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EC98-793 Farm*A*Syst Nebraska's System for Assessing Water Contamination Worksheet 16: Crop Pesticide Application Management

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Grisso, Robert; Hay, DeLynn; Jasa, Paul J.; Koelsch, Richard K.; Skipton, Sharon; and Woldt, Wayne, "EC98-793 Farm*A*Syst Nebraska's System for Assessing Water Contamination Worksheet 16: Crop Pesticide Application Management" (1998). *Historical Materials from University of Nebraska-Lincoln Extension.* Paper 1472.
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University of Nebraska Cooperative Extension EC 98-793-S

Farm•A•Syst

WORKSHEET 16

Nebraska's Farm Assessment System for Assessing the Risk of Water Contamination

Crop Pest Management Practices

Why should I be concerned?

Pesticides are important agricultural production tools that provide many benefits. Pesticides have been developed and used because human beings compete with insects, weeds, diseases and rodents for food, fiber and habitation.

Proper management of these pests requires a responsible, systematic approach, which Integrated Pest Management (IPM) provides. See Farm*A*Syst *Fact Sheet 16, Improving Crop Pesticide Management.* Several pest control methods, including pesticides, are considered within IPM. If a pesticide is selected as one of the control methods, the applicator has the responsibility for its proper use.

Several environmental conditions have the potential to influence a pesticide application. Weather, soil type and conditions, time of year, crop production techniques, equipment and other managerial decisions affect pesticide usage and effectiveness.

Farming practices affect pest problems and the amount of chemical pesticides needed. Good sanitation practices, pest-resistant plant varieties, crop rotation, good plant nutrition, competitive varieties, scouting, timing of application and Integrated Pesticide Management (IPM) practices are helpful techniques to reduce the use of pesticides and the threat to water contamination.

Many pesticides are toxic to people and livestock. *Fact Sheet 4, Pesticide Storage and Handling* covers the proper ways to store and handle pesticides. **Contamination most often happens when pesticides are handled or stored improperly.**

Drinking water is least likely to be contaminated if you follow appropriate management procedures and dispose of wastes in an approved, off-the-farm site. However, proper off-site disposal practices are essential to avoid contamination that could affect the water supply and health of others.

A 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 application practices.
- It will rank your activities according to how they might affect the groundwater that provides your drinking water.
- It will provide you with easy-to-understand rankings that will help you analyze the "risk level" of your pesticide application and selection 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.

How do I complete the worksheet?

Follow the directions at the top of the chart on the next page. It should take you about 15-30 minutes to complete this worksheet and determine the risk level.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture.
Elbert C. Dickey, Interim Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.

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Glossary

These terms may help you make more accurate assessments when completing *Worksheet 16*. They may also help clarify some of the terms used in *Fact Sheet 16*.

Beneficial Organism: Organisms that reduce pest numbers, normally predators or parasites of pests. Frequently insects and bacteria but may be fungi, nematodes, etc.

Biological Control: Control of pests by means of predators, parasites, and disease-producing organisms.

Calibration: The method of adjusting pesticide application equipment to apply the correct amount of pesticide to the target site.

Commercial Applicator: Any person who uses restricted use pesticides for hire or any purpose other than as provided in the definition of a private applicator.

Crop Rotation: The growing of different crops in recurring succession on the same land. Rotation allows changing of pesticide practices, breaks pest host cycles, and spreads risk.

Drift: Movement of pesticides off-target by wind during application. Drift may be in the form of particles or vapors.

Economic Threshold: That point of pest infestation where application of a control measure would prevent an increasing pest population from reaching the economic injury level and would return more income than the cost of the control procedure.

Emergency Response Plan: A set of guidelines and information used by personnel at a facility to guide decision-making during an emergency.

Environmental Assessment: The process of evaluating a given site/area for possible or potential contamination or the level, extent and movement of contamination if found.

Integrated Pest Management (IPM): A systems approach to managing crop pests that focuses on strategies to prevent economic pest damage.

Narrow vs. Broad Spectrum Pesticide: Narrow spectrum pesticides act on a single species or a limited range of species while broad spectrum pesticides are toxic to a wide range of organisms.

Persistence: The amount of time a pesticide remains in the environment before breaking down to less toxic compounds.

Pesticide: A chemical to control, kill, repel, or alter the activity of a pest. Examples include herbicide (weed control), insecticide (insect control), and fungicide (mold control).

Pest Resistant Varieties: The ability of an organism (plant or animal) to tolerate a certain pest as a result of genetic breeding, biotechnology or natural selection.

Personal Protective Equipment (PPE): Clothing or other protective equipment intended to protect the human body from pesticides or pesticide residues. Examples include masks, gloves, boots, and aprons.

Private Applicator: A certified applicator who uses a restricted use pesticide to produce an agricultural commodity on property he or she owns or rents, or an employer's property, or on the property of another person IF there is no compensation other than trading personal services.

Recommended Application Rate: The correct amount of pesticide to be applied according to the label instructions.

Rinsate: Water and sometimes solids containing a pesticide or fertilizer residue of relatively low concentration. Rinsate is considered a hazardous waste if it is not designated to be used according to the pesticide label.

Scouting: Observing a crop, any potential crop pests and field conditions that may affect the quality of the agricultural commodity.

Tank Mix: A mixture of two or more compatible pesticides for simultaneous application.

Weak Link: A stage during the development cycle of a pest when it is most vulnerable to control strategies.

Pest Management Practices: Assessing the Risk of Surface Water and Groundwater Contamination

1. Use a pencil. You may want to make changes.
2. For each category listed on the left that is appropriate to your farmstead, read across to the right and circle or mark the statement that best describes **past** practices or conditions on your farmstead. (Skip and leave blank any categories that don't apply to your farmstead.)
3. Then look above the description you circled to find your "risk number" (1, 2, 3, or 4) and enter that number in the blank under "YOUR SCORE".
4. Allow about 15-30 minutes to complete the worksheet and figure out your risk for pest management practices.

	HIGH RISK (risk 4)	HIGH-MODERATE RISK (risk 3)	MODERATE-LOW RISK (risk 2)	LOW RISK (risk 1)	YOUR RISK
TRAINING, RECORD-KEEPING, MONITORING					
Pesticide applicator training	**Pesticide Applicators are not certified by Nebraska Department of Agriculture.**	Pesticide applicators are certified by the Nebraska Department of Agriculture.	Pesticide applicators are certified by the Nebraska Department of Agriculture, and others who handle pesticides or pesticide-contaminated material are certified and all label recommendations are followed.	Pesticide applicators are certified by the Nebraska Department of Agriculture and keep current on Integrated Pest Management strategies.	
Pest identification training and other management skills.	Operator has **not** been trained in pest identification, does **not** use professional consultants, does **not** attend educational meetings or attempt to learn new methods of crop and animal protection.	Operator has been trained in pest identification, attends educational meetings less than once a year and selects pesticides based on price and control levels.	Operator has been certified in pest identification, attends educational meetings annually, and has changed application practices or pest control within the last five years.	Operator uses multiple pest controls in an IPM strategy, actively attends multiple educational programs annually, and regularly seeks professional advice / consultation.	
Pest monitoring and scouting.	Crops are **not** inspected for pests. Pesticide applications are made at certain stages of crop development or by calendar date.	Crops are inspected for pests. Pesticide applications are made at the first sign of pests.	Crops are inspected for pests. Controls and treatment are adjusted based on pest levels.	Crops are inspected for pests during critical periods of crop development (e.g. fruit set, flowering, early development). Pest controls are based on IPM economic thresholds. Field records are kept for long-term comparisons.	

Bold face type: Besides representing a higher-risk choice, this practice also violates Nebraska regulations.

	HIGH RISK (risk 4)	HIGH-MODERATE RISK (risk 3)	MODERATE-LOW RISK (risk 2)	LOW RISK (risk 1)	YOUR RISK
TRAINING, RECORD-KEEPING, MONITORING (continued)					
Record-keeping	No records are kept. Chemicals are known by memory or invoices only.	Records are kept of chemicals applied and location applied.	Pesticide records are kept for general use and restricted use pesticide applications in accordance to state and federal law.	Pesticide records are kept for general use and restricted use pesticide applications in accordance to state and federal law. Records include information on crop, weather, pest and soil conditions.	
METHODS OF CONTROL					
Integrated pest management (IPM)	No alternatives to pesticides are considered OR adequate and timely pest information was not available to minimize the use of pesticides OR applicator was not trained to identify pests OR does not seek advice from professional consultant.	Applicator knows key pests and had training in pest identification, but does not routinely use scouting information to manage pests.	Applicator knows key pests and had training in pest identification. Information on beneficial organisms is not used.	IPM alternatives have been considered to reduce or eliminate pesticide use, such as crop / animal monitoring, and biological control, cultural practices, or the use of resistant varieties. Applicator understands key pest life cycle factors and exploits weak links.	
Crop rotation used	Single crop species grown for three years or more in same field (not including forages and perennial horticultural crops.)	Two-crop rotation (such as corn-soybean).	Crop rotation includes conserving use crops such as forage crops and / or small grains.	Crop rotation is specifically designed to reduce pest infestations and the need for chemical pest control. Additional crop diversity is used as needed such as strip cropping, trap crops, underseeding, and cover crops.	

Bold face type: Besides representing a higher-risk choice, this practice also violates Nebraska regulations.

	HIGH RISK (risk 4)	HIGH-MODERATE RISK (risk 3)	MODERATE-LOW RISK (risk 2)	LOW RISK (risk 1)	YOUR RISK
METHODS OF CONTROL (continued)					
Other control options	Pesticide is the only method used for pest control. Pesticide selected by price and effectiveness.	Pesticide is the only method used for pest control. Impact on the environment is considered in selecting pesticides (e.g. the potential to move away from the site of application, toxicity to non-target animals and plants, residue at harvest, etc.).	Combination of mechanical and chemical control of pests (e.g. banded spray and cultivation versus broadcast spray).	All options for pest control are assessed. Where possible, non-chemical methods are used to reduce insect pests, weeds and disease (e.g. crop rotation, resistant varieties, sanitation, biological control, and other best management practices).	
PESTICIDE APPLICATION Even if you use a custom applicator, answer the following questions.					
Economic threshold	Pesticide application based on calendar date or state of crop development.	Pesticide application made at first sign of pests.	Pesticide application based on pest population levels determined by scouting, but economic threshold is not used.	Pesticide applications are made to reduce pest problems only when they reach a predetermined economic threshold. "Weak Link" of pest's life cycle is targeted for pesticide applications.	
Pesticide selection	Pesticides selected by price and effectiveness only.	Pesticides selected based on effectiveness against known pests. Health and environment are not significant factors in pesticide selection.	Impact on environment is considered in selecting pesticide (e.g. toxicity, effect on non-target crops and animals, solubility, volatility, persistence).	Pesticides selected for effectiveness, to minimize human health concerns, and to avoid environmental impact as part of an IPM strategy (e.g. low toxicity, narrow spectrum, no effect on non-target crops and animals, low leaching and runoff potential, low volatility, short persistence).	

Bold face type: Besides representing a higher-risk choice, this practice also violates Nebraska regulations.

	HIGH RISK (risk 4)	HIGH-MODERATE RISK (risk 3)	MODERATE-LOW RISK (risk 2)	LOW RISK (risk 1)	YOUR RISK
PESTICIDE APPLICATION **Even if you use a custom applicator, answer the following questions. (continued)**					
Pesticide application	Pesticide label is not read or is not considered.	_____	Pesticides are applied according to label instructions.	Non-chemical alternative pest controls are used.	
Drift management	Pesticide applications move off-target. Little concern for wind velocity, direction, etc.	Rarely use drift reduction techniques and methods.	Does not have a drift management plan, but drift reduction measures are frequently used.	Follows a written drift management plan. Drift reduction measures always used (low-drift nozzles, high spray volumes, drift reduction agents).	
Pesticide application timing	Applied on saturated soils, frozen soils, or other conditions where runoff is likely.	Applied outside of the growing season of the crop.	Applied only during the crop growing season.	Applied as light applications (less than the soil moisture deficit) only during the crop growing season.	
EQUIPMENT MANAGEMENT **Even if you use a custom applicator, answer the following questions.**					
Sprayer calibration and maintenance	Application equipment is serviced only after the unit breaks. Equipment is in disrepair (leaks, clogged, dirty or can't be calibrated).	All spray and granular application equipment is serviced and calibrated before the start of each growing season.	All spray and granular equipment is serviced and calibrated before the start of each crop season. Sprayers use lowest pressure that is effective to minimize drift. Spray is directed at target.	All spray and granular equipment is serviced and calibrated several times each crop season. Use sprayers capable of precision application. Pesticide mixed at time of application so tank remains clean.	
Protective clothing and equipment (Personal Protective Equipment)	**No protective clothing or equipment are worn if required by the label. Label directions are not checked for safety precautions.**	The pesticide label is checked for safety precautions. Only chemical-resistant gloves are worn for mixing, loading and clean-up.	The pesticide label is checked for safety precautions. All label PPE requirements are followed. Protective clothing and personal safety equipment are worn for mixing, loading, spraying, and clean-up.	The pesticide label is always checked and followed for PPE requirements and safety precautions. Protective clothing and personal safety equipment are worn for mixing, loading, spraying and clean-up. All personal safety equipment is cleaned after daily application and properly maintained (e.g. cartridge of respirator).	

Bold face type: Besides representing a higher-risk choice, this practice also violates Nebraska regulations.

	HIGH RISK (risk 4)	HIGH-MODERATE RISK (risk 3)	MODERATE-LOW RISK (risk 2)	LOW RISK (risk 1)	YOUR RISK
CLIMATIC/SOIL CONDITIONS					
Weather conditions (spraying for pest control and tillage for weed control)	Spraying and tillage operations done in any weather without regard to weather forecasts. Spraying in weather conditions where drift occurs.	Spraying done on windy days (more than 10 mph). Weather forecasts are considered when planning spraying and tillage.	No spraying or tillage if winds are greater than 10 mph (small branches moving in wind). Spraying and tillage are postponed when heavy rain is forecast within the next 24 hours.	Spraying is eliminated with the use of non-chemical alternative pest control methods. Tillage is postponed when heavy rain is forecast within the next 24 hours.	
Separation distance of pesticide application from water sources.	Application is done adjacent to surface water or over top of water source, tile drain inlet, or well.	Application is done less than 100 feet from a well or less than 30 feet from surface water or tile drain inlet.	Application is done 100 to 200 feet from a well or between 30 and 50 feet from surface water or tile drain inlet.	Application is done more than 200 feet from a well or more than 50 feet from surface water or tile drain inlet.	
LAND APPLICATION SITE CHARACTERISTICS: GROUNDWATER RISKS					
Depth to water table	Less than 20 feet.	Between 20 and 50 feet.	Between 50 and 100 feet.	Over 100 feet.	
Soil depth and permeability. "A" horizon.	Coarse-textured soils (sandy, sandy loam) to gravel. Very shallow (less than 20 inches)	Moderately well-drained coarse textured soils (sandy, sandy loam). Shallow (20-30 inches)	Moderately well-drained medium- or fine-textured soils (loam, silt loam, clay loams, clays). 30-40 inches deep	Well-drained medium or fine-textured soils (loam, silt loam, clay loams, clays). More than 40 inches deep	
LAND APPLICATION SITE CHARACTERISTICS: SURFACE WATER RISKS					
Slope of landscape for: *Annual Crops *Perennial Crops	 Greater than 10% Greater than 15%	 6 to 10% 9 to 15%	 2 to 5% 4 to 8%	 Flat to 1% Flat to 3%	
Surface water location	No buffer strip (crop land with no pesticide application or grass or wooded filter strip). Moderate slope.	20 foot or less buffer strip. Moderate slope. Buffer is poor, spotty stand of grass or trees.	20 to 50 foot buffer strip. Slight slope. Buffer is moderate to good stand of grass or trees.	Greater than 50 foot buffer strip. Slight slope or at grade. Buffer is good, dense stand of grass or trees.	
Frequency of flooding	Frequently	Occasionally	Rarely	Never	

Bold face type: Besides representing a higher-risk choice, this practice also violates Nebraska regulations.

NOTE: If pesticides are stored, you should also complete *Worksheet 4, Pesticide Storage and Handling.*
If pesticides are applied with irrigation water, you should also complete *Worksheet 15, Irrigation Wellhead Protection.*

Your groundwater vulnerability score from *Worksheet 2* was _____
Note: If the surface texture, subsurface texture, or depth to groundwater used to calculate this score are not characteristic of the site conditions present for the activities / practices discussed in this worksheet, calculate a new vulnerability score for this site.

If your groundwater vulnerability score is:
- 1 to 1.4: your site has a LOW VULNERABILITY to pollution reaching groundwater.
- 1.5 to 2.4: your site has a MODERATE-LOW VULNERABILITY to pollution reaching groundwater.
- 2.5 to 3.4: your site has a HIGH-MODERATE VULNERABILITY to pollution reaching groundwater.
- 3.5 to 4.0: your site has a HIGH VULNERABILITY to pollution reaching groundwater.

Your surface water vulnerability score from *Worksheet 2* was _____
Note: If the surface texture, slope toward surface water, or distance from surface water used to calculate this score are not characteristic of the site conditions present for the activities / practices discussed in this worksheet, calculate a new vulnerability score for this site.

If your surface water vulnerability score is:
- 1 to 1.4: your site has a LOW VULNERABILITY to pollution reaching surface water.
- 1.5 to 2.4: your site has a MODERATE-LOW VULNERABILITY to pollution reaching surface water.
- 2.5 to 3.4: your site has a HIGH-MODERATE VULNERABILITY to pollution reaching surface water.
- 3.5 to 4.0: your site has a HIGH VULNERABILITY to pollution reaching surface water.

Look over your worksheet scores for individual activities:

- **Low risk** practices (1's): are ideal and should be your goal regardless of your site's vulnerability to pollution reaching groundwater. Cost and other factors may make it difficult to achieve a low risk rating for all activities.

- **Moderate-low risk** practices (2's): provide reasonable water quality protection unless your site's vulnerability to pollution reaching groundwater is moderate-high or high.

- **High-moderate risk** practices (3's): do not provide adequate protection in many circumstances, especially if your site's vulnerability to pollution reaching groundwater is high or high-moderate. They may provide reasonable water quality protection if your site's vulnerability to pollution reaching groundwater is low to moderate-low.

- **High risk** practices (4's): pose a serious danger of polluting water, especially if your site's vulnerability to pollution reaching groundwater is high, high-moderate, or moderate-low. Some high risk activities may not immediately threaten water quality if your site's vulnerability to pollution reaching groundwater is low, but still pose a threat over time if not corrected.

Read *Fact Sheet 16: Improving Crop Pesticide Application Management* and consider how you might modify your family practices to better protect your drinking water supply and other ground and surface water supplies. Some concerns you can take care of right away; others could be major or costly projects requiring planning and prioritizing before you take action.

Summary Evaluation for Crop Pest Management Practices Worksheet

Summarize your potential high risk activities in the following table and consider the response options you can take to reduce the potential for water quality contamination.

High Risk Activities and Activities Impacted by Site Vulnerability	Response Options (Check One)		Taking Action For "immediate action possible" items, note practices and when each will occur. For issues "requiring further planning," note estimates, consultations, or other activities necessary and when each will occur. Establish a target date for making necessary changes.
	Immediate Action Possible	Further Planning Required	

Partial funding for materials, adaptation, and development was provided by the U.S. EPA, Region VII (Pollution Prevention Incentives for States and Nonpoint Source Programs) and USDA (Central Blue Valley Quality HUA). This project was coordinated at the Department of Biological Systems Engineering, Cooperative Extension Department, Institute of Agriculture and Natural Resources, University of Nebraska - Lincoln.

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Technical reviews were provided by Gerald Bodman, Extension Agricultural Engineer; Larry Schulze, Extension Pesticide Coordinator; Robert Klein, Extension Cropping System Specialist; Gary Buttermore, Nebraska Department of Environmental Quality; Tom Dorn, Extension Educator; and Gary Zoubec, Extension Educator. The views expressed in this publication are those of the authors and do not necessarily reflect the views of either the technical reviewers or the agencies they represent.

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