

Assessing the Risk of Groundwater Contamination from Pesticide Storage and Handling

Why should I be concerned?

In some locations, pesticides are showing up where they're not wanted – in our drinking water. 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.

Pesticides play an important role in agriculture. They have increased farm production, and they have enabled farmers to manage more acres with less labor. 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, insects and other pests. 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 concentrations high enough to cause acute health effects, which can include chemical burns, nausea and convulsions. Instead, they typically occur at 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 and dispose of wastes 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 the drinking water for you, your neighbors, and the public. It is not used for, nor is it related to, any type of enforcement action from any agency.

How will this worksheet help me protect my drinking water?

- ◆ It will take you step by step through your drinking water well condition and management practices.
- ◆ It will rank your activities according to how they might affect the groundwater that provides your drinking water supplies.

- ◆ 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.
- ◆ **When you see this symbol  behind any text in the worksheet you will know that it is an illegal activity. Remember this is for your use and will not in anyway lead to enforcement.**
- ◆ **Be sure to read the footnotes to see what the *, italicized or bold font means.**

How do you fill out the worksheets?

Focus on the well that provides drinking water for your home or farm. If you have more than one drinking water well on your farmstead, fill out a worksheet for each one.

- ◆ Use a pencil. You may want to make changes.
- ◆ For each category listed on the left that is appropriate to your farmstead, read across to the right and circle the statement that best describes conditions on your farmstead. (skip and leave blank any categories that don't apply to your farmstead.)
- ◆ Then look above the description you circled to find your "Rank number" (4, 3, 2, or 1) and enter that number in the blank under "Your Rank."
- ◆ Directions on overall scoring are explained in the next section "What do you do with the rankings?"
- ◆ Allow between 20-45 minutes to complete the worksheet to figure out your risk ranking for management practices and complete the Farmstead Improvement Action Plan.

What do you do with the rankings?

Step 1: Look over your rankings for individual activities:

- ◆ Low-risk practices (4's): ideal; should be your goal despite cost and effort
- ◆ Low-to-moderate-risk practices (3's): provide reasonable groundwater protection
- ◆ Moderate-to-high-risk practices (2's): inadequate protection in many circumstances
- ◆ High-risk practices (1's): inadequate; pose a high risk of polluting groundwater

Any individual rankings of "1" require immediate attention. Some concerns you can take care of 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 & 2's and list them under "High Risk and Medium-High Risk Practices" in the Farmstead Improvement Action Plan section following the worksheet.

Step 2: Read Fact Sheet # 2, Pesticide Storage and Handling, and consider how you might modify your farmstead practices to better protect the water that you and the public drink. This will help with filling out the Farmstead Improvement action Plan.

Step 3: Fill out the Farmstead Improvement Action Plan (FIAP). Contact your local Soil and Water Conservation District for technical assistance and help with the FIAP if needed.

Step 4: Implement the FIAP- Contact NRCS for possible designs and/or funding for practices. Funding availability depends on the practice installed and the current USDA farm programs.

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 the 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 other mechanical device to prevent the unwanted reverse flow of liquids back down a water supply pipe into a well.

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.

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.

Common ME Agricultural Pesticides with Environmental Fate Info.* and 2006 Drinking Water Advisory Levels**								
Active Ingredient	Selected Trade Names	Fungicide (F) Herbicide (H) Insecticide (I)	Potential for Water Contamination			Drinking Water Guidelines (ug/L; ppb)		
			Groundwater	Surface Water; Runoff		EPA		Maine
			Leaching	Solution	Adsorbed	MCL	HAL	MEG
2,4-DICHLOROPHENOXYACETIC ACID (salts and esters)	Amine 4, Formula 40, Weedar 64, Weedestroy	H	Intermediate	Intermediate	Low	70	na***	70
ATRAZINE	Aatrex, Bicep, Lumax, Liberty Atz, Axiom AT, Basis Gold, Lariat, Bullet, Harness Xtra, Marksman, Laddok 5L, etc.	H	High	High	Intermediate	3	na	3
AZINPHOS-METHYL	Guthion, Sniper	I	Low	Intermediate	Intermediate	na	na	11
AZOXYSTROBIN	Heritage, Abound, ICIA5504, Quadris/Ridomil Gold, Dynasty, Amistar, Quilt, Protégé	F	Low	High	High	na	na	na
CAPTAN	Captan, Captec	F	Low	Intermediate	Low	na	na	146
CARBARYL	Carbaryl, Sevin	I	Very Low	Low	Low	na	na	70
CARBOFURAN	Furadan	I	High	High	Intermediate	40	na	35
CHLOROTHALONIL	Bravo, Echo, Equus, Daconil	F	Low	Intermediate	Intermediate	na	na	45
CHLORPYRIFOS	Dursban, Lorsban	I	Low	Low	Intermediate	na	2	20
CYMOXANIL	Curzate, Dupont Tanos, Evolve	F	Low	Intermediate	Low	na	na	na
DIAZINON	Diazinon	I	Low	High	High	na	1	0.6
DIQUAT	Reglone, Reward, Prosecutor	H	Very Low	Low	High	20	na	15
DISULFOTON	Di-Syston	I	Intermediate	High	Low	na	0.7	0.3
DIURON	Direx, Karmex, Krovar	H	Intermediate	High	Intermediate	na	na	14
ENDOSULFAN	Thiodan, Phaser	I	Very Low	Intermediate	High	na	na	42
ENDOTHALL	Des-I-cate	H	Intermediate	Intermediate	Low	100	50	140
ESFENVALERATE	Asana	I	Low	Intermediate	Intermediate	na	na	na
ETHOPROP	Mocap	I	High	Intermediate	Low	na	na	na
FENVALERATE	Crossfire	I	Low	Intermediate	Intermediate	na	na	na
FLUTOLANIL	Prostar, Contrast, Systar, Montero, Moncoat, Artisan	F	Intermediate	High	Intermediate	na	na	na
FOSETYL-AL	Aliette, Lesco Prodigy Signature, Terronate	F	Low	Intermediate	Low	na	na	na
GLUFOSINATE-AMMONIUM	Finale, Derringer	H	Low	Intermediate	Low	na	na	na
GLYPHOSATE	Touchdown, Roundup	H	Very Low	High	High	700	na	700

HEXAZINONE	Velpar, Pronone	H	High	High	Intermediate	na	400	230
IMIDACLOPRID	Admire, Provado, Gaucho, Merit	I	High	High	Intermediate	na	na	na
LAMBDA-CYHALOTHRIN	Demand, Warrior	I	Very Low	Low	Intermediate	na	na	na
LINURON	Linex, Lorox, Layby	H	Intermediate	High	Intermediate	na	na	na
MALEIC HYDRAZIDE	Royal MH-30, Sprout Stop	Plant Growth Regulator	Intermediate	Intermediate	Low	na	4000	3500
MANCOZEB	Manzate, Penncozeb, Dithane	F	Low	High	High	na	na	6
MCPA	Rhomene, Tripower, Trimec	H	Low	Intermediate	Intermediate	na	30	4
MCPP	Tripower, Trimec	H	High	Intermediate	Low	na	na	na
METAM-SODIUM	Vapam	Fumigant	Intermediate	Intermediate	Low	na	na	na
METHAMIDOPHOS	Monitor, Orthotox	I	Intermediate	Intermediate	Low	na	na	na
METHOMYL	Lannate	I	High	Intermediate	Low	na	200	175
METIRAM	Polyram	F	Very Low	Low	Intermediate	na	na	na
METRIBUZIN	Boundary, Sencor, Turbo, Axiom, Domain, Authority, Canopy, Top Gun, Metri	H	High	High	Low	na	70	na
NAPROPAMIDE	Devrinol	H	Intermediate	High	Intermediate	na	na	na
PARAQUAT	Gramoxone, Cyclone, Surefire, Marman Herbiquat	H	Very Low	Low	High	na	30	3
PENDIMETHALIN	Prowl	H	Low	Intermediate	High	na	na	na
PENTACHLORONITROBENZENE	Terraclor	F	Low	Low	Intermediate	na	na	na
PHOSMET	Imidan	I	Low	Intermediate	Low	na	na	na
PROPICONAZOLE	Orbit	F	Intermediate	High	High	na	na	9
SETHOXYDIM	Poast	H	Low	Intermediate	Low	na	na	na
SIMAZINE	Princep	H	High	High	Intermediate	4	na	3.5
S-METOLACHLOR	Dual, Bicep	H	High	High	Intermediate	na	700	100
TERBACIL	Sinbar	H	High	High	Intermediate	na	90	90
THIABENDAZOLE	Mertect	F	Low	High	High	na	na	na
THIOPHANATE-METHYL	Topsin M, Banrot	F	Low	Intermediate	Intermediate	na	na	na
TRIPHENYLTIN	Super Tin	F				na	na	na
VINCLOZOLIN	Curalan, Lesco Touche, Ronilan, Vorlan	F	Intermediate	Intermediate	Low	na	na	na

**All environmental fate information in this table was provided by the United States Department of Agriculture's Natural Resources Conservation Service. For details on how these values were established call Joseph Bagdon, Pest Management Specialist and WIN-PST Team Leader, at (413) 253-4376, or e-mail joseph.bagdon@ma.usda.gov. Written correspondence can be sent to: USDA/NRCS National Water and Climate Center, 451 West Street, Amherst, MA 01002-2995, Fax: (413) 253-4375.*

***There are basically two types of health-based acceptable levels for pesticides in drinking water; these are the standards (EPA's MCLs) and the guidelines (EPA's HALs and Maine's MEGs). MCLs are enforceable for public water systems, as defined by the Safe Drinking Water Act, and in setting them, the best available technology to achieve the level has to be considered. MEGs are set by the Environmental Toxicology program in the Maine Centers for Disease Control (MeCDC), and some of the values listed are final MEGs and some are interim. The MCLs and the guidelines (HALs and MEGs) are all used for guidance in private well situations. **Other potential routes of pesticide exposure to humans include dermal and inhalation.** For more information, please contact Lebelle Hicks, BPC Toxicologist, (207) 287-7594, or lebelle.hicks@maine.gov.*

**** na = not available*

Acronyms and abbreviations used in this table:

EPA—US Environmental Protection Agency

HAL—Health Advisory Level

MCL—Maximum Contaminant Level

MEG—Maximum Exposure Guidelines

ppb—parts per billion

ug/L—micrograms per liter

Link to the above form: <http://www.ehrs.columbia.edu/HazardousChemicalList.html>

Worksheet # 2

Pesticide Storage and Handling: Assessing Drinking Water Contamination Risk

	Low Risk (Rank 4)	Low-Mod Risk (Rank 3)	Mod-High Risk (Rank 2)	High Risk (Rank 1)	Your Rank
<u>Pesticide Storage</u>					
2.1 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.	_____
Types stored:					
2.2 Leachability*	----	Chemicals classified as having low leaching potential.	Chemicals classified as having medium leaching potential.	Chemicals classified as having high leaching potential.	_____
2.3 Liquid or dry formulation	No liquids. All dry.	Some liquids. Mostly dry.	Mostly liquids. Some dry.	All liquids.	_____
2.4 Spill or leak control in storage area	Impermeable surface (such as sealed concrete) does not allow spills to soak into soil or fractured bedrock. Curb installed on floor to contain leaks and spills.	Impermeable surface with curb installed has some cracks, allowing spills to get to soil or fractured bedrock OR impermeable surface	Permeable surface (wooden floor) has some cracks. Impermeable surface has no curb. Spills could contaminate wood or soil.	Permeable surface (gravel or dirt floor). Spills could contaminate floor.	_____

*See attached Pesticide Leachability Chart.

	Low Risk (Rank 4)	Low-Mod Risk (Rank 3)	Mod-High Risk (Rank 2)	High Risk (Rank 1)	Your Rank
2.5 Containers	Original container clearly labeled. No holes, tears or weak seams.	Original containers old. Labels partially missing or hard to read	Containers old but patched. Metal containers show signs of rusting.	Containers have holes or tears that allow chemicals to leak. No labels.	_____
2.6 Security	Fenced or locked area separate from all other activities.	Fenced area separate from most other activities.	Open to activities that could damage containers or spill	Open access to theft, vandalism and children.	_____

Mixing and Loading Practices

2.7 Location of well in relation to mixing/loading area with no curbed and impermeable containment area	100 feet or more downslope from well.	50-100 feet downslope from well.	Within 50 feet Downslope from well, or within 300 feet upslope. **	Adjacent to Downslope well or within 100 feet upslope from well. **	_____
2.8 Mixing and loading pad (spill containment)	A sealed concrete pad with curb keeps spills contained. Sump allows collection and transfer to storage.	A sealed concrete pad with curb keeps spills contained. No sump.	A sealed concrete pad with some cracks keeps some spills contained. No curb or sump.	No mixing/loading pad. Permeable soil (sand). Spills soak into ground.	_____
2.9 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 water line.	_____
2.10 Water source	Separate water tank.	Hydrant away from well.	Hydrant near well.	Obtained directly form well.	_____
2.11 Filling supervision	Constant	-----	Frequent	Seldom or never	_____

**Some pesticides prohibit mixing and loading within 5 feet of a well. Read the label carefully.

	Low Risk (Rank 4)	Low-Mod Risk (Rank 3)	Mod-High Risk (Rank 2)	High Risk (Rank 1)	Your Rank
2.12 Handling system	Close system for all liquid and dry product transfers.	Closed system for most liquids. Some liquid and dry product 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.	_____
2.13 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. <i>Rinsate dumped at farmstead or in field.</i>	_____

Container Disposal

2.14 Disposal location	Triple-rinsed general and restricted use container returned to dealers or taken to Solid waste disposal facility, or container recycling drop-off. Shake bags clean and dispose of them at the local solid waste disposal facility.	<i>Unrinsed container and empty bags taken to licensed landfill, municipal incinerator or dump</i>	<i>Disposal of unrinsed container or empty bags on farm or in field. Disposal of triple-rinsed containers on farm.</i>	<i>Disposal of partially filled plastic or paper containers on farm or in field.</i>	_____
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Only Italicized type in the sections with the  violates Maine Law and is representing a higher-risk choice.

Worksheet Section #	List High Risk and Med-High Risk practice(s)	Alternative Low Risk practice (Include potential sources of technical and financial assistance.)	Action Plan	
			Planned completion date	Indicate date when completed

I understand that this farmstead assessment (Farm-A-Syst) and corresponding Farmstead Improvement Action Plan were developed on the basis that I have disclosed, to the best of my knowledge, all information pertaining to my farmstead operations.

Farmstead address:

Street _____

City _____ ME, Zip code _____

Watershed name: _____

___ Aerial map with farmstead boundaries is attached

Producer's signature _____

Date ____/____/_____

Farm-A-Syst conducted by:

Name _____

Title _____ Date ____/____/_____

Acknowledgments

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Revision Editors of Farm-A-Syst Worksheet #2: Megan Wooster, AVSWCD; Susan Gammon, AVSWCD; Andrews Tolman, State of Maine CDC Drinking Water Program; Henry Jennings, Maine Board of Pesticides Control; Peter Moulton, Maine Department of Environmental Protection; Marianne DuBois, Maine Department of Environmental protection; Susan Breau-Kelley, Maine Rural Water Association. 2007-2008.

Original Farm-A-Syst team members: John M. Jemison, Jr., University of Maine Cooperative Extension; Marianne DuBois, Maine Department of Environmental Protection; Tammy Gould, Board of Pesticides Control; Chris Jones, Natural Resources Conservation Service; Lisa Krall, Natural Resources Conservation Service; Craig Leonard, Maine Department of Agriculture; Craig Neil, Maine Geological Survey; David Rocque, Maine Soil and Water Conservation Commission; and David Lytle, University of Maine Cooperative Extension. Original Worksheet #2 Adapted by Tammy Gould, Board of Pesticides Control. 1995.