundreds of significant pollution threats to municipal drinking water sources, and have done what they can to manage them. However, the drinking water sources of almost one-fifth of Ontarians are not protected under the Clean Water Act, most of Ontario’s lakes and rivers are not protected, and not all threats have been adequately addressed. Further, uncertainty about funding leaves the future of this critical program up in the air.

Chapter 2 shows how gaps in provincial laws still allow serious pollution to pour into lakes and rivers, closing beaches, harming fish, and harming economic activities that rely on clean water. Four of these major pollutants are raw municipal sewage, agricultural runoff, industrial wastewater, and road salt – none of which the province adequately controls.

Whiskey Harbour on the Bruce Peninsula, Lake Huron.

Photo credit: Shane Zurbrig (CC BY-NC-ND 2.0)
Chapter 1

Protecting Ontario’s Drinking Water from Pollution
Abstract

The contaminated drinking water tragedy in Walkerton, Ontario in May 2000 set in motion a new era in drinking water regulation in the province. The Ontario government enacted several laws aimed to protect drinking water at each stage from "source to tap." In 2006, the final piece – the Clean Water Act – established a process for protecting sources of drinking water (the lakes, rivers and aquifers from which we draw drinking water) on a watershed-by-watershed basis.

In November 2015, after eight years of intensive planning work by local source protection committees, the last of the 38 source protection plans was approved. These plans are now being implemented across much of the province to protect municipal drinking water sources.

Given the enormous amount of time, effort and resources that have gone into this process, the ECO examined how source protection committees applied the new law and what’s been achieved so far. The ECO looked at a selection of over 500 source protection policies, and held discussions with key stakeholders. The ECO’s review examined three questions:

- Did the watershed planning approach work? As intended, the local-led source protection process resulted in individually tailored source protection plans that respond to the specific geography and local circumstances of each watershed. The source protection committees proved to be committed and capable arbiters, creating policies that thoughtfully weighed the financial consequences of complying with more onerous policies without sacrificing the ultimate goal of drinking water safety. The process also resulted in a wealth of valuable watershed information that both supported source protection work and facilitates other work of conservation authorities to protect watersheds across the province (see section 1.3).

- Is the Clean Water Act improving the safety of most Ontarians’ drinking water? The source protection program is resulting in thousands of on-the-ground actions to reduce drinking water threats. For example, ministries are updating pollution permits to incorporate source protection provisions, municipalities are amending their official plans to designate restricted areas for source protection, and local risk management officials and inspectors are actively enforcing source protection policies to reduce threats to drinking water. It is still early days of implementation, but these actions should over time reduce the risk of spills and unsafe discharges to municipal drinking water sources, which supply water for about 80% of Ontarians (see section 1.4).

- What’s missing?
  - Not all drinking water sources are protected. Almost one-fifth of Ontario’s population is excluded from the province’s drinking water source protections. The drinking water systems of most northern Ontario and First Nation reserve communities are not protected by the source protection framework. Similarly, non-municipal sources of drinking water, such as private wells, are not protected, even within source protection areas (see section 1.5.2).
  - Some threats to drinking water are not adequately addressed. The province’s source protection rules fail to give source protection committees the tools needed to properly address all threats, including some threats posed by fuel tanks and manure spreading (see section 1.5.3). The province does not deal effectively, within the Clean Water Act or otherwise, with threats posed by old contaminated sites (see section 1.5.4).
  - Uncertainty about future funding and capacity. The various bodies responsible for implementing source protection – including the conservation authorities, municipalities, source protection committees, and the Ministry of the Environment, Conservation and Parks – require secure ongoing funding and resources to ensure they have the capacity to keep doing source protection work. Uncertainty about future funding leaves the success of the source protection program up in the air (see section 1.5.5).

Ontario has invested significant effort to protect the province’s water resources that are municipal sources of drinking water. Contaminated drinking water can cause sickness or, in the worst case, death. But protecting municipal drinking water sources, which are a small portion of Ontario’s water resources, is not all that matters. As we discuss in Chapter 2 of this volume, Ontario must protect all of our water resources from pollution, to preserve our lakes and rivers as places that Ontarians can safely go swimming, boating and fishing, and so that Ontario can continue to sustain an abundant and healthy diversity of aquatic plants and animals. Ontario has made great strides in safeguarding the sources of drinking water of most Ontarians, but there is still much work to be done.
There were hundreds of significant threats to municipal drinking water. Because of Walkerton, they are now better controlled.
1.1. Introduction: Walkerton crisis ushered in new era of drinking water protections

Every day, we turn on the faucets in our kitchens and bathrooms countless times, to fill a glass, brush our teeth, replenish the coffee pot or wash a dish. Without even thinking about it, most Ontarians expect that the water coming out of our taps will be safe.

We should not take safe abundant water for granted. Many things can threaten the safety of our drinking water. Raw sewage, leaking oil tanks, road salt, manure from farm fields, and many other substances can wash into our lakes, rivers, streams and aquifers, potentially contaminating our water with chemicals or pathogens.

Without adequate laws, policies and investments, contaminated water sources can have devastating effects. The events in Walkerton, Ontario in 2000 (see The Walkerton Crisis) woke Ontario up to this reality.

The Walkerton Crisis

In May 2000, following several days of heavy rains, cow manure from a farm in Walkerton, Ontario washed into a vulnerable groundwater well, contaminating the town’s water supply with *E. coli* bacteria. The operators of the water treatment plant – who lacked sufficient training and expertise, and who had knowingly engaged in improper treatment and monitoring for years – did not have adequate chlorination and failed to promptly detect the bacteria. When the operators did discover the contamination, they concealed the problem, even after residents started to fall ill.

The Walkerton Commission, which examined the crisis, found fault in many parts of the system. The Ministry of the Environment, whose inspection program was slashed by provincial budget cuts, had failed to catch the operators’ illegal conduct. The province had also ended government lab testing and reporting, which would have caught the problem earlier and ensured that public health officials knew about it.

As a result of these many failures, seven people died and over 2,300 fell ill, with many in Walkerton still suffering from the effects today. The Walkerton crisis remains a symbol of the immense consequences of poorly designed budget cuts that ignore environmental risks.
1.1.1 Improving water treatment and testing

Following the Walkerton crisis, the government called a public inquiry to review the tragedy and recommend ways to make Ontario’s drinking water safer. In response, Ontario passed several new laws and regulations to better protect our drinking water. The Safe Drinking Water Act, 2002, created stringent requirements to ensure that municipal water treatment plants are better equipped to detect and treat contaminants before the water is piped to our homes. Tests from municipal drinking water systems, which serve over 80% of all Ontarians (see Drinking water protections for all?), show that these systems meet the province’s strict drinking water quality standards 99.8% of the time.

1.1.2 Stopping pollution at the water source

The Safe Drinking Water Act provides very good protection, but it is not fail-safe. No operating system is infallible and a major contamination incident can potentially overwhelm a drinking water system. Given the possible dire consequences of consuming unsafe water, the Walkerton inquiry recognized that drinking water requires a multi-barrier approach to protection. A crucial first line of defence is to protect the source of the drinking water – the lake, river or aquifer from which we draw the water – from becoming contaminated in the first place. In 2006, the Ontario government introduced the Clean Water Act, 2006, to require protection of the sources of municipal residential drinking water across much of the province (called “source protection,” see section 1.2 for how it works). This law created the first barrier in the province’s multi-barrier “source to tap” drinking water safety net.

Drinking water requires a multi-barrier approach to protection.

This first barrier is crucial, as it is far easier and less expensive to stop pollution from entering water sources in the first place than it is to try to remove those contaminants later. In some cases, it is not even technically possible to do so. In other cases, it is possible, but the contamination makes the water treatment process more difficult, expensive and energy-intensive. Source protection measures that keep chemicals, sediments or nutrients out of the water can improve drinking water safety as well as provide economic benefits by reducing water treatment costs.

Moreover, within the designated vulnerable zones covered by source protection rules (see section 1.2.1), pollution reduction measures can also greatly benefit the plants and animals that live in, or rely on, those lakes or rivers for survival. Source protection can also improve water-based recreational activities in those same areas by creating cleaner water for fishing and swimming. However, for the majority of Ontario’s lakes, rivers and shorelines that fall outside of the Clean Water Act’s protected vulnerable zones, we must rely on the other pollution-control laws and policies to fulfill this role – see Chapter 2.
1.2 How Ontario’s source protection process works

The Clean Water Act is built around the core feature of local watershed-based planning. In brief, local committees develop plans to protect the sources of municipal drinking water within their watershed from threats.

Source protection planning happens at the watershed scale, instead of by town or city, because water flows across political boundaries. The Clean Water Act divides most of Ontario (the more populated parts) into source protection areas or regions, generally corresponding to the watershed boundaries (see Figure 1).

For each source protection area or region, a designated source protection authority – typically the local conservation authority – leads the planning work. The lead source protection authority establishes a multi-stakeholder source protection committee (with members from the municipal, agricultural, industrial, commercial, environmental and health sectors, the general public, and First Nation communities where they reside within the area) to help carry out the source protection planning work.

1.2.1 Identifying the vulnerable areas for drinking water protection

As a first step, each local source protection committee prepares a science-based assessment report for their watershed, which:

- characterizes the quality and quantity of the water in the watershed
- identifies the vulnerable areas that require special protection, such as areas surrounding a municipal well or drinking water intake pipe in a lake or river (see Figure 2)
- identifies all potential drinking water threats within the vulnerable areas, and
- classifies each identified threat as significant, moderate or low.

Figure 1. Ontario’s source protection areas and regions. There are 38 source protection areas, some of which are grouped into larger source protection regions for source protection planning purposes.

Source: Ministry of the Environment, Conservation and Parks, Source Protection Programs Branch, base map provided by Microsoft Bing, graphic compiled by the ECO.
Source protection only applies to the areas designated as “vulnerable” to threats, including zones around municipal intake pipes, wellheads and highly vulnerable aquifers. Therefore, while much of the land mass in southern Ontario is covered by source protection areas (Figure 1), the actual area that receives protection from pollutants under the Clean Water Act is relatively small (Figure 3). For everywhere outside of these zones, we rely on the other laws and policies to protect Ontario’s lakes and rivers from pollution (see Chapter 2).

**Figure 2.** Vulnerable areas that require special protection from drinking water threats. Generally, the areas closest to a wellhead or surface water intake are considered most vulnerable. 
Source: Created by the ECO.

**Figure 3.** Vulnerable zones in which significant drinking water threats can be identified make up a relatively small portion of the source protection areas. The wellhead protection areas and intake protection zones represent vulnerable zones that require protection from identified significant drinking water threats. The pink areas that cover much of the map (intake protection zone 3) represent areas that receive little protection because contaminants in these areas are less likely to reach municipal water intakes.
Source: Ministry of the Environment, Conservation and Parks.
1.2.2 Identifying drinking water threats

Each source protection committee must identify the threats to their municipal drinking water sources. The regulation under the Clean Water Act lists the specific activities – such as discharging sewage, spreading fertilizer or storing road salt – that committees may deem to be a “drinking water threat” (see Table 1 for full list). Not all forms of these prescribed activities are considered threats. The Ministry of the Environment, Conservation and Parks’ (MECP) companion Technical Rules and Tables of Drinking Water Threats set out detailed constraints on the particular circumstances in which a prescribed activity can be identified as a drinking water threat.

Table 1. Prescribed threats to drinking water. There are 20 prescribed threats to water quality, and two threats that relate to water quantity. This report focuses on pollution to water, and therefore only focuses on threats to water quality.

<table>
<thead>
<tr>
<th>Prescribed Drinking Water Threats</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Waste</strong></td>
<td></td>
</tr>
<tr>
<td>Establishing, operating or maintaining a waste disposal site.</td>
<td>Disposing waste in landfill; storing PCBs, waste oil and other hazardous wastes.</td>
</tr>
<tr>
<td><strong>Sewage and Septic Systems</strong></td>
<td></td>
</tr>
<tr>
<td>Establishing, operating or maintaining a system that collects, stores, transmits, treats or disposes of sewage.</td>
<td>Building or operating a septic system, stormwater treatment pond, sewage treatment plant or sewer system; discharging effluent from an industrial facility.</td>
</tr>
<tr>
<td><strong>Agriculture</strong></td>
<td></td>
</tr>
<tr>
<td>Applying agricultural source material to land.</td>
<td>Storing animal manure or farm wash water; spreading these materials on farm land.</td>
</tr>
<tr>
<td>Storing agricultural source material.</td>
<td></td>
</tr>
<tr>
<td>Managing agricultural source material.</td>
<td></td>
</tr>
<tr>
<td>Applying non-agricultural source material to land.</td>
<td>Spreading sewage biosolids, pulp and paper biosolids, or waste materials from food processing on land.</td>
</tr>
<tr>
<td>Handling and storing non-agricultural source material.</td>
<td></td>
</tr>
<tr>
<td>Using land for livestock grazing or pasture land, for an outdoor confinement area, or a yard for farm animals.</td>
<td>Managing manure on fields from livestock grazing or from confinement areas outside barns.</td>
</tr>
</tbody>
</table>
### Fertilizer/Pesticides (on agricultural or non-agricultural lands)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applying commercial fertilizer to land.</td>
<td>Spreading synthetic or natural fertilizers containing nitrogen, phosphorus or potassium for crop growth.</td>
</tr>
<tr>
<td>Handling and storing commercial fertilizer.</td>
<td></td>
</tr>
<tr>
<td>Applying pesticide to land.</td>
<td>Spreading chemicals to control weeds (herbicides) or fungi (fungicides), such as on a golf course.</td>
</tr>
<tr>
<td>Handling and storing pesticide.</td>
<td></td>
</tr>
</tbody>
</table>

### Road Salt and Snow Storage

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applying road salt.</td>
<td>Spreading salt on roads and parking lots; storing salt in outdoor containment areas.</td>
</tr>
<tr>
<td>Handling and storing road salt.</td>
<td></td>
</tr>
<tr>
<td>Storing snow.</td>
<td>Storing piles of plowed snow that is contaminated with road salt and automobile fuel.</td>
</tr>
</tbody>
</table>

### Fuel Oil

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handling and storing fuel.</td>
<td>Handling or storing fuel at oil refineries, gas stations, marinas, farms or industrial sites with onsite fuel supplies; storing heating oil in below-grade tanks for homes or businesses.</td>
</tr>
<tr>
<td>Establishing and operating a liquid hydrocarbon pipeline¹ (prescribed as of July 1, 2018).</td>
<td>Operating a local or transboundary pipeline that carries oil or liquid gasoline.</td>
</tr>
</tbody>
</table>

### Contaminants from Commercial and Industrial Processes

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handling and storing a dense non-aqueous phase liquid.</td>
<td>Handling and storing dry-cleaning chemicals, paint and spot removers, rug cleaning fluids and varnishes.</td>
</tr>
<tr>
<td>Handling and storing an organic solvent.</td>
<td>Handling and storing paints, varnishes, lacquers, adhesives, glues, degreasing or cleaning agents, substances used to produce dyes, polymers, plastics, textiles and printing inks.</td>
</tr>
<tr>
<td>Managing the chemical run-off from the de-icing of aircraft.</td>
<td>Using ethylene glycol to de-ice aircrafts at airports.</td>
</tr>
</tbody>
</table>

### Threats to Water Quantity (*not reviewed in this report*)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taking water from a water body or aquifer without returning it to the source.</td>
<td>Taking water for water bottling, beverage manufacturing, food preparation, etc.</td>
</tr>
<tr>
<td>Engaging in an activity that reduces the recharge of an aquifer.</td>
<td>Increasing impervious cover of the ground, e.g., constructing a paved parking lot.</td>
</tr>
</tbody>
</table>

Source: Adapted from the Quinte Conservation Authority.
Once the committees have identified all potential threats, they must determine which of those threats have the potential to pose a significant risk (known as “significant drinking water threats”). Source protection plans must include policies to address all significant drinking water threats. Source protection committees must also determine which of the identified threats are moderate or low threats. Threat level is based on the “hazard rating” of the activity (the threat posed by the chemicals and/or pathogens) and the “vulnerability score” of the location where the activity occurs.

1.2.3 Developing source protection policies

Based on the information in the assessment report, each committee then develops a source protection plan. The plan must include a set of policies to address all identified significant drinking water threats, and may include policies to address other threats.

To address significant threats, committees can use an array of policy tools (see Table 2) ranging from strong regulatory tools (such as prohibiting or restricting activities in certain areas) to softer policy tools (such as education, outreach and best management practices). For moderate or low drinking water threats, committees may also create policies, but were not allowed to use the more powerful regulatory tools (collectively referred to as “Part IV tools”) to control them.

Only those policies that relate to significant threats can be legally binding. For example, a source protection committee can require a provincial ministry to amend an approval, such as an approval for a sewage treatment system, to address a significant drinking water threat, but for lesser threats, the committee may only ask the ministry to “have regard to” that policy.

Source protection plans must include policies to address all significant drinking water threats.

Source protection committees may also identify other activities that are not on the list of prescribed threats (or that do not meet the accompanying criteria) as a significant threat, but only if the MECP has confirmed the activity has a sufficiently high hazard rating. Indeed, several committees received permission from the ministry to identify oil pipelines as a local drinking water threat, despite pipelines not being on the initial list of prescribed threats (see section 1.5.1 for discussion of pipelines).

What about threats from historical contamination?

The primary intent of the Clean Water Act is to prevent drinking water problems arising from existing and future activities. The law does recognize that historical contamination may also pose a threat: the law defines “drinking water threats” to include not only an existing or future “activity,” but also a historical “condition” that presents a current or future risk to a drinking water source. However, the Clean Water Act provides only limited tools to deal with historical contamination. See section 1.5.4 for a discussion of the challenges of addressing historical conditions.

Photo credit: LeoPatrizi, (iStock standard licence).
### Table 2. Overview of source protection policy tools.

<table>
<thead>
<tr>
<th>Policy Tool</th>
<th>Applicability</th>
<th>Policy’s Legal Effect</th>
<th>Implementing Body</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part IV tools – may only be used to address significant threats</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prohibitions</strong>&lt;br&gt;The most powerful tool available. Committees can outright prohibit certain activities in designated vulnerable areas.</td>
<td>May apply to existing or future activities.</td>
<td>Legally binding (no prohibited activities may continue or start).</td>
<td>Local risk management inspectors are responsible for ensuring compliance with this policy.</td>
</tr>
<tr>
<td><strong>Risk Management Plans</strong>&lt;br&gt;Committees can require risk management officials to negotiate a risk management plan (a legally enforceable negotiated agreement) with a business or property owner, that would require the person to reduce the threat posed by an activity (e.g., require better storage containment). For more information, see section 1.4.2.</td>
<td>May apply to existing or future activities.</td>
<td>Legally binding (activities may not continue or start without an approved risk management plan).</td>
<td>Local risk management officials approve plans; risk management inspectors ensure compliance.</td>
</tr>
<tr>
<td><strong>Land Use Restrictions</strong>&lt;br&gt;Committees can restrict municipal authorities from approving certain Planning Act applications or issuing building permits for activities that would be a significant threat, unless safeguards are in place.</td>
<td>May only apply to future activities in vulnerable areas.</td>
<td>Legally binding (municipal authorities must follow policy).</td>
<td>Municipal planning approval authorities.</td>
</tr>
<tr>
<td><strong>Other policy tools – may be used to address any threats (significant, moderate or low)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prescribed Instruments</strong>&lt;br&gt;Committees can require provincial ministries to review certain instruments (e.g., approvals or permits) and, as necessary, amend the instruments to manage threats. They can also require ministries to revoke or refuse to issue instruments for prohibited activities.</td>
<td>May apply to existing and future activities, as well as historical conditions.</td>
<td>Legally binding for significant threats only (ministry need only “have regard to” the policy for other threats).</td>
<td>Provincial ministries (Environment, Conservation and Parks; Natural Resources and Forestry; and Agriculture, Food and Rural Affairs).</td>
</tr>
<tr>
<td><strong>Land Use Planning (Official Plan and Zoning By-Law Conformity)</strong>&lt;br&gt;Committees can require municipalities to amend their official plans and zoning by-laws to reflect prohibitions against the establishment of certain threat activities or restrictions in designated vulnerable areas.</td>
<td>May apply to existing or future activities.</td>
<td>Legally binding for significant threats only (municipality must amend its official plan and zoning by-laws to conform with policies for significant threats).</td>
<td>Municipalities.</td>
</tr>
<tr>
<td><strong>Other “soft” policies (e.g., education, incentives, promoting best management practices, etc.)</strong>&lt;br&gt;May apply to existing or future activities, and in some cases to historical conditions.</td>
<td>Legally binding on some (but not all) bodies, only for significant threats.</td>
<td>Various implementing bodies.</td>
<td></td>
</tr>
</tbody>
</table>
1.2.4 Implementing source protection policies

Each policy within a source protection plan assigns an implementing body – such as a local conservation authority, municipality or provincial ministry – that is responsible for implementing that policy (see Table 2 above). Each policy also sets out implementation deadlines by which the responsible body must complete the assigned tasks (see Table 3). As a general rule, most policies apply immediately for new activities, and provide two to three years for bodies to apply the policies to existing activities. Some policies, however, need longer implementation timelines, such as those that require amendments to municipal official plans or zoning by-laws.

Table 3. Sample implementation deadlines from some source protection policies (although actual dates vary).

<table>
<thead>
<tr>
<th>Policy Tool</th>
<th>Timeline For New Activities</th>
<th>Deadline For Existing Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prohibitions</td>
<td>Apply immediately.</td>
<td>2-3 years.</td>
</tr>
<tr>
<td>Risk management plans</td>
<td>Required immediately.</td>
<td>3-5 years.</td>
</tr>
<tr>
<td>Land use restrictions</td>
<td>Apply immediately.</td>
<td>n/a</td>
</tr>
<tr>
<td>Prescribed instruments</td>
<td>Ministries must ensure new instruments conform with source protection plan.</td>
<td>Ministries have 2-5 years to ensure all pre-existing instruments conform with source protection plan.</td>
</tr>
<tr>
<td>Land use planning</td>
<td>Day-to-day land use planning decisions apply immediately when plan takes effect. Official Plan conformity must occur by the earlier of: a) end of the next 5-year official plan review, or b) 5 years. Some committees provided the same deadline for zoning by-law conformity, others provided an extra 2-3 years after the official plan amendments to amend the by-laws.</td>
<td></td>
</tr>
<tr>
<td>Other policies (education, incentives, etc.)</td>
<td>Education and outreach policies and incentive activities must have at least begun within 2-3 years.</td>
<td></td>
</tr>
</tbody>
</table>

1.3 Review of select source protection policies: what the ECO found

Ontario’s Clean Water Act came into force in July 2007, kicking off almost a decade of intensive planning work across much of Ontario. By December 2015, after eight years of hard work, the source protection committees had completed, with ministry approval, all 38 source protection plans, containing over 12,500 source protection policies. These policies are now being implemented to protect those limited areas across the province that are classified as municipal drinking water vulnerable source areas (see section 1.4).

The ECO looked at a selection of source protection policies (see What the ECO reviewed), and held discussions with key stakeholders, to examine how source protection committees applied the drinking water protection tools given to them under the Clean Water Act. This section looks at three categories of drinking water threats – manure storage and spreading, waste sites, and fuel handling and storage – and the policy tools that the various committees used to address these threats.
The local planning process proved to be a generally effective approach to managing drinking water risks, while addressing local needs and circumstances. Where we found shortcomings in how the source protection policies addressed drinking water threats, the problem lay not in the source protection committees’ implementation, but with the limitations of the province’s source protection rules themselves (see sections 1.5.3 and 1.5.4 for a discussion of what’s missing).

**What the ECO reviewed**

The source protection process resulted in 38 source protection plans, containing over 12,500 source protection policies. With so many policies, the ECO could not look at every source protection policy in detail, not even within a limited number of source protection plans.

Therefore, the ECO selected three representative drinking water threats to review: manure and other agricultural source materials, waste disposal sites, and fuel. These threats were chosen to represent a variety of issues that affect different types of properties (agricultural, industrial, residential) and that require different types of management strategies. The ECO then selected eight representative source protection plans in a range of geographic areas (see Figure 4), comprising both urban and rural watersheds, and reviewed all policies in those eight plans that addressed the selected threats.

Altogether, the ECO reviewed over 500 policies in detail. The ECO also reviewed the explanatory documents that accompany each source protection plan, which provided valuable insight into each committee’s rationales for the approaches selected to manage threats based on their particular circumstances and geographic conditions.

Finally, the ECO interviewed a number of people active in the source protection regime during 2016 and 2017, including representatives from conservation authorities, municipalities, the Ministry of the Environment, Conservation and Parks, and the Ministry of Agriculture, Food and Rural Affairs. These interviews assisted the ECO in identifying issues and understanding the perspectives and rationales behind certain approaches taken to source protection planning and implementation.

**Figure 4.** The eight source protection plan areas reviewed by the ECO. These are: 1) Lakehead Region; 2) Mattagami Region; 3) Grand River; 4) Saugeen Valley, Grey Sauble, Northern Bruce Peninsula; 5) Credit Valley, Toronto and Region and Central Lake Ontario (CTC); 6) Halton Region and Hamilton Region; 7) Quinte Region; and 8) Raisin-South Nation.

Source: Ministry of the Environment, Conservation and Parks, Source Protection Programs Branch, base map provided by Microsoft Bing, graphic compiled by the ECO.
1.3.1 Source protection committees created balanced policies to protect drinking water

A central feature of the Clean Water Act is its focus on local, watershed-based planning. A local-led approach can be resource intensive and time consuming, and also runs the risk of creating uneven protections, especially if there is potential for undue pressure from local influences. The ECO’s review of select plans, however, found that source protection committees applied the local planning approach effectively to develop thoughtful, individualized plans to protect the drinking water within their watershed.

The committees proved to be committed and capable arbiters of the wide variety of issues at play.

The ECO was impressed with how the committees – and in particular the conservation authorities in their leadership role as source protection authorities – executed their responsibilities. The committees proved to be committed and capable arbiters of the wide variety of issues at play when deciding on which policy approach to apply. In particular, the committees demonstrated careful weighing of the financial consequences of imposing various requirements, without sacrificing the ultimate goal of drinking water safety.

As expected, the plans resulted in some variation in the policies being used across the province, as each committee took its own tailored approach to managing threats based on the local environmental and social circumstances of each area. In some cases, the localized approach allowed committees to “think outside the box” and create unique policies that addressed threats without being overly restrictive or cumbersome. This nimble approach would not have been possible if source protection planning occurred only at the provincial level.

As a general rule, committees sought to use the least intrusive policy tool that could achieve the goal of source protection. For example, committees made use of existing tools to manage drinking water threats (such as adding a new condition into an already-issued permit) wherever possible, rather than create a whole new tool that could potentially duplicate efforts, create conflicts or add unnecessary burdens. Committees also prioritized policies that would allow current activities to continue, by regulating rather than outright prohibiting an activity, wherever possible – for example, by requiring better storage containment of a chemical and more inspection activity (see the detailed discussions of how committees addressed select threats in sections 1.3.2, 1.3.3 and 1.3.4 below).

Another feature of the local source protection planning approach was that it enabled committees to go further than a province-wide standard might have reached. While committees were only required to develop policies to address “significant” threats to drinking water, many source protection committees opted to go beyond the minimum requirements to include policies to address lesser, but still relevant, threats as well.

Further, the watershed-based committee approach helped to get local “buy-in” to the new source protection requirements. Based on the ECO staff discussions with various stakeholders, there seemed to be a generally high level of satisfaction with the process and the outcomes.

Source protection committees were able to collect a wealth of valuable information about our water resources.
Lastly, the ECO’s review revealed a remarkable level of detail in the assessment reports and source protection plans. The conservation authorities, in their role as source protection authorities, and the source committees did an enormous amount of work assessing their watersheds and identifying threats. Because of the Clean Water Act process, and the associated funding provided to source protection authorities and committees to support those efforts, source protection committees were able to collect a wealth of valuable information about our water resources. This knowledge— including water maps, water budgets, and information about water quality and quantity trends, stresses and risks— provided immense value both within and outside the source protection program. Conservation authorities have used the information gained through the source protection process as they fulfill their other duties to protect water resources, beyond just drinking water sources.

1.3.2  How committees addressed drinking water threats from manure

Farmers apply nutrient-rich materials, such as fertilizers and manure, to their fields to help crops grow. Such materials can greatly improve soil quality, but they can also pose a serious threat to drinking water if they are not properly managed, as nutrients and bacteria can run into and degrade nearby or underground water. Nutrients in manure and other fertilizers can contribute to algae blooms, which can pose a serious threat to drinking water, as well as harm water bodies in other serious ways (see Chapter 2). Bacteria in manure can cause illness or even death if bacteria-contaminated water is consumed. Indeed, farm manure was the source of the contamination that led to the Walkerton tragedy (see section 1.1). For this reason, the ECO chose the storage and application (i.e., spreading) of manure and other “agricultural source materials” as the first category of drinking water threats we examined.

Policy tools used to address manure threats

To address significant threats to drinking water from manure and other agricultural materials, most of the source protection committees relied on the province’s existing nutrient management framework as the foundation for its policies (see Regulation of manure under the Nutrient Management Act).

The Nutrient Management Act regulates the storage and use of manure, but only on some farms.
Regulation of manure under the Nutrient Management Act

The Nutrient Management Act, 2002, regulates the storage and use of manure in Ontario, but only on some farms. This law requires large or expanding livestock farms to develop a nutrient management strategy for storing and transferring manure to other farms, and requires the larger livestock farms to also develop a nutrient management plan to manage the spreading of manure on land. Nutrient management strategies and plans must be developed by a certified nutrient management planner. The strategies must be submitted, and in most cases approved, by the Ministry of Agriculture, Food and Rural Affairs (OMAFRA), whereas plans are neither submitted nor approved. The law also sets out some standard rules, such as restrictions on the spreading of manure on snow-covered or frozen land, for those farms that are subject to nutrient management plans.

Only 6,513 farms out of 19,409 livestock operations in Ontario are required to prepare and follow a nutrient management strategy. Of those 6,513 farms, 1,303 large operations must also prepare and follow a nutrient management plan (see Figure 5). Since smaller farms (such as the farm that was the source of contamination in Walkerton) are not captured, these rules only catch about 34% of Ontario’s livestock operations, 6% of the farms that spread manure, and 44% of Ontario’s total manure by volume. In other words, the Nutrient Management Act does not protect Ontario’s water from most of Ontario’s manure.

Figure 5. Proportion of farms regulated for manure management (storage and spreading) under the Nutrient Management Act.

Source: Created by the ECO, based on data from Statistics Canada and the OMAFRA.
Most source protection committees took a two-part approach: for farms in vulnerable areas that are already required to have a nutrient management strategy and/or nutrient management plan, many directed the OMAFRA to review these strategies and add conditions as necessary to address the drinking water threats; for farms in vulnerable areas that are not required to have a nutrient management strategy/plan, they directed those farms to prepare and implement a risk management plan that mirrors a nutrient management strategy/plan.

A few source protection committees went further and required all farms that spread agricultural source materials in vulnerable areas to prepare a risk management plan, even if they already have a nutrient management strategy and/or plan in place. However, the Clean Water Act rules provides that where a farm is subject to a nutrient management strategy or plan, rather than developing a risk management plan, the farm may obtain a “statement of conformity” (stating that the plan complies with the source protection policies) from a certified nutrient management planner instead. The responsibility to ensure nutrient management plans comply with source protection policies falls entirely on the farmer and the certified planner retained by the farmer. Neither the OMAFRA nor the risk management officials can require that conditions be added to a nutrient management plan.

Some committees set out specific provisions that must be included in a risk management plan. As one example, the Credit Valley, Toronto and Region and Central Lake Ontario (CTC) Source Protection Committee set out requirements for soil testing to ensure that no more agricultural source materials than necessary is applied, and set limited application periods to reduce the amount of runoff.

The source protection committees expressed confidence that the nutrient/risk management plan approach would effectively and efficiently manage threats from manure application, while making good use of a tool that is already familiar to the farming community, is easy to implement, and would not duplicate existing requirements.

Nonetheless, most committees also included some prohibitions against manure spreading in certain areas as an additional safeguard. For the most part, these prohibitions only apply to areas near wellheads where manure spreading is already prohibited under the Nutrient Management Act, or to very small additional areas. Source protection committees sought to apply prohibitions narrowly to avoid impacting existing farming operations.

**Policies should reduce manure threats to municipal drinking water, but monitoring for effectiveness is key**

The approach taken by the source protection committees to manage the threats posed by manure spreading is consistent with the government’s general approach to regulating agriculture: to minimally intrude on farming practices and minimize any regulatory burden. The source protection committees imposed some additional, but not overly onerous, requirements on manure spreading – with some committees pushing the boundaries further than others – that should reduce the risk of manure contamination to municipal drinking water sources.

The expansion of nutrient management requirements to more farms, whether through more nutrient management plans or through similar-functioning risk management plans, is a positive step. The ECO has long expressed disappointment about the limited coverage of the nutrient management framework, so capturing more farms, especially farms in higher-risk areas that may affect drinking water, is welcome progress.

The committees’ rationale for relying on expansion of the existing nutrient management approach is...
understandable; however, this rationale assumes that the existing nutrient management approach is working well. This is not necessarily a safe assumption. Both the ECO and Ontario’s Auditor General have raised concerns in the past about weak inspection and enforcement of the nutrient management framework. These concerns remain. In 2016/2017, the MECP conducted 174 nutrient management inspections and found a mere 38% of the inspected farms were fully compliant with their strategies and plans. The ECO has also noted that there is no available data to show whether, or to what extent, this regulatory framework, which has been in place for over 15 years, is in fact working effectively to reduce runoff of manure and other agricultural materials.

Additionally, the rules under the Clean Water Act prevent risk management officials from implementing source protection measures on farms subject to the Nutrient Management Act, raising further concerns about the reliance on the existing nutrient management framework to address source protection. While risk management officials and inspectors are not allowed to implement and enforce source protection measures on these farms, neither are the OMAFRA or the MECP, who are ostensibly responsible, ensuring it is done. The ECO urges the ministry to address this gap as part of its process of continual improvement (see section 1.5.3).

Still, some of the benefits of the source protection program is increased inspection and enforcement of some farms by the local risk management inspectors, and increased effectiveness monitoring and reporting by the source protection committees (see section 1.4.5) in the limited areas that the source protection policies cover. In a few areas, the MECP or municipalities are monitoring and sampling some water sources for manure contamination. Ideally, such monitoring data should help identify if manure contaminant levels are decreasing, and in turn, help source protection committees determine if indeed this nutrient management approach is effective or if, conversely, these policies need to be revised. However, funding and support for more monitoring is needed (see section 1.5.5).

Assessments by the source protection committees, based on monitoring data, can hopefully provide insight into not only the effectiveness of the nutrient management framework for source protection, but also more generally the effectiveness of nutrient management rules to reduce farm runoff to other water bodies outside of vulnerable source protection zones, particularly in regions with algae problems (see Chapter 2).

### 1.3.3 How committees addressed drinking water threats from waste

The second category of drinking water threats the ECO looked at was waste disposal sites. This category includes ten sub-categories of activities, such as landfiling waste, storing and handling hazardous wastes, and applying untreated sewage waste to land. All of these activities can potentially contaminate water sources with chemicals or pathogens. For example, decomposing waste in a landfill can produce a liquid called “leachate” that, in the absence of a well-functioning leachate collection system, can contaminate the surrounding groundwater with metals, chlorides, chemicals and other toxic chemicals from the waste. Storage of chemical wastes similarly carries serious risks, as a leak in the storage drum or accidental spill of a storage container could result in dangerous chemicals, such as PCBs, pouring into the environment.

#### Policy tools used to address waste threats

Most waste activities are already regulated by the MECP, typically through an environmental compliance approval that imposes terms and conditions on the waste operations. The source protection plans reviewed by the ECO all took advantage of this existing approval process, as an efficient tool to manage drinking water threats from waste. Where there were waste sites currently operating in vulnerable areas, the committees required the MECP to review and, if necessary, amend the approval for these waste sites to include terms and conditions that would address any significant threats to the drinking water.
When it came to potential future waste sites, nearly every committee choose to go further. Almost all of the plans reviewed directed the MECP to refuse to issue an approval for the future establishment of a waste disposal site that would be a significant threat. Only one committee, the Mattagami Source Protection Committee, chose instead to direct the MECP to include conditions in any approval of a future waste site to ensure the site never becomes a significant threat. As an extra measure, four of the plans reviewed included land use policies that require municipalities to amend their official plans and zoning by-laws to prohibit future waste disposal sites within vulnerable areas where they could be a significant drinking water threat.

To manage the remaining waste threats that are not subject to environmental compliance approvals (such as short-term storage of some industrial wastes), the source protection committees employed a much greater variety of approaches. Several of the committees chose to require existing owners of these wastes to implement risk management plans, and to prohibit any such future waste sites from occurring within vulnerable areas. Many of the committees also included complementary restricted land use policies, which serve as a flag to municipal planning departments to screen for requirements for risk management plans or prohibitions before processing Building Code or planning applications in designated areas. Other committees relied on outreach efforts to address some waste threats, such as educating the public and businesses about proper storage and disposal of small quantities of hazardous waste.

Policy tools used to address historical contamination from waste sites

In addition to the threats posed by current waste activities, historical waste sites can also pose a threat. In particular, old landfills that predate modern engineering requirements (such as impermeable liners) can remain a problem for decades long after closure, continuing to leak contaminants into the soil and groundwater.

There are numerous old, closed landfills dotting the province. However, of the plans reviewed, only one plan – the Quinte Source Protection Plan – identified a significant threat posed from historical waste sites. Quinte’s assessment report identified that contamination from two closed landfill sites, one in Picton and one in Belleville, could present a risk to drinking water intakes. The policy tools available to address past contamination are limited (see section 1.5.4). Using the few available tools, the Quinte plan directed the municipalities to monitor water samples and if necessary take remedial action, and asked the MECP to issue appropriate instruments (e.g., Director’s Orders) that should include requirements for monitoring and remedial actions.

Waste policies reflect a reasonable balancing of the varying risk levels and cost factors

The approaches taken by the committees to address waste threats appear reasonable. The committees’ general reliance on the existing MECP approval process to manage threats from most waste sites is appropriate, given that this established process is well-suited to regulating contaminants from present and future waste operations.

The broader variety of policies used to address the remaining waste operations (i.e., those not subject to MECP-approvals) reflects the committees’ differing
circumstances. This variability included a wide range in actual risks from these particular waste threats in each committee’s respective watershed. For example, the Grand River Source Protection Committee identified 159 waste disposal activities as potential significant threats to its municipal water sources. The Halton-Hamilton committee, on the other hand, stated that there are no existing waste activities that posed a significant threat to their municipal water sources (but still included policies to ensure that future waste activities do not become significant threats).

The variability also included a range in the committees’ cost-benefit analyses of applying different management approaches. For example, Haldimand County (within the Grand River) choose to implement an education and outreach program on the proper handling, storage and disposal of wastes, rather than using stronger tools, such as requiring risk management plans. Haldimand County explained that its rationale for taking this approach was based on a concern about the financial burden of implementing risk management plans, for both the county and the affected property owners, particularly relative to the level of risk to their drinking water sources.

The CTC Source Protection Committee similarly relied on education and outreach to manage threats from waste storage, describing the volume of such waste threats as typically small (e.g., a few litres of residues left in storage drums, and battery and paint piles at recycling depots). The committee concluded that this approach “is an appropriate balance between protecting the municipal source of drinking water and avoiding the workload burden on the Risk Management Official and costs to landowners that would result from requiring a Risk Management Plan.” However, the committee also noted that it did not have a full understanding of what was included in this threat subcategory, and that once the full extent of the threat subcategory became clearer, the committee may reconsider this policy approach in future plan updates.

Overall, the committees’ choices of policy tools appear to reflect a fair balancing of factors to ensure that reasonable measures are in place to protect their drinking water from contamination from waste. However, whether the policies are adequately addressing waste threats will be determined over time through the monitoring of waste management practices (i.e., if inspectors are seeing proper waste storage practices), through the provincial spills reports (i.e., if overall numbers of spills from waste threats in vulnerable areas are decreasing), and in the sampling results of any source water areas that are currently contaminated by waste threats (i.e., if the levels of relevant contaminants are decreasing). This information will emerge as source protection implementation continues (see section 1.4).

1.3.4 How committees addressed drinking water threats from fuel

The third category of drinking water threats the ECO looked at was the storage and handling of fuel. This category covers most – but not all – places where liquid fuels (such as oil or propane) are produced, sold or stored. It includes petrochemical refineries, gas stations, farms or industrial facilities that have on-site fuel supplies, as well as small below-grade or partially below-grade tanks, such as those used to store heating oil for homes and small businesses (including tanks buried underground as well as tanks stored in basements). At the time that the committees were preparing the source protection plans, the Clean Water Act’s list of prescribed drinking water threats and the accompanying tables of circumstances for identifying threats specifically excluded fuel pipelines as well as smaller above-grade fuel tanks, such as outdoor tanks used to store home heating oil (see sections 1.5.1 and 1.5.3 for a discussion of the subsequent revisions to pipelines and above-grade fuel tanks, respectively).

Fuel handling and storage is a drinking water threat because fuel, which is toxic, may spill during transfer from one vessel to another or may leak from a faulty storage tank, and contaminate nearby water sources. Fuel spills and leaks are unfortunately quite common, presenting a real risk to drinking water, as well as having
other environmental and economic consequences. Oil contamination can persist in the soil and groundwater for decades, can migrate long distances through surface water, and can be costly to clean up (see, for example, Home heating oil spills in the Kawartha Lakes).

Home heating oil spills in the Kawartha Lakes

The City of Kawartha Lakes, known best for its 250 beautiful lakes and rivers, is also known for a significant and costly fuel spill that occurred in 2008. A homeowner noticed oil pooling on his basement floor shortly after the oil tanks for his furnace had been filled with 700 litres of heating oil. The oil made its way to a crack in the basement wall and into the soil under the house. Several hundred litres of oil seeped into the soil, onto neighbouring property owned by the city, into drainage culverts and the stormwater sewer system, and ultimately into Sturgeon Lake. The oil damaged 300 metres of shoreline, resulting in a temporary drinking water advisory for those residents.

The homeowner made an insurance claim, but his insurance funds ran out long before remediation was complete. The Ministry of the Environment (controversially) ordered the city to clean up and contain the contamination, at great expense to the city. The remediation – including removing the oil from the shores of Sturgeon Lake, removing over 70 tonnes of contaminated soil from under the house, and demolishing the house in the process – took over a year and cost municipal taxpayers almost $2 million.

In May 2018, almost a decade later, yet another fuel spill of home heating oil occurred in the City of Kawartha Lakes, this time in Balsam Lake. The spill prompted a drinking water advisory for residents in the southern part of the lake, impacting about 100 properties, that lasted over a week while the oil was cleaned up.

Policy tools used to address fuel threats

All source protection plans reviewed by the ECO addressed the threat posed by industrial and commercial fuel storage and handling in a similar way. The committees generally required existing facilities that store over 2,500 litres of fuel on site to have a risk management plan. To prevent future fuel threats from arising, most committees used a combination of prohibitions (e.g., prohibiting future gas stations or bulk storage facilities over 2,500 litres in designated areas) and requiring facilities to develop a risk management plan.

Most committees supplemented the prohibitions and risk management plans with additional policies, which varied from plan to plan. For example, many committees included complementary restricted land use policies, which serve as a flag to municipal planning departments to screen for source protection restrictions before processing Building Code or planning applications in designated restricted areas. A few committees required municipalities to amend their official plans and zoning by-laws to limit future threats, such as imposing size restrictions on new fuel tanks, or requiring new facilities to follow defined best management practices.

When it came to the smaller fuel oil tanks used by residences and small businesses...
partially below-grade tanks, typically under 1,250 litres), the source protection committees diverged in their approaches.

Several plans reviewed by the ECO required some homeowners in designated areas to complete a risk management plan for their home fuel tanks. For example, the Quinte Source Protection Committee explained that, while it had initially intended to use only an education and outreach program to manage the risks from residential fuel tanks, based on input from experts in the committee’s fuel working group, it decided ultimately to require risk management plans for existing fuel tanks and to prohibit future tanks in the most vulnerable areas to reduce drinking water threats. Most of these plans also included policies directing municipalities, conservation authorities or others to develop education and outreach programs to minimize fuel threats.

Conversely, some other plans excluded small tanks (under 2,500 litres) from the requirement for a risk management plan, and relied exclusively on education and outreach programs to manage these threats. The CTC Source Protection Committee, which used this approach, explained that requiring the risk management official to “negotiate Risk Management Plans at potentially hundreds of single family homes and small businesses would be a large administrative burden and divert resources away from developing Risk Management Plans for other threat activities...”21

Generally, all of the education and outreach policies focus on educating homeowners, businesses and others about the risks associated with fuel tanks, and explaining what they should do in the event of a fuel leak or spill. For example, the Halton-Hamilton Source Protection Plan directs that businesses and homeowners be given instructions on proper spill response measures, including when and how to contact the MECP’s Spills Action Centre (the provincial body that provides emergency response services in the event of a fuel leak or spill), as well as stickers with emergency phone numbers to be placed on or near fuel tanks and pipes for quick contact if there is a spill or leak.

A number of the committees included additional, mostly non-binding, policies to address fuel-related emergencies more generally. For example, Quinte requested that the MECP’s Spills Action Centre update spill response procedures and emergency response plans in designated areas, and that municipalities update emergency response plans, spill contingency plans and spill prevention plans in designated areas. Halton-Hamilton, among many others such policies, requested that the MECP instruct facility owners to update emergency preparedness and contingency plans to include the location of municipal intakes and other details.

**Committees took reasonable approach to address fuel threats, but revealed gaps in the rules**

While there was some variability in how committees managed fuel threats, particularly from smaller tanks, the ECO believes that all committees took a reasonable approach addressing these threats using the powers and tools available to them. The implementation of risk management plans, along with better educating fuel tank owners about good maintenance practices and appropriate responses to leaks or spills, should reduce both the risk of oil spills and the impact of spills on the environment when they do occur. As source protection implementation continues (see section 1.4), the ongoing monitoring of fuel threats and sampling of contaminants in source water should help source protection committees determine if these measures are working effectively to reduce fuel spills and their impacts on water resources.

Several gaps in the source protection rules prevented the committees from being able to efficiently or fully address all threats from fuel.
However, several gaps in the source protection rules prevented the committees from being able to efficiently or fully address all threats from fuel. Specifically, a number of committees identified the following three major gaps:

- The list of prescribed drinking water threats did not include fuel pipelines. A few committees did include pipelines in source protection policies through an alternate process of identifying local threats that required the MECP's permission; however, the omission of pipelines on the list of prescribed threats made it more difficult for committees to identify them as a significant threat, and also made it more likely that other committees overlooked them as potential threats.

- Under the rules that set out circumstances for prescribed drinking water threats, committees could not identify smaller above-grade fuel tanks as potential significant threats, and as such, could not develop legally binding policies to effectively address these threats, even though spills from such tanks are comparatively common and can create substantial contamination.

- None of the licences or approvals issued by the Technical Standards and Safety Authority (TSSA), which is the primary regulator of fuel handling in Ontario, are subject to the Clean Water Act. Therefore, committees could not require the TSSA to review licenses or include conditions to reduce the risk of fuel spills to source water, or more generally compel the TSSA to implement source protection policies. Several committees expressed concern about their inability to rely on the primary regulator and technical expert for fuel handling to address fuel risks.

These three shortcomings in addressing fuel threats in the source protection plans lie not with any failing of the source protection committees, but rather with the provincial rules. When these concerns were flagged, the MECP did subsequently revise some of the rules and regulations regarding fuel threats. The ministry’s revisions partially address the identified shortcomings (see section 1.5.1), but substantial gaps remain. The ECO urges the ministry to fully address these gaps as part of its process of continual improvement (see section 1.5.3).

1.4 Source protection on the ground: what’s been done so far?

The eight-year process of developing assessment reports and source protection plans was just the beginning. The next step is implementing all of these source protection policies. Over the last few years, provincial ministries, conservation authorities, municipalities, businesses, farmers and homeowners have been busy executing the thousands of individual actions included in the 38 source protection plans to protect municipal drinking water sources across much of the province.

Implementation timelines vary based on when each source protection plan came into effect, and based on the specific policy, but generally, most source protection areas are at least half-way through the timelines for initial plan implementation. And so far, implementation of source protection policies is on track and progressing well.

The source protection process is resulting in a lot of on-the-ground action that should over time reduce the risk of spills and discharges to our municipal drinking water sources (see How to measure if the Clean Water Act is protecting drinking water). This section highlights a small sampling of the many source protection actions.
Implementation of source protection policies is on track and progressing well.

that have been taken over the last few years to reduce the risk of spills, accidents and chronic leaking of contaminants into municipal source water.

How to measure if the Clean Water Act is protecting drinking water

The Clean Water Act is intended to prevent current and future threats to drinking water. If source protection measures are working, they should be preventing both the chronic leaking of contaminants into drinking water sources and the catastrophic accidental spills of contaminants into drinking water sources, as well as improving spill response measures if contaminants do get into water sources.

Demonstrating the effectiveness of source protection to prevent drinking water problems can be difficult: if no accident occurs, we can never prove that the source protection measures worked to prevent a spill that might otherwise have happened. However, source protection, if it is working, should result in some observable improvements, such as a reduction of contaminants that are discharging into a raw municipal water supply or an overall reduction in the number of serious spills in or near water. For some chronic issues, it could take decades to achieve reductions of the contaminants in the drinking water sources.

Nonetheless, a few committees have already reported decreases in some contaminants at their municipal drinking water supplies. For example, the Cataraqui Source Protection Area’s 2018 progress report stated that testing of the raw water supply at five municipal wells or intakes that had identified contamination issues in 2011, showed a decrease in contaminants of concern at three of those water sources, with two maintaining similar trends (see Table 4).

It is still early days, generally too soon to observe the effects of these actions, but some early indicators are positive. As implementation continues, the committees’ monitoring and annual progress reports (see section 1.4.5), as well as other provincial program monitoring, such as spills reports from the MECP’s Spills Action Centre, should more fully reveal the level of effectiveness of the source protection process.

Table 4. Contaminants of concern at municipal wells or intakes with identified contamination issues in the Cataraqui area, in 2011 and 2017.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Brockville</td>
<td>E. coli</td>
<td>E. coli</td>
</tr>
<tr>
<td>Fairfield (Amherstview)</td>
<td>Total coliform</td>
<td>None</td>
</tr>
<tr>
<td>Bath</td>
<td>Organic nitrogen and E. coli</td>
<td>Total coliform and E. coli</td>
</tr>
<tr>
<td>Cana (well supply)</td>
<td>Sodium, chloride, total coliform, and E. coli</td>
<td>None</td>
</tr>
<tr>
<td>Miller Manor (well supply)</td>
<td>Sodium, chloride, nitrate, E. coli, and total coliform</td>
<td>None</td>
</tr>
</tbody>
</table>

1.4.1 Incorporating source protection into provincial approvals

Most source protection plans required provincial ministries to ensure that certain prescribed instruments (e.g., environmental approvals or licenses) include source protection provisions. For example, many plans required the MECP to review its approvals for any waste disposal site that is or may become a significant threat, and to amend the terms and conditions of these approvals as needed to ensure that the site ceases to be or never becomes a significant threat.

To comply with these policies, the various ministries responsible for these instruments have developed practices to ensure that all new approvals comply with applicable source protection policies. The ministries have also been reviewing and, as appropriate, amending existing instruments to ensure they too conform with source protection policies.

For example, the MECP published new Standard Operating Policies in 2015, which set out how the ministry would fulfill its duties to implement source protection policies. Specifically, the MECP’s Standard Operating Policies established screening procedures for new applications for prescribed instruments and guidelines for ministry staff to ensure new instruments meet all relevant source protection policies. The MECP also created instrument-specific guidance for reviewing existing instruments to ensure they conform with source protection policies.

As of April 2018, the MECP has amended 18 instruments to include new requirements or restrictions, reducing the threat that these activities pose to drinking water supplies. The MECP is required to review and, as needed, amend all relevant prescribed instruments within three years of the governing source protection plans’ effective dates. The ministry states that it is on track to meet that deadline, which runs until July 2019. By April 2018, the ministry had screened 528 prescribed instruments, with an estimated 600 more to screen, to determine if they pose a significant threat to drinking water sources. Of the 528 instruments screened, the ministry determined that 149 of those regulate activities that pose a significant threat to municipal drinking water sources; the ministry is currently reviewing these 149 approvals to determine what amendments, if any, are needed. As of April 2018, the MECP has amended 18 instruments to include new requirements or restrictions, reducing the threat that these activities pose to drinking water supplies.

Several committees also directed the OMAFRA to review instruments under its jurisdiction – namely, nutrient management strategies and “non-agricultural source material plans” (required for the spreading of non-farm materials like biosolids) – and, as needed, to add conditions to those instruments to protect drinking water sources. In April 2018, the OMAFRA reported to the ECO that the ministry had completed a detailed review of all existing nutrient management strategies and non-agricultural source material plans identified by source protection committees and found that very few needed revision. In all, the ministry determined that only ten might not conform with local source protection policies, and thus, based on further review, may need new conditions (such as requiring the farmer to relocate its temporary field storage of manure). The small number of amendments is because few nutrient storage areas were identified in vulnerable areas, and the existing nutrient management strategies should have, if they were developed properly, already included basic provisions to avoid contamination of drinking water sources.

While the source protection process did not trigger the OMAFRA to amend many pre-existing instruments, it does expand nutrient management coverage to more farm properties that were previously unregulated (see section 1.3.2). The OMAFRA initiated a process in 2015 for ensuring that any new nutrient management strategies submitted to the ministry conform to the requirements of applicable source protection policies. Just as importantly – as most nutrient management...
plans are not subject to ministry review and approval – the OMAFRA included source protection principles into its nutrient management certification training program for farmers and consultants who develop nutrient management plans and strategies. The training is intended to ensure that drinking water protection measures are included in the plans and strategies of all applicable farm operations. Some certified nutrient management planners have indicated, however, that due to the volume of new information, more training and support is needed (see section 1.5.3).

1.4.2 Local risk management officials and inspectors implementing the regulatory tools

All municipalities within source protection areas are required to appoint “risk management officials” and “risk management inspectors” to implement and enforce the prohibitions and restrictions (the “Part IV” regulatory tools) on local activities as set out in the source protection policies. Some municipalities chose to add the risk management official and inspector responsibilities to existing positions within their workforce, while others created new, dedicated positions for these roles, and others delegated this responsibility to the local conservation authority.

Every risk management official and inspector is required to take a four-day training course developed and delivered by the MECP. The MECP reported in 2016 that the ministry had trained the initial cohort of over 250 risk management officials and inspectors, preparing them for their responsibilities. In addition to this general training, the OMAFRA provided a special training session for risk management officials working on farms, and continues to share ongoing information with them on nutrient management issues.

According to the source protection annual progress reports submitted so far, local risk management officials have established over 500 risk management plans, which set out measures to reduce the risk of contamination to municipal drinking water sources. These risk management plans are one of the key tools of the Clean Water Act to manage activities that pose a threat to drinking. They are legally enforceable agreements, negotiated between the local officials and the landowners, that impose new requirements on property owners, often for activities that were previously unregulated or loosely regulated for environmental purposes. There are hundreds of varieties of requirements that risk management officials may impose depending on the circumstances. For example, the plans may require a business or property owner to:

- install a new wastewater collection system, more secure storage containment for hazardous waste, a new impervious (e.g., concrete) base for the storage area, and/or a secondary containment or barrier for the storage area
- relocate the storage of materials (e.g., manure, fertilizer, chemicals, road salt, etc.) further away from vulnerable source water, and/or cover previously open-air piles of materials so that rain will not wash contaminants into the water sources

Photo credit: SHSPhotography, (iStock standard licence).
• obtain annual inspection and maintenance of fuel tanks by a certified technician, including regular leak tests

• monitor inventory of chemicals, including daily volumes, so that leaks are detected immediately

• reduce maximum allowable volumes of waste stored at any given time, so that if a leak does occur, the volume of contaminants discharged is minimized, and/or

• develop a spill contingency and response plan.

Local risk management inspectors conduct inspections through site visits to ensure compliance with the source protection policies dealing with prohibitions and risk management plans. Risk management inspectors have so far conducted over 1,000 inspections of properties located within source protection vulnerable areas. In the ten source protection progress reports that included compliance data, inspectors reported achieving a remarkable average compliance rate of 99% with the source protection policies (i.e., prohibitions and risk management plans that have been implemented so far).

Inspectors reported achieving a remarkable average compliance rate of 99% with the source protection policies.

1.4.3 Municipal amendments to official plans and zoning by-laws

As a complimentary tool to reinforce other source protection policies, municipalities are required to amend their official plans and zoning by-laws to reflect prohibitions or restrictions on activities (such as prohibiting a new dry cleaner or restricting the handling of chemicals or road salt) in designated vulnerable areas. Incorporating these designations into official plans and zoning by-laws provides another layer of legally enforceable protection for municipal drinking water sources. In addition, municipalities must ensure their day-to-day planning decisions conform with these source protection prohibitions and restrictions prior to official plans or zoning being updated.

Although most municipalities were given longer timelines (generally five years) to amend their official plans and zoning by-laws to ensure conformity with source protection plans, many have already completed this process ahead of the deadlines. According to the source protection annual progress reports submitted in 2018, about 70% of the required municipalities have already amended or are in the process of amending their official plans to conform to the applicable source protection plan.

1.4.4 Education and outreach

Most source protection committees developed a general education and outreach policy, as well as some threat-specific education and outreach policies. These policies directed ministries, conservation authorities, municipal governments and/or other agencies to develop drinking water education materials and share certain information with property owners. The specific instructions vary from one plan to another, but they generally included:

• advising property owners in vulnerable areas that they are in a vulnerable source water protection area and that there may be policies affecting activities on their property

• educating the public about the importance of clean water and threats to source water, and

• sharing best management practices to help property owners reduce threats to drinking water.

As directed by these policies, and in some cases going beyond the policies, provincial ministries, conservation authorities, municipalities and others have been developing and disseminating numerous drinking water education and outreach materials over the past few years.
For example, Conservation Ontario, along with individual conservation authorities, has developed education and outreach materials to support source protection for over a decade, including factsheets, videos, guides and social media posts. They have developed numerous products, including materials targeted to individual audiences (e.g., residential property owners, businesses, aggregate industry and realtors) to address specific drinking water threats.

In 2014, when source protection implementation was just getting underway, the MECP launched an online catalogue of source protection education and outreach resources to help municipalities and others carry out education work. The catalogue included basic information about a range of topics (such as road salt, hazardous liquids and fuels), along with lists of available resources, and a ministry contact person who could provide more information.

The MECP also created the online Source Water Protection Information Atlas, a publicly accessible source protection map that allows individuals to locate vulnerable areas in the province (e.g., wellhead protection zones and intake protection zones), and to undertake customized searches to find out if there are restrictions on activities on a specific property. The MECP has also been using social media effectively to reach and educate new audiences about source protection – its hashtag #SourceWaterON has been displayed over a million times on social media.

Other ministries have also delivered education and outreach programs. For example, the OMAFRA provided educational materials to risk management officials to support source protection on farms. The Ministry of Transportation has aided with outreach by posting source protection zone signs along highways (see Signage for drinking water protection zones).

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**Signage for drinking water protection zones**

Several source protection committees developed education and outreach policies that asked the Ministry of Transportation and municipalities to erect road signs identifying source protection zones along highways and roads.

Even though these policies were not legally binding, the Ministry of Transportation agreed to install road signs in source protection areas as requested. As of April 2018, the Ministry of Transportation had installed 127 signs on provincial roads. Municipalities have installed a further 900 signs on local municipal roads.

Such signage can help ensure that emergency responders dealing with spilled contaminants (such as fuel) are made immediately aware that they are in a municipal drinking water source area and should take special measures to contain and clean up the spill as quickly as possible. The signs can also make travelers aware of source protection areas and possibly encourage them to learn more about source protection.
### 1.4.5 Monitoring, reporting and assessing plan implementation

Source protection committees and other implementing bodies have also been busy over the past few years with monitoring and reporting work. The Clean Water Act includes several requirements to ensure the ongoing monitoring of individual source protection actions as well as the ongoing evaluation of the overall source protection program.

**Monitoring**

The Clean Water Act requires every source protection plan to include policies to monitor activities and conditions that are significant threats to drinking water. These monitoring policies are legally binding, meaning that a public body assigned responsibility in the plan (e.g., municipality, ministry, local board or conservation authority) must monitor the threat activities as required by the policies. Source protection plans may include additional monitoring policies for moderate and low threats, but those are not legally binding.

Monitoring policies can require assigned bodies to conduct monitoring and sampling related to specific threats, including sampling for particular contaminants in the source water – but these policies are typically tied to the availability of resources to conduct such monitoring (see section 1.5.5). Where monitoring programs are occurring, they are contributing valuable additional information to the province’s existing water monitoring networks. For example, the City of Sudbury has increased sampling of sodium levels in Ramsey Lake to monitor threats from road salt to the municipal source water. This added information will help determine over time if the source protection actions are reducing salt concentrations in the raw water supplies.

The implementing bodies are required to submit the monitoring information, as well as detailed information about the actions they have taken during the year to implement a significant threat policy, to the source protection authority (i.e., the lead conservation authority) each year. This monitoring information enables the source protection authority to assess the status of implementation of the significant threat policies, as well as evaluate their effectiveness over time. The source protection authorities then share summaries of all of this information with the MECP and the public through annual progress reports.

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**Monitoring information enables the source protection authority to assess the status of implementation of the significant threat policies, as well as evaluate their effectiveness over time.**

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### Annual reporting

The Clean Water Act requires each source protection authority to produce an annual progress report that describes the measures taken by the various bodies to implement the source protection policies, the results of all monitoring programs, the extent to which the objectives set out in the source protection plan are being achieved, and an explanation of any failures to implement actions by the deadline.

The detailed annual reports, which must be made publicly available, provide accountability and help ensure that the policies are being implemented as required. Annual progress reports are an important means of assessing whether source protection plans are achieving what they were intended to achieve. The MECP also uses the annual progress reports from each source protection authority to evaluate the overall implementation and efficacy of the source protection program.

The first annual progress report for each source protection plan covers the first two years after the plan became effective, and is due May 1 of the third year, and then each year thereafter. By May 1, 2018, all but
three source protection authorities had published their first annual progress report (and three had published their second or third annual report).

All but three of the source protection authorities reported that overall implementation in their area or region was “progressing well,” meaning that most policies in the plan were or are being implemented on schedule; the remaining few described their progress as “satisfactory,” but even they reported that about 75% of their policies had been or were being implementing on schedule.

The source protection authorities that reported delays in implementation were due primarily to challenges in implementing the risk management plans. Because of the individualized work and negotiations required, the development of risk management plans has generally been the most challenging and slowest source protection measure to implement. As the Mississippi-Rideau Source Protection Authority noted: “The risk management program is new, and managing activities in this way requires trust and relationship building between staff and affected landowners. There must be consideration for the type and extent of risk management measures asked, as well as their feasibility for individuals to complete.” Nonetheless, as noted above, progress is being made on this front, with over 500 risk management plans already in place.

Plan review

The Clean Water Act also requires all assessment reports and source protection plans to be periodically reviewed, on a timeframe established by the MECP. The MECP required each source protection committee to begin its first review within roughly three years of their plan coming into effect. This means that the majority of committees are required to provide a work plan for reviewing their source protection plan shortly, by November 30, 2018.
1.5 Continual improvement: what’s still needed?

While source protection plans are all complete and implementation is well underway, work on the source protection program is not over. The initial round of source protection planning revealed some gaps and limitations in the source protection rules. Fortunately, the MECP committed to continuous improvement of the source protection framework to fix flaws and address emerging issues. The MECP also committed to integrate source protection into other provincial programs and initiatives as appropriate.

Over the past decade, the MECP has been making good on its commitments, introducing several rounds of revisions to strengthen the source protection framework (see section 1.5.1). The ministry’s efforts so far and its commitment to continually improve the source protection program should enable source protection to evolve over time, to reflect both advances in scientific knowledge as well as changes to watershed needs and circumstances.

The MECP has been identifying and addressing flaws and emerging issues, but gaps remain.

The ECO is encouraged that the MECP has been identifying and addressing flaws and emerging issues, but gaps remain. Some key measures or improvements are still needed to ensure the protection of Ontario’s drinking water sources:

- Better protecting water sources across the province, including the source water of First Nation communities, northern communities, and individuals relying on private water supplies (section 1.5.2)
- Ensuring source protection committees have the tools they need to address all drinking water threats, including all threats from fuel and manure (section 1.5.3) and threats posed by old contaminated sites (section 1.5.4), and
- Ensuring secure, ongoing capacity and funding for source protection going forward (section 1.5.5).

1.5.1 Improvements to the source protection framework so far

Since the MECP’s Technical Rules first came into effect in November 2008, the ministry has amended them three times – in 2009, 2013 and 2017 – to address issues identified by committees during the preparation of the assessment reports and source protection plans.

For example, the 2017 revisions to the rules addressed major concerns flagged by committees in the Great Lakes regions regarding the challenge of identifying vulnerable areas and threats in large water bodies. The initial Technical Rules assumed that the drinking water intake pipes in the Great Lakes were long and deep enough to not be vulnerable to threats, such as fuel spills; many committees did not agree. The 2017 amendments now provide source protection committees greater flexibility to recognize that drinking water intakes in large water bodies, such as the Great Lakes, can be vulnerable to contamination in the near shore environment. The 2017 revisions also changed the rules relating to threats from above-grade fuel tanks (see section 1.5.3).

In 2018, as part of a broader review of the source protection program, the MECP addressed another major concern flagged by several committees, by amending the regulation under the Clean Water Act to include fuel pipelines as a prescribed drinking water threat (see Adding fuel pipelines to the list of prescribed drinking water threats).

The MECP has also developed internal guidance for ministry staff to identify emerging issues in source protection. The document includes procedures for ministry staff when they become aware of new science or emerging significant threats to drinking water. This internal guidance should help ministry staff track and flag issues that may need to be incorporated into future source protection planning.
Adding fuel pipelines to the list of prescribed drinking water threats

Major spills from fuel pipelines are infrequent, but when they occur, they can cause serious environmental impacts. Given the high volume of fuel travelling through a pipeline, even a small leak can quickly cause significant damage and risk to drinking water sources.

For example, in March 2010, a buried petroleum pipeline running through Oakville, Ontario, leaked an estimated 90,000 litres of liquid gasoline before the leak was discovered. The fuel migrated through the soil, eventually reaching Bronte Creek, over 300 metres away. Trans Northern Pipelines, the pipeline operator, spent several years and over $23 million cleaning up the massive spill, removing 11,000 tonnes of contaminated soil and treating fuel-contaminated surface and ground water.

The spill fortunately occurred far enough away from the municipal drinking water intake (located downstream at the mouth of Lake Ontario), but the spill demonstrated the very real risk of contamination from fuel pipelines to drinking water.

Despite the risk of spills from the many thousands of kilometers of fuel pipelines that cross the province, pipelines were not initially included in the Clean Water Act's list of prescribed drinking water threat activities. The MECP’s Technical Rules, however, allow committees to use an alternate method to identify an activity that does not fall within a prescribed threat activity as a local threat, but only with permission from the MECP. In this manner, six source protection committees identified fuel pipelines as local significant threats to their municipal source water.

The number of source protection committees that identified fuel pipelines as a local drinking water threat suggested that pipelines belong on the list of prescribed threats. The initial omission of pipelines from the list meant that committees may well have overlooked potential drinking water threats from pipelines. Accordingly, in April 2018, as part of the ministry’s commitment to continuous improvement, the MECP amended the Clean Water Act regulation by adding “the establishment and operation of a liquid hydrocarbon pipeline” as a prescribed drinking water threat. This threat category includes both provincially regulated pipelines (those are entirely within Ontario borders) as well as federally regulated (transboundary) pipelines.

With this amendment, all committees are now required to consider whether any pipelines in their source protection area pose a significant drinking water threat, and if so, to include policies in their updated source protection plans to address such threats. As with other threats, committees may only impose legally binding requirements on certain public bodies, such as municipalities, conservation authorities and the MECP.

Future policies to address pipeline risks will likely be similar to those included in the six source protection plans that previously identified pipelines as a threat. Those source protection plans included policies requiring mapping of pipelines near water sources, emergency planning and spills prevention, and integrity testing. However, these policies will not be adopted until committees next review and revise their assessment reports and source protection plans and develop new policies, a process that will take a few years.
### 1.5.2 Protecting the source water of First Nation communities, northern communities, and private water supplies

The purpose of the Clean Water Act is “to protect existing and future sources of drinking water.” The law has resulted in source protection policies to protect most Ontarians’ drinking water supplies, but it does not protect the drinking water sources of all Ontarians.

Over 3% of Ontario’s population, mostly northern and First Nation reserve communities, reside outside of a source protection area and are therefore not protected by source protection plans. Another 15% of Ontario’s population live within a source protection area but rely on a private well or other non-municipal drinking water supply; their water is also excluded from source protection plans. All told, almost 18% of Ontario’s total population – representing well over 2 million people – are not protected by the province’s source water protections (see Figure 6).

#### First Nation communities

First Nation reserve lands do not fall under provincial jurisdiction, so First Nation communities may only be included in source protection plans if the reserve community is located within or adjacent to a source protection area and if they opt into the source protection plan process. Of the 133 First Nation communities in Ontario, only 27 are located where they could opt in. Three of these First Nation communities opted to include their drinking water systems in source protection plans: Chippewas of Kettle and Stony Point First Nation; Six Nations Grand River Supply System at Ohsweken (Grand River intake); and Mnjikaning First Nation 32 Indian Reserve (Chippewas of Rama First Nation). Another six First Nation communities, while not opting to be officially included in the source protection process, have been participating in the development and implementation of various source protection plans. In addition, some First Nation communities...
communities have developed their own version of source protection plans, outside the Clean Water Act process.47

As the ECO reported in our 2017 Environmental Protection Report, thousands of First Nation people across Ontario continue to live without household access to safe drinking water.48 The federal government, which is responsible for water infrastructure in First Nation reserve communities, has been leading efforts to improve access to clean water. Since the ECO reported last fall, the number of First Nation communities subject to a long-term drinking water advisory has fallen from 36 to 26.49 This is good progress, but the problem remains far from solved.

The persistence of drinking water advisories in Ontario’s First Nation communities remains a blight on the province.

While the federal government holds primary responsibility, the persistence of drinking water advisories in Ontario’s First Nation communities remains a blight on the province as well. The Ontario government can, and should, do what is within its power to support access to safe drinking water for First Nation communities. As the ECO noted last year, one such mechanism is through the source protection framework. The MECP should look for ways to work with the First Nation communities that participated in the source protection program to develop guidance materials and sample policies that could be used by other First Nation communities to address common drinking water risks. The MECP should also acknowledge and support the implementation of all source protection plans created by First Nation communities, whether they were created under the Clean Water Act or through their own process. (For more information on drinking water issues in First Nation reserve communities, see Chapter 3 of the ECO’s 2017 Environmental Protection Report, Good Choices, Bad Choices.)

Northern Ontario communities and non-municipal drinking water users in southern Ontario

While nearly all of southern Ontario is covered by source protection areas, most northern Ontario communities are not. The Clean Water Act only requires source protection plans for areas governed by a conservation authority (local watershed protection agencies), and much of northern Ontario is not under the jurisdiction of any conservation authority. The Minister may establish source protection areas in any part of the province. Indeed, the Minister did establish two additional source protection areas – the Northern Bruce Peninsula and Severn Sound – which were each incorporated into larger source protection regions.50 Other northern communities, comprising collectively more than 400,000 people,51 remain outside of any source protection area.

In southern Ontario, over 1.7 million people rely on private (i.e., non-municipal) wells or intakes for their drinking water supply.52 These non-municipal drinking water supplies are also excluded from the source protection program, even though they are located within a source protection area (although some private wells located within vulnerable areas receive some protections from the measures directed at the threats to the nearby municipal water supplies). The law does allow a municipal council to elect to include a cluster of six or more private wells or intakes into the source protection process,53 but this has not been done.54 It appears that the MECP and municipalities choose to focus resources, at least initially, on the larger municipal systems that serve the majority of the population.

The MECP had originally suggested that private water supplies “would be considered in subsequent phases.”55 However, the MECP confirmed to the ECO in 2015 that the ministry was unlikely to include private water supplies in future source protection planning.56 The ECO agrees that the Clean Water Act’s existing source protection planning process may not necessarily be the ideal mechanism to protect all types of drinking water sources, given the time and resources involved.
In many ways, people on private water supplies need protection of their water supply even more than those that receive municipal drinking water. Without the benefit of the Safe Drinking Water Act’s requirements for testing and treatment (see section 1.1), source protection is the main line of defence for private water supplies. Private wells are just as, if not more, susceptible to many of the drinking water threats, such as sewage, manure, road salt (see section 2.5 in Chapter 2) and algae blooms (see section 2.3 in Chapter 2).

The source protection process is providing a new wealth of knowledge and data about sources of water pollution, water quality issues, and ideally, as we go forward, the effectiveness of various policy tools. Based on this emerging data and information, the province should apply effective policy tools to protect other water resources. For example, the ministry should examine the effectiveness of the septic re-inspection programs and, if appropriate, apply these measures more broadly across the province (see Using septic inspections to protect water sources).

To better protect drinking water sources for all Ontarians, the ECO recommends that the Ministry of the Environment, Conservation and Parks use the knowledge and tools developed through the source protection program to protect other water resources from contamination, particularly drinking water sources not protected by the Clean Water Act.
Using septic inspections to protect water sources

There are over a million septic systems in use in Ontario. When any one of these septic tanks fails, it can release raw human sewage, which can carry dangerous pathogens and nutrients that contribute to algae blooms in the surrounding water.

Regular inspection and proper maintenance of septic systems, can reduce the risk of sewage leaks

The U.S. Environmental Protection Agency estimated that 10-20% of septic systems will typically fail, with higher rates for older systems. Regular inspection and proper maintenance of septic systems, however, can reduce the risk of sewage leaks. Septic inspection programs can help identify faulty or leaking systems, which can then be repaired before they pollute nearby surface and groundwater.

Since 2012, municipalities in some parts of the province must establish a septic inspection program (for re-inspection every five years). Specifically, under the Ontario Building Code, municipalities must establish an inspection program for septic systems that are either identified in assessment reports as significant drinking water threats, or are within 100 metres of a lake or stream in the Lake Simcoe watershed.

As a result of the Lake Simcoe requirement, between 2012 and 2015, municipalities, health units and conservation authorities inspected about 3,700 septic systems along the Lake Simcoe shoreline. In the three years leading up to the inspections, government funding programs assisted many hundreds of property owners within that watershed to upgrade, repair or replace faulty or malfunctioning septic systems. The South Georgian Bay Lake Simcoe Region, which includes the Lake Simcoe watershed, reported in its 2017 annual progress report that recent inspections found that 98% of septic systems were now functioning properly or required only minor maintenance, such as a tank pump-out – likely due to the prior efforts and upgrades.

It is reasonable to expect that these mandatory septic inspection programs, accompanied by education and outreach, encourage property owners to repair or replace old or faulty systems. Source protection committees, following several years of education, outreach and mandatory septic inspections, have reported very high compliance rates, generally in the range of 88-100% (not counting minor deficiencies). These high compliance rates are much higher than rates found in jurisdictions without mandatory inspection programs.

In the rest of Ontario (outside of those source protection vulnerable zones and the Lake Simcoe watershed where re-inspections are mandated), septic systems can be used for many decades without ever being inspected. The ECO and others have long urged the province to expand septic system inspection and maintenance programs to other parts of the province.

Now that parts of Ontario have experience running septic inspection (and education) programs, and have proven their value, there is no longer any legitimate excuse for ignoring septic system failures in the rest of Ontario. Mandatory septic inspection programs should be expanded to all areas that are a source of drinking water not covered by source protection plans and/or that are experiencing, or are at risk of experiencing, nutrient-related algae problems (see Chapter 2 for a discussion of algae issues).
1.5.3 Stronger tools to address important fuel and manure threats

As discussed in sections 1.3.2 and 1.3.4, the ECO’s review of select source protection plans identified serious gaps in the province’s source protection rules, by failing to give source protection committees the tools needed to fully address all significant threats from fuel and manure. The MECP has addressed parts of this gap (see discussion of fuel pipelines in section 1.5.1), but further improvements are still needed.

Exclusion of above-grade fuel tanks under 2,500 litres

As explained in section 1.2.2, activities will only be considered a significant threat if they meet specific parameters set out in the Tables of Drinking Water Threats, and certain policy tools may only be used to manage significant threats. Under the Clean Water Act’s technical rules, outdoor above-grade fuel storage tanks with a capacity between 250 and 2,500 litres could not be identified as a significant threat. This category of tanks includes residential home heating oil tanks, as well as the tanks that serve many small businesses including farms.64

Fuel spills are the most common type of spills to the environment. As noted in section 1.3.4, a fuel spill can pose a very serious risk to drinking water. Yet, because outdoor, above-grade residential tanks could not be classified as a significant threat, source protection committees could only manage these threats using soft tools such as education and outreach programs.

In March 2017, the MECP partially addressed this issue by revising the criteria in the Technical Rules to allow source protection committees to identify smaller outdoor, above-grade tanks as significant threats.
to surface water. However, until these changes are incorporated into the revised source protection plans (a process likely to take a few years), the issue will remain unaddressed under current source protection policies. Furthermore, these changes do not address the threat above-grade outdoor tanks can pose to groundwater, continuing to leave many sources of municipal drinking water vulnerable to this threat. The MECP has committed to review the threat circumstances for fuel storage as part of a second phase of proposed rule amendments and as part of a broader review of the source protection program.65 The ECO urges the ministry to act on this promise quickly.

The ECO recommends that the Ministry of the Environment, Conservation and Parks amend the Technical Rules to include threats to groundwater from above-grade outdoor fuel storage tanks as significant threats as soon as possible.

The role of the TSSA in addressing fuel threats

The Technical Standards and Safety Authority (TSSA) – an arm’s-length administrative authority under the jurisdiction of the Ministry of Government and Consumer Services (MGCS) – is the primary regulator for fuel safety in Ontario. The TSSA, under the authority of the Technical Standards and Safety Act, 2000, licenses facilities for handling and storing fuel, registers fuel contractors, and certifies tradespersons who install and service equipment. The TSSA also provides education and outreach programming on fuel safety, and is the lead agency in the case of fuel spills occurring at sites under its jurisdiction and where contamination is contained onsite (all spills must first be reported to the MECP’s Spills Action Center, and the MECP retains control in cases where fuel spills go offsite).

Despite the TSSA’s central role in regulating fuel, none of the licences or approvals issued by the TSSA for fuel handling and storage are subject to the Clean Water Act, and nor is the TSSA legally required to comply with source protection policies (i.e., the TSSA is not an implementing body).66 As a result, several source protection committees felt constrained in developing policies related to fuel handling and storage – i.e., unlike the option available to address other threats (waste, manure, etc.), committees could not enlist the help of the main body charged with regulating the sector. Some committees noted that the MGCS and the TSSA took the position that environmental protection generally, and source water protection in particular, was beyond their mandate and outside their areas of authority (see box).
The TSSA's perspective

The TSSA reiterated to the ECO that the Technical Standards and Safety Act does not expressly grant the TSSA any environmental jurisdiction or set out environmental protection as an objective for the corporation. The TSSA also stated that activity under the Clean Water Act is highly location-specific, whereas most fuel-related activities are common across the province and should be regulated uniformly. The TSSA explained that its codes and standards, which govern its licences and approvals, “provide uniform safety (and environmental) protection regardless of local conditions.”

The TSSA also noted that representatives from conservation authorities and the MECP’s Source Protection Programs Branch participated in consultation sessions regarding updates to both the Liquid Fuel Handling Code in 2017, to reflect new technologies and address emerging issues such as source water, and the Fuel Oil Code in 2016. The TSSA stated that “the fuel oil code includes Ontario-specific requirements that enhance the outcomes of source protection policies.”

When asked about the role of the TSSA in source protection, the MECP noted that the TSSA’s authority is bound by the terms of its operating agreement with the MGCS, and that the agreement does not speak to source protection. The MECP further indicated that it believed it would not be appropriate to put significant responsibility on the TSSA to ensure that privately owned equipment does not pose a threat to source water because it is an owner’s responsibility to maintain fuel equipment. The MECP expressed satisfaction with the arrangement reached in most source protection plans, in which the TSSA has agreed to carry out education and outreach activities and to share information with the source protection authorities.

Despite the MECP’s endorsement of the TSSA’s current role in protecting water sources, several committees remain concerned about the agency’s limited role. The body charged with regulating fuel equipment, and that already has convenient regulatory tools at its disposal, should use those tools to protect source water from fuel leaks. The MECP and MGCS should listen to these concerns. The ECO recommends that the Ministry of the Environment, Conservation and Parks add TSSA instruments related to liquid fuels to the list of prescribed instruments under the Clean Water Act, 2006.

Manure threats on farms subject to the Nutrient Management Act

The province’s rules under the Clean Water Act also fail to give source protection committees the tools needed to manage significant threats from manure spreading on farms that are subject to the Nutrient Management Act.

As noted in section 1.3.2, the Nutrient Management Act regulates manure spreading on some large farms through property-specific nutrient managements plans. Currently, 1,303 farms, which collectively spread 44% of the province’s total manure by volume, are regulated in this way. Where source protection committees have identified significant drinking water threats from manure spread in vulnerable areas on these regulated farms, the Clean Water Act relies almost entirely on the farmer (and on the certified nutrient management planner retained by the farmer) to protect drinking water from the threat through the nutrient management plan.

There is no government oversight of these plans. Unless the source protection committee chooses to outright prohibit manure spreading in the vulnerable area (which committees are directed to do only as a very last resort), the committee is forced to rely on the farmer and planner to change their own nutrient management plan to reduce the threat. The planner gives the farmer a “statement of conformity” that the plan complies with the local source protection policy. No one checks the planner’s conclusion that the plan is adequate to protect drinking water sources. Under the Clean Water Act, risk management officials have no power to ensure the plan
protects drinking water. They cannot add conditions to a nutrient management plan or require a risk management plan for a farm that has a nutrient management plan. The OMAFRA does not review or approve these nutrient management plans either.

Compounding this lack of government oversight on what the plan says is a gap in enforcement of these plans once they have been adopted. Together, these two gaps make it unlikely that manure threats to water sources from these farms can be caught and corrected. Risk management inspectors may only check if these farms have a nutrient management plan and statement of conformity from the planner. Risk management inspectors are not allowed to check whether the plans, or the farm’s activities, comply with the source protection policies. The MECP is responsible for inspecting and enforcing compliance with nutrient management plans. However, the MECP inspects few farms (see section 1.3.2), and when it does, it only looks at whether farms are complying with the plans as written, not whether the plans protect drinking water sources.

No one in government is checking to see if nutrient management plans are indeed protecting drinking water sources from manure contamination.

In short, no one in government is checking to see if nutrient management plans are indeed protecting drinking water sources from manure contamination. Risk management officials and inspectors are not allowed to implement or enforce source protection measures on these regulated farms. The OMAFRA and the MECP could and should, but do not.

We should not underestimate the threat posed by manure to drinking water sources. The very crisis that sparked the creation of the Clean Water Act was manure contaminating a Walkerton well. The MECP and the OMAFRA should fix this serious gap. The ECO recommends that the OMAFRA review, and as needed amend, nutrient management plans for farms within a vulnerable source water area to ensure the plans comply with source protection policies, and that the MECP prioritize inspecting these farms to ensure compliance with the plans.

### 1.5.4 Stronger tools to mitigate historical contamination

The intent of the Clean Water Act is to protect drinking water sources by preventing threats to municipal sources of drinking water. The law focuses primarily on addressing existing and future activities that may pose a threat to drinking water, but “conditions” – historical contamination from past activities that left contaminated soil and/or groundwater behind – may also pose a drinking water threat.

The Clean Water Act provides no effective means for source protection committees to address drinking water threats posed by historical contamination. It can be challenging for committees to identify conditions as significant threats, and even if identified, the committees have no real powers to do anything about these threats.

**Barriers to identifying conditions as drinking water threats**

Source protection committees must identify conditions that pose a significant threat to municipal drinking water sources. The Technical Rules set out the criteria for committees to determine if a site can be identified as a condition, and if so, if the condition is a significant threat.
Some participants in the assessment process raised concerns about the difficulty identifying conditions, particularly the evidentiary burden necessitated by the Technical Rules, given the challenges locating information about historically contaminated sites. Committees were largely reliant on records provided by the MECP and the local municipalities. The MECP reviewed available district and regional files and provided source protection authorities with materials that it had located relating to properties within their area, and conducted a records search for any specific property that committees inquired about. Nonetheless, many properties known or suspected to be contaminated do not have historical records available, making it difficult or impossible for committees to identify these sites as threats. For example, the MECP might never have become involved (i.e., if there was no knowledge of contamination migrating onto a neighbouring property) and so would not have any records.67 Or, for some smaller municipalities, the records might be in paper copies that are hard to access and search.

Even in cases where there were records, a lack of comprehensive information about the status of the contamination could make it difficult to confirm whether a condition met the thresholds set out in the Technical Rules to be listed as a significant threat. In particular, some participants in the assessment process stated that the requirement for evidence of offsite contamination with the potential to deteriorate the source water presented too high a threshold. It is not unusual for testing of contamination in soil or groundwater to be limited to one property, and although there may be strong reason to believe that contamination continues beyond that property line, without hard proof the site cannot be designated as a condition and significant threat. Source protection committees generally do not have the capacity to carry out investigative work to confirm suspected conditions, as such investigations are expensive and often require access to private property, which may not be granted.

**Lack of tools for addressing conditions once identified**

Unlike activities that are identified as significant threats, for which source protection committees must develop policies, committees have the discretion to address threats from historical conditions. Even if committees wish to develop policies to address conditions, the Clean Water Act provides minimal policy options. Committees cannot use prohibitions, risk management plans to compel remedial or other action, or land use restrictions to manage threats from conditions. Committees can require certain bodies to monitor the conditions, as well as make non-binding policies, such as requesting others to investigate and share information about the condition. But essentially, a source protection committee wanting to clean up historical contamination identified as a significant drinking water threat is reliant on the Minister of the Environment, Conservation and Parks to, at his or her discretion, use its powers under the Environmental Protection Act to issue an order (e.g., a control or clean-up order) to address the condition.

The outcome is that committees can identify conditions that pose a significant threat to drinking water, but there is little they can do to address the danger. Although the fact that a committee has identified a contaminated property as a threat may influence the MECP to take some action under the Environmental Protection Act, there is no obligation on the ministry to address the issue at all. Committees are utterly dependant on the MECP’s discretion to act, which it may not (see Solution is often to take a well offline rather than address historical contamination).
The Clean Water Act gives the perception that the law addresses conditions that are drinking water threats, without actually doing so. Source protection committees have no substantial tools at their disposal to protect drinking water sources from historical contamination. Municipalities, which bear the onus of providing safe drinking water to their residents, similarly have no such powers. Municipalities very rarely have the finances to control or remediate contamination themselves, nor do they have any authority to force property owners to remediate. They can only ask the province to act.

The province should be obliged to address historical conditions that are significant threats to the relatively small vulnerable source water areas, whether the contamination threatens an existing source of municipal drinking water or a source that has been shut down but is critically needed by a municipality to supply residents with drinking water.

Where the province owns a contaminated property that is a significant threat in a vulnerable area, the province should prioritize the immediate control or clean-up of such sites. For sites within the relatively small vulnerable source water areas that are not owned by the government, the MECP should use its authority under the Environmental Protection Act to order property owners to control or remediate the contamination as needed. The ECO recommends that the MECP take action to ensure that historical conditions that have been identified as significant drinking water threats are controlled or remediated so that they cease to pose a risk to drinking water sources.
1.5.5 Ensuring secure capacity and funding going forward

Implementing the source protection program has been a massive endeavour, requiring a significant amount of work from many bodies. Between 2004 and 2018, the provincial government has provided over $275 million for the source protection program (see Figure 7). Of this:

- $224.3 million went towards the initial work of the source protection committees, led by the conservation authorities, and municipalities to complete technical and scientific studies for the assessment reports.

- $24.5 million was provided as financial assistance to landowners through the “Ontario Drinking Water Stewardship Program” to encourage early voluntary actions (up until 2013) to protect water supplies. The program helped landowners take over 3,000 early actions, such as measures to control runoff and erosion, inspect and upgrade septic systems, and close or upgrade wells. The program also funded early education, outreach and incentive programs related to source protection.

- $14.1 million was provided to almost 200 small, rural municipalities through the “Source Protection Municipal Implementation Fund” to offset some of their costs of taking on new source protection duties (including risk management planning, land use policy changes, and education and outreach).

- In 2018, the MECP advised the ECO that the province has committed another $7.2 million to support local source protection activities in 2018/19.

Figure 7. Provincial funding for source protection, 2006-2018 (millions).

Source: Created by the ECO, based on information from the MECP.
The province made a big investment in the early development of the source protection program, including funding the source protection authorities’ and committees’ work to produce detailed technical and scientific information about their watersheds. This investment has provided immensely valuable information that not only supports source protection, but also supports other important work of conservation authorities to protect Ontario’s watersheds. Other start-up costs, such as the training of risk management officials and inspectors and the creation of education materials, will also provide long-term value. With most of the upfront work now complete, the cost of the source protection program will decrease, but it will not go to zero. The ongoing success of the source protection program depends on the responsible bodies having the resources they need to keep doing their jobs.

Currently, the province has committed to provide funding for source protection work only until March 31, 2019. Uncertainty about secure funding beyond March 2019 leaves the success of the source protection program up in the air. The MECP, conservation authorities, source protection committees, and municipalities all require ongoing resources to implement, review, update, monitor and enforce the source protection program.

Uncertainty about secure funding beyond March 2019 leaves the success of the source protection program up in the air.

Funding for conservation authorities, source protection committees and municipalities

Conservation authorities and municipalities are responsible for implementing about two-thirds of the source protection policies.\textsuperscript{71} Implementing these policies requires considerable human and financial resources. Local risk management officials and inspectors, employed by either the local municipality or conservation authority, are permanent positions and require ongoing resources to perform their duties. Similarly, education and outreach programs, carried out primarily by municipalities and conservation authorities, should also be continual; these bodies advise that they can only carry out such programs when resources are provided.

Source protection committees and conservation authorities (who act as source protection authorities and members of source protection committees) also require resources to ensure they have the capacity to periodically review and update the assessment reports, including the scientific and technical studies that underlie the assessment reports, and source protection plans as required by the law.

Updating the underlying scientific and technical studies (i.e., to delineate vulnerable areas and identify threat activities) is critical to the success of the source protection program, as threats are not static and new threats can emerge. The province had funded earlier technical studies, but has not committed to fund future technical work or science updates, despite the fact that much information requires updating. For example, several conservation authorities have identified the need to update outdated drainage maps, which influence the shape and size of vulnerable areas.

Some conservation authorities and larger municipalities may have the resources and capacity to update technical work, but such studies are not cheap, and many conservation authorities and smaller municipalities cannot afford the costs. A lack of funding means that the science can not be updated to identify new or changing threats in parts of the province, undermining confidence in the program’s role to protect municipal source water from all significant threats.

Lastly, conservation authorities and municipalities also require resources to do monitoring work. Monitoring and sampling of source water is critical to both detect water quality problems in raw water supplies and to evaluate the effectiveness of the source protection policies. The province has previously provided funding to some conservation authorities to sample source water, but with no current funding, important monitoring
work is now limited to the few municipalities with the resources to do so.

It is thus not surprising that the ECO repeatedly heard municipalities and conservation authorities express a need for steady-state funding for source protection. The ECO heard from conservation authorities that even slight decreases in their annual funding can lead to a reduction in staff dedicated to source protection. Moreover, the uncertainty of year-over-year funding (renegotiated through annual funding agreements between the MECP and conservation authorities) can result in job insecurity and the loss of in-house expertise as staff leave to find more secure employment elsewhere.

Municipalities and conservation authorities require secure long-term resources and capacity for full-time staff to ensure ongoing implementation, monitoring and enforcement of source protection policies, but no long-term source of funding for this work has been identified.

**Capacity within the MECP**

The MECP also requires ongoing capacity to carry out its many responsibilities under the source protection program, including: finishing the review and updating of prescribed instruments, reviewing the source protection authorities’ annual progress reports and compiling the province’s own progress reports, reviewing and approving plan amendments, evaluating and reviewing the overall source protection program, and implementing continuous improvement to address shortcomings in the program as well as changes on the landscape.

In particular, the ECO has concerns about the MECP’s capacity to swiftly review the upcoming amendments to the assessment reports and source protection plans. During the first round of assessment reports and source protection plans, it took the MECP over three years to approve all source protection plans.

Sufficient capacity within the MECP, conservation authorities, municipalities and source protection committees is vital to ensure the future success of the source water protection program. The government should commit to multi-year funding to ensure all responsible bodies can continue ongoing source protection work. The province should not squander the substantial investment it has made. The ECO recommends that the Ontario government commit steady-state, multi-year funding for the source protection program to ensure that the MECP, conservation authorities, municipalities and source protection committees have sufficient capacity to successfully implement, monitor, review and amend source protection plans.

### 1.6 Conclusion

After all that time, effort and money, are sources of drinking water safer? For the 82% of Ontarians whose drinking water sources are protected by the Clean Water Act, the answer is yes, with much more work to do.

The hard work done by source water protection authorities and committees has revealed hundreds of significant threats to municipal water sources across Ontario.

The Clean Water Act is designed to reduce both chronic contamination and the risk of acute spills from 20 common threats to source water quality. The hard work done by source water protection authorities and committees has revealed hundreds of significant threats to municipal water sources across Ontario. These astonishing findings should remind us all how much our municipal water supplies had been relying on luck in the years before the Walkerton water tragedy.

As a result of the Clean Water Act, and the substantial funds invested to implement it, thousands of actions...
have been taken to reduce drinking water threats. In many areas, septic systems have been repaired, manure handling improved and fuel storage better managed. These actions should, over time, reduce both chronic sources of contamination and the number of accidental spills that threaten municipal drinking water sources. They should also ensure that any source of pollution that threatens municipal water quality is detected and reported more quickly than what happened in the Walkerton water tragedy.

It could take time for these improvements to be reflected in source water monitoring data. The measures within source protection committees’ control may only gradually reduce chronic contaminants, and can only reduce, not eliminate, some kinds of threats. In addition, the Clean Water Act does not deal effectively with “conditions”, i.e., contamination coming from historical activities, which can persist for decades. Contaminants still threaten some municipal water supplies, and 18% of Ontarians receive no comparable protection of their drinking water sources. Still, it is encouraging to see early reports that some municipal water intakes are reporting lower levels of some contaminants. And, of course, there has been no recurrence in Ontario of the Walkerton water tragedy.

In summary, the Clean Water Act has been good for Ontario. Justice O’Connor was correct; in addition to good water treatment by municipal water treatment plants, Ontario must actively protect the quality of our sources of drinking water, much better than we did before 2000. Ontario needs the Clean Water Act and the source water protection committees of Ontario, with local program delivery led by the conservation authorities, have done a good job in implementing it.

But this is no time for the MECP to turn its back on source water protection, as the last funding commitment to support source protection runs out early next year. Drinking water threats are not static, and the vigilance necessary to protect drinking water sources will never be unneeded. Growing populations, loss of natural buffers such as wetlands and woodlands, the warmer wilder weather that climate change brings, new fuels and new chemicals, all will require fresh threat assessments and responses. Education and enforcement will remain significant tasks indefinitely.

The ECO recommends that the Ministry of the Environment, Conservation and Parks:

• use the knowledge and tools developed through the source protection program to protect other water resources from contamination, particularly drinking water sources not protected by the Clean Water Act
• amend the Technical Rules to include threats to groundwater from above-grade outdoor fuel storage tanks as significant threats as soon as possible
• add TSSA instruments related to liquid fuels to the list of prescribed instruments under the Clean Water Act, and
• take action to ensure that historical conditions that have been identified as significant drinking water threats are controlled or remediated so that they cease to pose a risk to drinking water sources.

The ECO recommends that the Ontario Ministry of Agriculture, Farms and Rural Affairs review, and as needed amend, nutrient management plans for farms within a vulnerable source water area to ensure the plans comply with source protection policies, and that the Ministry of the Environment, Conservation and Parks prioritize inspecting these farms to ensure compliance with the plans.

The ECO recommends that the Ontario government commit steady-state, multi-year funding for the source protection program to ensure that the Ministry of the Environment, Conservation and Parks, conservation authorities, municipalities and source protection committees have sufficient capacity to successfully implement, monitor, review and amend source protection plans.
Endnotes

1. There are legally 38 source protection plans – one plan for each of the 38 source protection areas. Some areas are grouped into regions, creating a total of 10 regions and 9 stand-alone areas. Many of the regions submitted replica plans for each source protection area within the region, and so they are often collectively referred to as one source protection plan. As such, the total number of source protection plans is often counted as 22 or 24 distinct plans. However, the Ministry of the Environment, Conservation and Parks currently cites the total number of plans as 38 (despite some being exact copies of the same plan).

The Ministry of the Environment, Conservation and Parks approved the final source protection plan, for the Grand River Source Protection Area, in November 2015.

2. Auditor General of Ontario, Annual Report 2014, Chapter 3, Section 3.12, Source Water Protection (Toronto: Queen’s Printer for Ontario, 2014) at 413: “A study conducted by the U.S. Environmental Protection Agency in the mid-1990s estimated that the cost of dealing with contaminated source water is on average 30 to 40 times more than preventing contamination in the first place.”


4. A watershed is an area of land in which all water, including rain and snowmelt, flows into a common body of water such as a river or lake.

5. Conservation authorities are local watershed management agencies established under the Conservation Authorities Act. Conservation authorities deliver programs and services, in partnership with government, landowners and other organizations, to ensure the responsible management of Ontario’s water and other natural resources. There are 36 conservation authorities in Ontario.

6. There is a preliminary step before this. Terms of reference must first be prepared and approved by the Ministry of the Environment, Conservation and Parks for each source protection area. Terms of Reference set out a work plan for the major tasks required for source protection planning in the area.

7. Source protection areas cover about 14% of the total land mass of the province (Auditor General of Ontario, Annual Report 2014, Chapter 3, Section 3.12, Source Water Protection (Toronto: Queen’s Printer for Ontario, 2014) at 410). Vulnerable zones only cover a small subset of that area. Note, however, that the majority of Ontario’s land mass is uninhabited and outside areas of development, so is not subject to the same risk of pollution.

8. At the time of development of the source protection plans, this threat – establishment and operation of a liquid hydrocarbon pipeline – was not included, and so is not yet addressed the source protection policies. This threat was added in April 2018, and came into force on July 1, 2018.


10. Organic matter that is produced on farms and applied to fields as a source of nutrients for the soil is called “agricultural source materials” or “ASM”. ASM is defined in section 1(1) of O. Reg. 267/03 under the Nutrient Management Act, 2002, and incorporated into the Clean Water Act, 2006 through s.1.1(2) of O. Reg. 287/07.

11. Nutrient Management Strategies address the generation, transfer and storage of manure from some farms. A Nutrient Management Strategy requires, for example, construction of proper storage of manure and controls to avoid run-off. Nutrient Management Strategies are only required for existing large farms that generate more than 300 “nutrient units” of manure and/or milkhouse washwater, or to new or expanding farms that produce over 5 “nutrient units” and that construct a barn or manure storage facility (a “nutrient unit” is calculated based on the amount of manure produced by a given livestock, e.g., 1 cow produces 3 nutrient units).

Nutrient Management Plans can only be required if the farm is also already required to have a Nutrient Management Strategy and the farm either produces more than 300 nutrient units and/or is within 100 meters of a municipal well. The Nutrient Management Plan specifies criteria for the application of nutrients on the field.

12. Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO (July 2018); Statistics Canada, CANSIM table 004-0200 - Census of Agriculture, farms classified by the North American Industry Classification System (Ottawa: Statistics Canada, 2016).

13. Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO (July 2018).

14. That farm produced only about 60 nutrient units of manure, so would not have been subject to the nutrient management regulations. Auditor General of Ontario, Annual Report 2016, Volume 2: Follow-Up Reports on Value-for-Money Audits, Chapter 1, Section 1.12, Source Water Protection (Toronto: Queen’s Printer for Ontario, 2016) at 164.


18. This order was the subject of lengthy litigation. See: The Corporation of the City of Kawartha Lakes v. Director, Ministry of the Environment, 2012 ONSC 2708.


21. The implementation timelines relate to the date that the source protection plan came into effect (the “effective date”). The Source Protection Plans came into effect gradually over a couple of years, with the last plans coming into effect in July 2016. As such, timelines vary from area to area.
23. For example, South Georgian Bay Lake Simcoe Region’s Source Protection Annual Progress Report (1 May 2018), observes at page 8 that “a consultant’s report suggests it could take between 10-38 years to see the effects of any implemented risk management measures” on the nitrate levels in the groundwater.


25. Ministry of the Environment, Conservation and Parks, information provided to the ECO (11 April 2018).

26. Ministry of the Environment, Conservation and Parks, information provided to the ECO (11 April 2018).

27. Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO (24 April 2018).

28. Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO (24 April 2018).


30. Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO (24 April 2018).


34. For example, see Ministry of the Environment, Conservation and Parks Source Protection Programs Branch, Standard Operating Procedure - Considering and Incorporating Emerging Issues into Source Protection Program, (April 14, 2016).

35. See Environmental Registry Policy Decision Notice #010-7573, Proposed Amendments to the technical rules made under section 107 of the Clean Water Act, 2006 with respect to the preparation of an assessment report; (18 November 2009); Environmental Registry Policy Decision Notice #011-2168 (10 December 2015); and Environmental Registry Policy Decision Notice #012-8507, Proposed Amendments to the Director’s Technical Rules made under Section 107 of the Clean Water Act, 2006 (9 March 2017).


39. A source protection committee may identify an activity not on the list of prescribed activities as a local drinking water threat using the alternate “local threats-based approach.” This approach requires the committee to provide information to the MECP Director of the Source Protection Programs Branch indicating that the activity has a high chemical or pathogen hazard rating, as defined in the Technical Rules (see rules 119 to 121). Identification of a threat using the local threats-based approach requires permission from the MECP Director.


41. The supporting document “Changes to the Tables of Drinking Water Threats Established under the Technical Rules – July 2018” states that the pipeline circumstances contain the following: “The conveyance of a liquid hydrocarbon by way of a pipeline within the meaning of Ontario Regulation 210/01 under the Technical Standards and Safety Act, or that is subject to the National Energy Board Act.” This includes both provincially regulated pipelines (i.e., those that fall entirely within the provincial borders as regulated under O. Reg. 210/01), as well as transboundary pipelines (those regulated federally under the National Energy Board Act).

42. Based on 2006 data. Ministry of the Environment, Conservation and Parks, information provided to the ECO (24 January 2017).


46. Ministry of the Environment, Conservation and Parks, information provided to the ECO (7 June, 2016).


49. Since the ECO reported in 2017, 11 communities in Ontario have had their long-term advisories lifted, and one new one (Wabaseemoong) has been added. As of September 30, 2018, there were 26 communities with long-term advisories. See: Government of Canada’s website, Water in First Nation communities, online: <www.sac-isc.gc.ca/eng/1100100034879/1521124927588/>. Note: this is the number of communities affected by advisories, rather than the number of advisories – one community can have multiple advisories because each individual system will be under a separate advisory.

50. O. Reg. 284/07 (made under the Clean Water Act, 2006, S.O. 2006, c. 22), Table 2 and Table 3. Those areas were consolidated into the Saugeen, Grey Sauble, Northern Bruce Peninsula Source Protection Region and the South Georgian Bay-Lake Simcoe Source Protection Region, respectively.


53. O. Reg. 287/07 (made under the Clean Water Act, 2006, S.O. 2006, c. 22), s. 4.1(1). Private wells and intakes are excluded unless the municipality chooses to include, through a council resolution, a cluster of six or more wells or intakes (including clusters of private wells, communal systems, and other non-municipal supplies) in the source protection process.

54. Note, at least one committee (North Bay Mattawa Source Protection Committee) had proposed to include a cluster of private wells (the Trout Creek well cluster), but it was subsequently removed from the source protection plan. See the North Bay Mattawa Source Protection Area approved plan, March 5, 2015 (Letter of Submission to Source Protection Authority, section 1.4, and Appendix B).


56. Ministry of the Environment, Conservation and Parks, information provided to the ECO (9 November 2015).

57. For example, Ontario’s Auditor General noted in 2016, “During our 2014 audit, we noted that 36% of the 166,000 private-well water samples that were tested by Public Health Ontario in 2013 tested positive for bacteria, including E. coli.” Auditor General of Ontario, Annual Report 2016, Volume 2: Follow-Up Reports on Value-for-Money Audits, Chapter 1, Section 1.12, Source Water Protection (Toronto: Queen’s Printer for Ontario, 2016) at 162.

58. United States Environmental Protection Agency, USEPA Onsite Wastewater Treatment Systems Manual, February 2002, at 1-4 and Table 1-3. While the US EPA's data is older, it provides among the most comprehensive estimate of septic system failure rates.


60. Ministry of the Environment, Conservation and Parks, Minister’s Five Year Report on Lake Simcoe: To protect and restore the ecological health of the Lake Simcoe watershed (23 October 2015) at 9.


62. For example, Massachusetts’ time-of-transfer inspection identified a 20% failure rate based on an inspection of each septic system prior to home sale (and the Massachusetts program only identifies failures according to code and does not track ground water contamination that may result from septic system failures). United States Environmental Protection Agency, USEPA Onsite Wastewater Treatment Systems Manual, at 1-4.

Similarly, in Michigan: “Several counties that require septic tank inspections during real estate transactions have reported a septic system failure rate of 20 percent to 25 percent, according to a Michigan Department of Environmental Quality report.” Jeff Alexander, “Thousands of failed septic tanks across the state threaten Michigan’s waters,” MLive (14 May 2013), online: <www.mlive.com/environment/index.ssf/2013/05/thousands_of_failed_septic_tan.html>.

63. The Ontario Building Code regulatory process essentially ends with the permit-related inspection at the completion of an installation. Municipalities can voluntarily establish a local septic re-inspection program, but these appear to be few.

64. The Table of Drinking Water Threats does not distinguish between different tanks based on use (i.e., residential vs. industrial), only by the size of the tank. Tanks under 2,500L include virtually all residential tanks, as well as other types of properties that would have a smaller tank (i.e., many farms and small businesses). Residential tanks generally range between 280 and 1,250 litres.


Chapter 2

Polluting our waters
Abstract

Ontario is lucky to have so many lakes and rivers, containing some of the most abundant fresh water in the world. Unwisely, we still pollute much of it.

Since the Walkerton water tragedy, Ontario has put significant effort into protecting those limited water resources that provide municipal drinking water (see Chapter 1). Nothing comparable has been done to protect the rest of Ontario’s lakes and rivers, many of which are being seriously harmed by pollution. This pollution is threatening many provincial aquatic ecosystems, impairing Ontarians’ ability to swim and fish, and harming economic activities that rely on clean water.

Government laws and policies have reduced many types of water pollution over the last half-century. But big, deliberate gaps in these laws are allowing some water pollution problems to persist or worsen, especially when compounded by population growth and climate change.

This chapter examines four significant sources of major pollutants that threaten Ontario’s waters, and the province’s failures to regulate them:

1. Raw municipal sewage – a major source of potentially dangerous pathogens like E. coli, that spoil some Ontario beaches (section 2.2);
2. Agricultural runoff – a major source of phosphorus, that contributes to algae blooms (section 2.3);
3. Industrial wastewater – a major source of metals and toxic chemicals, that can harm aquatic animals and potentially humans (section 2.4), and
4. Road salt – a major source of sodium and chlorides, that damage aquatic ecosystems and can render sources of drinking water undrinkable (section 2.5).
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Endnotes
2.1 Introduction: a sea of pollutants is harming Ontario’s waters

Ontario is fortunate to have an abundance of freshwater. The province is home to over 250,000 lakes – including four of the five Great Lakes – as well as countless rivers, streams and creeks. In contrast to the water stress that faces many people around the globe, most Ontarians have easy access to one of life’s basic necessities: clean drinking water. In 2000, Ontario received a shocking reminder of the vigilance necessary to protect this precious resource. See Chapter 1 for how, following the Walkerton tragedy, the Clean Water Act has improved the protection of those limited water resources that provide municipal drinking water.

However, nothing comparable has been done to protect the rest of Ontario’s lakes and rivers, many of which are being seriously harmed by pollution. Most of Ontario’s lakes and rivers fall outside of the Clean Water Act’s protected vulnerable zones, including the drinking water sources of almost one-fifth of Ontario’s population. Further, the need for drinking water is not the only reason to keep Ontario’s water bodies unpolluted. Ontario’s lakes and rivers are essential habitat for an amazing variety of aquatic life. They are where many people prefer to go for tourism and recreation, including swimming, fishing and boating. They also support jobs and businesses, from farming to manufacturing to energy generation.

Today, pollution is threatening many provincial aquatic ecosystems, impairing Ontarians’ ability to swim and fish, and harming economic activities that rely on clean water. Despite existing laws that are supposed to control water pollution, a growing array of contaminants pour into Ontario’s lakes and rivers every day – including faeces, plastic, petroleum products, salt, heavy metals, pesticides, nutrients and pharmaceuticals. Once these pollutants have entered waterways, they are difficult or impossible to remove. Many cause adverse impacts, even in low concentrations. Some kill or sicken fish and wildlife; some are toxic to humans; some trigger excess plant or algae growth; some change the chemical or biological composition of the ecosystem. The Ministry of the Environment, Conservation and Parks (MECP) does not know what long-term effects this chemical soup has on ecosystems and on us.

Government laws and policies have reduced many types of water pollution over the last half-century. But big, deliberate gaps in these laws are allowing some water pollution problems to persist or worsen, especially when compounded by population growth and climate change.

To illustrate the problem, this chapter examines four significant sources of major pollutants that threaten Ontario’s waters, and the province’s failures to regulate them:

1. untreated sewage from municipal sewer systems – a major source of pathogens
2. agricultural runoff – a major source of phosphorus
3. industrial wastewater – a major source of metals and other toxic chemicals, and
4. road salt – a major source of sodium and chlorides.

These four sources of pollutants are significant threats because:

• each discharges into Ontario waters in large quantities
• each causes major harm, and
• current Ontario laws and policies do not effectively control them.

Ontario’s new government, upon election in June 2018, identified “protecting and preserving our waterways” as one of its priorities. As this chapter shows, they have a lot of work to do.
2.1.1 Laws to protect Ontario’s water resources from pollution

Several laws are intended to protect Ontario waters from pollution (Table 1). The Ontario Water Resources Act and the Environmental Protection Act regulate many activities that may pollute water and generally prohibit the discharge of most contaminants into water without a permit. The federal Fisheries Act also prohibits depositing substances that may degrade water quality in or near “waters frequented by fish.”

Ontario added some new laws after the Walkerton water tragedy in 2000. These include the Nutrient Management Act, which regulates nutrient-containing material on some farms, and the Clean Water Act, designed to restrict activities that risk polluting waters that are sources of municipal drinking water (see Chapter 1).

Table 1. Ontario’s four key laws to protect Ontario’s water resources from pollution. The Ministry of the Environment, Conservation and Parks (MECP) is responsible for administering and enforcing all of these laws, except for the Nutrient Management Act, which is administered by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and enforced by the MECP.

<table>
<thead>
<tr>
<th>Law</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Ontario Water Resources Act</strong></td>
<td>Ontario’s primary law to regulate water pollution</td>
</tr>
<tr>
<td>(originally enacted in 1956, as</td>
<td>• Prohibits discharge of polluting materials into or near water that may impair the quality of the water (surface or groundwater)</td>
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<tr>
<td>the predecessor Ontario Water Resources Commission Act)</td>
<td>• Regulates the discharge of municipal and industrial sewage (wastewater) and stormwater through sewage works approvals</td>
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<td></td>
<td>• Authorizes the ministry to issue orders prohibiting or regulating sewage discharges or requiring measures to prevent, reduce or alleviate impairment of water quality</td>
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<tr>
<td><strong>Environmental Protection Act</strong></td>
<td>Ontario’s general pollution control law</td>
</tr>
<tr>
<td>(enacted in 1971)</td>
<td>• Prohibits discharge of contaminants into the environment (including water) that cause or are likely to cause adverse effects</td>
</tr>
<tr>
<td></td>
<td>• The law and its regulations govern a number of potential sources of water pollution, including: landfills, sewage systems, mining, pulp and paper, road salt, etc.</td>
</tr>
<tr>
<td></td>
<td>• Sets rules for cleaning up spills of pollutants</td>
</tr>
<tr>
<td></td>
<td>• Does not apply to “normal farming practices”</td>
</tr>
<tr>
<td><strong>Nutrient Management Act</strong></td>
<td>Regulates the management, storage and use of nutrient-containing materials (such as manure, biosolids and food waste) on some farms to prevent contamination of surface and groundwater</td>
</tr>
<tr>
<td>(enacted in 2002)</td>
<td>Regulates pollution threats to surface and groundwater that are a specific source of municipal drinking water (see Chapter 1).</td>
</tr>
<tr>
<td><strong>Clean Water Act</strong></td>
<td></td>
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<td>(enacted in 2006)</td>
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</tbody>
</table>
In addition, the Great Lakes and other border waters are subject to a number of treaties, compacts, and other agreements that aim to facilitate inter-jurisdictional cooperation, such as the Great Lakes Water Quality Agreement and the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health. (These Great Lakes agreements are outside the scope of this report, for more information refer to Part 3.1 of the ECO’s 2014/2015 Annual Report.)

Even more recently, geography-specific laws have been adopted, such as the Lake Simcoe Protection Act, 2008, and the Great Lakes Protection Act, 2015. Together, these laws have dramatically reduced many types of water pollution. Yet none of these laws have proved effective in stopping the continuing pollution described in this chapter.

### 2.2 Untreated sewage: transporting pathogens and spoiling beaches

The first pollutant we examine is raw and diluted sewage from municipal sewer systems. About 90% of Ontario’s population is serviced by sewers that take sewage to treatment plants. These sanitation systems are essential to a modern society and do much to protect the health and wellbeing of Ontarians and our environment. However, far too often, raw and partially treated sewage flows from these sewage systems into lakes and rivers through bypasses and overflows (see section 2.2.2).

Untreated sewage is dangerous, carrying potentially harmful pathogens like pathogenic *E. coli*, and threatening human health as well as aquatic life. Local source protection plans developed under the Clean Water Act help to keep untreated sewage out of municipal drinking water, but as described in Chapter 1, that law does nothing to protect most Ontario waterways, or the drinking water of many rural and remote Ontarians.

The ECO honours Josephine Mandamin for her leadership and inspiration. Ms. Mandamin is the water walker, an Anishinaabe grandmother who walked 10,900 kilometres all the way around the Great Lakes, to remind us all that water is precious and that it is wrong to pollute it.

Photo credit: NASA, (CC by 2.0).
What’s in raw sewage?

Raw sewage can contain anything that people or businesses put down their sinks, toilets and drains, including:

• human urine and excrement (which can carry pathogens)
• other bodily wastes like hair, toenails, blood, vomit and mucus
• paper products (toilet paper, tissues)
• soaps, detergents and other cleaning agents
• personal care products
• pharmaceuticals
• food waste
• condoms
• feminine hygiene products, and
• process wastewater and chemical wastes flushed down drains from businesses and industries.

In combined sewer areas, raw sewage can also contain anything that rain and snowmelt washes off outdoor areas and the streets, including:

• salt
• petroleum products
• wildlife and domestic animal excrement
• metal and rubber fragments
• fertilizers and pesticides, and
• litter.

Debris from a sewage overflow is seen attached to a grate covering the outflow pipe.

Photo credit: HugoTagholm, (CC BY-SA 4.0).

2.2.1 Impacts of pathogens: swim advisories and beach closures

Playing in the water is an iconic part of an Ontario summer for both adults and children. Ontario has hundreds of beautiful beaches, 26 of which are certified as consistently safe and clean and so can fly the international Blue Flag.5

However, a good experience cannot be taken for granted at other beaches. Far too often, many beaches are fouled by pollutants including garbage, nutrients that cause algal blooms (see section 2.3), and harmful pathogens like some types of E. coli bacteria. The presence of E. coli in particular can lead to swim advisories or full beach closures (see box) to protect people from swimming in water dangerous to their health.
When is a swim advisory or beach closure declared?

According to the Ministry of Health and Long-Term Care, the local health unit should issue a swim advisory when beach quality is not suitable for recreational use, and should order a beach closure when a significant risk to health and safety has been identified.

Until early 2018, the provincial threshold to swim safely was a maximum 100 units of \(E. \text{ coli}\) bacteria/100 mL water; the province has recently changed the threshold to 200 units of \(E. \text{ coli}\) bacteria/100 mL to align with the national standard.

\(E. \text{ coli}\) exceedances at Ontario beaches are unfortunately a regular occurrence. While most of Ontario’s monitored Great Lakes beaches met bacterial standards for swimming, the conditions in some areas are declining. For example, Windsor and Essex County’s 10 monitored beaches contained too much \(E. \text{ coli}\) 46 times in the 2017 summer season, i.e., in 34% of all samples taken. Huron County’s 10 beaches, including Goderich and Bayfield, had too much \(E. \text{ coli}\) 58 times in 2017, i.e., in 21% of samples taken. The City of Toronto had 103 exceedances in the summer of 2018 (see box).

In addition to the public temporarily losing the use of the beach, the effects can be felt economically by the local small businesses and the municipality. For example, recreational activities on Lake Simcoe are estimated to contribute $200 million annually to the local economy. Public beach closures in such an area can cause serious economic losses over time.
Toronto swim advisories

The City of Toronto takes daily samples at its 11 supervised beaches during the summer (generally early June to Labour Day) to check the level of \textit{E. coli}. From 2007 to 2018, the percentage of summer days with too much \textit{E. coli} ranged from 2\% at Gibraltar Point Beach on Toronto Island to 36\% at Maris Curtis Park East Beach on the west side of the region (Figure 1). In the summer of 2018, there was too much \textit{E. coli} at one or more Toronto beaches 103 times.

Figure 1. Map showing the percentage of sampled days during the summer months for the years 2007 – 2018 that exceeded the \textit{E. coli} threshold at each of Toronto’s 11 supervised beaches.

Source: Beach data provided by the City of Toronto; map data provided by Google Earth; graphic compiled by the ECO.

2.2.2 Combined sewage overflows take pathogens to our beaches

Pathogens can come from a variety of sources, including stormwater (e.g., from dog and geese excrement washed into the lakes during rain storms), leaky sewer pipes, faulty septic systems (see section 1.5.2 of Chapter 1), and manure runoff from agriculture (see section 2.3 as well as section 1.3.2 of Chapter 1). But the main source of pathogens that pollute many Ontario beaches is typically overflows and bypasses from municipal wastewater infrastructure, primarily from combined sewage overflows – mixtures of untreated sewage and stormwater from combined sewers.

Combined sewers carry both sanitary sewage (i.e., domestic, industrial and commercial sewage from toilets, sinks and drains), plus stormwater (i.e., rain or snow melt). Combined sewers were cheaper to install, and most of the time they offer the environmental benefit of treating the pollutants and debris that stormwater sweeps off the streets. Their fatal flaw occurs in wet weather, when heavy rainfall or rapid snow melt floods into the sewers, mixes with sanitary sewage and overwhelms the capacity of the sewage treatment plant. To prevent the sewage mixture from backing up into homes and businesses, public spaces and the sewage treatment plant itself, municipal sewage systems are designed to allow the mixture to overflow or bypass directly into nearby streams, rivers and lakes.

These overflows and bypasses are typically called combined sewer overflows, and they are a major water pollution hazard. Combined sewer overflows can occur at a number of points in the sewage system (see Figures 2 and 3).
Figure 2. Diagram of a combined sewer overflow and how it can discharge diluted or raw sewage into Ontario’s waters.

Source: Created by the ECO.

Figure 3. Graphic showing the locations of overflows and bypasses in a typical sewage treatment system.

Source: Created by the ECO (adapted from the Ministry of the Environment and Climate Change).
Many combined sewers date from the 1940s or earlier. Since 1985, Ontario has prohibited any municipality from installing new combined sewers; however, there are still 57 combined sewer systems in 44 municipalities (see Figure 4). These municipalities are listed in Table 2.

Figure 4. Map of combined sewers across Ontario.
Source: sewer data provided by the MEOP, map data provided by Google maps, graphic compiled by the ECO.
Within each of these municipalities, combined sewers are usually found only in older areas. In Toronto, for example, about 23% of the city still relies on combined sewers. Similarly, in Kingston, about 25% of the city is still served by combined sewers (see Figure 5).
Despite decades of work to reduce the environmental hazards of combined sewers, in 2017-2018 Ontario had 766 combined sewage overflows. An additional 561 overflows and bypasses occurred due to situations outside normal operating conditions at sewage treatment plants including emergency situations and/or unscheduled shutdowns of treatment units causing other units to operate above design capacity. The risk of a combined sewage overflow is compounded by more intense precipitation due to climate change, as well as by population growth, which increases the volume of sanitary sewage. Land use intensification, like the conversion of natural areas to hard surfaces like roofs and asphalt, also increase the speed and volume of stormwater runoff, which in turn can exacerbate sewage overflows where combined sewers exist.

The public does not usually know when or where combined sewage overflows occur, at least until the Medical Officer of Health closes a local beach because of its contamination. In the meantime, people or pets could have been exposed to the contamination. As a result of public use of the Environmental Bill of Rights, this is starting to change.
Update on successful use of the EBR to get public notification of sewage bypasses in some cities

In July 2014, the ECO received an EBR application from members of the public requesting a review of the need to require the City of Toronto to notify the public when sewage bypasses occur, as these bypasses create a public health risk. The Ontario Water Resources Act requires municipalities to notify the MECP of sewage bypasses, but there is no requirement for public notification.

The MECP undertook the review and, in July 2015, ultimately agreed with the applicants that the public should be informed when a sewage bypass occurs. The MECP committed to consult with Toronto Public Health, Toronto Water (the City’s division responsible for stormwater management), the Ministry of Health and Long-Term Care, Lake Ontario Waterkeeper and others to develop messaging about the health risks of poor water quality. The MECP also reported that it was in discussions with Toronto Water about how the City could report bypass events in real time.

The MECP subsequently amended the water treatment plants’ environmental compliance approvals in June 2016, requiring the city to report more frequently and requiring a procedure to notify the public and downstream water users that may be adversely impacted by a bypass or overflow.

Despite the MECP’s decision, it took the City of Toronto considerable time to implement a public notification process for sewage bypasses. Finally, in June 2017, the City of Toronto began alerting the public of sewage bypasses via Twitter (Figure 6). The MECP has since amended 12 water treatment plant environmental compliance approvals to include a similar notification procedure and will amend more as proponent-led amendments are received. This large legacy of problematic sewer systems is so pervasive that a private members bill was introduced in 2017 requiring municipalities or other operators of a sewage facility to publicly report bypasses and overflows.

These municipalities report bypass and overflow information including the number of events and volume of raw and diluted sewage that enters nearby waters. For example, Utilities Kingston provides both real-time overflow and bypass information in addition to annual summaries. However, these reports do not explain why such contamination is continuing to occur nor what is being done to stop it.

Figure 6. The first sewage bypass notice posted by the City of Toronto on Twitter in June 2017.
2.2.3 Combined sewer overflows can be stopped

Municipalities have many options to reduce combined sewer overflows, to reduce the volume of sewage discharged, and to minimize its toxicity and adverse effects. These include:

- Increasing the capacity of sewage treatment systems to safely handle larger flows by:
  - Using storage tanks to hold mixed sewage until the sewage treatment plant can treat it
  - Optimizing treatment plant operations to better manage increased mixed sewage flow.

- Keeping stormwater and groundwater from mixing with sanitary sewage by:
  - Replacing combined sewers with separate pipes for stormwater and sanitary waste
  - Improving leak detection and repair to reduce groundwater infiltration of combined sewers

- Reducing the amount of stormwater that flows into combined sewers with:
  - Downspout and weeping tile disconnection programs
  - Green infrastructure to reduce surface runoff towards streams and sewers
  - Stormwater area charging, to give property owners a financial incentive to keep stormwater out of combined sewers (as described in the ECO’s 2016 report Urban Stormwater Fees: How to Pay for What We Need), and

- Reducing sanitary flows in combined sewers with:
  - Water conservation programs (as described in the ECO’s 2017 Energy Conservation Progress Report, Every Drop Counts).

Green infrastructure

Green infrastructure or low impact development is an important, but underused option. It replaces impervious surfaces (like concrete and asphalt) with permeable materials that can absorb water, such as rainwater gardens, vegetated highway medians and green roofs. Green infrastructure filters and stores stormwater, cleaning it, slowing it and reducing the amount of water entering the sewers. As well as reducing combined sewer overflows, green infrastructure helps to reduce flooding and adds green space, which can improve both physical and mental health.¹¹

Toronto’s Green Building Standard is better than that of most Ontario municipalities, but pales in comparison with other jurisdictions and with the increasing intensity of rain. For example, Toronto’s green roof bylaw requires buildings to retain 5 mm of precipitation, while Rotterdam’s requires buildings to retain 60 mm. In August 2018, some areas of Toronto received 130 mm of precipitation in a single storm, almost all of which flooded swiftly into the sewers.

Permeable areas like this green median divert water from a municipality’s combined or stormwater system by allowing more water to absorb into the ground.

Photo credit: Philadelphia Water Department, (CC BY 2.0).
2.2.4 Inadequate regulation of combined sewer overflows

It is the MECP’s job to ensure that municipalities place sufficient priority on stopping the flow of sewage into Ontario’s lakes and rivers. The MECP is well aware of the harm of combined sewer overflows, but has not taken effective measures to bring them to an end. Section 30 of the Ontario Water Resources Act clearly prohibits combined sewer overflows, because they impair water quality:

Section 30: Discharge of polluting material prohibited – Every person that discharges or causes or permits the discharge of any material of any kind into or in any waters or on any shore or bank thereof or into or in any place that may impair the quality of the water of any waters is guilty of an offence.

So why does the MECP almost never prosecute municipalities for these overflows? Municipalities with combined sewers are entitled to be excused for breaching this law, but only if they have used due diligence, i.e., have taken all reasonable steps to avoid each combined sewer overflow. Although considerable efforts have been made, it seems unlikely that each of the 44 municipalities have taken all reasonable steps to avoid each and every one of the 766 combined sewer overflows that occurred last year.

Municipalities have legitimate financial and/or technical constraints. But how can a municipality claim to be exercising due diligence to prevent overflows unless it is using all of the options listed in section 2.2.3 to the best of its ability? Few, if any, of the 44 municipalities with combined sewers can justly make this claim. For example, few have adopted stormwater fees and none use green infrastructure to its full effect, even in the areas of their municipalities served by combined sewers. In other words, the MECP tolerates combined sewage overflows from municipalities without requiring them to exercise due diligence to comply with the Ontario Water Resources Act (see box for example).

The MECP tolerates combined sewage overflows from municipalities without requiring them to exercise due diligence to comply with the Ontario Water Resources Act.

Every one of the 57 sewage systems with combined sewers requires, and must comply with, an environmental compliance approval issued by the MECP under the Ontario Water Resources Act. These legally binding approvals could, but do not, require the 44 municipal owners to do much more to end combined sewer overflows that occur during high rates of flow or in emergencies. For most systems, the approvals merely require municipalities to sample and report during combined sewer overflows.

Instead, the MECP cites a non-legally binding guidance document known as Procedure F-5-5 – Determination of treatment requirements for municipal and private combined and partially separated sewer systems (the “Procedure”) – which the MECP does not even rigorously follow. The MECP Procedure, published in 1997, has three modest goals, none of which have been achieved:

• to eliminate the occurrence of combined sewer overflows in dry weather
• to minimize the impacts of combined sewer overflows on human health and aquatic life, and
• to achieve compliance with recreational water quality objectives at beaches impacted by combined sewer overflows for at least 95% of the four months, June 1 - September 30, in an average year.

To achieve these goals, the Procedure states that “…each municipality or operating authority of a combined sewer system will be expected to…develop a Pollution Prevention and Control Plan…. ” The Plan is to describe
the nature, cause and extent of pollution problems, examine alternatives, propose remedial measures, and set out an implementation program including cost estimates and schedule. The MECP is supposed to “ensure that the proponent is in compliance with the Procedure prior to the issuance of [an environmental compliance approval].”

Instead, the MECP does not ensure that the 57 sewage treatment systems with combined sewers use a Pollution Prevention and Control Plan to reduce their overflows. According to the MECP, only 23 of the 57 have reported even having a Plan. None of them are obliged to post the Plan publicly, so the ECO could not evaluate when the Plans can be expected to finally stop sewage overflows. The MECP does little to ensure that these Plans are implemented, by any particular date or at all. Twenty years after the Procedure was adopted, the MECP should be embarrassed by its inaction.

The ECO recommends that the MECP insert, into the environmental compliance approval of every municipality that has a combined sewer system, a legal obligation to adopt a public Pollution Prevention Control Plan to virtually eliminate combined sewer overflows within a reasonable time, and the MECP should enforce these Plans.

EBR investigation illustrates lack of enforcement

A recent EBR application for investigation illustrates the lack of enforcement to stop combined sewage overflows. The applicants alleged that the City of Timmins is allowing discharges of raw sewage into Porcupine Lake, and that the city has failed to meet deadlines to upgrade its sewage system, as required by an MECP Provincial Officer’s Order, after years of delay.

The MECP investigation confirmed that the applicants are correct. The city is breaking the law. Its deteriorating sewage system causes sewage to bypass treatment and discharge directly into the Porcupine Lake. The City of Timmins does not have a stormwater fee system to reduce stormwater flow into its combined sewers. Nor has the city met the deadlines in the Order to upgrade its sewage system. However, the ministry took no enforcement action, and accepted the city’s excuses for its non-compliance. The city argued that the required sewage system upgrades had been delayed again by ground settling, which caused a major sewer pipe to break shortly after it was installed. (For more details about this application, see Volume 1, Chapter 2 of this report.)

Some algal blooms can be toxic to fish, animals and people such as the blue-green algal bloom off the southeast shore of Pelee Island, Ontario in 2011.

Photo credit: Tom Archer. Used with permission.
Resources for municipal sewage infrastructure

Many municipalities are working hard to reduce combined sewer overflows, to reduce the volume of sewage discharged, and to minimize its adverse effects. For example, the City of Hamilton has cut its volume of combined sewer overflows by half, after building seven combined sewer overflow tanks that can hold roughly two billion litres of mixed sewage until the sewage plant has capacity to treat it. Utilities Kingston has installed nine combined sewer overflow tanks, is replacing 3-4% of its combined sewer pipes each year, and has increased pipe and pumping capacity at its treatment plants.

However, a purely engineered approach, focussed on building sewage infrastructure, is expensive. For example, the City of Niagara Falls estimates the cost to replace all of its combined sewers with separated sewers is around $100 million. In total, municipalities have an estimated shortfall of more than $8 billion for municipal water, stormwater and sewage management infrastructure. Municipalities typically look to senior levels of government to fund such large projects, but there is never enough funding to meet more than a small fraction of the demand. Provincial unwillingness to fund new infrastructure is often blamed for municipal combined sewer overflows, and may partly explain the province’s lack of enforcement when overflows occur.

The provincial government has been working with municipalities to identify the sewage infrastructure in most need of upgrade. The Infrastructure for Jobs and Prosperity Act, 2015 requires mandatory asset management plans for all municipalities, which is a key first step to identifying priority infrastructure for improvement, such as combined sewers. The province has been providing millions of dollars in training, support and financial assistance to small, rural and northern municipalities to complete their asset management plans through the Ontario Community Infrastructure Fund.

The province should ensure that municipalities look much harder at comparatively inexpensive upstream options, such as green infrastructure, water conservation, and stormwater fees.

Still, in a time of government financial restraint, municipalities cannot count on receiving large provincial cheques for all their preferred “gray infrastructure” solutions, such as storage tanks, separating pipes and moving outfalls. Instead, the province should ensure that municipalities look first, and much harder, at comparatively inexpensive upstream options, such as green infrastructure (see box in section 2.2.3), and water conservation. And it is no longer reasonable to expect that stormwater management should take place only on public land at public expense. Every area served by combined sewers should be required by law to implement stormwater charges to provide a strong direct financial incentive to property owners to keep stormwater out of sewers whenever possible (see our 2016 report, Urban Stormwater Fees: How to Pay for What We Need).

The province should also ensure that municipalities collect from their residents and businesses the true cost of providing them with sewage systems, and use the money for this purpose. The total replacement value of stormwater and sewage infrastructure is many billions. It is far less expensive to keep this valuable infrastructure in good repair than to let it run down and then have to rebuild it, but municipalities often skimp on the maintenance and upgrade of invisible infrastructure, especially if they do not have dedicated resources at hand.

The Walkerton Inquiry strongly recommended mandatory full-cost recovery for water infrastructure, but the province has implemented it only partially and only for drinking water systems. A law passed in 2002 would have required municipalities to implement...
full-cost pricing for all water infrastructure, including sewers, but the necessary regulations were never adopted and the law was repealed in 2012.

Full-cost accounting can admittedly be challenging. For example, checking the physical condition of stormwater and sewage infrastructure can be expensive, so assumptions are often made based on each asset's age alone. Such assumptions may not give a clear picture of the true condition of the infrastructure, potentially leading to incorrect priority-setting and missed opportunities for maintenance. Further, there is no single definition of “full-cost.” Different jurisdictions weigh different factors differently such as environmental, operating, financing, renewal, replacement, and improvement costs. There is a role for both the province and municipalities to help address the funding shortfall through a full-cost recovery model. The ECO recommends that the Ministry of Infrastructure and the MECP work with municipalities to achieve full-cost recovery for stormwater and sewage systems.

2.3 Agricultural runoff: excess phosphorus contributing to algal blooms

A second significant source of water pollution is agricultural runoff that carries excess nutrients, primarily phosphorus. Phosphorus is a key nutrient leading to algae growth in Ontario’s waters. Once phosphorus enters a waterbody, it can stay there and contribute to algal blooms for decades.

Agriculture is a major – but not the only – source of phosphorus. There are several other sources that leak phosphorus into Ontario’s lakes and rivers. In section 2.3.2 below, we discuss discharges from municipal sewage treatment plants. Elsewhere in this volume, we discuss ways to control the other major sources of phosphorus. In particular, in section 2.2 above, we discuss measures to reduce combined sewage overflows (containing a mix of phosphorus-laden untreated sewage and stormwater), as well as measures to better control direct runoff of urban stormwater through increased use of green infrastructure and stormwater charges. In Chapter 1, we discuss the need to address leaking septic systems, another considerable source of phosphorus in some regions (see section 1.5.2 of Chapter 1).

But in many areas of the province, the major Ontario source of phosphorus is agricultural runoff, past and present. Most of this section therefore focuses on agricultural runoff.

2.3.1 Impacts of phosphorus: algal blooms

Phosphorus feeds the growth of algal blooms, which can clog drinking water intakes and impair the quality of our drinking water. Algal blooms can spoil our shorelines and cause beach closures, make boating difficult and decrease property values. Some types of algae create “nuisance” blooms, while others can be toxic and cause adverse health effects on people, fish, and animals. Treating water that contains excessive algae is expensive, and the chemicals that are used can form by-products that have been associated with reproductive and developmental health problems in humans. Excess algae can also disrupt energy generation. For example, four reactors at the Pickering nuclear power plant were shut down in July 2018 after significant amounts of algae, stirred up by a storm, clogged the intakes.

Excess algae can alter ecosystems in ways that harm fish and, in turn, damage recreational and commercial fishing. For example, all types of algal blooms can deprive aquatic organisms of available dissolved oxygen in the water, resulting in higher death rates for local fish, invertebrate and plant populations. These low oxygen conditions, called hypoxia, can last as little as minutes or can cause long-term adverse impacts on oxygen levels in the water. Excess algae also costs Ontario a lot of money both in clean up and lost revenue. In 2015, Environment and Climate Change Canada estimated that algal blooms in the Canadian Lake Erie basin could cost the economy up to $272 million annually.
Algal blooms and drinking water

Algal blooms can not only harm aquatic ecosystems and recreational activities, they can also have serious impacts on drinking water sources. Some forms of blue-green algae may release toxins, including microcystin-LR, which is a dangerous hepatotoxin. Toxic algal blooms near water intake pipes can force water treatment plants to make potentially costly operational changes and upgrades to safeguard drinking water (which have, so far, successfully ensured no detections of unsafe microcystin-LR in treated drinking water in the province), on top of other actions to address the sources of the problem.

For example, Pelee Island in Lake Erie has been faced with increasingly frequent and severe blue-green algal blooms. A particularly harmful algal bloom in 2014 resulted in numerous beach closures, made it unsafe to drink water from the lake or shoreline wells, and temporarily closed Pelee Island’s water treatment plant. The municipality has had to upgrade the plant and adopt more expensive operational procedures, in part to better remove algae and neutralize their toxins in the drinking water. The majority of residents on Pelee Island are on private wells and must take their own precautions to protect their drinking water.

Microcystin-LR is also an issue for other Lake Erie municipal drinking water intakes, such as the Harrow-Colchester, Union, and Wheatley water treatment plants, as well as a potential issue that must be addressed on Lake St. Clair.

The City of Greater Sudbury faces similar challenges with phosphorus levels and algal blooms at its surface water intake on Ramsey Lake. The municipality has to monitor Ramsey Lake weekly from June to October to detect algal blooms. The water treatment plant then uses specialized operating procedures to treat it for the microcystin-LR so that it is safe for drinking. In the summer of 2018, Public Health Sudbury and Districts warned about algal blooms in several of the area’s lakes, advising people not to drink the water or swim in it.
Algae problems in the Great Lakes and Ontario’s inland waters are worsening. An algal bloom in 2014 contaminated drinking water in Toledo, Ohio and, in 2015, Lake Erie experienced what scientists described as the most severe toxic algal bloom of the century. In August of 2018, Ramsey Lake in Sudbury, Ontario experienced the largest algal bloom in a decade. Reports of cyanobacteria blooms, which have the potential to produce toxins that can impact human health, are increasing. Blooms in Ontario are also occurring and persisting later in the year due, in part, to climate change creating warmer conditions for algae growth.

Given these trends, it is essential that Ontario address the main sources of phosphorus that are creating these blooms.

### 2.3.2 Where does phosphorus pollution come from?

Municipal wastewater (i.e., sewage) treatment plants used to be a major source of phosphorus pollution, and were consequently the focal point of most provincial phosphorus regulation. As a result, most Ontario wastewater treatment plants now employ relatively extensive – secondary or tertiary (see box) – treatment to remove phosphorus from their effluent, and have become a less significant source of nutrient pollution. In the Lake Erie basin, all of the municipal wastewater treatment plants provide at least secondary treatment and some use tertiary treatment to enhance phosphorus removal.

While municipal wastewater treatment plants have become a much smaller contributor of phosphorus in Ontario, they remain an important source of phosphorus (see box below on the Duffin Creek Water Pollution Control Plant debate).

### The different levels of wastewater treatment

Different levels of treatment are used in combination by treatment plants to meet the performance criteria requirements outlined in their environmental compliance approvals.

<table>
<thead>
<tr>
<th>Treatment type</th>
<th>Description</th>
<th>Percentage of Ontario population serviced by treatment type²⁰</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Removes contaminants only through settling, usually without additional chemical treatment</td>
<td>2.2%</td>
</tr>
<tr>
<td>Secondary</td>
<td>Removes dissolved organic compounds by consuming them with microorganisms. The MECP calls for secondary treatment at a minimum.</td>
<td>89.4%</td>
</tr>
<tr>
<td>Tertiary</td>
<td>Removes non-dissolved materials that are too small to be removed by primary and secondary treatment as well as soluble components, by addition of chemicals</td>
<td>8.4%</td>
</tr>
<tr>
<td>Quaternary</td>
<td>Employed where enhanced source water protection is required or for water reuse applications and includes reverse osmosis, membrane filtration and activated carbon technologies</td>
<td>0%</td>
</tr>
</tbody>
</table>
Algal blooms in Ajax: the Duffin Creek water pollution control plant debate

The Duffin Creek water pollution control plant, operated jointly by the Regional Municipalities of Durham and York, is located in Pickering, east of Toronto, and which, like all sewage plants, discharges phosphorus. Nearby is a large amount of green algae fouling the Ajax and Pickering nearshore waters, which feed on phosphorus.

In 2007, Durham and York Regions received approval to expand the Duffin Creek plant to accommodate large increases in wastewater from their growing populations, with a condition that the facility undergo a Class Environmental Assessment for Municipal Infrastructure Projects (class EA) to address capacity limitations for the plant outfall. The regions spent hundreds of millions of dollars to build the plant expansion, but are not yet permitted to fully use it due to the limitations of the outfall. In 2013, the Minister received 90 submissions, including 75 formal requests from the public to “bump-up” the outfall class EA to an individual environmental assessment, on the grounds that the class EA process is inadequate to address their environmental concerns. The Minister has not yet decided whether to grant these bump-up requests. To help decide, in 2016, the minister required the regions to submit a proposed phosphorus reduction action plan.

The regions submitted the phosphorus reduction action plan in January 2018. The regions proposed to limit their phosphorus discharge levels by optimizing their existing secondary treatment process, rather than adding tertiary treatment. The regions argue that they should not have to pay the high costs of tertiary treatment because: optimization of the plant’s secondary treatment process would reduce monthly average phosphorus concentrations to about half of the maximum levels allowed in the plant’s current environmental compliance approval; the levels that would be achieved through tertiary treatment are more stringent than those required at other plants on Lake Ontario; and tertiary treatment would not resolve the algae problem in any case because of other large, mainly non-point, sources of phosphorus.

The Town of Ajax argues that, even with optimized secondary treatment, its forecasts show that the total amount of phosphorus discharged from the plant would substantially increase over time due to population growth and thus more sewage. Further, the town and the regions disagree about the cost of tertiary treatment.

Five years after the outfall class EA was submitted, the algae problem remains unresolved and the sewage plant expansion is not in full use. All parties are still waiting for the Minister to decide the bump-up requests and, ultimately, how much phosphorus the Duffin Creek water pollution control plant will be allowed to discharge.

*Please be advised that in January 2019, the ECO updated this box to include additional information and correct factual errors.
“Nonpoint sources” such as agricultural, rural and urban stormwater runoff are now typically the largest contributor to phosphorus loads, but government policy has not caught up. For example, the Canada-Ontario Lake Erie Action plan contains goals for phosphorus reductions from municipal wastewater treatment plants (which contribute less than 15% of the phosphorus in Lake Erie) but not for the larger non-point sources.21

The precise amount of phosphorus from each non-point source is not well-established and differs from watershed to watershed.

In some areas, urban stormwater is the major contributor of phosphorus. Stormwater carries, among other contaminants, phosphorus from wildlife and domestic animal excrement, as well as from fertilizer used on lawns, gardens, and golf courses. In some cases, efforts to reduce combined sewage overflows by separating sewers can actually result in more stormwater flowing untreated into water bodies. As discussed in section 2.2 above, the province should require municipalities to reduce and better manage poorly controlled urban stormwater, such as through increased use of green infrastructure as well as the use of stormwater charges to provide a strong direct financial incentive to property owners to reduce stormwater runoff (see also the ECO’s 2016 report Urban Stormwater Fees: How to Pay for What We Need). These measures are needed in all urban areas that experience algae.

In many areas of the province with the worst algae problems, runoff from agricultural lands is the main source of phosphorus.

However, in many areas of the province with the worst algae problems, runoff from agricultural lands is the main source of phosphorus. For example, in the most southwestern portion of Ontario, where almost all of the watersheds have water quality problems from excessive phosphorus,22 the dominant land use is cropland used to grow soy and corn. In the case of Lake Erie, an estimated 85 to 90% of the phosphorus loading is from non-point sources originating from rural and agricultural land from both sides of the border;23 a large portion of those phosphorus loads come from the American rivers and lakes, accounting for 84% of total phosphorus load to Lake Erie.

2.3.3 Curbing phosphorus runoff from agriculture

Farmers provide essential services by growing our food and contributing to our economy, and many are good environmental stewards. Most farming practices include the addition of phosphorus-containing fertilizer in the form of manure, inorganic chemical fertilizer or “non-agricultural source materials” such as leaf and yard waste, food waste, pulp and paper biosolids, and sewage sludge, to enhance crop growth. Crop residues may also contain phosphorus. However, phosphorus from these fertilizers and residues can run off into waterways, either overland or through subsurface flow in agricultural tile drains.

Farmers can save money and help alleviate Ontario’s algae problem by keeping phosphorus in the soil where it is needed, and not letting it run off.

Farmers can save money and help alleviate Ontario’s algae problem by keeping phosphorus in the soil where it is needed, and not letting it run off. However, some farming practices can lead to increased runoff. For example, some farmers put phosphorus-containing manure and fertilizers on their land in the fall and winter, after the growing season. This may help a farmer short on manure storage or save them time in the spring, but can result in large phosphorus runoff over the winter.
The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) has two main approaches for reducing nutrient pollution, including phosphorus, from farms. First, it provides cost-sharing for farmers that adopt “best management practices” through voluntary programs, and promotes adoption through outreach.24 Second, it has some mandatory standards for nutrient management from manure and fertilizer on a minority of farms, under the Nutrient Management Act. These two approaches have not yet reduced phosphorus levels in Ontario waters and should be made more effective.

In Chapter 4 of the ECO’s 2017 Environmental Protection Report, the ECO reported on other options for the province to reduce nutrient contamination by runoff from agricultural land. A little progress has been made since then. In April 2018, the OMAFRA ministry released New Horizons: Ontario’s Agricultural Soil Health and Conservation Strategy. This strategy correctly recognizes that healthy soils do a better job retaining phosphorus within the soil, and thus reduce runoff. However, the ministry should do more to ensure that Ontario farms will have healthy soils and support farmers in converting from conventional to soil-focused agriculture.

Best management practices

An Environmental Farm Plan is a voluntary self-assessment of a farm’s environmental impacts, with an implementation plan for environmental best management practices, some of which aim to reduce nutrient runoff. Best management practices that can reduce phosphorus runoff include planting cover crops, upgrading manure application equipment, and creating wetlands, among others. About 70% of Ontario’s farm businesses (just over 35,000 farms) have Environmental Farm Plans.25 Developing a plan means farmers intend to implement some best management practices and many of these practices would also theoretically help to keep nutrients from phosphorus in the soil and out of Ontario’s water. About 850 farms also implement best management practices under the Farmland Health Check-Up initiative, a voluntary program partially focused on helping farmers improve their nutrient management and soil health in specific watersheds. Farmers may also qualify for other cost-share programs focussed specifically on creating habitat for species at risk or improving soil health, which may have the co-benefit of reducing phosphorus runoff.

The OMAFRA spends hundreds of millions of dollars each year in farm support programs, including crop insurance. A tiny amount of this, $22 million over five years (2013-2018), has gone to help farmers implement environmental best management practices in their Environmental Farm Plans, the Great Lakes Agricultural Stewardship Initiative, and other similar programs. The OMAFRA has committed to keep funding similar cost-share programs under the Lake Erie Agriculture Demonstration Sustainability (LEADS) program (a subprogram of the Canadian Agricultural Partnership) until 2023.

Best management practices can, in theory, be effective in reducing nutrient runoff. However, the OMAFRA inspects only 20% of projects that utilize best management practices to ensure they are adequately implemented according to program rules. There is also no coordinated database to track best management practices implemented through the various publicly funded voluntary programs, or long-term monitoring to check whether these practices are still in use. We need better information on best management practices so we can connect the dots between the actions farmers take on their fields and their impacts on phosphorus loads in Ontario’s waters.

There have been positive steps in the right direction. For example, the recently ended federal-provincial Great Lakes Land Stewardship Initiative Priority Subwatersheds Program helped farmers implement best management practices that specifically targeted
nutrient loss and will be monitored for several years to determine ongoing phosphorus loss from participating farms. Going forward, the ministry states that measuring performance and improving outcomes are important priorities under the Canadian Agricultural Partnership, but has not said how “best management practices” will be monitored nor how outcomes will be defined and measured. Similarly, the Canada-Ontario Lake Erie Action Plan states that the province will investigate the adoption of best management practices within the Lake Erie basin, but does not provide any specifics or timelines.

Effective monitoring of phosphorus reduction in farm runoff is a long-term endeavor and the collection of better information on best management practices is the crucial first step.

Effective monitoring of phosphorus reduction in farm runoff is a long-term endeavor and the collection of better information on best management practices is the crucial first step. We need to start now; many years of data are needed to reliably distinguish the effectiveness of best management practices versus other variables such as weather, and to be sure that public money is being well spent. For soil that contains large amounts of phosphorus, it may take up to a decade of best management practices to reduce nutrients leaving the farm in runoff.

To address the growing prevalence of algae in Ontario’s lakes and rivers, the ECO recommends that the Ontario Ministry of Agriculture, Food and Rural Affairs track best management practices across publically funded programs, and increase monitoring efforts to check whether the best management practices it has funded are in use. This is the first step to scaling up effective practices that drive down phosphorus pollution from agricultural land in Ontario’s rivers and lakes.

The Nutrient Management Act

The OMAFRA’s second approach to phosphorus runoff is through regulation of storage and land application of nutrients on a small number of farms under the Nutrient Management Act. This law was adopted after the Walkerton water tragedy, to help keep manure and similar contaminants out of water sources. Unfortunately, the Nutrient Management Act lacks the scope, strength and enforcement effort to substantially reduce phosphorus losses from agricultural lands.

Doing a better job identifying and regulating areas at high-risk for nutrient loss

Phosphorus is a high-risk threat to water quality where a concentrated source of phosphorus (i.e., manure, commercial fertilizer or some non-agricultural source material) has high potential for transport to a sensitive location (see Figure 7). 27

![Figure 7. Factors determining risk for nutrient loss on agricultural land.](image-url)

Source: Adapted from Andrew Sharples, The Pennsylvania State University (2001). “Managing Phosphorus for Agriculture and the Environment.” Created by the ECO.

Photo Credit: Lynn Betts, USDA (CC0)
To identify areas that are high-risk for phosphorus loss (i.e., high phosphorus and high transport potential), the OMAFRA offers farmers an assessment tool called NMAN. With this tool and others like it, farmers input the rate and method they use to apply nutrients (including phosphorus) on their farm, the soil nutrient levels on their cropland, and the characteristics of the land that may increase the risk of nutrient pollution (such as the slope and proximity to surface water). From this information, NMAN enables the farmer to assess their overall risk of contaminating nearby surface water with nutrients and helps them with “nutrient balancing” (i.e., applying nutrients in a responsible way).

However, only a few Ontario’s farmers are required to use assessments to calculate their risk and balance their nutrients. Assessments like NMAN are only compulsory for the few farmers who must complete a Nutrient Management Plan or a Non-Agricultural Source Materials (NASM) Plan under the Nutrient Management Act. Only larger livestock farms that generate a large amount of manure and apply it to cropland are required to have Nutrient Management Plans, and only farmers that spread non-farm generated nutrients, such as sewage biosolids, are required to complete a NASM plan. In total, only the 1000 farms that have a NASM Plan, plus the 1,303 farms that have a Nutrient Management Plan (6% of the 22,215 Ontario farms that use manure as fertilizer) are required to complete assessments that test soil for nutrient build-up, document nutrient application practices, and calculate the risk of nutrient loss based to nearby water (see Figure 8).

**Figure 8.** Subset of Ontario farms required by law to have a Nutrient Management Plan.

Sources: Statistics Canada, Census of Agriculture, 2016; OMAFRA, 2018. Data compiled by the ECO.
This leaves out:
• most livestock farms that generate manure
• all farms that spread manure supplied by other farms, and
• all phosphorus pollution risks from the tens of thousands of farms that use only commercial fertilizer, but no manure or off-farm biosolids.

As a result, many farm phosphorus pollution risks are probably not being assessed, even in the highest risk and most polluted areas. The ECO recommends that the Ontario Ministry of Agriculture, Food and Rural Affairs require all farms in Ontario’s most impaired watersheds to assess their nutrient runoff risks and submit a plan to minimize that risk.

In addition, the ministry should be proactive in identifying areas where the soil and topography create a high risk of nutrient runoff, so that high risk farms can be targeted with regulatory efforts as well as financial, technical or educational resources to help them reduce phosphorus loss.

**Strengthening the Nutrient Management Act requirements related to winter spreading**

Most phosphorus loss from farmland occurs in the non-growing season. Frozen, snow-covered, or saturated ground leaves nutrients concentrated at the soil surface, easier to run off. When soil is bare, the lack of vegetation creates an easy pathway for nutrients to flow over bare land in the event of rainfall or snowmelt.

For this reason, jurisdictions like Manitoba and Quebec ban wintertime nutrient spreading. Some jurisdictions go further; Ohio restricts the spreading of manure on agricultural land located in the western basin of the state when the top two inches of soil are saturated or before significant rainfall. Instead, Ontario has minimal restrictions on the winter-spreading of manure, no restrictions related to rain-saturated soils or imminent rainfall, and no restrictions on winter-spreading of commercial fertilizer. Even on the small number of farms regulated under the Nutrient Management Act, the winter spreading of manure is “not recommended” but is permitted on most farms (subject to some regulatory requirements). Although most farmers are good stewards, the harmful practice of winter manure spreading is still happening in Ontario.

Although most farmers are good stewards, the harmful practice of winter manure spreading is still happening in Ontario.

The OMAFRA has been working in partnership with representatives from the livestock industry to encourage peer education on the potential harmful impacts of spreading manure on frozen or snow-covered ground, but in the ECO’s view, this is not enough. The ECO’s 2016/2017 Environmental Protection Report (Part 4.3.2) recommended eliminating the practice of nutrient application in winter to reduce phosphorus runoff from agricultural land. Simply put, manure (or any type of fertilizer) should not be put on frozen farm fields, because it is highly likely to runoff and contaminate lakes and rivers instead of fertilizing crops. This easy regulatory change would catch up with neighbouring provinces, and could go a long way to reduce the growing algae problem. The ECO reiterates our 2017 recommendation that Ontario ban the spreading of manure and fertilizer on frozen ground, snow-covered or saturated ground, with no exceptions.

22,215 Ontario farmers reported using manure as fertilizer on their farms in 2016.

Photo Credit: Paul Clarke, (CC BY 2.0).
Increasing enforcement and compliance with the Nutrient Management Act
The MECP is responsible for enforcing compliance on the small fraction of farms that are regulated under the Nutrient Management Act. The inspection rate remains low. In 2016/2017, only an estimated 3% of regulated farms with Nutrient Management Plans were inspected, and 62% of those inspected were found to be non-compliant with the Nutrient Management Act.32

Only an estimated 3% of regulated farms with Nutrient Management Plans were inspected, and 62% of those inspected were found to be non-compliant with the Nutrient Management Act.

In 2017, in response to earlier critiques from the Auditor General about the ministry’s inspection program,33 the MECP began a risk-based inspection approach to enforcing the Nutrient Management Act. It now selects farms for inspection that have the highest risk of endangering human health through manure contamination of drinking-water sources, considering the farm’s size, number of animals, manure management strategy and proximity to a drinking-water source. Notably, the MECP selection criteria do not prioritize risks of nutrient pollution that cause environmental harm, such as algae, and omit important environmental risk factors such as nutrient build-up in soil and the phosphorus levels in the receiving lake or river.

The ECO is pleased that the MECP is conducting more targeted inspections for Nutrient Management Act compliance, but is concerned by the incomplete targeting and by the high levels of non-compliance. The ECO urges the ministry to also focus enforcement efforts in areas at high risk for nutrient loss into highly vulnerable water bodies, particularly at times when the risk of nutrient loss is at its highest (e.g., periods of heavy rains, snowmelt, or on frozen ground).

Soil health
Soil erosion increases the quantity of phosphorus running off into surface water. Good soil health practices can reduce erosion, keep water and nutrients in the soil where they are needed, and increase soil resilience to floods and droughts. They promote food security, protect water quality, and help with climate change mitigation and adaptation (see Figure 9).

Figure 9. The principles and benefits of the soil health approach.
Source: Created by the ECO.
As described in our 2016 report, Putting Soil Health First, healthy soil practices include:

• crop rotations
• keeping the soil covered at all times with cover crops, regular crops or crop residues
• reduced use of agricultural chemicals
• minimizing ploughing and other forms of soil disturbance, and
• leaving living roots in the ground as long as possible.

In 2015, two members of the public used the Environmental Bill of Rights to ask the government to develop new policies, programs and financial incentives to encourage farmers to improve soil health (see Volume 1, Chapter 2 of this report). In 2018, the Government of Ontario responded with a new soil strategy, New Horizons: Ontario's Agricultural Soil Health and Conservation Strategy. The strategy recognizes that increasing soil organic carbon and lowering the risk of erosion are desired outcomes, and includes some useful actions such as mapping, evaluating, and monitoring. The strategy states that Ontario will rely on Agriculture and Agri-Food Canada indicators – such as those measuring soil organic carbon, soil erosion risk, and soil cover – to gauge province-wide success in improving soil health.

However, the strategy does not commit Ontario to do much to actually achieve better soil health. There are no concrete targets, and lacks new financial incentives for farmers to improve soil health. For example, other jurisdictions, such as Iowa, give farmers a discount on their crop insurance rates if they plant cover crops; Ontario does nothing comparable.

In summary, the government has responded to agricultural runoff with weak laws, poor monitoring, minimal enforcement, and too little financial support for improving soil health. It should therefore be little surprise that agricultural nutrient runoff is feeding algae growth in so many of Ontario’s lakes and rivers.

The government has responded to agricultural runoff with weak laws, poor monitoring, minimal enforcement, and too little financial support for improving soil health.

The ECO recommends that the Ontario government adopt clear targets, effective monitoring and financial incentives for dramatic reductions in phosphorus runoff from farms.

2.4 Industrial wastewater: toxic chemicals polluting our waters

Many industries in Ontario produce valuable goods and services, but in the process release toxic chemicals and heavy metals that have significant lasting effects on Ontario’s waters.

2.4.1 Impacts of toxic chemicals: long-lasting threats to humans and the environment

As many areas in Ontario have experienced, toxic industrial wastes can create long-lasting legacies of contaminated lakes and rivers that are, at best, difficult and expensive to clean up. For example, heavy metals, such as lead and mercury, can persist in the aquatic environment indefinitely, posing a long-term serious threat to humans and the environment. Heavy metals never break down. Instead, they can accumulate in tissues and cause neurological, physiological, and mental dysfunction. These contaminants may lay dormant in lake or river sediment for decades, but can be re-suspended in the water by a storm or other disturbance, where they can again adversely affect people and the ecosystem.
One notorious example is the enduring mercury contamination in Grassy Narrows from mercury dumped by a long-closed pulp and paper mill. After decades of neglect, the Ontario government has committed $85 million to hopefully clean up this contamination (see Chapter 3.1 of the ECO’s 2017 Environmental Protection Report).

Prior to modern environmental laws, the industrial boom in the early 20th century left some parts of Ontario’s Great Lakes too toxic for most aquatic life. An unfortunate example is the Randle Reef in Hamilton Harbour on Lake Ontario. The aquatic ecosystem of Randle Reef is severely impaired because of contamination by polycyclic aromatic hydrocarbons and other toxic chemicals in the lake bed sediment from local industries. The remedial planning process for Hamilton Harbour was initiated by the Ministry of the Environment, Conservation and Parks in 1985. Work has been underway since 2015 to entomb the contaminants in concrete, at a cost of $139 million, in the hope of making nearby water safer for people and aquatic species.

Many other toxic chemicals are discharged into Ontario waters, some in very high volumes, and many with potentially very significant, and in some cases not-yet-known, impacts on humans and the environment. For example, nonylphenol, a toxic chemical widely used as an industrial detergent, is an endocrine disruptor that can interfere with human pregnancies. Many of the full effects of toxics on people and the environment are not even known, especially the long-term impacts of chronic and varying exposure to multiple toxics, sometimes called toxic soup. For some contaminants, like mercury, even small quantities can have very serious health impacts.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Releases in 2016 (kg)</th>
<th>Examples of Sources</th>
<th>Chronic effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylene glycol</td>
<td>76,000</td>
<td>• Paper production</td>
<td>Neurobehavioral effects, similar to Parkinson’s disease</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Steel manufacturing</td>
<td></td>
</tr>
<tr>
<td>Methanol</td>
<td>51,000</td>
<td>• Industrial processes</td>
<td>Headache, dizziness, insomnia, nausea, gastric disturbances, conjunctivitis, visual disturbances</td>
</tr>
<tr>
<td>Nonylphenol (and its ethoxylates)</td>
<td>40,000</td>
<td>• Industrial cleaning and degreasing</td>
<td>Endocrine disruptor with hormone-like effects, associated with breast cancer risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Paint and adhesive manufacturing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pulp and paper</td>
<td></td>
</tr>
<tr>
<td>Arsenic (and its compounds)</td>
<td>3,680</td>
<td>• Burning of fossil fuels</td>
<td>Human cancer-causing agent, decreased blood cell production, abnormal heart rhythm, numbness in hands and feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Metal production</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Waste burning</td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>2,780</td>
<td>• Fuel additive</td>
<td>Delayed intellectual and behavioural development, neurobehavioural and cognitive effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Paints</td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td>20</td>
<td>• Metal mining and smelting</td>
<td>Respiratory failure, development delay, neurological effects including tremors, changes in vision and loss of muscle coordination</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Coal-fired power generation</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td>10</td>
<td>• Natural gas dehydrators</td>
<td>Carcinogenic, primarily leukemia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Steel manufacturing</td>
<td></td>
</tr>
</tbody>
</table>
2.4.2 Regulation of industrial toxic discharges

Most of Ontario’s most severe toxic contamination that continues to impair surface and groundwater comes from yesterday’s industries, dumped decades ago or leaked from old landfills. But toxic water pollution is still occurring. Many of today’s businesses still routinely use toxic chemicals, such as dry cleaners, auto mechanics, painting and varnishing operations, and especially industrial manufacturing. While Ontario has some rules to limit toxic chemical discharges into water bodies, those rules relating to industrial manufacturing have not been updated in a quarter century and are out of date.

In Ontario, toxic pollution discharges to water from nine major industrial sectors are supposed to be limited by the municipal-industrial strategy for abatement (MISA) regulations under the Environmental Protection Act:

- Electric power generation
- Iron and steel manufacturing
- Inorganic chemical manufacturing
- Organic chemical manufacturing
- Metal casting
- Industrial minerals
- Metal mining
- Pulp and paper
- Petroleum

Facilities within these sectors are allowed to release into Ontario’s lakes and rivers over 50 types of toxic chemicals up to limits set by the MISA regulations for concentration and total loading. The regulations include limits on daily, monthly, and “acute lethality” (meaning the level of contaminants in the effluent must not be lethal to more than a specified percentage of aquatic life like fish and invertebrates). They also set out sampling, monitoring, and reporting requirements.

The MISA regulations were meant to set achievable caps on facilities’ toxic water pollution, based on intensive review of each sector. The regulations were developed in the late 1980s and early 1990s, based on the pollution limits that facilities could reasonably achieve at that time using the “best available, economically achievable technology” for each industrial sector, and based on the assumed capacity of the receiving water to assimilate the pollutants (e.g., the bigger and less polluted the water body that a facility discharges into, the more pollution it can dilute). When the regulations were passed between 1992-1994, the Ministry of the Environment committed itself to keep them updated through “periodic re-examinations,” with the eventual goal of “virtual elimination of persistent toxic substances.” The ministry promised:

…when re-examinations find better technology has been developed, or industry abatement standards have improved, or the receiving body of water is suffering, new and lower limits will be imposed.

Twenty-five years later, this has never happened. Indeed, these outdated regulations still claim to cover facilities that no longer even operate in Ontario.

The outdated MISA regulations might not matter if up-to-date pollution limits were set by the individual environmental compliance approval issued to each facility under the Ontario Water Resources Act. But this
has not happened either. Ontario industrial wastewater approvals are not regularly reviewed and are rarely updated. Other jurisdictions, including the U.S. Environmental Protection Agency, include expiry dates on approvals for industrial facilities that release toxic chemicals to ensure regular review of the approvals; Ontario does not.

Many of the toxic industrial chemicals persist for long periods in the environment. As noted above, when the MISA regulations were developed, the goal of the program was “the virtual elimination of persistent toxic substances.”35 This goal is just as important today as it was then, but the MECP seems to have been content to make no progress towards it in 25 years.

In the last quarter century, we have become more aware of the harmful effects of chemicals, while the ability of water bodies to accept them has been eroded by population growth, loss of natural areas and climate change. Meanwhile, it is reasonable to expect that industry has better technology for detecting, managing and reducing toxic chemicals, just as today’s flat screens, LEDs and smart phones outperform 1993’s tube televisions, incandescent bulbs and landline telephones. It is long past time for the MECP to update the legal limits for toxic industrial discharges into our water, especially persistent toxic substances.

In 2010, two environmental organizations submitted an application under the Environmental Bill of Rights asking the MECP to review the MISA regulations, arguing that they were insufficient and outdated even then. The ministry denied the request, claiming that:

• The ministry’s “modernization” of its approvals process would free up time for ministry staff to update the individual environmental approvals of the MISA facilities, and

• The Toxics Reduction Act, 2009, would reduce industrial toxic discharges. (Under this law, facilities must track each prescribed toxic substance, submit a publicly-available plan to reduce their use and creation to achieve targets of the industry’s choosing, and submit an annual report to the MECP. There is no requirement for a prescribed facility to implement its toxics reduction plan and the ministry takes no enforcement action on the contents or implementation of the plans.)

The ECO considered the rejection of this application unreasonable at the time. Eight years later, the ECO still has no evidence that toxic industrial discharges to water have been reduced.

As the ECO reported in Chapter 2 of our 2017 Environmental Protection Report, the MECP’s modernization of approvals program is valuable, but it has not yet resulted in updates of the older environmental compliance approvals for MISA-regulated facilities.36 Similarly, the Toxics Reduction Act has not achieved significant reductions of toxic industrial discharges. Despite small year to year decreases reported in 2017, toxic industrial discharges to air, land and water have increased by 2% since 2012. The Toxics Reduction Act has proved to be no substitute for better regulation of wastewater discharges.

It is time to bring the MISA regulations and the associated industrial wastewater approvals up to date.

It is time to bring the MISA regulations and the associated industrial wastewater approvals up to date.

The ECO recommends that the MECP update the limits in the MISA regulations and environmental compliance approvals, to require industries to use the best available technology to minimize toxic substances discharged into Ontario waters, and to require industries to virtually eliminate discharges of persistent toxic substances.
2.5 Road salt: salinizing Ontario’s waters

The fourth pollutant we examined is road salt. Ontario uses enormous amounts of salt to maintain the safety of roadways and walkways during the long winter. Far too much of this salt ends up unnecessarily in Ontario’s lakes, rivers and groundwater, where it does great and lasting harm. Excess road salt enters Ontario’s water bodies through runoff from roads and walkways, losses at salt storage yards, and meltwater from snow disposal sites. Ontario’s pollution laws do almost nothing to control this damage.

2.5.1 Impacts of road salt on Ontario’s waters

High amounts of salt in Ontario’s water are toxic to aquatic plants and animals in many ways. For example:

- Salt impairs animal and plant cells’ ability to carry out key ecological processes, and eventually can kill the organisms.
- Salt can change the weight of lake water enough to block the normal mixing process, which is essential to bring oxygen into the deeper, cooler water that fish like lake trout need. 37
- Salty water can dissolve the bonds between heavy metals and sediments, making the metals more likely to harm aquatic plants and animals.

High amounts of salt in Ontario’s water are toxic to aquatic plants and animals.

Road salt contaminates drinking water too

Salt can also contaminate drinking water sources (see Chapter 1 of this volume for a discussion on drinking water threats), making the water risky for humans to drink. In fact, the application and storing of road salt and salt-saturated snow are three of the 22 prescribed drinking water threats under the Clean Water Act. Many source protection committees are finding it challenging to reduce salt threats to the small parts of Ontario’s water supplies that are active sources of municipal drinking water.

For example, in the Quinte Source Protection Area, the source protection committee is having difficulty determining where salt application is a significant drinking water threat, but knows that road salt is a significant threat in at least one municipality and a moderate to low threat in seven more. More than ten years after adoption of the Clean Water Act, most of the municipalities have made no progress in addressing these threats. The Trent Conservation Coalition, who administers the source protection plans for the Otonabee-Peterborough, Crowe Valley, Kawartha-Haliburton, and Lower Trent areas, reports similar challenges, but has made more progress. The region reports that it has addressed 26 road salt threats of the 48 identified.

In Simcoe, sodium (salt) levels in the town’s drinking water became so high in 2017 that the Haldimand-Norfolk health officer issued a ‘do not consume’ warning for people with high blood pressure and sodium-restricted diets.38 Such residents would have to buy bottled water for drinking, or carry it from elsewhere.
Salt can also harm soil, gardens, vegetation and trees, which we will increasingly need for shade as the summers get hotter. Salt damages shoes and other clothing, as well as injures animal paws. It corrodes cars and damages sidewalks, buildings, bridges and other infrastructure, leading to increased maintenance costs and sometimes dangerous disasters. The resulting repair and maintenance costs are substantial. The hidden costs of road salt on infrastructure and the environment range from $200 to $470 per ton of road salt applied, while salt corrosion costs car owners $850 per year and can cause vehicle brake failures.

Contamination of Ontario’s water by road salt is being experienced across the province. Consider Frenchman’s Bay in Pickering, on the north shore of Lake Ontario (see Figure 10). A 2010 study found more than double the level of chlorides in its waters compared to the Great Lakes generally. The reason? Salt from plowed snow and runoff from paved areas, including the nearby Highway 401. Some of the salt flows into nearby waterbodies during winter thaws, causing extreme spikes in chloride. The rest accumulates in groundwater, then is slowly released into creeks as salty water throughout the summer. This combined acute and chronic salt contamination changes the number and age structure of the fish and decreases the diversity of aquatic species.

Figure 10. Satellite image of Frenchman’s Bay in Pickering, Ontario.

Source: map data provided by Google Earth, graphic compiled by the ECO.
This problem is not unique to Frenchman’s Bay. Rising salt levels have been observed all over the province. The Canadian Water Quality Guideline states that long-term average chloride levels for freshwater should be below 120 mg/litre, and short-term peaks below 640 mg/litre. Instead, chloride levels in Hotchkiss Creek, which runs into Lake Simcoe, have been measured at over 6,000 mg/litre (see Figure 11). Similar levels have been found in many Toronto area creeks, including Etobicoke Creek and Mimico Creek. The Credit Valley Conservation Authority has found chronic chloride levels in several of its creeks well above 1,000 mg/litre, with acute readings as high as 18,000 mg/litre. This approaches the chloride levels found in seawater (19,400 mg/litre). Ontario’s plants and animals cannot survive so much salt.

Figure 11. Comparison of chloride concentrations in a selection of Ontario waters relative to Canadian Water Quality Guidelines (graphic for illustrative purposes and not to scale).

Source: Created by the ECO based on data compiled from the Greater Sudbury Watershed Alliance, the Toronto and Region Conservation Authority, the Lake Simcoe and Region Conservation Authority, and the Credit Valley Conservation Authority.
Chloride problems exist further north too. In Ramsey Lake, Sudbury’s drinking water supply, increasing salt levels prompted the Greater Sudbury Watershed Alliance to hold a public meeting and produce a discussion paper. The Alliance concludes that the increase in salt in Ramsey Lake is largely due to the additional road salt used by recent expansions to an industrial area and a new recreational facility parking lot, both located in the lake’s watershed.

Road salt studies from within Ontario and across North America show that the problem is widespread and getting worse.

Road salt studies from within Ontario and across North America show that the problem is widespread and getting worse. For example, a 2017 study of chloride levels in lakes in north-eastern North America (including nine in Ontario) found that road salt is a rising threat to numerous freshwater lakes, particularly in urbanized areas. A separate, long-term study of Ontario streams showed a significant increase in chloride concentrations at almost all of the sites tested, with the highest concentrations in urbanized areas. However, chloride concentrations of 650 monitored inland lakes in Ontario are currently below the national guidelines.

Climate change may also be playing a role in rising chloride levels. Climate change will bring more extreme weather and chloride concentrations tend to be higher in years with more precipitation and total snow depth.

2.5.2 The (over) application of road salt

Environment and Climate Change Canada estimates that about 5 million tonnes of road salt is spread on roads across Canada each year. In 2009, Environment Canada and Climate Change reported that Ontario uses over 2.2 million tonnes of road salt each year (although the amount varies considerably year-over-year depending on weather conditions). The biggest single users are the Ministry of Transportation and large municipalities, but private applications on parking lots, driveways and walkways spread a huge amount of road salt, often with less precision.

At temperatures below -18 celsius, road salt is virtually ineffective.

Even more salt may now be used in Ontario. In May 2018, changes to the Municipal Act regulations (without consulting the public as required by the Environmental Bill of Rights) made municipalities responsible for snow and ice removal on sidewalks and bike lanes (in addition to their prior responsibilities for roadways). While this may enhance pedestrian and cycling safety, it could also lead to municipalities spreading more salt.

Some of Ontario’s road salt is wasted. As temperatures drop further below freezing, road salt becomes less effective at melting ice. At temperatures below -18 celsius it is virtually ineffective.
**Water softeners: another source of salt**

While road salt makes up most of the salt that reaches lakes and rivers across the province, household water softeners can also be a considerable source of salt entering the environment.

For example, the Grand River watershed is contaminated with high levels of salt. Some streams in the watershed have average chloride levels of 560 mg/litre, almost five times higher than the national guideline of 120 mg/litre.

Much of this is from road salt. But Waterloo Region (in the Grand River watershed) drinks groundwater, and has some of the hardest drinking water in the country. Water is considered “very hard” when it has over 180 mg/litre of calcium carbonate; measurements in Waterloo Region can reach 960 mg/litre. Hard water occurs when groundwater picks up minerals in the ground such as calcium and magnesium. While hard water is safe to drink, it is a nuisance as it builds up on household fixtures and needs more soap to create lather for washing. To remedy this, 72% of households in Waterloo Region use a water softener, which uses salt to remove the minerals from the water.

Waterloo Region estimates that this extensive water softener use puts about 20,000 tonnes of extra salt into the Grand River each year, and adds to the salt threat to the city’s drinking water. Waterloo Region has been researching lower-salt methods to manage hard water, including water softeners that use less salt, and a potential salt-free alternative. The Region also has an active Smart About Salt program (see section 2.5.4 below) and a campaign to educate the public on proper road salt use called Curb The Salt.

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**2.5.3 40+ years, and still no commitment to finding an alternative**

In 1975, the Ontario government formally recognized that road salt causes substantial environmental harm. Ever since, the MECP’s guideline for snow disposal and de-icing operations has recommended keeping chloride application to a minimum. However, the MECP has always exempted road salt from the Environmental Protection Act and other laws that control environmental contamination.

In 1995, the government reiterated the negative environmental impact of salt, and noted that it could be reduced by supporting research into alternative methods of de-icing. For example, calcium magnesium acetate, magnesium chloride and calcium chloride are alternatives, but they are usually rejected because of their higher product cost and are also not environmentally benign. Calgary increasingly uses beet brine for de-icing because it is less toxic and less corrosive than road salt and bonds better to the road. However, Ontario has not made a major commitment to research into alternatives. Instead, it kept exempting
In 2001, the federal government’s scientific assessment confirmed that road salts are harmful to plants, animals and the aquatic environment, and recommended that road salt be recognized as toxic, i.e., added to the federal List of Toxic Substances under the Canadian Environmental Protection Act, 1999, which would trigger legal obligations to reduce its use. This was not done. Instead, the federal government merely published a Code of Practice for the Environmental Management of Road Salt.

In 2018, after more than 40 years, Ontario has still made no significant investment in less harmful alternatives. Ontario still calls salt the cheapest option, largely because the province measures only the cost of the product, leaving out all of road salt’s negative impact on infrastructure, on the environment, on vehicles and on drinking water supplies. Such an unbalanced assessment is foolish, and unwisely keeps Ontario locked in to heavy reliance on road salt.

The ECO recommends that the MECP and the Ministry of Transportation compare the cost-effectiveness of de-icing alternatives in terms of both the cost of the product, and of that alternative’s negative impacts on infrastructure, on the environment and on drinking water supplies.

### 2.5.4 Safe roads with less salt

While safe roads and walkways are essential, we do not need to so completely sacrifice environmental protection, drinking water sources, damage to vehicles and public infrastructure to the automatic use of road salt. At a minimum, Ontario should minimize unnecessary salt use, and has many ways to do so.

Ontario should minimize unnecessary salt use, and has many ways to do so.

Example of a de-icing truck operating on a highway.

Photo credit: ODOT, (CC BY 2.0).

**Progress on provincial highways**

The Ministry of Transportation has been setting a generally good example. While it does too little to support research into alternatives to road salt, it has successfully decreased the amount of road salt applied to provincial highways while maintaining a high level of road safety, through technologies such as:

- Direct application of anti-icing liquids prior to winter storms, which prevents snow and ice from bonding with the road surface, reducing the need to add salt later
• Pre-wetting salt with anti-icing liquid so that it sticks better to the road and decreases application rates, instead of running off into ditches and having to be replaced, and

• Electronic spreader controllers, which apply salt consistently across the pavement.

For example, the MTO installed Fixed Automated Spray Technology and an Advanced Road Weather Information System at the Highway 401/416 interchange near Prescott. These two systems work together to apply an anti-icing chemical in advance of icy conditions. Since its installation, salt has been more effectively applied with no winter-related accidents. The MTO also uses best management practices to reduce salt losses during salt transfer and storage, and to reduce water contamination from snow storage and disposal.

The ECO commends the MTO for these efforts and urges the ministry to continue its knowledge-sharing with municipalities.

**Municipal salt management plans**

Some municipalities have also successfully reduced their salt use.

Collectively, municipalities are the biggest users of road salt in the province. While necessary, they should do so carefully and only as needed. The 2004 federal Code of Practice for the Environmental Management of Road Salt recommends that large road salt users, or those that could impact vulnerable ecosystems, (including municipalities) adopt a salt management plan and keep it up to date. The plans are to specify site-specific implementation of best management practices for winter maintenance, including for snow removal and disposal, technology review, staff training, and identify environmentally sensitive areas. Environment and Climate Change Canada recommends that every municipality with a salt management plan review it annually.

Most Ontario municipalities do now have salt management plans. By 2010, about 90% of larger municipalities had developed a salt management plan, and 57% of them had reviewed their plans at least once. As a result, some jurisdictions have significantly reduced the amount of salt they use, saving money with the same high level of road safety. For example, the Town of St. Mary’s found it could safely and cost-effectively put less salt in its sand-salt blends. Similarly, the County of Wellington and its lower-tier municipalities have kept their roads safe while reducing the percentage of salt in its sand-salt mix from 10% to 5%, leading to a reduction of salt usage and cost savings.

However, some Ontario municipalities have no salt management plan, and others have never updated theirs. This means that some may not have yet taken measures known to reduce salt contamination, such as installing domes over salt storage piles. Many others are not using up-to-date technologies and best practices, and are therefore causing more salt contamination than is necessary for public safety.

The ECO recommends that the MECP and the Ministry of Municipal Affairs and Housing require each municipality to adopt a salt management plan, and to review and publicly report on their effectiveness on a regular basis.

**Excess salt on parking lots and walkways**

The biggest opportunity to reduce salt damage probably occurs on parking lots and walkways, which are often one of the worst sources of road salt runoff. Observations by the Lake Simcoe and Region Conservation Authority in the Lake Simcoe watershed found that salted parking lots’ runoff is four times saltier than ocean water, i.e., extremely toxic.

Much snow removal and salt application on parking lots and private walkways involves much more salt than is needed for public safety. One major reason for over-salting is concerns about liability (see below). Other reasons should be comparatively easy to solve.
Some private contractors are encouraged to over-salt because they are paid based on the amount of salt they spread. This practice should be strongly discouraged.

In addition, many contractors and landowners lack knowledge about the harm caused by excess salt, and about how to reduce salt use, while maintaining safety. This knowledge is available. A consortium of provincial, municipal and non-governmental organizations, coordinated through Landscape Ontario, have established scientifically defensible salt application rates for parking lots, based on extensive monitoring by researchers at the University of Waterloo. This research shows the potential for at least a 25% reduction in salt use and helps contractors who use the lower rates to prove their due diligence in lawsuits.

Research shows the potential for at least a 25% reduction in salt use.

Because of the serious threat that excess salt use poses to Waterloo Region’s drinking water, the Region offers a Smart About Salt training program based on this research. The program certifies salt-smart contractors, and trains contractors and property owners on how to reduce salt use, while maintaining safety. The Smart About Salt administrators report that certified contractors use less salt, in some cases by as much as 50%.

This type of training should be offered, and required, for winter maintenance contractors across Ontario, and especially in areas where salt is adversely affecting surface and groundwater. To start, the ECO recommends that the Ontario government require all contractors retained to provide winter maintenance on property that is publicly owned or open to the public (e.g., public parking lots) to be certified in the proper use of salt.

Reduce the fear of liability

For both public and private landowners, a major factor in excess salt use is fear of being sued should a slip-and-fall or car accident occur. Judges in such cases put substantial weight on whether property owners have spread salt, but rarely give weight to the environmental harm of excess salt.

Salt-smart training and certification of contractors provide an option for reducing such fears. For example, to reduce chloride pollution of its water bodies, the State of New Hampshire passed legislation that gives limited liability relief for landowners whose maintenance staff or contractors have completed a Green SnowPro training program. The Green SnowPro program provides training on up-to-date technologies and snow management practices, with the twin goals of safety and salt reduction.

The ECO recommends that the Ontario government adopt a law that provides liability protection for landowners and contractors who use up-to-date technologies and snow management practices to achieve road safety with the minimum amount of salt.

2.6 Conclusion: the province should do more to fight water pollution

Ontario has a wealth of freshwater that is the envy of much of the world. However, we cannot take this precious resource for granted. If Ontarians want to continue to enjoy a high quality of life that includes clean and abundant freshwater, that water requires constant vigilance. When we choose not to protect our freshwater from pollution, we cannot count on it remaining swimmable, fishable and drinkable.

The province has had laws against water pollution in place for more than 60 years. These laws have worked to reduce many kinds of water pollution, but population growth, urbanization, agricultural changes and climate change are eroding their effectiveness. And as this chapter shows, persistent regulatory failures by the provincial government are allowing huge amounts of damaging pollution to flow into Ontario surface and ground water. We can see symptoms of this pollution when lakes and creeks turn green with algae, when
beaches are closed by sewage overflows, and when creeks are too salty for freshwater plants and fish. Our environment is sending us a message.

Pollution of our lakes, rivers and groundwater is neither inevitable nor necessary.

This pollution of our lakes, rivers and groundwater is neither inevitable nor necessary. It is neither efficient nor cost-effective to keep allowing pollution into our water, in the hope of somehow treating it after it occurs. Ontario should not keep tolerating the regulatory failures that are allowing such pollution.

When our water is clean, we all benefit.

To reduce pollution from combined sewer overflows, the ECO recommends that:

• the MECP insert, into the environmental compliance approval of every municipality that has a combined sewer system, a legal obligation to adopt a public Pollution Prevention Control Plan to virtually eliminate combined sewer overflows within a reasonable time, and the MECP should enforce these Plans.

• the Ministry of Infrastructure and the MECP work with municipalities to achieve full-cost recovery for stormwater and sewage systems.

To reduce pollution from farm runoff, the ECO recommends that:

• the Ontario Ministry of Agriculture, Food and Rural Affairs track best management practices across publically funded programs, and increase monitoring efforts to check whether the best management practices it has funded are in use.

• the Ontario Ministry of Agriculture, Food and Rural Affairs require all farms in Ontario’s most impaired watersheds to assess their nutrient runoff risks and submit a plan to minimize that risk.

• the Ontario government ban the spreading of manure and fertilizer on frozen ground, snow-covered or saturated ground, with no exceptions.

• the Ontario government adopt clear targets, effective monitoring and financial incentives for dramatic reductions in phosphorus runoff from farms.

To reduce pollution from industrial wastewater, the ECO recommends that:

• the MECP update the limits in the MISA regulations and environmental compliance approvals, to require industries to use the best available technology to minimize toxic substances discharged into Ontario waters, and to require industries to virtually eliminate discharges of persistent toxic substances.

To reduce pollution from road salt, the ECO recommends that:

• the MECP and the Ministry of Transportation compare the cost-effectiveness of de-icing alternatives in terms of both the cost of the product, and of that alternative’s negative impacts on infrastructure, on the environment and on drinking water supplies.

• the MECP and the Ministry of Municipal Affairs and Housing require each municipality to adopt a salt management plan, and to review and publicly report on their effectiveness on a regular basis.

• the Ontario government require all contractors retained to provide winter maintenance on property that is publicly owned or open to the public (e.g., public parking lots) to be certified in the proper use of salt.

• the Ontario government adopt a law that provides liability protection for landowners and contractors who use up-to-date technologies and snow management practices to achieve road safety with the minimum amount of salt.
Endnotes

1. The National Pollutant Release Inventory lists more than 180 substances that are reported as released into Ontario waters annually from large industrial facilities, including substances like arsenic, cyanide, and mercury.

There are also numerous other pollutants not included in this inventory. For example, large volumes of microplastics have been found in Ontario’s waters (see Environmental Commissioner of Ontario, “A problem too big to ignore: microplastics in the Great Lakes” in Small Things Matter, Annual Report 2014/2015 (Toronto: ECO, November 2015) at 78-82.). Another serious example is pharmaceuticals that are flushed down toilets, directly or through human waste, and find their way into Ontario’s lakes and rivers (see Environmental Commissioner of Ontario, “Human Pharmaceuticals in the Aquatic Environment: An Emerging Issue” in Planning Our Landscape, Annual Report 2004/2005 (Toronto: ECO, October 2005) at 179-185; and Canadian Water Network, Canada’s Challenges and Opportunities to Address Contaminants in Wastewater (Ottawa: CWN, 2018) at 22.).

Beyond direct contaminants, other water issues can also affect water quality. For example, water-takings can lower water levels in streams, and climate change can alter both water levels and temperatures, both of which can alter the characteristics and quality of the water (such as promoting algae growth).


3. The federal government reduced the scope and effectiveness of the Fisheries Act in 2012. However, the Department of Fisheries and Oceans Canada is currently seeking feedback to restore lost protections and incorporate modern safeguards into the Fisheries Act.

4. In addition to the Clean Water Act that addresses pollution to municipal sources of drinking water, Ontario’s Safe Drinking Water Act regulates drinking-water treatment systems and drinking water testing.

5. The Blue Flag program certifies that beaches meet a set of criteria relating to the environment, education, safety, and access. Two additional beaches (Erieau Beach on Lake Erie and Station Beach on Lake Huron) are currently in the process of being certified.

6. Ontario Ministry of the Environment and Climate Change, information provided to the ECO in response to ECO inquiry (12 September 2018).


10. Ontario Ministry of the Environment and Climate Change, information provided to the ECO in response to ECO inquiry (19 June 2018).

11. The ECO has reported on the advantages of green infrastructure a number of times; for more information, see our 2011 and 2009 Annual Reports.

12. For example, the Ashbridges Bay plant approval is posted on Access Environment at https://www.accessenvironment.ene.gov.on.ca/instruments/0779-AB2H7X-14.pdf.


15. The federal Clean Water and Wastewater Fund provides funding for municipalities across Canada, totalling $2 billion, for projects that will rehabilitate water and wastewater treatment and distribution infrastructure, including combined sewers and treatment plant capacity. The Ontario Community Infrastructure Fund also provides capital funds.

16. “Building together – Guide for municipal asset management plans”, online: Ontario Ministry of Infrastructure https://www.oa pto.ca/page/building-together-guide-municipal-asset-management-plans. “Asset management planning will allow needs to be prioritized over wants. It will help ensure that investments are made at the right time to minimize future repair and rehabilitation costs and maintain municipal assets.”


22. Many conservation authorities grade the health of the water bodies in their watersheds, using total phosphorus measured in the surface water. Almost all conservation authorities in the southwestern tip of Ontario graded the health of the water bodies in their watersheds as very poor or poor, with a few graded average.


24. Ontario farmers also participate in voluntary technological initiatives to reduce their phosphorus from agricultural runoff. For example, a partnership between the Cities Initiative and the Ontario Federation of Agriculture, the Thames River Phosphorus Reduction Collaborative, has raised $1M toward at least 10 demonstration projects of infield and drain technologies that will be up and running by spring 2019.

25. Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO, October 12, 2018
26. Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO, June 8, 2018.


28. Statistics Canada, Census of Agriculture, manure and manure application methods in the year prior to the census, Table 32-10-0410-01 (Ottawa: Statistics Canada, 2016); Statistics Canada, Census of Agriculture, farms classified by farm type, Table: 32-10-0403-01 (Ottawa: Statistics Canada, 2016); Statistics Canada, Census of Agriculture, land inputs in the year prior to the census, Table: 32-10-0409-01 (Ottawa: Statistics Canada, 2016); The Ontario Ministry of Agriculture, Food and Rural Affairs, information provided to the ECO, July 5, 2018.

29. Nutrient management strategies are only required for existing large farms that generate more than 300 “nutrient units” of manure (and/or milkhouse washwater), or to new or expanding farms that produce over 5 “nutrient units” and that construct a barn or manure storage facility (a “nutrient unit” is calculated based on the amount of manure produced by a given livestock, e.g., 1 beef cow and calf produces 1 nutrient unit).

30. The documented management of commercial fertilizer is only mandatory for the same small subset of farms that are required to have either a NASM or Nutrient Management Plan.


32. Ontario Ministry of the Environment, Conservation and Parks, information provided to the ECO, October 17, 2018. In 2016/17, the MECP conducted 174 nutrient management inspections (out of 6,513 farms with Nutrient Management Strategies) and found only 38% to be in full compliance.

33. The Auditor General found that the MECP had low inspection rates and that those inspections were not focused on farms at the highest risk of causing water contamination. Ontario Auditor General, “Source Water Protection: Follow Up on VFM Section 3.12, 2014 Annual Report” in Annual Report 2016 (Toronto: Ontario Auditor General, 2016) at 165-166.
