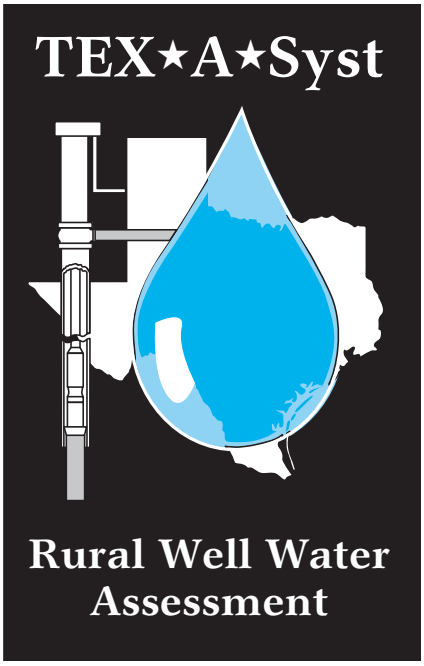

TEXAS A&M AGRILIFE EXTENSION

Reducing the Risk of Ground Water Contamination by Improving Pesticide Storage and Handling

B.L. Harris, D.W. Hoffman and F.J. Mazac, Jr.*

1. Do you store pesticides on your land?
2. Do you use or store any agricultural chemicals near a water well?
3. Are chemicals stored on a permeable surface such as wood, gravel or soil, or are chemicals stored on an impermeable surface with no curb?
4. Do you have any chemical containers that are rusted, damaged or leaking?
5. Are chemicals stored in an area where containers could become damaged or where a chemical spill could occur?
6. Are chemicals stored in a location that is unlocked and open to vandalism or to children?
7. Do you fill the sprayer tank directly from a water well?
8. Do you fill a sprayer tank with a hose that does not have a check valve, or put the hose in the tank so that it is below the liquid line during filling?
9. Do you leave the sprayer tank unattended when filling?
10. Do you mix or load chemicals upslope or within 150 feet of a water well?
11. Do you have a concrete pad with a curb to contain spills during the mixing or loading of chemicals?
12. Do you wash the sprayer tank out and dump the rinsate on your land less than 150 feet from a water well?
13. Do you apply pesticides without reading the label first?
14. Has it been longer than 5 years since you attended a pesticide applicator training?

If these questions create doubt about the safety of your management practices, this publication will provide helpful information.

*Professor and Extension Soils Specialist; Research Scientist, Texas Agricultural Experiment Station; and Extension Associate-Water Quality, The Texas A&M University System.

Pesticide Handling Overview

Pesticides play an important role in agriculture. They have increased farm production and enabled farmers to manage more acres with less labor. Taking voluntary action to prevent pesticide contamination of ground water will help ensure that pesticides remain available for responsible use.

Pesticides work by interfering with the life processes of plants and insects. Some pesticides are also toxic to humans. If a pesticide enters a water supply in large quantities, which could happen with spills or back-siphonage accidents, acute health effects (toxic effects apparent after only a short period of exposure) could occur, depending on the toxicity of the pesticide. Contaminated ground water used for drinking water supplies may cause chronic exposure (prolonged or repeated exposure to low doses of toxic substances). Chronic exposure may be hazardous to humans and livestock.

Normally pesticides are not found in water supplies in high enough concentrations to cause acute health effects, which can include chemical burns, nausea and convulsions. Instead, pesticides usually occur in trace amounts, and the concern is for the chronic health problems that may result from prolonged exposure.

Proper pesticide management on your property is an important step toward preventing ground water contamination. This guide will provide information about the following areas:

1. Pesticide storage
2. Mixing and loading practices
3. Spill clean up
4. Container disposal
5. Other management practices
6. Evaluation table
7. Pesticide Leachability Chart

Pesticide Storage

If stored in a secure, properly constructed location, pesticides pose little danger to ground water. Common sense suggests keeping pesticides out of the way of activities that might knock over a jug or rip open a bag. Short-term storage (during a season) poses a lower risk than year-round storage, but storage for any length of time can be a risk to ground water.

Secondary containment includes an impermeable (waterproof) floor and walls around the storage area. This will minimize the amount of pesticide seeping into the ground if a bulk liquid pesticide storage tank leaks.

If a spill does occur, an impermeable concrete floor should prevent chemical seepage into the ground. Putting a curb around a concrete floor also will prevent chemicals from spreading to other areas.

A mixing or loading pad provides secondary containment during the transfer of pesticides to spraying equipment or nurse tanks.

Building a New Storage Facility

Building a new facility just for pesticide storage may be expensive, but it is usually easier than trying to modify areas meant for other purposes. When building a new facility, keep in mind a few principles of safe pesticide storage.

- ★ Locate the building downslope and at least 100 feet away from your water well. The distance from the well should be greater if the site has sandy soils or fractured bedrock near the soil surface. The risk of pesticides contaminating ground water is influenced by properties of both the pesticide and the soil on which it is spilled or applied.
- ★ Drain surface water to a confined area because, in the event of a fire, contaminated surface water can be collected more safely.
- ★ Locate the mixing and loading area close to your storage facility in order to minimize the distance that chemicals are carried.
- ★ Provide a well-drained building foundation or secondary containment floor that is high above the water table. The finished soil grade should be 3 inches below the floor and sloped to provide surface drainage away from the building. The subsoil should have a low permeability.
- ★ Keep large drums or bags on pallets and off the floor. Shelves for smaller containers should have lips to keep the containers from sliding off. Steel shelves are easier to clean than wood if a spill occurs. Store dry products above liquids to prevent wetting from spills.

- ★ Provide a containment area large enough to confine 125 percent of the contents of the largest bulk container, plus the displaced volume of any other storage tanks in the area.
- ★ Keep the storage area or building locked for security. Preventing unauthorized use of pesticides reduces the chance of accidental spills or theft. Post signs or labels to identify the area as a pesticide storage area. Labels on the outside of the building will give firefighters information about pesticides if they must respond to a fire or a spill. Also, it is a good idea to maintain, in a separate location, a list of the chemicals and amounts stored.
- ★ Provide adequate road access for deliveries and emergency equipment.
- ★ Keep pesticides separate to prevent cross-contamination. Herbicides, insecticides and fungicides should be kept on separate shelves or in separate areas.

For information on other factors to consider in the design of a storage facility, such as ventilation, water access, temperature control and worker safety, contact your county Extension office or the Texas A&M University Department of Agricultural Engineering.

Modifying an Existing Storage Facility

Remodeling an existing facility to serve as pesticide storage may be less expensive than building a new facility, but remodeling can be complicated. When existing buildings must accommodate other activities, also using them to store pesticides could compromise the safety of people and the environment. Storing chemicals in a separate facility reduces the risk associated with fire or accidental spills. Never store pesticides inside a wellhouse or in a facility containing an abandoned well.

Even if you decide to improve your current storage building, applying the above principles can be expensive. Compared to the cost of a major accident or a lawsuit, however, storage improvements are a bargain. Also, note that the last five items listed in the section above are important points to remember for existing storage facilities.

The least expensive alternative you may have is to reduce the amounts and types of pesticides stored. If that is not practical, consider how stored pesticides can be protected. Sound containers are the first defense against a spill or leak.

When modifying a structure, it is important to note that the building should have a solid floor. If liquid pesticides are stored the building also should have a curb. The modified structure should be large enough to hold 125 percent of the contents of the largest full container, plus the displaced volume of any other storage tanks in the area.

When modifying an existing structure, label windows and doors to alert firefighters to the presence of pesticides and other products stored in the structure. It is always a good idea to keep a list of the stored chemicals and amounts in a separate location.

If a fire should occur, consider where the surface runoff water will go and where it might collect. For example, adding a curb around a floor can help confine contaminated water. In making the storage area secure, also make it accessible in order to help get chemicals out in a hurry.

Mixing and Loading Practices

Ground water contamination can result even from small spills in the mixing and loading area. Small quantities spilled regularly in the same place can go unnoticed, but the chemicals can build up in the soil and eventually reach ground water. By mixing and loading on an impermeable concrete surface most spilled pesticides can be recovered and reused.

A Mixing and Loading Pad

Containing pesticide spills and leaks requires an impermeable or waterproof surface for mixing and loading. The surface, or pad, should be large enough to contain leaks from bulk tanks, to hold wash water from cleaning equipment, and to keep spills from transferring chemicals to the sprayer or spreader. (See Figure 1.)

The size of the pad depends on the equipment used. The pad should provide space around the parked equipment for washing and rinsing. Having several rinsate (rinse water) storage tanks allows the user to keep rinsate separate from other chemicals. That way, the rinsate can be used as mixing water on subsequent loads.

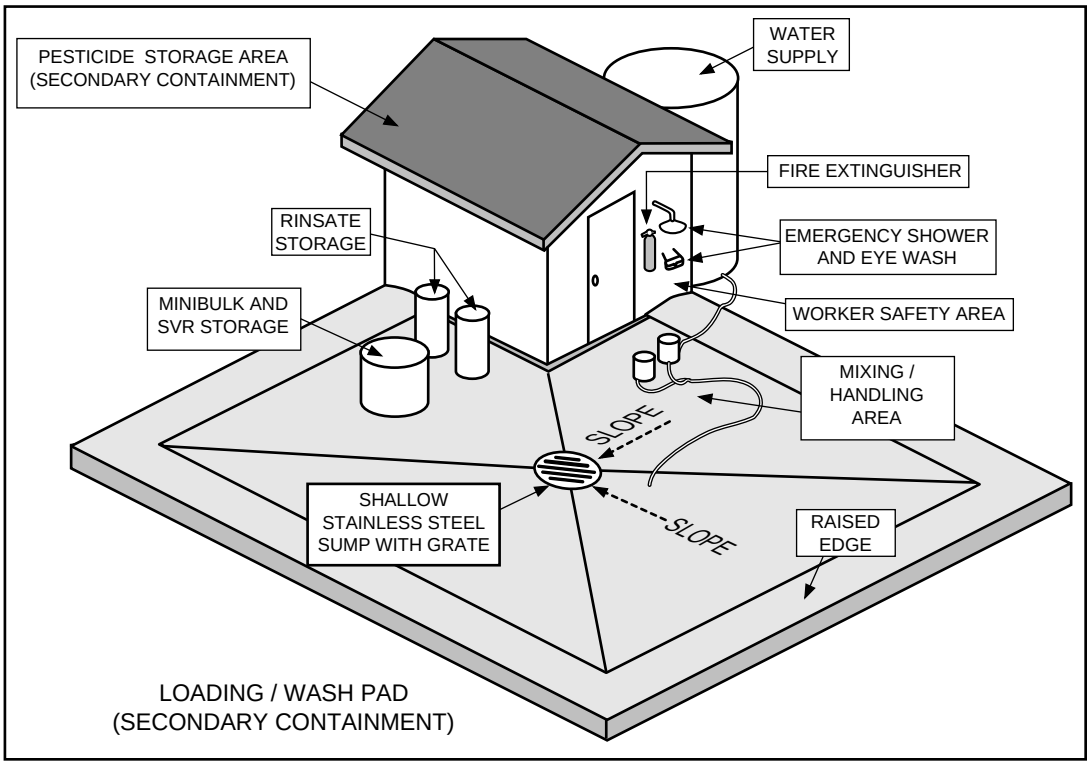

Figure 1. Farm-sized pesticide facility. Source: Farm-Sized Mixing/Loading Pad and Agri-chemical Storage Facility, by D.W. Kammel and D. O'Neil, presented at Summer Meeting of the American Society of Agricultural Engineers, June 24-27, 1990.

Always keep the pad clean and dispose of pesticides properly so that rainfall will not mix with spilled pesticides and cause contamination. Storage of rainfall increases the required size of the sump.

Locate the pad next to the storage area. Make sure that any water from the pad moves away from the well. At sites where runoff water could reach the well, construct a diversion to another area.

For help in constructing a mixing and loading pad, contact your county Extension office or the Texas A&M University Department of Agricultural Engineering.

Better Management on an Existing Mixing and Loading Site

Spills and leaks are bound to occur from time to time. Even if there is no impermeable mixing and loading pad, the risk of contamination can be minimized by following some basic guidelines.

- ★ Avoid mixing and loading pesticides near any well. One way to do this is to use a nurse tank to transport water to the mixing and loading site. Ideally, the mixing site should be moved within the field of application each year to avoid build-up of spilled pesticides in the soil.
- ★ Avoid mixing and loading on gravel driveways or other surfaces that allow spills to sink quickly through the soil. A clay surface is better than sand.
- ★ Install a backsiphon prevention device on the well or hydrants to prevent reverse flow of liquids into the water supply.
- ★ Leave an air gap of 6 inches between the hose and the top of the sprayer tank. Never put the hose in the sprayer tank.
- ★ Supervise sprayer filling. For restricted-use and state-limited-use pesticides, a trained and licensed applicator must supervise operations.
- ★ Consider using a closed handling system, which transfers the pesticide directly from a storage container to the application equipment (through a hose, for example). This will ensure that humans and the environment are never inadvertently exposed to the pesticide.
- ★ Use rinsate for mixing subsequent loads.

Spill Cleanup

Promptly sweep up dry spills and reuse the pesticide as it was intended. Dry spills are usually easier to clean.

For liquid spills, recover as much of the spill as possible and reuse it as it was intended. It may be necessary to remove some contaminated soil from clay pads and spread it on fields. Have clay, sawdust or cat litter available to adsorb unrecovered liquid from concrete pads. Have an emergency response plan for the site. Know where the runoff water will go, how to handle a particular chemical, and whom to call for help.

Container Disposal

Unwashed and improperly stored containers can lead to ground water contamination if chemical residues leak onto the ground. Some guidelines that can help prevent this problem include the following:

- ★ Use returnable containers and minibulks, and take them back to the dealer as often as possible.
- ★ Pressure-rinse or triple-rinse containers immediately after use, since residue can be difficult to remove after it dries. Pour the rinse water into the spray tank. Puncture containers and store them in a covered area until you take them to a permitted landfill.
- ★ Recycle plastic and metal containers whenever possible.
- ★ Shake out bags, bind or wrap them to minimize dust, and take them to a permitted landfill.
- ★ Do not bury or burn pesticide containers or bags on private property.

Other Management Practices

Reducing pesticide waste makes financial as well as environmental sense, but it means more than just reducing spills. It also means not buying more than you need to apply, keeping records of what is on hand, and using older products first.

- ★ Buying only what is needed makes long-term storage unnecessary. Storing pesticides during cold weather can make some of them useless.
- ★ Record keeping may seem unrelated to ground water contamination, but knowing what pesticides have been used in the past and what is currently on hand allows for better purchasing decisions. Keep records of past field application rates and their effectiveness. Along with field records, add information such as the manufacturer's name and address, chemical types and handling precautions. This information can be important if you must respond quickly to an accident.
- ★ Using older products first keeps any inventory current and effective. Before using chemicals that have been stored for a few years, though, check with your county Extension agent about possible restrictions on their use.

Evaluation Table

The following table can be used to help agricultural producers and rural homeowners determine the risk that drinking water on a given property will be contaminated as a result of the management practices being used. For each category on the left that is appropriate, read across the right and circle the statement that best describes conditions on your land. Allow 15 to 30 minutes to complete the worksheet, and skip any categories that do not apply. Note any high risk ratings and take appropriate actions to remedy them. Strive for all low or low to moderate risk ratings.

Pesticide Storage and Handling: Assessing Drinking Water Contamination Risk				
	Low Risk	**Low-Moderate Risk**	**Moderate-High Risk**	**High Risk**
Pesticide Storage				
Amount stored for more than one season	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.
Amount stored for less than one season	No pesticides stored at any time.	More than 10 gallons or less than 100 pounds of each pesticide.	More than 10 gallons or more than 100 pounds of each pesticide.	More than 55 gallons or more than 550 pounds of each pesticide.
Separation distance	150 ft. down-slope from well.	100 to 150 ft. down-slope from well.	Less than 100 ft. down-slope from well.	Up-slope of well or less than 50 ft. down-slope from well.
Types stored: **Leachability***	No chemicals stored.	Chemicals classified as having low leaching potential.	Chemicals classified as having medium leaching potential.	Chemicals classified as having high leaching potential.
Liquid or dry formulation	No liquids. All dry.	Some liquids. Mostly dry.	Mostly liquids. Some dry.	All liquids.
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 has some cracks, allowing spills to get into soil. OR impermeable surface without cracks has no curb installed.	Permeable surface (wooden floor) has some cracks. Impermeable surface has no cracks but no curb. Spills could contaminate wood or soil.	Permeable surface (gravel or dirt floor). Spills could contaminate soil.
Containers	Original containers 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.
Security	Fenced or locked and separate from all other activities.	Fenced areas are separate from most other activities.	Open to activities that could damage containers or spill chemicals.	Open access to theft, vandalism and children.
Mixing and Loading Practices				
Location of mixing/ loading area (in relation to well) with no curbed and impermeable containment area	100 feet or more downslope from well.	50 to 100 feet downslope from well.	10 to 50 feet downslope from well, or 100 to 500 feet upslope.	Within 10 feet downslope or within 100 feet upslope from well.
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.	Concrete pad with some cracks keeps some spills contained. No curb or sump.	No mixing/loading pad. Spills soak into ground.
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.
Water source	Separate water tank.	Hydrant away from well.	Hydrant near well.	Obtained directly from well.

*See attached Pesticide Leachability Chart.

Pesticide Storage and Handling: Assessing Drinking Water Contamination Risk				
	Low Risk	**Low-Moderate Risk**	**Moderate-High Risk**	**High Risk**
Mixing and Loading Practices (continued)				
Filling supervision	Constant	-------	Frequent	Seldom or never.
Handling system	Closed system for all liquid and dry product transfers.	Closed system for most liquids. Some liquid and dry products hand poured. Sprayer fill port easy to reach.	All liquids and dry products hand poured. Sprayer fill port easy to reach.	All liquids and dry products 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 homestead. Rinsate used in next load and applied to labeled crop.	Sprayer washed out at homestead. Rinsate dumped at homestead or in field.	Sprayer washed out at homestead. Rinsate sprayed less than 100 feet from well.
Pesticide and Container Disposal				
Unwanted or banned pesticides	Participation in EPA cancelled (banned) pesticide buy-back program if available. Unused pesticides returned to dealer or retailer. Waste pesticide collection, hazardous waste collection service or approved incinerator is used.	Pesticides sold for restricted or general purposes used up or taken to a licensed landfill.		Disposal of unused pesticides on the property.
Pesticide containers–plastic, metal or bags	Returnable containers or refillable minibulks are returned to the dealer. Triple-rinsed non-refillable containers are offered for recycling or taken to licensed landfill. Rinsate applied to appropriate crop. Bags taken to a licensed landfill.	Unrinsed containers or empty bags illegally sent to licensed landfill, municipal incinerator or dump.	Disposal of unrinsed containers or empty bags on your proprty. Disposal of triple- or pressure-rinsed containers on your property.	Disposal of partially filled containers on your property.

Pesticide Leachability Chart

The pesticides listed on this chart are identified by brand name, common name and rating for movement by leaching (low, medium or high). Identify the pesticides stored on your property from the listing below. Note the "leachability factor" for each pesticide you store. Then give yourself an overall "leachability ranking" (low, medium or high), based on which ranking best represents the pesticides you store.

Product	Chemical name	Risk
Accent	nicosulfuron	—-
Alanap	naptalam	—-
Ally	metsulfuron-methyl	—-
Amiben	chloramben	—-
Amitrol T	amitrole	Med
Antor	diethatyl-ethyl	Low
Arsenal	imazapyr acid	High
Arsenal	imazapyr amine	High
Assert	imazethabenz	High
Assure	quizalofop ethyl	Low*
Atrazine	atrazine	High
Avenge	difenzoquat	Low
Balan	benefin	High
Basagran	bentazon	High
Beacon	primsulfuron	—-
Betamix	phenmedipham & desmedipham	Low Low
Betanex	desmedipham	Low
Bicep	metolachlor & atrazine	Med High
Bladex	cyanazine	Med
Blazer	acifluorfen	Med
Bolero	thiobencarb	—-
Bronate	bromoxynil & MCPA ester	Low Low
Bronco	glyphosate & alachlor	Low Med
Bueno 6	MSMA	—-
Buckle	triallate trifluralin	Low Low
Buctril	bromoxynil	Low
Buctril-atrazine	bromoxynil & atrazine	Low High
Bullet	alachlor & atrazine	—-
Butyrac	200, 2,4-DB amine	Med
Butyrac	2,4-DB ester	Low
Canopy	metribuzin & chlorimuron	High
Cannon	alachlor & trifluralin	Med Low
Caparol	prometryn	—-
Carbyne	barban	—-
Casoron	dichlobenil	High
Classic	chlorimuron	—-
Cobra	lactofen	—-
Command	clomazone	Med
Commence	trifluralin & clomazone	Low Med
Cotoran	fluometuron	—-
Crossbow	triclopyr & 2,4-D amine	Low Med
Curtail	triclopyr & 2,4-D amine	Med Low
Cycle	metolachlor & cyanazine	—-
Dacthal	DCPA	Low
Diazinon	diazinon	Med*
Dowpon	dalapon	High
Dual	metolachlor	Med
Eptam	EPTC	Med
Eradicane	EPTC	Med
Eradicane Extra	EPTC	Med
Evik	ametryn	Med
Extrazine II	atrazine & cyanazine	High Med
Finesse	metsulfuron methyl & chlorsulfuron	High Med
Fusilade DX	fluazifop	Low
Galaxy	bentazon & acifuorfen	High Med
Genate Plus	butylate	Med
Genep	EPTC	Med
Glean	chlorsulfuron	—-
Goal	oxyfluorfen	Low
Gramoxone Extra	paraquat	Low
Grazon PC	picloram	—-
Grazon P+D	picloram & 2,4-D	—-
Harmony Extra	DPX-M6316 & DPX-L5300	—-
Herbicide 273	endothall	Low
Hoelon	diclofop	Low
Hyvar	bromacil	—-
Kerb	pronamide	Low
Krenite	fosamine	Low
Krovar	bromacol & diuron	—-
Laddock	atrazine & bentazon	High High
Landmaster	glyphosate & 2,4-D	—-
Lariat	alachlor & atrazine	Med High
Lasso EC	alachlor	Med
Lasso Micro Tech	alachlor	—-
Lasso II	alachlor	Med
Lasso-atrazine	alachlor & atrazine	Med High
Lexone	metribuzin	High
Lorox	linuron	Med
Lorox Plus	linuron & chlorimuron	Med —-
Marksman	dicamba & atrazine	High High
MCPA Amine	MCPA amine	—-
MCPA Ester	MCPA ester	Low
Nortron	ethofumesate	High
Option	fenoxaprop	Low
Oust	sulfometuron	—-
Pinnacle	DPX-M6316	—-
Poast	sethodydim	—-
Poast Plus	sethoxdim	—-
Pramitol	prometon	High
Prefar	bensulide	—-
Preview	metribuzin & chlorimuron	—-
Princep	simazine	High
Probe	methazole	—-
Prowl	pendimethalin	Low
Pursuit	imazethapyr	—-
Pursuit Plus	imazethapyr & pendimethalin	—- Low
Pyramin	pyrazon	High
Ramrod	Propachlor	Low
Ramrod-atrazine	propachlor & atrazine	Low High
Ranger	glyphosate	Low
Reflex	fomesafen	High
Rescue	naptalam & 2,4-DB	—- Med
Rhino	butylate & atrazine	Med High
Ro-Neet	cycloate	Med
Roundup	glyphosate	Low*
Salute	metribuzin & trifluralin	High Low
Scepter	imazaquin	—-
Sencor	metribuzin	High

Pesticide Leachability Chart (continued)

Product	Chemical name	Risk
Sinbar	terbacil	High
Solicam	norflurazon	—-
Sonalan	ethalfluralin	Low
Spike	tebuthiuron	High
Stam	propanil	Low
StampedeCM	propanil & MCPA ester	Low Low
Stinger	clopyralid	High
Storm	bentazon & acifluorfen	High Med
Stomp	pendimethalin	—-
Surflan	oryzalin	Low
Sutan+	butylate	Med
Sutazine+	butylate & atrazine	Med High
2,4-D Amine	2,4-D Amine	Med
2,4-D Ester	2,4-D ester	Low*
Tandem	tridphane	Low
Thistrol	MCPB	—-
Tillam	pebulate	Med
Tordon	picloram	High
Treflan	trifluralin	Low
Turbo	metolachlor & metribuzin	Med High
Vapam	metham	—-
Velpar	hexazinone	High
Vernam	vernolate	Low
Weedar	MCPA amine	—-
Weedmaster	dicamba & 2,4-D amine	High Med
Weedone-2,4-DP	dichlorpropester	Low*
Whip	fenoxaprop	Low
Zorial	norflurazon	—-

INSECTICIDES

Ambush	permethrin	Low
Aqua 9-Parathion	parathion	Low
Asana XL	esfenvalerate	Low
Bolstar	sulprofos	Low
Carzol	formetanate	Low
Counter	terbufos	Low
Cygon	dimethoate	Med*
Cythion	malathion	Low
Dimilin	diflubenzuron	Low
DiSyston	disulfoton	Low
Dyfonate	fonofos	Med
Dyfonate II	fonofos	Med
Dylox	trichlorfon	High
Endocide	endosulfon	Low
Endocide Plus	endosulfon & parathion	High Low*
Force	tefluthrin	—-
Furadan	carbofuran	High
Guthion	azinphos-methyl	Low
Imidan	phosmet	Low
Knox-Out	diazinon	Med*
Larvadex	cyromazine	High*
Larvin	thiodicarb	Low
Lindane	lindane	Med
Lorsban	chlorpyrifos	Low
Malathion	malathion	Low
Malathion/ Methoxychlor	malathion & methoxychlor	Low
Mavrik	fluvalinate	Low
Metasystox-R	demeton-s-methyl	High**
Methoxychlor	methoxychlor	—-
Mitac	amitraz	Low**
Mocap	ethoprop	High
Monitor	methamidophos	High
Nudrin	methomyl	High
Orthene	acephate	Low
Parathion	parathion	Low**
Penncap-M	methyl parathion	Low
Phosdrin	mevinphos	Med
Phoskil	parathion	Low*
Pounce	fenvalerate	Low
Pydrin	fenvalerate	Low
Rampart	phorate	Low
Scout-Xtra	tralomethrin	—-
Sevin	carbaryl	Low
Somanil	methidathion	Med
Supracide	methidathion	Med
Swat	phosphamidon	—-
Temik	aldicarb	High
Thimet	phorate	Low
Thiodan	endosulfan	Low
Trigard	cyromazine	High*
Vydate	oxamyl	Low

FUNGICIDES

Asgco	TN-IV tin	—-
Agsco MN F	maneb & zinc	Low**
Bayleton	triamefon	Med
Benlate	benomyl	High
Blitex	maneb & triphenyl tin	—-
Botran	dicloran	Low**
Bravo	chlorothalonil	Low
Captan	captan	Low
Carbamate	ferbam	Med
Champion	copper-fixed	—-
Crotothane	dinocap	Low**
Cyprex	dodine acetate	Low**
Daconil	chlorothalonil	Low
Dithane	mancozeb	Low
Duter	tin	—-
Karathane	dinocap	Low**
Kelthane	dicofol	Low**
Kocide	copper hydroxide	—-
Magnetic 6	sulfur	—-
Maneb & Zinc	maneb & zinc	Low** —-
Manzate	mancozeb	Low
Merteck	thiabendazole	—-
Orbit	propiconazole	Med**
Penncozeb	mansozeb	Low
Polyram	metiram	Low**
Protex	maneb triphenyl tin	Low**
Ridomil	metalaxyl	High
Ronilan	vinclozalin	Low**
Rovral	iprodione	Low*
Rubigan	fenarimol	High
Super Six	sulfur	—-
Super Tin	tin	—-
Telone II	dichloro-propene	Med
Terrachlor	PCNB	Low*
Tersan	benomyl	High
That F	sulfur	—-
Thiolux	sulfur	—-
Tilt	propiconazole	Med**
Top Cop	basic copper sulfate	—-
Topsin	thiophanate methyl	Low**
Triphenyl Tin Hydroxide	triphenyltin hydroxide	—-
Triple Tin	triphenyltin hydroxide	—-
Vivatex	carboxin	Low
Vorlex	dichloropropene	Med
	metyl-isothiocyanate	Med

* The rating is an estimate, but reasonably accurate compared to estimated ratings footnoted.

** The rating is a guess and subject to a higher degree of error than estimated ratings footnoted.

Data from USDA NRCS/ARS Pesticides Properties Data Base, Ver. 1.9, Aug. 1989, developed by R.D. Wauchope et al., and ratings derived by D.W. Goss. Chart modified annually.

Glossary

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-back-siphoning) 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.

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 a storage container to application 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 a higher pressure, enters the potable water system.

Micrograms per liter: The weight of a substance measured in micrograms contained in 1 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 1 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 1 billion units of another.

Parts per million (ppm): A measurement of concentration of one unit of material dispersed in 1 million units of another.

Pesticide: A chemical intended to prevent, destroy, repel or mitigate any pest.

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.

Sump: A pit or reservoir serving as a drain or receptacle for liquids.

Toxicity: The quality, state or degree of being poisonous.

Contacts and References

For additional information contact your county Extension agent or:

- Natural Resources Conservation Service office,
- The Texas Department of Agriculture (800) TELL TDA,
- the Texas Natural Resource Conservation Commission (512) 239-1000,
- Texas Agricultural Extension Service – Agricultural and Environmental Safety unit (409) 845-7026, Water Quality unit (409) 845-0887, or Agricultural Engineering unit (409) 845-7451,
- Texas State Soil and Water Conservation Board, (817) 773-2250.

Internet address: TEX*A*Syst bulletins and links to other water quality sites are contained in a homepage located on the World Wide Web at: http://waterhome.tamu.edu

TEX*A*Syst is a series of publications to help rural residents assess the risk of ground water pollution, and to describe Best Management Practices (BMPs) that can help protect ground water. The TEX*A*Syst documents were developed from the national Farm*A*Syst ground water protection program. The TEX*A*Syst system is designed to help the user learn more about the environment, existing environmental policies and regulations, and recommended management practices. Thus, the user can voluntarily reduce the pollution risks associated with water wells.

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