

Pesticide Contamination of Farm Water Sources

Table of Contents

1. [Introduction](#)
2. [Types of Contamination](#)
3. [Impacts on Water Quality](#)
4. [Avoiding Pesticide Contamination](#)
5. [In Case of a Pesticide Spill](#)
6. [Decontamination of Water Sources](#)
7. [Summary](#)
8. [Resources](#)

Introduction

A large volume of water is taken every year from farm wells, ponds, ditches and streams and mixed with pesticides for application to crops. Sometimes pesticides are incorrectly or accidentally released into the environment, contaminating water sources. Contamination of ground or surface waters is an offence under provincial legislation, including the *Pesticides Act, 1990*, the *Ontario Water Resources Act, 1990*, and the *Environmental Protection Act, 1990*. Pesticide contamination that negatively impacts fish (e.g., respiratory kills) is also considered a violation of the federal *Fisheries Act, 1985*.

This Factsheet provides information for avoiding contaminating any well or surface water source by mixing, loading or applying pesticides improperly. It also provides information about responsibilities if a spill should occur.

Avoid contaminating any well or surface water source by mixing, loading and applying pesticides properly. Contaminated water source poses a significant threat to the health of people, livestock and crops.

In porous soil, pesticides can leach into the groundwater and contaminate wells. On clay soils, rain can wash the contaminated surface soil into a well. Concentrations of pesticides in the well may be low, however they can continue to accumulate over an extended period of time.

Types of Contamination

Contamination can occur from improper handling and use of pesticides, including:

- spilling pesticide concentrate when mixing and loading sprayers
- dropping or fracturing containers, spilling pesticide concentrate
- discarding unrinsed, "empty" containers in or near a water supply

- back-siphoning or overfilling sprayer tanks without an anti-backflow device
- rinsing or washing spray equipment near a water source
- applying pesticides under windy conditions, causing spray or vapour drift
- allowing pesticides to move from treated land via runoff water, heavy rain or soil erosion
- spilling pesticides that then leach into groundwater and move laterally into aquifers

Improper Storage of Pesticides and Empty Containers

Contamination can occur from improper storage of pesticide containers, such as:

- concentrates stored in leaking containers
- pesticides storage areas not meeting proper requirements
- pesticides storage areas located near surface water or wells
- pesticides stored in corroded containers
- unrinsed empty containers left in or near streams, or in dried-up ditches that later carry runoff contaminating surface water

Filling Spray Equipment

Accidents that happen when filling spray equipment can result in water contamination that is hazardous to human and livestock health. Most common are back-siphoning from spray equipment directly into surface water or the well, and overfilling tanks, creating spills into surface water or in and around well head

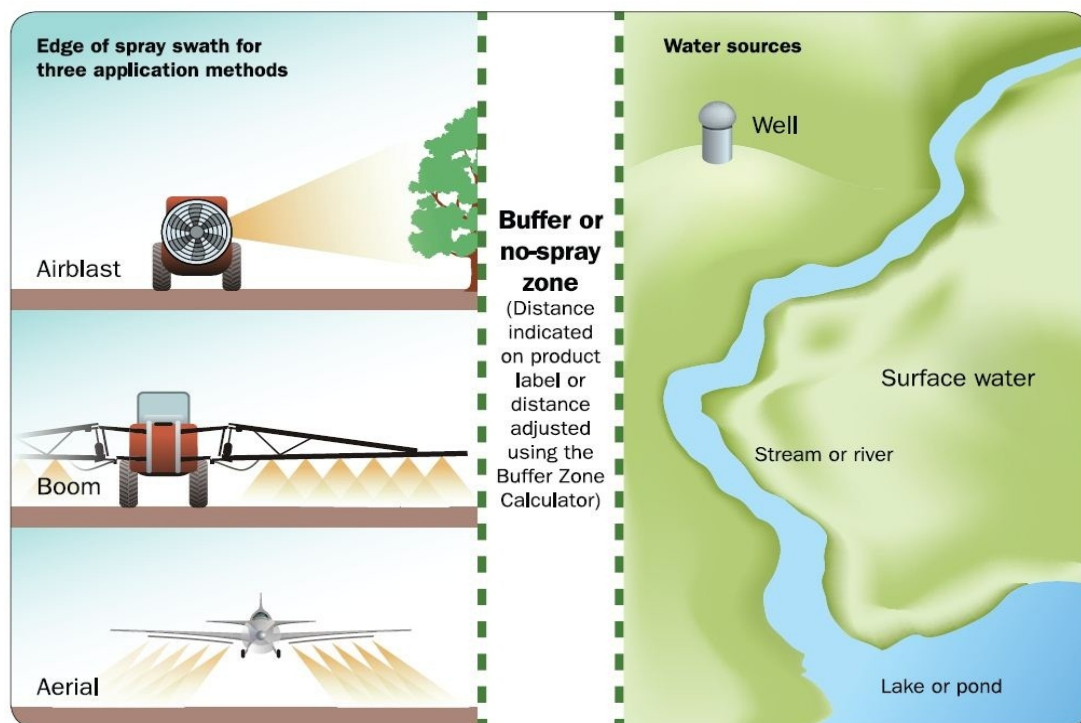


Figure 1. Pesticide application with a buffer zone between wells and surface water.

Pesticide Spray Drift

The best way to manage drift is to spray under the correct conditions, with a properly adjusted sprayer. Consult the label for specific instructions on buffer or no-spray zones between the water source and treated areas before applying a pest control product. If the label does not specify, then apply best management practices.

practices to ensure that the buffer zone is wide enough (Figure 1). Information on buffer zones is available from the Buffer Zone Calculator on Health Canada's [website](#) (search for "buffer zone calculator").

Surface Runoff

Surface runoff is the movement of water over a surface. Surface runoff water picks up soil particles and pesticides from pesticide-treated fields or spills, and carries them into streams, ditches, ponds and other water bodies. The greatest effect from surface runoff occurs when rain falls within 24 hr of a pesticide application. Pesticides are also carried in surface runoff, months after application, if the pesticides are persistent in the soil. Runoff is normally more severe on clay soils and less of a problem on sandy soils.

Subsurface Drainage Water

Pesticides that are persistent and water soluble can move through the soil and into the water table. Subsurface contamination is the result of a spill of formulated concentrates that reaches groundwater. If such groundwater may reach wells and streams.

Impacts on Water Quality

Water quality standards for potable water, fish and wildlife, and irrigation waters are available from [Canada <http://www.hc-sc.gc.ca>](http://www.hc-sc.gc.ca) (search for "water standards"), and the [Ontario Ministry of the Environment and Climate Change <http://www.ontario.ca/ministry-environment-and-climate-change>](http://www.ontario.ca/ministry-environment-and-climate-change) (search for "water quality objectives").

Stream Water or Other Surface Waters

Pesticide contamination can impact the health of a stream and affect wildlife, livestock, crops and people. When the contaminant is a pesticide such as rotenone and endosulfan (to be phased out by 2016), visible fish kills may result. When a herbicide is involved, the contaminated water may cause problems for crops used for irrigation, especially in the horticultural production of highly sensitive plants. Surface water is not used as potable water in several communities in Ontario, so contamination can pose a hazard to human health.

Farm Ponds and Wells

Similar effects are observed in farm ponds where fish are killed and crops are damaged by the irrigation water drawn from a pond. When well waters are contaminated, greenhouse plant losses can be particularly high. The water also develops off-flavours and becomes unpleasant or unsafe to drink.

Avoiding Pesticide Contamination

Proper Pesticide Storage

Store pesticides safely on the farm. Always store them in their original containers with a legible label. For Class 2 and 3 pesticides, a locked storage area is required. If the original container is damaged, store the pesticide in a replacement container made of a similar material and label the container with the original label or a label that includes the PCP registration number, trade name and concentration of the active ingredient in the product. Make sure pesticides are stored away from food, drinks and pet food, and are stored according to the label instructions.

Spray Equipment

Use backflow-prevention devices on all equipment where water is being drawn from surface water (e.g., spray tanks) and move away from the source of water before adding the pesticide to the spray equipment. Unless otherwise directed by the product label, a minimum distance of 15 m for drilled wells and 30 m for other wells and surface water is recommended. Using nurse tanks for water supplies and automatic devices to add the pesticide can greatly reduce the possibility of contamination of water supplies. Always supervise the filling or mixing of spray equipment.

Spray Operations

The build-up of spray drift into surface water is largely due to spraying too close to water or spray wind is too strong. Cover wells if spraying in the immediate vicinity. It is important to refer to the p label for maximum wind speed and minimum distance to water sources.

To further reduce spray drift, remember the following:

- Study the wind speed, wind direction, time of day and equipment used when deciding whether to complete a pesticide application.
- Do not spray during thermal inversions, when air closest to the ground is colder than the air above.
- Use the largest nozzle opening that gives adequate coverage.
- Use solid cone or fan spray nozzles that produce larger droplets.
- Use the lowest pressure possible consistent with good coverage and nozzle design.

Farm Practices

It is important to protect water supplies from surface water runoff. Heavy rain that produces surface runoff can carry pesticides into streams, ponds and wells. Growers follow certain farm practices to limit the movement of pesticides through surface water runoff. Consider planting across the slope to reduce pesticide loss from treated fields located along streams and ponds. Buffer zones (Figure 2) also reduce runoff on relatively flat land but will not be as effective on sloping land. Incorporate the pesticide into the soil by applying to bare soil or use a foliar application after crop emergence to reduce losses. Reduce the risk of well contamination by constructing berms, ditches or buffer strips between the surface water and the well. Controlling soil erosion will also help reduce the loss of pesticides to ponds and streams.



Figure 2. Buffer strip between a well and an agricultural field.

Proper Construction and Maintenance of Wells

Protect wells against surface water runoff by ensuring that the well is properly constructed and maintained in accordance with the requirements of O. Reg. 903 under the Ontario Water Resources Act, 1998. Details on how to maintain wells are found in the Ministry of the Environment and Climate Change's publication [Supply Wells - Requirements and Best Management Practices <http://www.ontario.ca/environment/energy/water-supply-wells-requirements-and-best-practices>](http://www.ontario.ca/environment/energy/water-supply-wells-requirements-and-best-practices), December 2009 and Best Management

Practices: Water Wells (BMP 12) from OMAFRA, which can be ordered through [ServiceOntario <http://www.publications.serviceontario.ca>](http://www.publications.serviceontario.ca).

Disposal of Pesticide Containers

Use clean water, or an appropriate solvent, to triple-rinse or jet-rinse empty containers made of metal or glass that were used to hold Class 1, 2, 3 or 4 pesticides. Add the rinse water to the spray mixture tank. Don't wash any pesticide containers into or near a well, lake, river or other water body.

Take the thoroughly rinsed empty containers to a Pesticide Container Depot or a licensed waste disposal site. To locate the closest pesticide recycling depot, call CleanFARMS at 416-622-4460 (toll-free at 877-446-4460) or the Ontario Pesticide Education Program (University of Guelph Ridgetown Campus) at 1-800-652-8585. Contact your pesticide dealer or municipality, or visit the CropLife Canada [website <http://www.croplife.ca>](http://www.croplife.ca). When triple rinsing a container is not possible, follow the directions on the pesticide label or contact the [Ministry of the Environment and Climate Change <http://www.ontario.ca/ministry-environment-and-climate-change>](http://www.ontario.ca/ministry-environment-and-climate-change) for "MOECC office locations") for information about how to dispose of the container.

Dispose of empty paper and cardboard containers by taking them to a licensed waste disposal site. Plastic containers cannot be disposed of immediately, ensure the containers are stored in a dry, safe place (separate from pesticide storage area) until they are disposed of properly.

In Case of a Pesticide Spill

Use the following guidelines for managing pesticide spills. They supplement, but do not replace info found on the product label, Material Safety Data Sheet (MSDS) or provided by key agencies:

- Immediately notify the Spills Action Centre of the Ministry of the Environment and Climate Change by calling 1-800-268-6060 and the municipality.
- Contact the distributor/registrant of the pesticide product or the Canadian Transport Emergency Centre - CANUTEC - (Ottawa, 613-996-6666 or *666 on a cell phone).
- Remove all people and animals from the spill area to protect them from pesticide exposure.
- Isolate the area so that no unauthorized person, animal or vehicle is exposed or contaminated. Establish a decontamination line around the perimeter such that anyone entering the area must wear adequate protective equipment and persons/vehicles leaving the spill area are decontaminated.
- Wear personal protective equipment and use extreme caution when entering a contaminated area.
- Contain the spread of the spill. If possible, stop the continued leaking of the container. Construct a barrier made of soil, sawdust or newspaper to prevent further contamination of the environment.
- Apply the general principles of first aid, such as basic life support procedures. Remove contaminated clothing and thoroughly wash affected skin areas with soap and water.
- Clean up the spill! Pump surplus liquid product into drums and soak up small amounts of liquid with vermiculite, dry soil or other absorbent, such as activated charcoal or pet litter. For dry powder or granular product, shovel the material into a waste drum. If the spill occurs on the ground, it may be necessary to dig up the contaminated site and place the soil in drums. Place leaky or damaged containers in a drum or heavy plastic bag. If the spill occurs inside a building, ventilate the area to prevent the build-up of toxic fumes.
- The clean-up guidelines above may not be appropriate for all spill situations. Once the spill is contained, follow directions from the manufacturer and regulatory authorities on cleaning the area.

contaminated area.

- Decontaminate all equipment used in the clean-up, as well as vehicles contaminated by the spill. Follow the same procedures as described for the specific pesticide.
- Cover and label drums containing the clean-up material. Labels should read "Pesticide - Poisonous". Labels should include the PCP registration number(s), trade name(s) or common name(s). Transport drums to a licensed waste hauler to a disposal site approved by the Ministry of the Environment and Climate Change.
- All workers must take a shower, and change into clean clothing. Wash all clothing, boots, gloves with soap and water before reuse.
- Re-evaluate pesticide handling procedures and the spill contingency plan to determine its effectiveness. Update both procedures as necessary to minimize the chance of another spill.
- Restock the spill kit, replacing the materials used during the clean-up.

Decontamination of Water Sources

Streams and Ponds

Pesticides can take a long time to break down in a stream or pond. Removal of empty containers or contaminated soil can shorten the time required for the clean-up. The length of time depends on the

- type of pesticide
- time of year (e.g., water temperature)
- extent of the spill or contamination

Farm Wells

If the well is contaminated with low amounts of soluble pesticides from spray drift, decontaminate the well of water several times. Well water is cold and often alkaline, and most pesticides are less soluble under these conditions. Pesticide may have spilled down the sides of the well, and decontamination includes cleaning the walls, casing and/or bottom and removal of any sediment in order to affect a circulation. After cleaning, empty the well frequently over several days, weeks or months. It is important that the water is discharged at least 30 m from the well. Ensure that the water does not have a negative impact on surface water or the environment. Have the well tested for pesticides to determine if the decontamination methods have worked.

Ontario Reg. 903 of the *Ontario Water Resources Act*, 1990, allows private well owners to perform certain work on their own wells. However, the equipment, materials and expertise needed generally exceed the resources of some well owners. Consider hiring a licensed well contractor to complete the cleaning.

Remove the contaminated surface soil when the contamination involves a spill around the well casing. If a large quantity of highly soluble pesticides (e.g., amitrole) is spilled, and the spill occurs on sandy or silty soils, the pesticide may seep into the well in succeeding years during the spring melt or under heat conditions. When only water is removed from the well and not the contaminated soil, decontamination can take from 6 months to 3 years, and in some cases the well has to be abandoned.

Treatment options such as activated carbon filters are available for decontaminating water when in a drinking water line. However, abandonment of the well and finding an alternative drinking water source is the recommended option.

Keep a separate well for drinking water purposes only, and never use it for pesticide uses. If the drinking water is suspected of being impacted by a spill, have the water tested for pesticides. Otherwise, test for pesticides every 5 years.

Summary

Protect Water Supplies

To safeguard the health of wildlife, livestock, crops and people, include the following practices on the farm:

- Always read the label before applying any pesticide product.
- Keep concentrates out of the flood plain, away from wells, and store pesticides safely. Follow storage requirements on the label.
- Store Class 2 and 3 pesticides in a locked storage area.
- Properly dispose of empty pesticide containers.
- Mix concentrates and water at an appropriate distance away from any water supply.
- Use appropriate buffer zones and berms to avoid surface water contamination by spray drift or runoff. See the product label or Buffer Zone Calculator for required setback distances.
- Follow the setbacks listed on the pesticide label when spraying near wells or other water supplies.
- Use a separate well for drinking water purposes.

Resources

There are several other resources available to help minimize the impact of pesticides on water quality, the environment and pollinators. These include:

- [Buffer Zone Calculator <http://www.hc-sc.gc.ca>](http://www.hc-sc.gc.ca), Health Canada
- OMAFRA Best Management Practices, BMP 12, *Water Wells*
- OMAFRA Best Management Practices, BMP 13, *Pesticide Storage, Handling and Application*
- OMAFRA Factsheet, *Farm Pesticide Storage Facility*
- OMAFRA Factsheet, *Pesticide Drift from Ground Applications*
- OMAFRA Factsheet, *Ways to Avoid Pesticide Spills*
- Ontario Pesticide Education Program (University of Guelph Ridgetown Campus) [Grower Pesticide Safety Course Manual <http://www.opep.ca>](http://www.opep.ca)
- *Ontario Water Resources Act* and Ontario Regulation 903
- [Pest Management Regulatory Agency <http://www.pmra-arla.gc.ca>](http://www.pmra-arla.gc.ca)
- *Pesticides Act* and Ontario Regulation 63/09
- [Reducing the Risk to Pollinators <http://www.ontario.ca/crops>](http://www.ontario.ca/crops)
- Well Owners Information Package, Ministry of the Environment and Climate Change

This Factsheet was revised by Tim Brook, P.Eng. Water Management Engineer, OMAFRA, Elora, Derwent Valley Crop Protection Program Lead, OMAFRA, Guelph, Jason Deveau, Application Technology Specialist, Guelph, and Katherine Olejarz, Senior Program Officer, Pesticides Management Section, MOECC.

Some of the information contained in this Factsheet is not authoritative. It is derived from the Pesticides Act, the Ontario Regulation 63/09, the Ontario Water Resources Act and O. Reg. 903 and is for informational purposes only. Efforts have been made to make it as accurate as possible, but in the event of a conflict, inaccuracy or error, the requirements set out in the referenced legislation take precedence. Please consult the Act and its regulations at www.ontario.ca/laws <<http://www.ontario.ca/laws>> for the specific legal details, and consult your lawyer if you have questions about your legal obligations.

For more information:

Toll Free: 1-877-424-1300

E-mail: ag.info.omafra@ontario.ca