

Agriculture & Pesticides Facts

PESTICIDES AND WELL WATER

Many rural homeowners are concerned about the potential for contamination of their wells by pesticides applied to their land or to neighbouring farms. Fortunately, pesticide contamination of groundwater in Ontario has been a rare occurrence and usually has resulted from accidental spills, rather than from normal agricultural use of pesticides.



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CONTAMINATION ROUTES

There are three main routes by which wells can become contaminated:

- accidental spillage of pesticides into or around the well when a sprayer is being filled
- flow of contaminated surface runoff water into a well that is not properly sealed
- leaching of pesticides down through the soil into groundwater.

Contamination of wells from spillage and surface runoff is almost entirely preventable if both pesticide users and well-owners take the proper precautions.

LEACHING OF PESTICIDES

Leaching refers to the downward movement of materials through the soil with water. Pesticide contamination of the groundwater through leaching is a rare occurrence in Ontario, because the combination of conditions required for a pesticide to leach into the groundwater occurs infrequently in Ontario.

FACTORS INFLUENCING PESTICIDE LEACHING

Before a pesticide can be leached into the groundwater:

- the pesticide must be prone to moving within the soil; and
- water must be moving downward through the soil; and
- the pesticide must persist in the soil long enough to be active when it reaches the groundwater.

Thus, the risk of a pesticide leaching into the groundwater in sufficient quantities to pose a hazard to human or animal health, depends on:

1. THE PROPERTIES OF THE PESTICIDE,
2. THE NATURE OF THE SOIL TO WHICH IT IS APPLIED, AND
3. THE WEATHER.

1: PESTICIDE PROPERTIES

Only pesticides that are both mobile and relatively persistent pose a risk to the groundwater. Few pesticides possess both of these characteristics:

Mobility - Many pesticides are not prone to leaching because they bind with soil particles and are thereby immobilized (e.g., glyphosate - Roundup - binds with soil very quickly and is rendered immobile almost as soon as it hits the soil. Thus, when Roundup is applied at recommended application rates there is no risk of it leaching into groundwater.)

Persistence - Water drains relatively slowly through all but the most porous of soils. Most pesticides in use today degrade within a few days or weeks after they are applied, and thus do not stay in an active form long enough to reach the groundwater under most of the soils in Ontario.

2: SOIL PROPERTIES

Water drains downward through the soil only when the moisture content of the soil exceeds its moisture- holding capacity. Several soil characteristics affect the amount of moisture required for leaching to occur:

Soil moisture content - The wetter the soil when the pesticide is applied, the greater the risk that subsequent rains will cause leaching.

Organic matter content - Soils that are high in organic matter tend to hold more water and to bind more pesticide against leaching than do soils with a lower organic matter content.

Soil texture - The risk of leaching is greatest on coarse textured soils (i.e., sandy and gravelly soils) because their moisture-holding capacity is lower than that of finer textured soils (loams, silts and clays). Also, water tends to move more quickly through coarse textured soils than through the finer textured soils.

Permeability - The speed at which water drains through soil is closely related to soil texture, but it is also affected by factors such as compaction and the manner in which the soil has been worked. Drainage is also affected by the nature of the subsoil. Water moves down through soils underlain by sand or gravel much more quickly than through soils underlain by clay or by a compacted layer. In very highly permeable soils, water can reach the groundwater within a matter of days. In most Ontario soils, however, water is more likely to take weeks or months to move from the soil surface to the groundwater.

Slope - Water is more likely to drain downward through flat land than through sloping land (where runoff would be the greater concern).

Depth to Groundwater - The closer the groundwater (or water table) is to the surface of the soil, the greater the risk of contamination by leaching. The depth to groundwater can vary within a field, being closer to the surface under low-lying flat areas than under sloping areas or hills. The depth to the water table will also vary throughout the year. Usually the water table is closest to the surface in the early spring and late fall, when more rain is received than is removed by the crop.

3: WEATHER

The more rain that is received immediately following application, the greater the risk of leaching. Similarly, the sooner heavy rainfall is received after application, the greater the risk.

Meet with the farmer cropping your land to discuss his or her pest management practices. If the farmer is using the following practices, there is little risk of pesticides contaminating your well:

- integrated pest management
- application of pesticides only when necessary and at the lowest effective rate
- application equipment that is properly and regularly calibrated
- recognition of which pesticides have the potential to leach
- highly mobile pesticides not applied when heavy rainfall is predicted
- unsprayed buffer zones around areas of high risk for leaching.

INTERNET RESOURCES:

Pesticides and Groundwater Contamination (Ohio State University Bulletin 820)

<http://ohioline.osu.edu/b820/index.html>

Pesticides and Their Behavior in Soil and Water (University of Florida)

<http://pmep.cce.cornell.edu/facts-slides-self/facts/gen-pubre-soil-water.html>

Water and the Soil (Cornell University)

<http://pmep.cce.cornell.edu/facts-slides-self/facts/wat-so-grw85.html>

PROTECTING THE QUALITY OF YOUR WELL WATER

Ensure that the well-head and casing of your well is properly sealed to prevent entry of surface water.