SOURCE WATER PROTECTION

"The first barrier to the contamination of drinking water involves protecting the sources of drinking water." – Justice Dennis O'Connor, Walkerton Inquiry 2002.

"Source water" refers to the lakes, rivers and aquifers from which we get the water we drink and use. All of these sources of water are linked in a watershed through the water cycle. Drinking water sources can be easily contaminated and have a limited tolerance for stress. Long-term problems can develop that are costly or even impossible to correct. Source water protection is about protecting both the quality and the quantity of these water sources.

Multibarrier Approach

Drinking water is best protected by taking an approach that uses multiple barriers to prevent contamination from affecting our drinking water. Known as the 'multibarrier approach', it includes taking actions to prevent contamination of sources of our water, using adequate water treatment and distribution systems, water testing and training of water managers. In his Walkerton Inquiry, Justice O'Connor called for a multiple-barrier water management approach to prevent a similar tragedy from occurring again. He concluded that source protection is one of the most effective and efficient means of protecting the safety of drinking water. He also made 22 recommendations related to source water protection planning, including the need to develop legislation that would require source protection plans to be developed and implemented locally for every watershed in Ontario.

Source Water Contamination

Pure water does not exist in the natural environment. Water is always found in combination with minerals and chemicals of one kind or another. Sometimes these compounds are present naturally; other times they are present as a result of human activity.

Some naturally present contaminants have the potential to cause harm to humans. These include metals (such as arsenic, mercury and lead), radioactive compounds (such as radium) and microorganisms (such as parasites, bacteria, protozoa and toxic blue-green algae). Water can become contaminated with these compounds and microorganisms if they are naturally present in the surrounding soil or rock.

At other times, water contamination is a result of human activity. Agriculture, industrial activity and urban development all affect the quality and quantity of surface water and groundwater sources. Some of these land-use activities, such as urban development, decrease the surface area available for water to filter into the ground. As a result, water simply flows across the land's surface (called "surface runoff") instead of recharging groundwater. Furthermore, water quality can be threatened by overuse and inefficient use, and human activity can directly and indirectly introduce contaminants into both surface water and groundwater.

Cost of Remediating Groundwater

According to the US Environmental Protection Agency, remediating groundwater can be 40 times more expensive than taking steps to protect the water at the source. Preventing contamination at the source also reduces the costs of treating water later in the drinking water

treatment process. The United Nations warns that if current trends of wasting and polluting freshwater continue, two out of every three people on earth will suffer moderate to severe water shortages in little more than two decades. It is imperative that we take measures to protect water sources today.

Types of Contamination

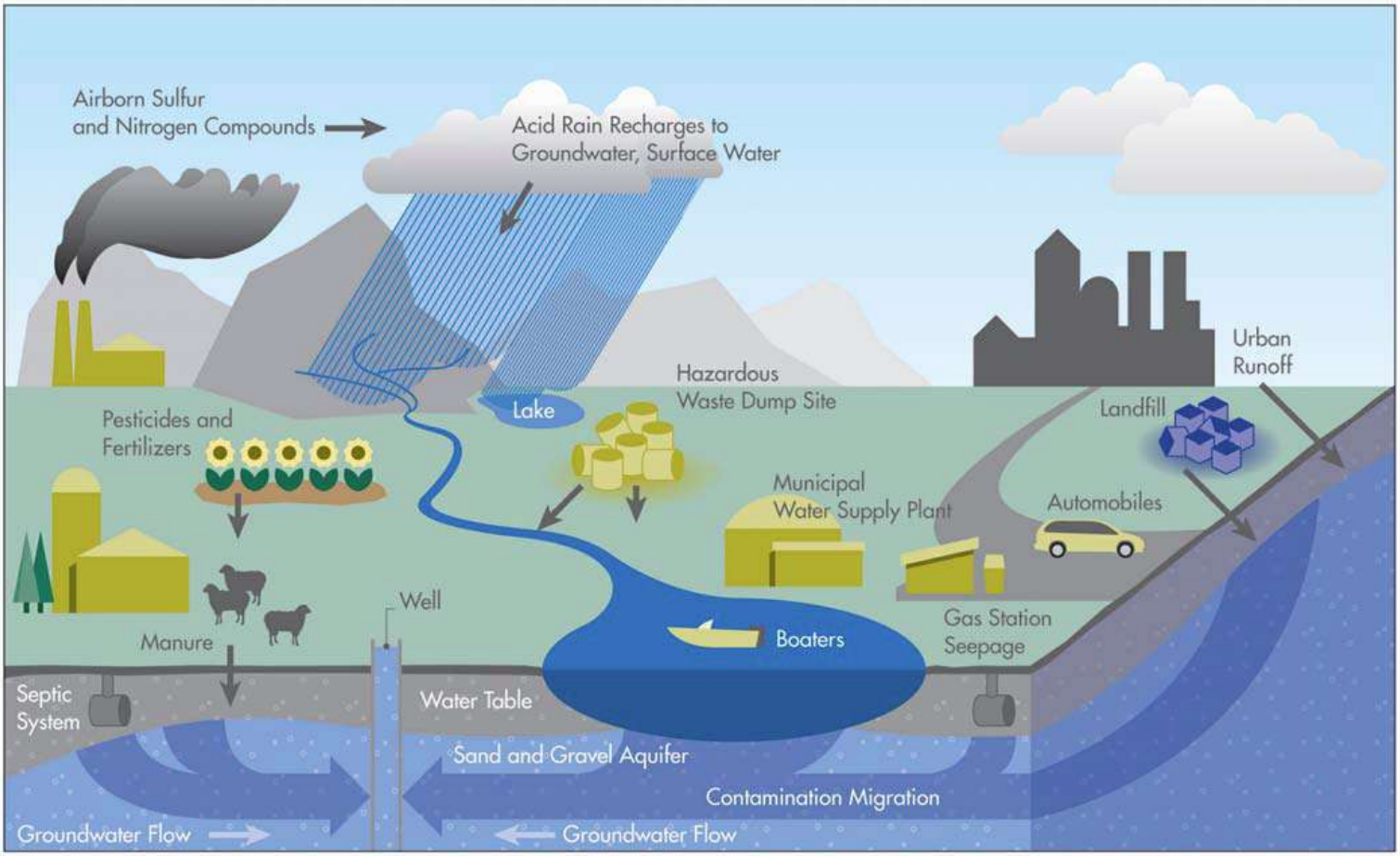
There are two types of surface water and groundwater contamination – point source pollution and non-point source pollution.

Point source pollution enters the environment at a specific place from an identifiable source. Some examples are:

- industrial point discharges, as well as spills and leaks of industrial chemicals;
- municipal wastewater effluents;
- landfill site leachate;
- wastes from existing and abandoned mining sites;
- on-site septic systems; and,
- leaking underground oil and gas storage tanks.

Non-point source pollution comes from many diffuse sources. Non-point source pollution is caused when water that runs over land picks up natural and human-made pollutants and deposits these pollutants directly into surface waters, or into groundwater through percolation. Examples include:

- agricultural runoff, which can contain oil, grease, fertilizers, pesticides, bacteria and nutrients from livestock and manure;
- urban runoff from buildings, streets and sidewalks that carry sediment, nutrients, bacteria, oil, metals, chemicals, pesticides, road salts, pet droppings and litter;
- bacterial and petroleum products from recreational boating;
- saltwater intrusion; and,
- acid precipitation and other forms of air pollution that fall into surface waters and onto the land



Human Activities Affecting Source Water;
http://www.pollutionprobe.org/report/swpprimer.pdf

Source Water Protection and Climate Change

The hydrologic cycle is very sensitive to changes in temperature, precipitation and evaporation. Studies of the impacts of climate change on the hydrologic cycle point to significant changes to stream flows, lake levels, water quality, groundwater infiltration, and patterns of groundwater recharge and discharge. In the years to come, there will be increased non-point source runoff due to increased precipitation, wildfires, and soil erosion. Changes in the frequency of extreme rainfall events may lead to greater frequency of waterborne diseases and increased transportation of contaminants from the land surface to water bodies. Changes to runoff may lead to reduced water quality because less water is available for dilution of sewage treatment plant effluents and runoff from agricultural and urban land as well as increased water treatment costs due to decreased water quality. Changes to lake levels may cause decreased water quality due to lower water volume, increased non-point source pollution, and increased chemical reactions between water, sediments and pollutants. Also, changes to lake levels may lead to increased water treatment costs due to reduced lake water quality. Changes to water temperature may lead to reduced water quality resulting from greater biological activity (e.g., algae production) as water temperature increases and greater frequency of taste and odour problems in drinking water supplies. All of the above problems are probable rather than possible. Therefore, it is certain that the need for highly effective, environmentally friendly and cost-effective water treatment will increase with each passing year. Thinking now about the

way in which climate change affects the hydrologic cycle, and how these changes affect human societies and ecosystems, will permit earlier and more effective adaptation.

Government Responsibility for Water Management

In Canada, a number of federal, provincial and municipal agencies are responsible for various aspects of water management. Laws and regulations exist to govern water protection and use, such as pollution prevention controls and limits on the discharge of industrial and municipal effluents. In addition, laws that govern other issues not directly related to water, such as laws regulating the use of pesticides and those pertaining to urban development, may still have an impact on source water protection.

Jurisdictional issues and authorities vary across Canada. Responsibilities are divided and some are shared among different levels of government. The federal government has responsibility for water on federal lands, including Canada's three territories, national parks and First Nations communities. However, Canada's territorial governments are acquiring more provincial-like responsibilities for water management.

Canadian provinces have the primary responsibility for most areas of water management and protection. Provincial governments are responsible for the management of water resources, including the provision and regulation of water flows, drinking water and wastewater services, and authorization of the use and development of water resources. They also have the authority to legislate in areas of water supply and pollution control, as well as in the development of thermal and hydroelectric power plants.

What You Can do to Protect Sources of Water

You can make choices which will help to protect water at its source:

- Minimize the waste you produce – reduce, reuse, recycle and compost.
- Do not use the toilet as a wastebasket.
- Properly dispose of products, such as cleaners that contain toxic chemicals, pesticides, paints, solvents, gasoline, and flammable liquids. Read the labels to learn how to use and dispose of the products safely. Do not dump these products into sewers, on the ground, in the toilet, or in the garbage can. Take these products to your local household hazardous waste depot.
- Properly dispose of pharmaceutical products. Some municipalities and pharmacies have established programs for the proper disposal of syringes and expired medications. Ask your local health department or pharmacy if such a program is available in your community.
- Use non-toxic cleaning products. Purchase products from businesses that produce environmentally safe products. Check company websites to learn about their environmental practices and products. Remember, white vinegar is a great 'all-in-one cleaner' and it is a natural organic bi-product of fruits, vegetables and grains. It is, therefore, edible and biodegradable.
- Take your car to commercial car washes designed to prevent pollutant runoff from entering storm sewers.
- If you do wash your vehicle at home, be sure to use appropriate cleansing agents, such as phosphate-free, biodegradable detergents. Make sure that soaps, dirt and oil do not enter storm sewers. Collect the wastewater using containment pads and pails.
- Take used motor oil to the recycling centre.
- To reduce air pollution emissions, use public transit, carpool, cycle or walk.
- Pick up after pets.

- Minimize the amount of road salt you use in the wintertime.
- Reduce urban runoff by replacing impervious surfaces, such as a paved driveway, with materials that are more porous. Sweep rather than hose down your driveway or sidewalk.
- Disconnect your eaves trough downspout from the sewer. Catch the stormwater in a rain barrel and use it to water your lawn and garden, or redirect the flow to a spot where it can soak into the soil and replenish the groundwater.
- Become energy efficient, and practice energy conservation.
- Use your lawn compost and grass clippings as fertilizer. Use "natural organic," "slow release" or "composted" fertilizers and avoid using "weed and feed" products. Always follow instructions.
- Aerate compacted soil in the fall to help oxygen, water and nutrients reach the roots.
- Explore the use of non-chemical pest controls.
- If you have a well, keep an adequate distance between your well and potential contaminant sources, including septic systems, pesticides, fertilizers and other sources of nutrients and hazardous materials. In general, the potential for well water to become contaminated decreases as the distance between the well and the sources of contamination increases.

The Safe Drinking Water Foundation has educational programs that can supplement the information found in this fact sheet. Operation Water Drop looks at the chemical contaminants that are found in water; it is designed for a science class. Operation Water Flow looks at how water is used, where it comes from and how much it costs; it has lessons that are designed for

Social Studies, Math, Biology, Chemistry and Science classes. Operation Water Spirit presents a First Nations perspective of water and the surrounding issues; it is designed for Native Studies or Social Studies classes. Operation Water Health looks at common health issues surrounding drinking water in Canada and around the world and is designed for a Health, Science and Social Studies collaboration. Operation Water Pollution focuses on how water pollution occurs and how it is cleaned up and has been designed for a Science and Social Studies collaboration. Operation Water Biology teaches high school science students about biological water treatment, a more effective and environmentally friendly water treatment method. Operation Community Water Footprint allows students or other community members to calculate the amount of source water which is required in order to produce one litre of treated drinking water. They can then add their data to our "Put Your Community on the Map" application. To access more information on these and other educational activities, as well as additional fact sheets, visit the Safe Drinking Water Foundation website at www.safewater.org.

Resources:

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Mehan, G. T. 2007. Emerging Issues: Adapting to Climate Change. http://www.horizons.gc.ca/doclib/Mehan_Climate-Change-Issue-Paper-FINAL_05_16_07%20_2_.pdf

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