



Worksheet #2
Assessing the Risk of Groundwater Contamination from

Pesticide Storage and Handling

Why should I be concerned?

Pesticides play an important role in agriculture. They have increased farm production, and they have enabled farmers to manage more acres with less labor. If pesticides are not handled carefully around the farmstead, they can seep through the ground after a leak or spill, or they can enter a well directly during mixing and loading. Taking voluntary action to prevent pesticide contamination of groundwater will help assure their continued availability for responsible use by farmers.

Pesticides work by interfering with the life processes of plants and insects. Pesticides are also toxic to people. If pesticides enter a water supply in large quantities -- as can happen with spills or backsiphonage accidents -- **acute health effects** (toxic effects apparent after only a short period of exposure) can range from moderate to severe, depending on the toxicity of the pesticide and the amount of exposure. Contaminated groundwater used for drinking water supplies may result in **chronic exposure** (prolonged or repeated exposure to low doses of toxic substances), which may be hazardous to people and livestock.

When found in water supplies, pesticides normally are not present in high-enough concentrations to cause acute health effects, which can include chemical burns, nausea and convulsions. Instead, they typically occur in trace levels, and the concern is primarily for their potential for causing chronic health problems from prolonged exposure.

Your drinking water is least likely to be contaminated if you follow appropriate management procedures or dispose of wastes in any location that is **off the farm site**. However, proper offsite disposal practices are essential to avoid risking contamination that could affect the water supplies and health of others.

The goal of Farm·A·Syst is to help you protect the groundwater that supplies your drinking water.

How will this worksheet help me protect my drinking water?

- It will take you step by step through your pesticide handling, storage and disposal practices.
- It will rank your activities according to how they might affect the groundwater that provides your drinking water supplies.
- It will provide you with easy-to-understand rankings that will help you analyze the risk level of your pesticide handling, storage and disposal practices.
- It will help you determine which of your practices are reasonably safe and effective, and which practices might require modification to better protect your drinking water.

Glossary

Pesticide Storage and Handling

These terms may help you make more accurate assessments when completing Worksheet #2. They may also help clarify some of the terms used in Fact Sheet #2.

Air gap: An air space (open space) between the hose or faucet and water level, representing one way to prevent backflow of liquids into a well or water supply.

Anti-backflow (anti-backsiphoning) device: A check valve or air gap to prevent the unwanted reverse flow of liquids back down a water supply pipe into a well, required under Accepted Agricultural Practice regulations.

Backflow: The unwanted reverse flow of liquids in a piping system.

Backflow prevention device: (See anti-backflow device.)

Backsiphonage: Backflow caused by formation of a vacuum in a water supply pipe.

Closed handling system: A system for transferring pesticides or fertilizers directly from storage container to applicator equipment (through a hose, for example), so that humans and the environment are never inadvertently exposed to the chemicals.

Cross-connection: A link or channel between pipes, wells, fixtures or tanks carrying contaminated water and those carrying potable (safe for drinking) water. Contaminated water, if at higher pressure, enters the potable water system.

Leachability: The ability for soluble materials to wash out and be removed from the soil.

Leaching Potential: The potential rating for soils based on surface runoff and soil leaching. Values are assigned by the Natural Resources Conservation Service by soil type.

Micrograms per liter: The weight of a substance measured in micrograms contained in one liter. It is equivalent to 1 part per billion in water measure.

Milligrams per liter (mg/l): The weight of a substance measured in milligrams contained in one liter. It is equivalent to 1 part per million in water measure.

Parts per billion (ppb): A measurement of concentration of one unit of material dispersed in one billion units of another.

Parts per million (ppm): A measurement of concentration of one unit of material dispersed in one million units of another.

Rinsate: Rinse water from pesticide or fertilizer tank cleaning.

Secondary containment: Impermeable floor and walls around a chemical storage area that minimize the amount of chemical seeping into the ground from a spill or leak.

Pesticide Storage and Handling

Resource Concern	Rank 4	Rank 3	Rank 2	Rank 1	Field Number
					<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

PESTICIDE STORAGE					
Amount stored	No pesticides stored at any time.	Less than 1 gallon or less than 10 pounds of each pesticide.	More than 1 gallon or more than 10 pounds of each pesticide.	More than 55 gallons or more than 550 pounds of each pesticide.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Leachability¹	No chemical stored.	Chemicals classified as having low leaching potential.	Chemicals classified as having medium leaching potential.	Chemicals classified as having high leaching potential.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Liquid or dry formulation	No liquids. All dry.	Some liquids. Mostly dry.	Mostly liquids. Some dry.	All liquids.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Spill or leak control in storage area	Impermeable surface (such as concrete) does not allow spills to soak into soil. Curb installed on floor to contain leaks and spills.	Impermeable surface with curb installed has some cracks, allowing spills to get to soil. OR impermeable surface without cracks has no curb installed.	Permeable surface (wooden floor) has cracks. Impermeable surface has no curb. Spills could contaminate wood.	Permeable surface (gravel or dirt floor). Spills could contaminate floor.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Containers	Original containers clearly labeled. No holes, tears or weak seams. Lids tight.	Original containers old. Labels partially missing or hard to read.	Containers old but not leaking. Metal containers showing signs of rusting.	Containers have holes or tears that allow pesticides to leak. No labels.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Security	Fenced or locked area separate from all other activities. Signs at storage area.	Fenced area separate from most other activities.	Open to activities that could damage containers or spill chemicals.	Open access to theft, vandalism and children. No signs.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
MIXING AND LOADING PRACTICES					
Location of well in relation to mixing/loading area	200 or more feet downslope from well.	200 to 100 feet downslope from well.	100 to 50 feet downslope from well, or 100-500 feet upslope.	Within 50 feet downslope or within 100 feet upslope from well.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

¹Use Pesticide Leachability Table to determine the risk factor.

Bold print indicates a serious concern for drinking water quality and may indicate conditions that violate state or federal laws and regulations.

Pesticide Storage and Handling

Resource Concern	Rank 4	Rank 3	Rank 2	Rank 1	Field Number □ □ □ □ □
Mixing and loading pad (spill containment)	Concrete pad with curb keeps spills contained. Sump allows collection and transfer to storage.	Concrete pad with curb keeps spills contained. No sump. Mixing in clay fields.	Concrete pad with some cracks keeps some spills contained. No curb or sump. Mixing in silt field.	No mixing/loading pad. Mixing on permeable soil (sand). Spills soak into ground.	□ □ □ □ □
Water source	Separate water tank.	Water supply away from well.	Water supply near well.	Obtained directly from well, river or pond.	□ □ □ □ □
Backflow prevention on water supply	Anti-backflow device installed or 6-inch air gap maintained above sprayer tank.	Anti-backflow device installed. Hose in tank above waterline.	No anti-backflow device. Hose in tank above waterline.	No anti-backflow device. Hose in tank below waterline.	□ □ □ □ □
Filling supervision	Constant		Frequent	Seldom or never	□ □ □ □ □
Handling system	Closed system for all liquid product transfers.	Closed system for most liquids. Some liquids hand poured. Sprayer fill port easy to reach.	All liquids and dry product hand poured. Sprayer fill port easy to reach.	All liquids and dry product hand poured. Sprayer fill port hard to reach.	□ □ □ □ □
Sprayer cleaning and rinsate (rinse water) disposal	Sprayer washed out in field. Rinsate used in next load and applied to labeled crop.	Sprayer washed out on pad at farmstead. Rinsate used in next load and applied to labeled crop.	Sprayer washed out at farmstead. Rinsate sprayed less than 100 feet from well.	Sprayer washed out at farmstead. Rinsate dumped at farmstead or in nearby field.	□ □ □ □ □
CONTAINER DISPOSAL					
Disposal location	Triple-rinsed containers returned to dealers or taken to licensed landfill or municipal incinerator. Bags returned to supplier or hazardous waste collection service used.	Unrinsed containers and empty bags taken to licensed landfill, municipal incinerator or dump.	Disposal of unrinsed containers or empty bags on farm. Disposal of triple-rinsed containers on farm. Disposal of container in a manner inconsistent with label.	Disposal of partially filled plastic or paper containers on farm. Disposal of container in a manner inconsistent with the label.	□ □ □ □ □
INTEGRATED PEST MANAGEMENT					
IPM knowledge and skills	Farmer and consultant (if hired) understand	Farmer knows key pest species of crops, has	Farmer knows key pest species of crops and	Farmer has not been trained to ID pests OR	□ □ □ □ □

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Pesticide Storage and Handling

Resource Concern	Rank 4	Rank 3	Rank 2	Rank 1	Field Number <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Crop rotation	<p>key pest life cycle factors and exploit "weak links" for effective management.</p> <p>Pest ID and scouting info. Always used to manage pests & beneficial organisms.</p> <p>Rotation with more years of small grains (oats, wheat, etc.) and/or legumes than row crops. Additional crop diversity is used, including stripcropping, and cover crops.</p>	<p>been trained in pest ID, OR employs certified consultant.</p> <p>Scouting information often used to manage pests. Information on beneficials is not used.</p> <p>Three-crop rotation used including a legume and/or small grain.</p> <p>OR Rotation of row crop with legume or small grain every other year.</p>	<p>has been trained in pest ID, but does not routinely use scouting information to manage pests.</p> <p>Rotation of row crops with a legume or small grain at least one out of every three years.</p>	<p>does not seek advice from professional consultant when managing pests.</p> <p>Continuous intense row crop(s) with no rotation.</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
PESTICIDE APPLICATION					
Treatment threshold	<p>Pesticide applications are made only when pests reach a predetermined treatment threshold. "Weak link" of pest's life cycle is targeted for pesticide applications.</p>	<p>Pesticide application is based on pest population levels determined by scouting, but treatment threshold is not used.</p>	<p>Pesticide application is made at first sign of pests.</p>	<p>Pesticide application is based only on calendar date or stage of crop development.</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Spill response plan	<p>Spill response plan is written, kept current, and reviewed by family and employees. Authorities are notified immediately after a spill of a hazardous compound.</p>	<p>Spill response plan is written and routinely reviewed by family and employees.</p> <p>Phone numbers of emergency response are next to phone.</p>	<p>Spill response plan is developed but not routinely reviewed by family and employees.</p>	<p>Farm has no written response plan.</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Residue management & cover crops	<p>Crop residues and cover crops are always used to minimize</p>	<p>Crop residues and cover crops are frequently used to</p>	<p>Crop residues and cover crops are sometimes used in</p>	<p>Crop residue and cover crops are not used anywhere on the farm.</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

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Resource Concern	Rank 4	Rank 3	Rank 2	Rank 1	Field Number
					<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

	pesticide leaching, runoff, and erosion by wind.	minimize pesticide leaching, runoff, and erosion by wind.	fields highly susceptible to leaching, wind erosion, or runoff of pesticides.		
Pesticide training	People who mix, load, and apply all pesticides are certified through a state regulatory agency, and keep current on pest control strategies between certifications.	People who mix, load, and apply all pesticides are certified, but do not stay current on new pest control strategies between certifications.	People seek certification only to mix, load, and apply restricted-use pesticides.	People who mix, load, and apply restricted-use pesticides are not certified.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Application rate	Farmer uses pesticide below label rates in conjunction with cultural practices (e.g. banding with cultivation or ridge tillage). Spreader is calibrated. Records are kept of materials applied.	Farmer uses sprayer technologies and methods to reduce amount applied. Spreader is calibrated. Records are kept of materials applied.	Farmer applies pesticide at label rates based on needs determined by scouting. Spreader is calibrated. Incomplete records kept of materials applied.	Pesticides are applied over the label rate, and/or not according to label. Sprayer is not calibrated. Records not kept of materials applied.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Weather Conditions (wind speed and rain forecast)	Weather forecasts are used to plan pesticide applications. No spraying is done when wind would move it off target. Applications are made during label-required rain-free periods.	Weather forecasts are considered when planning to spray. Pesticide application are made during rain-free periods and at low wind speeds.	Spraying is done on windy days OR post-emergence pesticides are applied when rain is imminent.	Weather forecasts are not considered when planning to spray. Spraying in weather conditions contrary to the label.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

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What do I do with these rankings?

Step 1: Begin by determining your overall well management risk ranking. Total the rankings for the categories you completed and divide by the number of categories you ranked:

_____ divided by _____ equals *	
Rankings total from previous page	number of risk ranking categories ranked (11 if ranked all)

*Carry your answer out to one decimal place.

Example:
 $26 \div 11 = 2.36$
Use **2.4**.

Risk Ranking Description

3.6 - 4.0 = low risk 1.6 - 2.5 = moderate to high risk
2.6 - 3.5 = low to moderate risk 1.0 - 1.5 = high risk

This ranking gives you an idea of how your well condition, **as a whole**, might be affecting your drinking water. This ranking should serve only as a **very general guide, not a precise diagnosis**. Because it represents an **averaging** of many individual rankings, it can overlook any **individual** rankings (such as 1's or 2's) that should be of concern. (Step 2 will focus on individually ranked activities of concern.)

Enter your boxed well condition ranking in the appropriate place in the table on the front of Worksheet #12. Later you will compare this risk ranking with other farmstead management rankings. Worksheet #11 will help you determine your farmstead's site conditions (soil type, soil depth, and bedrock characteristics), and worksheet #12 will show you how these site conditions affect your risk rankings.

Step 2: Look over your rankings for individual activities.

- **4's - Best:** low-risk practices
- **3's - Provide reasonable groundwater protection:** low- to moderate-risk practices
- **2's - Possibly inadequate protection:** moderate- to high-risk practices
- **1's - Inadequate protection with relatively high groundwater contamination risk:** high-risk practices

Regardless of your overall risk ranking, any individual rankings of "1" require immediate attention. You can take care of some of the concerns right away; others could be major or costly projects, requiring planning and prioritizing before you take action.

Find any activities that you identified as 1's and list them under "High-Risk Activities" on Worksheet #12.

Step 3: Read Fact Sheet #2, "*Improving Pesticide Handling and Storage*," and give some thought to how you might modify your farmstead practices to better protect your drinking water.

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