Virginia Farm*A*Syst

Farm & Home Water Quality Assessment

Virginia Cooperative Extension

Virginia Tech

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

VIRGINIA STATE UNIVERSITY

Revised 2003 442-915

NOAA

DEQ Virginia Department of Environmental Quality

DCR Department of Conservation & Recreation

CONSERVING VIRGINIA'S NATURAL AND RECREATIONAL RESOURCES

Introduction

If you're a farmer or rural resident depending upon a private well or spring for your drinking water, you're concerned about it's safety. Your farmstead–house, buildings, and other facilities–can be a major source of groundwater, or surface water, contamination, depending upon your management practices. This means that your family and your livelihood, as well as your neighbor's, could be at risk.

The Virginia Farmstead Assessment System, or Farm*A*Syst for short, is designed to give you the answers you need to protect your drinking water. Virginia Cooperative Extension, in conjunction with the Virginia Department of Conservation and Recreation, U.S.D.A. Natural Resources Conservation Service, Virginia Department of Agriculture and Consumer Services, Virginia Farm Bureau Federation, and Virginia Tech, developed the Virginia Farm*A*Syst Program to provide a comprehensive, practical approach to protecting groundwater, a valuable resource we cannot afford to lose.

Farm*A*Syst uses concise, step-by-step worksheets, supported by corresponding fact sheets, that look at each farmstead activity or structure that could contribute to groundwater, as well as surface water, contamination. The assessment also considers soil, geologic, and hydrologic features of the farmstead, along with the existing condition of the household well or spring, to give an overall picture of potential, as well as actual water quality problems at the site. You can use this information to help you develop an overall action plan for protecting your drinking water. Based on identified risks, corrective measures and/or management practices can be selected and implemented to reduce the likelihood of contamination.

Virginia Farm*A*Syst is a confidential assessment that you can conduct on your own, or by consulting with local experts. You complete only those worksheets that are applicable to your individual situation. You decide what to do with the results of your assessment and keep your action plan in your private records. It's like having a detailed environmental assessment of your farmstead at little or no cost....and you remain in control.

This manual was designed to complement Virginia Cooperative Extension publication No. 442-900, Virginia Farmstead Assessment System. It uses the same format of worksheets and fact sheets as the parent manual, with the same goals of water quality protection. It is, however, greatly condensed and simplified, and can be viewed as a self-assessment tool that can be used by the farm owner/manager without assistance from a water quality professional. This publication may be used as an end game strategy or may serve as an intermediate step toward conducting a more thorough Farm*A*Syst evaluation.

Groundwater pollution will not just go away. It can affect land values as lenders begin to deduct the cost of corrective action or cleanup in sale prices. Legal action is also a possibility for both owned and leased property. Virginia Farm*A*Syst can help you keep your property clean and avoid these costly problems. Most importantly, it can help keep your family's drinking water safe.

Protecting Your Water Quality Through a Farm & Home Assessment

Acknowledgments

This manual was adapted from material prepared by the National Farm*A*Syst / Home*A*Syst Staff, Madison, Wisconsin. This assessment does not cover all potential risks on your property that could impact the quality of your natural resources. There are other, more detailed Farm*A*Syst Programs availablae. Always check with your local offices listed in each section of the workbook before making changes to your resource management. If you have specific questions about protecting your natural resources, contact your local Extension Service Office, local USDA Natural Resources Conservation Service office, or your local Soil and Water Conservation District Office. You may also contact the National Farm*A*Syst / Home*A*Syst Office at B142 Steenbock Library, 550 Babcock Drive, Madison, Wisconsin 53706-1293 Phone (608) 262-0024.

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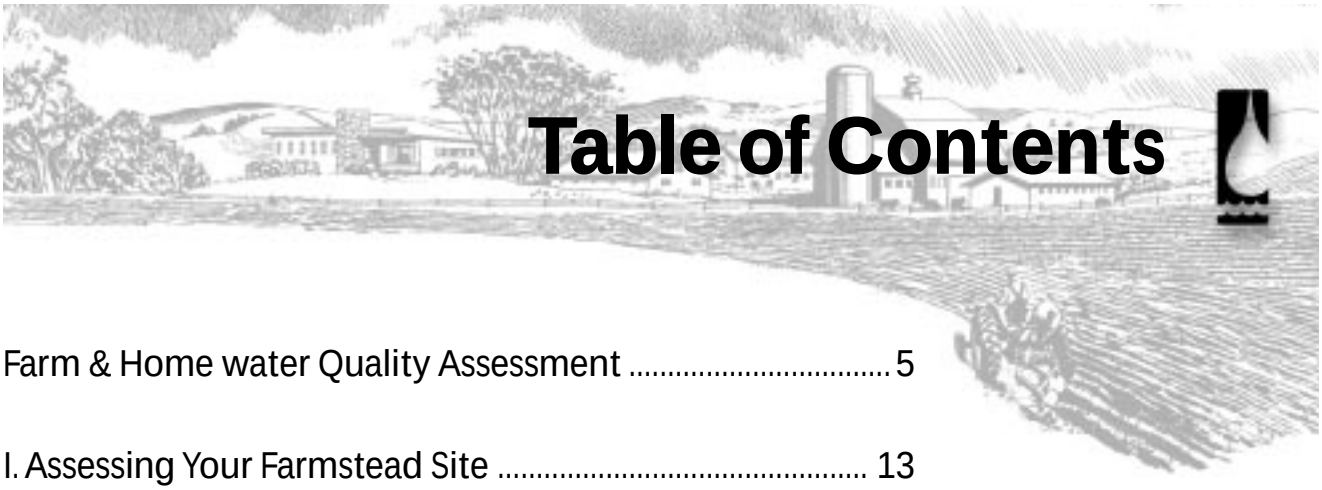
This publication was 50% funded by the Virginia Department of Conservation and Recreation in coordination with the Virginia Coastal Resources Management Program at the Virginia Department of Environmental Quality through Grant #NA970Z0181-01 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its sub-agencies. Funding for the development of the parent Virginia Farm*A*Syst package was provided by the EPA 319 Program, through the Virginia Department of Conservation and Recreation-Division of Soil and Water Conservation (DCR-DSWC). The Farm*A*Syst/Home*A*Syst Program is funded nationally by: USDA Cooperative State Research Education and Extension Service, USDA Natural Resources Conservation Service, and the U.S. Environmental Protection Agency. The program supports voluntary pollution prevention to protect surface and ground water through a partnership with governmental agencies and the private sector.



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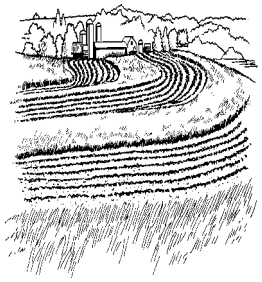
Protecting Your Water Quality Through a Farm & Home Assessment

Farm & Home Water Quality Assessment

Why should you be concerned?

About one-fourth of Virginia families get their drinking water from private, individual groundwater sources, such as wells and springs. These systems can be very reliable when they are designed and protected to provide clean, safe water. However, if the water supply equipment or storage and distribution facilities are not properly constructed and/or maintained, they can allow bacteria, pesticides, fertilizer, animal manure, petroleum products, or other pollutants to contaminate drinking water. These contaminants can put you and your family's health at risk.



Pollution is a serious threat to available fresh water supplies. You can help protect your drinking water supply by learning to recognize potential sources of pollution and by working to reduce or eliminate them.

What can you do?

This assessment manual has been designed to make you aware of conditions or practices on your farm property that increase the risk of contamination to your drinking water and other water resources on your farm. It is divided into nine sections so you can easily identify particular situations on your property that may be putting your water supplies at risk. You only need to complete those sections which are applicable to your individual activities and/or specific situations.

If you answer *Yes* or do not know the answer to any of the questions in a specific worksheet, you will be directed to a fact sheet in this manual that will provide more information on that topic. If a question is not applicable to your situation, skip it and move on to the next question.

Each worksheet will help you to develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply. Refer to the corresponding fact sheet if additional information is needed to develop your **Action Plan.** The worksheets and fact sheets also contain sources of additional information and assistance if required.

A glossary is provided at the end of this manual if you are unfamiliar with any of the terms used.

Protecting Your Water Quality Through a Farm & Home Assessment

I. Assessing Your Farmstead Site

Yes	No	
☐	☐	1. Has it been longer than five years since you updated or reviewed your farm's resource conservation plan, or do you not have one?
☐	☐	2. Is your soil sandy or gravelly (does your soil drain quickly)?
☐	☐	3. Is your soil less than three feet deep to bedrock and/or are sinkholes evident?
☐	☐	4. Is the water table less than ten feet below your soil surface ?
☐	☐	5. Do you have problems with soil erosion on your property?
☐	☐	6. Does potentially polluted runoff from your property reach surface waters?

If you have answered *Yes* or do not know the answer to any of the questions in this section, refer to the chapter in this workbook titled, *Assessing Your Farmstead Site*. This chapter contains valuable information and it will help you develop an *Action Plan* to reduce the risk of contamination to your drinking water supply and other water resources on your farm.

II. Assessing the Condition and Location of Your Water Supply System

Does your drinking water come from a well? If **Yes**, answer questions 1-6 and 8-12.

Does your drinking water come from a spring? If **Yes**, answer questions 6-12.

Does your drinking water comes from a Public Water Supply? If **Yes**, then answer question 6.

Yes	No	
☐	☐	1. Do you have a household water well less than 50 feet deep?
☐	☐	2. Do you have a dug or bored well, rather than a drilled well?
☐	☐	3. Does your well casing (well pipe) extend less than 18 inches above the ground or annual flood level?
☐	☐	4. Is there a depression around your well casing?
☐	☐	5. Can you see any cracks or holes in your well casing or cap?
☐	☐	6. Are there unused wells on your property that have not been properly plugged?
☐	☐	7. Do you get your household water from a spring?
☐	☐	8. Was your water supply system built more than 50 years ago?
☐	☐	9. Have you not had your drinking water tested recently, or did your water test positive for bacteria and/or indicate excessive nitrate levels the last time it was tested?
☐	☐	10. Is your water source located downhill from any nearby potential contamination sources (pesticides, fertilizer, animal manure, petroleum products, or other pollutants)?
☐	☐	11. Is your water source located closer to potential pollution sources than recommended?
☐	☐	12. Is it possible for contaminants to siphon back into your water supply system?

If you have answered *Yes* or do not know the answer to any of the questions in this section, refer to the chapter in this workbook titled, *Assessing the Condition and Location of Your Water Supply System*. This chapter contains valuable information and it will help you develop an *Action Plan* to reduce the risk of contamination to your drinking water supply and other water resources on your farm.

III. Assessing Your Household Waste Water Treatment System

Yes	No	
☐	☐	1. Do you have an on-site waste water treatment system (septic tank and drain field)?
☐	☐	2. Has it been longer than three years since you had your septic tank cleaned out?
☐	☐	3. Do you dump grease, oil, or leftover household chemicals down your drain?
☐	☐	4. Do you suspect that your septic system is failing, or will soon fail?
☐	☐	5. Is it possible to decrease the amount of water entering your septic system?

If you have answered *Yes* or do not know the answer to any of the questions in this section, refer to the chapter in this workbook titled, *Assessing Your Household Waste Water Treatment System.* This chapter contains valuable information and it will help you develop an *Action Plan* to reduce the risk of contamination to your drinking water supply and other water resources on your farm.

IV. Assessing Your Household Hazardous Waste Management Practices

Yes	No	
☐	☐	1. Do you dispose of household products such as furniture polish, paints, stains, and cleaners and/or their containers on your property?
☐	☐	2. Do you dispose of vehicle maintenance products on your property?
☐	☐	3. Do you have construction and wood maintenance products on your property?
☐	☐	4. Are any hazardous products accessible to pets, children, and vandals?

If you have answered *Yes* or do not know the answer to any of the questions in this section, refer to the chapter in this workbook titled, *Assessing Your Household Hazardous Waste Management Practices.* This chapter contains valuable information and it will help you develop an *Action Plan* to reduce the risk of contamination to your drinking water supply and other water resources on your farm.

V. Assessing Your Petroleum Product Storage Facilities

Yes	No	
☐	☐	1. Do you have a petroleum storage tank(s) on your property?
☐	☐	2. Is your petroleum storage tank(s) less than 100 feet from your drinking water supply?
☐	☐	3. Is your petroleum storage tank(s) old and/or underground?
☐	☐	4. Do you lack protection against leaks or spills from your petroleum storage tank(s) (i.e., no catch basin or concrete spill pad)?
☐	☐	5. Do you need to develop a method of record keeping to keep track of petroleum use?

If you have answered *Yes* or do not know the answer to any of the questions in this section, refer to the chapter in this workbook titled, *Assessing Your Petroleum Product Storage Facilities.* This chapter contains valuable information and it will help you develop an *Action Plan* to reduce the risk of contamination to your drinking water supply and other water resources on your farm.

VI. Assessing Your Fertilizer Storage and Handling Practices

Yes	No	
☐	☐	1. Has it been longer than three years since you had your soil tested?
☐	☐	2. Is your soil well drained?
☐	☐	3. Has it been longer than three years since you updated your nutrient management plan or do you not have one?
☐	☐	4. Do you apply manure, litter and/or crop residues to your fields?
☐	☐	5. Do you make fertilizer applications based on maximum crop yields rather than historical crop yields?
☐	☐	6. Do you apply fertilizer for the whole growing season all at one time instead of several applications?
☐	☐	7. Are fertilizer products stored improperly in an unsecured area in which spills cannot be contained?

If you have answered *Yes* or do not know the answer to any of the questions in this section, refer to the chapter in this workbook titled, *Assessing Your Fertilizer Storage and Handling Practices.* This chapter contains valuable information and it will help you develop an *Action Plan* to reduce the risk of contamination to your drinking water supply and other water resources on your farm.

VII. Assessing Your Pesticide Storage and Handling Practices

Yes	No	
☐	☐	1. Are your pesticides stored on wood, gravel, soil, or on a concrete pad without a curb?
☐	☐	2. Do you have pesticide containers that are damaged, leaking, and/or rusting?
☐	☐	3. Do you mix, apply or store pesticides without reading the label first?
☐	☐	4. Do you mix, apply or store pesticides within 100 feet of a water supply system (well, spring, etc.)?
☐	☐	5. Do you fill your sprayer tank with a hose that does not have a check valve, or put the hose in the tank so that it is in contact with the solution being mixed?
☐	☐	6. Do you leave your sprayer tank unattended while filling?
☐	☐	7. Do you apply pesticides without recalibrating your sprayer?
☐	☐	8. Do you rinse out your sprayer tank near your drinking water supply (well, spring, etc.)?
☐	☐	9. Are pesticides applied to your fields by a non-licensed applicator?

If you have answered *Yes* or do not know the answer to any of the questions in this section, refer to the chapter in this workbook titled, *Assessing Your Pesticide Storage and Handling Practices.* This chapter contains valuable information and it will help you develop an *Action Plan* to reduce the risk of contamination to your drinking water supply and other water resources on your farm.

VIII. Assessing Your Livestock and Poultry Operations

Yes	No	
☐	☐	1. Do you house livestock and/or poultry within 100 feet of a water supply (well, spring, etc.), or is your livestock and/or poultry facility located upslope from a water supply system?
☐	☐	2. Do you wait more than a week before scraping or cleaning your yard?
☐	☐	3. Do you store manure or litter within 200 feet of a drinking water supply?
☐	☐	4. Do you treat your milking center wastewater differently than your manure?
☐	☐	5. Do you stack or store manure or litter on soil that has a coarse texture (such as sands or sandy soils), or that has a shallow bedrock, or high water table within 10 feet of the surface?
☐	☐	6. Do you spread manure, litter, wastewater, and/or silage leachate from your livestock or poultry operations without a nutrient management plan?
☐	☐	7. Do you land apply your waste without any pretreatment methods?
☐	☐	8. Do you spread wastes on your fields, lawns, and gardens without considering the amount of nutrients it contains?
☐	☐	9. Do you apply manure, litter, wastewater, or silage leachate to fields when the ground is frozen, covered with snow, saturated with water, or within 100 feet from a drinking water supply, stream, pond, or sinkhole?
☐	☐	10. Do you dispose of dead animals on your property?
☐	☐	11. Do you make silage without considering the moisture content?
☐	☐	12. Is your silage stored less than 100-150 feet from wells or waterways?
☐	☐	13. Is your silo old, or in poor condition?

If you have answered *Yes* or do not know the answer to any of the questions in this section, refer to the chapter in this workbook titled, *Assessing Your Livestock and Poultry Operations*. This chapter contains valuable information and it will help you develop an *Action Plan* to reduce the risk of contamination to your drinking water supply and other water resources on your farm.

IX. Assessing Your Irrigation Management Practices

Yes	No	
☐	☐	1. Does your irrigation system apply water to areas other than the plant rooting zone?
☐	☐	2. Does your irrigation system distribute water in uneven patterns?
☐	☐	3. Do you irrigate without knowing the soil moisture level in the field?
☐	☐	4. Do you apply pesticides and/or fertilizers through your irrigation system?
☐	☐	5. Do you irrigate with liquid waste?
☐	☐	6. Do you irrigate without keeping updated field-by-field records of the amounts of water, pesticides, and fertilizers applied?

If you have answered *Yes* or do not know the answer to any of the questions in this section, refer to the worksheet titled, *Assessing Your Irrigation Management Practices.* This worksheet contains valuable information and it will help you develop an *Action Plan* to reduce the risk of contamination to your drinking water supply and other water resources on your farm.

We offer our programs and facilities to all persons regardless of race, color, national origin, religion, sex, disability, age, Vietnam era veteran status, sexual orientation, or familial status and are an equal opportunity employer.

I. Assessing Your Farmstead Site

Why should you be concerned?

The physical characteristics of your property can affect your drinking water quality. Some of these factors include soil type, slope of the land, depth and type of bedrock, and depth to ground water.

Some types of soils are more susceptible to ground water contamination. Others are more susceptible to erosion that can cause surface water contamination.

Because most contaminant breakdown occurs in the soil, sites with shallow soils, sandy soils, and soils over fractured bedrock will have a higher potential for ground water contamination. Also, areas with high water tables have a higher risk of ground water contamination.

What can you do?

This fact sheet has been designed to provide information on questions you have answered ***Yes*** to or do not know the answer to in the **Assessing Your Farmstead Site** worksheet. It will also help you develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply.

1 Has it been longer than five years since you updated or reviewed your farm's resource conservation plan, or do you not have one?

The management practices you use will influence your property as well as your neighbors. If you do not have a resource conservation plan for your farm, you should develop one. The plan should address: soil, water, air, plants, and animals and how they relate to the land and its surroundings. The plan should include proper management of all areas around your farmstead including your residence and all other land uses.

Contact your local NRCS or SWCD office for information on, and assistance with, farm plans.

Protecting Your Water Quality Through a Farm & Home Assessment

2 Is your soil sandy or gravelly (does your soil drain quickly)?

The soil provides a life support system for growing plants, and acts as a filter to reduce ground water contamination. It is important to know the type(s) of soil on your property to evaluate contamination risks.

Coarse textured soils, such as sands, are more susceptible to ground water contamination. These soils have larger pore spaces between the soil particles allowing water to carry contaminants quickly to ground water.

Finer textured soils, such as silt loams and clays, slow water movement and provide greater filtering. They allow time for bacteria and other soil organisms to break down contaminants before they reach ground water. However, these types of soils contribute to more surface water runoff and may put surface water bodies at risk of contamination.

County Soil Survey reports contain information that allows you to identify your soils and to determine their properties. Contact your local Cooperative Extension, NRCS, or SWCD office for a copy or for further assistance.

3 Is your soil less than three feet deep to bedrock and/or are sinkholes evident?

The depth of soil over bedrock is an important factor in reducing risk to ground water. Generally, soils that are less than three feet to bedrock are considered high risks to ground water contamination.

The type of bedrock below the soil also impacts contamination risk to ground water. Highly fractured rock structures such as limestone in karst terrain can provide a direct path for pollutants to the ground water supplying both shallow and deep wells.

Sinkholes form through the dissolving action of surface and ground water within carbonate and dolomite rocks. Large amounts of surface runoff, including some streams, may disappear into underground channels. This not only allows for pollution to easily enter the ground water, but also increases its rate of travel once there.

4 Is the water table less than ten feet below your soil surface ?

The depth to the water table under your property may impact the water quality of your drinking water well. Deeper aquifers generally have lower pollution risks than shallow aquifers. Water tables that are less than 10 feet from the surface are generally considered to have high contamination risk. If you rely upon a spring for drinking water, the depth to groundwater is **zero** at the point the water surfaces, greatly increasing the risk of contamination.

In the cases of shallow wells and springs, your ground water supply is coming from water that soaks through the soil and rock under your property. Your management practices can directly affect the quality of your drinking water supply.

You should know how deep the water table is under your property. If you do not know the depth to ground water, and cannot measure it, you may be able to consult your well log or local well driller if you have a well. The well log contains a record of the material drilled through and the depth to water. If you do not have a well log, talk to the well driller or previous property owner for more information. A copy of the well log may also be on file at the local Health Department office.

5 Do you have problems with soil erosion on your property?

Soil erosion happens when water moves across the soil surface and the water picks up soil particles. This process can be accelerated with intensive land use and can impact water quality with sediment, as well as nutrients and pesticides attached to soil particles.

By controlling erosion, you will help to protect water quality and maintain the long term productivity of your land. Soil erosion can be controlled through the implementation of conservation practices and/or best management practices.

Most people feel that they are doing a good job of controlling erosion on their property. Take a good look at the current practices you are using to reduce erosion. If there is room for improvement, look into some of the new technologies available by contacting your local Cooperative Extension, NRCS, or SWCD office.

6 Does potentially polluted runoff from your property reach surface waters?

Runoff, from stormwater, drainage, or irrigation practices, may impact surrounding surface water bodies. The level of impact to surface waters is determined by the amount and intensity of rainfall, distance to surface water bodies, slope of the land, density of vegetative cover, the contaminants in the path of the running water, and your conservation practices. Your local Cooperative Extension, NRCS, or SWCD office can assist you in identifying and addressing runoff and water quality problems.

Assessing Your Farmstead Site

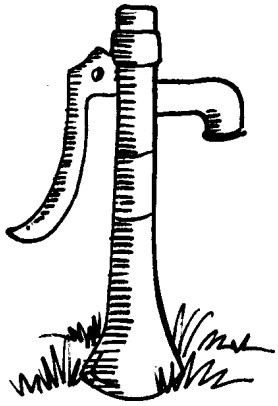
If you answered "Yes" to the following questions.	What to do	Who to call	Other References	What you did
Question 1,5,6	Develop or modify your Resource Conservation Management Plan to reduce soil erosion and impacts on water quality.	Cooperative Extension, NRCS, or Soil and Water Conservation District		
Question 2,3,4	Find out your soil type. Find out the depth and type of bedrock, and depth to the water table, under your property.	Cooperative Extension, NRCS, Soil and Water Conservation District, Health Department, or State Geological Survey office		

II. Assessing the Condition & Location of Your Water Supply System

Why should you be concerned?

The condition of your water supply system is an important factor to consider when looking at potential contamination of your drinking water. Specifically, you should be concerned about the location and condition of your water supply and the activities around your well or spring that may affect the quality of your drinking water supply. If your water supply system is located down slope from potential pollution sources, it is at a higher risk of contamination.

Some contaminants in water may only affect appearance, while others such as micro-organisms, nitrate, and toxic chemicals can be extremely harmful or even fatal. This worksheet contains a brief discussion about your water supply system. It will help you identify steps you can take to reduce the risk of contamination to your drinking water supply.



What can you do?

This fact sheet has been designed to provide information on questions you have answered ***Yes*** to or do not know the answer to in the **Assessing the Condition and Location of Your Water Supply System** worksheet. It will also help you develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply.

Water Supply Systems

1 Do you have a well less than 50 feet deep?

The depth of your well is an important factor to consider when looking at the potential for ground water contamination. Contaminants that infiltrate from the surface are more likely to contaminate shallow uncased wells than deep wells with a properly installed casing.

Drilled wells with a properly installed casing are deeper than most dug or bored wells and should have properly installed grout surrounding the casing to prevent contamination.

The well log, completed when the well was constructed, can tell you how deep the well is. A copy may be available from the well driller or your local Health Department office.

2 Do you have a dug or bored well, rather than a drilled well?

There are three main types of wells: dug, bored, and drilled wells.

A dug well is a large-diameter hole normally wider than three feet and is often constructed by hand. This type of well has the greatest risk of being contaminated because it is usually shallow and often poorly protected from surface water runoff.

A bored well is usually less than 100 feet in depth, and lined with 2-3 foot diameter open-jointed concrete pipe. The lower portions of the well have gravel placed between the well casing and the borehole. Closer to the surface (20 feet or less), the area between the casing and the borehole is sealed with grouting.

A drilled well uses percussion or rotary hydraulic drilling equipment to drill through a wide variety of geologic materials. The casing material is usually steel or PVC pipe, 4-8 inches in diameter. When properly installed, the casing is usually the least susceptible to contamination, resulting in the safest type of well.

3 Does your well casing (well pipe) extend less than 18 inches above the ground or annual flood level?

In looking at potential contamination, you need to consider casing height. In areas subject to flooding, the top of the casing, cap, or well cover should be at least **18 inches** above the annual flood elevation.

The area surrounding the well casing should also be sealed with clay soil or an impervious material. Surface water that enters a well casing can directly channel contaminants to your drinking water. In Virginia, the top of the well casing cannot end in basements, pits, or other spaces below ground level.

4 Is there a depression around your well casing?

The direction of surface water flow can affect the risk of contamination to your drinking water supply. Potential pollution sources on your property should be located downhill from your well. If contaminants get into the surface water, they will likely flow away from the well.

If the ground surface around your well casing is lower than the surrounding landscape, it provides an area for surface water to collect. Contaminants can either leak down along the well casing or through cracks in the well casing.

5 Can you see any cracks or holes in your well casing or cap?

The condition of the well casing and cap needs to be inspected periodically. Wells are commonly cased with steel, plastic or concrete to prevent the collapse of the borehole. The space between the casing and the sides of the borehole is filled with grout, cement, concrete, or bentonite, depending on the geological materials encountered. Both the casing and the grout prevent pollutants from seeping down into the well.

To prevent contaminants from flowing into the well casing, a tight fitting, vermin-proof cap must be installed on the well when it is constructed. The cap should have a screened vent that is turned downward so air can enter the well. The vent should be high enough so it will not allow surface water to enter the well. Not all wells are capped; some wells have pumps mounted on top of the casing.

It is possible for the well casing to corrode or crack and the well cap to become damaged. You should visually inspect the above-ground portion of your well for holes or cracks and make sure the cap is secure. You can also inspect the inside of the casing by removing the well cap and shining a light around the inside of the casing.

If you have a shallow well, you may also be able to determine the condition of your well casing. If you hear water running when the pump is not operating, there could be a crack or hole in the well casing.

6 Are there unused wells on your property that have not been properly abandoned?

Abandoned wells are a hazard and a direct pathway for contaminants to enter the ground water. When you plug an abandoned well on your property, local guidelines should be followed as closely as possible. Virginia has developed guidelines for the plugging

of abandoned wells and for proper temporary abandonment of wells. Consult your local Health Department, NRCS, Cooperative Extension Office, or DEQ.

7 Do you get your water from a spring?

Springs are often used in rural Virginia as a primary water supply. They are however very susceptible to contamination. Often springs in limestone regions are replenished from surface water running into sinkholes.

The following precautions should be taken when using springs for a water supply:

- Have a reinforced concrete spring box with a secure cover, over flow pipe, and provisions for emptying.
- A collection system should be in place to channel the flow away from the spring.
- Surface runoff from upslope should be diverted around the spring.
- Consider the need to install a continuous disinfection device, such as an automatic chlorinator.

8 Was your water supply system built more than 50 years ago?

The age of your water supply system is also a factor to consider when determining the potential for ground water contamination. Older wells are generally shallow and more likely to be located in an area that may be downhill or close to potential sources of contaminants. These wells may have structural problems such as inadequate casing, or the casing may be corroded.

Likewise, older spring catchments are also subject to deterioration and may have been the original source of water for the farmstead. This may have resulted in many farmstead operations and structures being located in the vicinity to the spring itself.

Every water supply has a finite lifespan and it should eventually be replaced, such as by the drilling of a new well. If you have an old well, you may want to have it inspected by a qualified well driller.

9 Have you not had your drinking water tested recently or did your water test positive for bacteria and/or indicate excessive nitrate the last time it was tested?

As part of your water supply system maintenance program, you should test your water at least every other year for bacteria, nitrate, and other potential contaminants. Water testing is the only sure way to know what substances are present in your drinking water.

Some contaminants may only affect appearance, while others such as bacteria, nitrate, and toxins can be harmful or even fatal.

Consult your local Health Department or Cooperative Extension office to determine what you should test for, and how to interpret test results.

10 Is your water source located downhill from any nearby potential contamination sources (pesticides, fertilizer, animal manure, petroleum products, or other pollutants)?

Whether a well taps water just below the ground surface or hundreds of feet deep, its location is a crucial safety factor. A water source downhill from a livestock yard, a leaking petroleum storage tank, or a failing septic system runs a much greater risk of contamination than a well located upslope of these pollution sources.

Surface slope does not always indicate the direction a pollutant might flow once it gets into the ground. In shallow aquifers, ground water flow is often in the same direction as the surface flow. If the aquifer supplying water to your well is deep below the surface, though, the ground water flow direction may be different than that of water on the land surface. This is also true in limestone regions.

Locating the well in a safe place takes careful planning and consideration. Factors such as location to surface drainage and ground water flow are important. When planning for a new well, it should be located up slope from potential contaminants. For existing wells, or springs, that are down slope from contaminants, consider removing

contaminant sources or diverting surface water runoff away from the water source.

11 Is your water source located closer to potential pollution sources than recommended?

Besides being uphill from potential pollution sources, your well should meet minimum separation distances from potential pollution sources.

Virginia has regulations for new wells listing minimum distances. For example, your septic system drainfield, as well as most other potential pollution sources, should be at least 50 feet from a drilled well and 100 feet from a bored well. Minimum separation distances are required but greater distances are preferred. While there are no regulatory requirements for springs, the same separation distances should apply, particularly when contaminants are located upslope of the spring.

If you are uncertain of specific distances, contact your local Health Department office.

12 Is it possible for contaminants to siphon back into your water supply system?

Use of an anti-backflow device will prevent chemicals from siphoning back through the hose and entering your water supply system. Inexpensive anti-backflow devices are often available at your local hardware stores.

If one of these devices is not used, be sure to keep the hose out of the tank when filling your pesticide sprayer, or other chemical container. (See fact sheet on Assessing Your Pesticide Storage & Handling Practices for more information)

Assessing the Condition and Location of Your Water Supply System

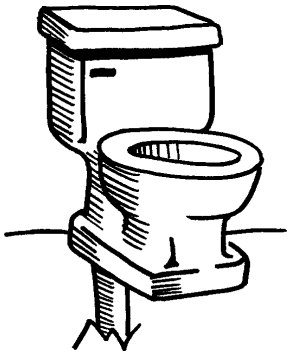
If you answered "Yes" to the following questions.	What to do	Who to call	Other References
Questions 1,2,7,8	Determine the properties and condition of your water supply	Health Department, or a licensed well driller.	
Questions 3,4,5	Extend well casing height if necessary. Have visible holes in casing repaired. Fill in depression and create a mound around well.	Cooperative Extension, Health Department, NRCS, Soil and Water Conservation District, or a licensed well driller.	
Question 6	Properly close all abandoned wells on your property.	Cooperative Extension, Health Department, NRCS, Soil and Water Conservation District, Department of Environmental Quality, or a licensed well driller.	
Question 9	Have your water tested annually for the most common contaminants, nitrate and bacteria, to see if a problem actually exists.	Cooperative Extension, Health Department, or private water testing laboratory.	
Questions 10,11	Relocate sources of pollution downslope at recommended distances from water source.	Cooperative Extension, Health Department, NRCS, or Soil and Water Conservation District.	
Question 12	Consider installing an anti-backflow device.	Local hardware store or plumber.	

III. Assessing Your Household Waste Water Treatment System

Why should you be concerned?

Virtually all rural residents use a conventional septic system or some other type of on-site waste water disposal system. While these systems are generally economical and safe, household waste water can contain contaminants that may harm drinking water quality.

Potential contaminants in household waste water can include disease-causing micro-organisms, household chemicals, and excess nutrients, such as nitrogen.



What can you do?

This fact sheet has been designed to provide information on questions you have answered ***Yes*** to or do not know the answer to in the **Assessing Your Household Waste Water Treatment System** worksheet. It will also help you develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply.

1 Do you have an on-site waste water treatment system (septic tank and drain field)?

Household waste water treatment systems are used to treat and dispose of waste water from the home.

A household waste water treatment system that is properly constructed and maintained will function for many years and can minimize the potential for ground and surface water contamination.

An individual household waste water treatment system, sometimes called a septic system, typically consists of a septic tank and drain field. Waste water from bathrooms, kitchen, and laundry room is routed to the septic tank where liquids and solids are separated.

Soft solids such as grease and soap float to the top and form a scum layer. Other solids settle to the bottom where they can be partially decomposed by bacteria.

Liquid from the septic tank is discharged into the drain field where harmful, disease causing microorganisms, organics, and nutrients are removed or broken down.

Both system design and location should be considered when assessing the potential for ground water contamination.

It is also important to avoid driving heavy machinery on the drain field area. This can damage the drain field by crushing pipes and compacting the absorption area. Also, you should avoid planting trees and shrubs in the drain field area.

2 Has it been longer than 3 years since you had your septic tank cleaned out?

Poor management of your septic system increases the risk of your drinking water becoming contaminated. Proper maintenance is one of the most important factors in making sure a septic system will function over a long period of time. Maintenance involves regular pumping and limiting the types of materials disposed of to those that the system can handle.

Most properly sized septic tanks need the solids pumped out every three to five years. If a garbage disposal is used, a septic system should be pumped out every one to two years. These are just estimates and the actual time between pumpings will depend on the size of your septic tank and number of household residents.

3 Do you dump grease, oil, or leftover household chemicals down your drain?

You should always avoid dumping grease and oil down your drain. They can plug the pipes or build up in the septic tank. Keep a separate container for used grease and oil. Properly dispose of them with other household garbage.

Household chemicals that are poured down the drain can damage your waste water disposal system. Bacteria present in the septic system break down the sewage. When household chemicals are added to the system, they may destroy the beneficial bacteria, reducing the effectiveness of the sewage treatment process.

4 Do you suspect that your septic system is failing, or will soon fail?

If you suspect your septic system is backing up or your distribution system is clogged, you may want to first contact your plumber or system installer. They may have suggestions for extending the life of your system. Otherwise your local Health Department office should be contacted for permits to repair or replace your septic system.

In attempting to fix failing systems:

- Do not use septic tank cleaners that contain degreasing solvents like TCE. They can contaminate groundwater.
- Do not place more soil over a surfacing soil absorption field. It will eventually surface again.
- Do not pipe sewage to a road ditch, storm sewer, sink hole, drainage ditch, stream, or drain tile; this leads directly to water pollution and creates a health hazard, in addition to being illegal.

5 Is it possible to decrease the amount of water entering your septic system?

Reducing the volume of wastewater entering the treatment system will improve the treatment efficiency by increasing the amount of time the water is retained in the septic tank. Consider reducing the overall flow into your septic system by the following ways:

- Installing a water saving toilet, showerhead, faucet, and front loading washing machine can result in a household water use reduction of 30 to 70 percent.
- Eliminate water that does not need to be treated from entering the system. Make sure water from your basement, foundation, and roof drains is not entering your wastewater system.
- A water softener can result in a significant addition of water to the system. Proper adjustment and timing of the softeners regeneration mechanism can reduce excessive water use.

Contact your local Cooperative Extension office for additional ways you can conserve water in the home and on the farm.

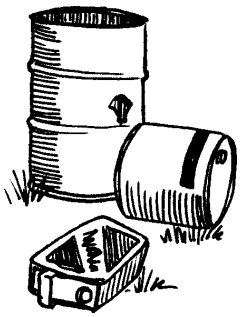
Assessing Your Household Waste Water Treatment System

If you answered "Yes" to the following questions.	What to do	Who to call	Other References	What you did
Questions 1 and 4	Determine the location and condition of your septic system.	Local Health Department, septic system installer, or septic tank pumper.		
Question 2	Monitor septic tank and pump scum and sludge when needed.	Local Health Department, septic system installer, or septic tank pumper.		
Question 3	Do not dispose of grease, oil or other household chemicals down your drain or toilet. Determine where these materials can be safely disposed of.	Local Cooperative Extension, Health Department, or Department of Environmental Quality.		
Question 5	Reduce the amount of water entering your septic system	Local Cooperative Extension, plumber, or hardware store.		

IV. Assessing Your Household Hazardous Waste Management Practices

Why should you be concerned?

Land owners/tenants and their families are generally familiar with the hazards of pesticides commonly used in their operations. They may be less aware of the hazards of other chemicals that make many tasks around their property easier or more efficient.



Consider the variety of products commonly used in households and on farms: paints, solvents, oils, cleaners, wood preservatives, batteries, adhesives, and pesticides. Small, unusable amounts of common chemicals often are spilled, buried, dumped or flushed onto rural property. Some common but unsafe disposal practices not only threaten your drinking water, but may also be illegal.

Your drinking water, as well as any other nearby water supply, is less likely to be contaminated by hazardous waste if you follow appropriate management practices and dispose of waste at an approved disposal site.

What can you do?

This fact sheet has been designed to provide information on questions you have answered ***Yes*** to or do not know the answer to in the **Assessing Your Household Hazardous Waste Management Practices** worksheet. It will also help you develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply.

1 Do you dispose of household products such as furniture polish, paints, stains, and cleaners and/or their containers on your property?

Household chemicals such as some furniture polishes, paints, stains, and drain cleaners can contaminate your drinking water supply.

Virginia regulations prohibit open burning of household garbage, wet combustible rubbish, oily substances, asphalt, plastic, or rubber products. Continual use of open burning sites over the years can lead to a build up of hazardous chemicals in a relatively small area. The potential for dangerous amounts of these chemicals to impact ground and surface waters increases significantly when they are concentrated in this manner.

Many communities have household hazardous waste collection days. These are usually advertised locally. Your local landfill may have more information about these events.

2 Do you dispose of vehicle maintenance products on your property?

Oil, antifreeze, grease, solvents, engine cleaners, paint, paint preparation products, and lead acid batteries can be grouped into this category. These should not be disposed of on your property. Recycling opportunities exist for much of this material; especially waste oil, antifreeze, solvents, and batteries. Never dump antifreeze into domestic septic systems. It may kill the organisms that break down the wastes in the tank, resulting in a system failure.

If unsure how to dispose of a product, contact your local health department or DEQ office to determine proper procedures for disposing of these products. These products should be properly stored until they can safely be disposed of. Proper storage includes a secured container on an impervious surface at least 150 feet from your water well and surface water.

3 Do you have construction and wood maintenance products on your property?

This category of substances includes:

- Solvent-based building and wood cleaners, such as wood polish and products for wood floors, furniture, and panel cleaning
- Solvent-based stripping and finishing products such as varnishes, stains and paints, brush or spray gun cleaning products, adhesives such as glues and caulk, and solvents such as paint thinner and degreasers
- Wood preservative compounds

These products should not be stored closer than 150 feet to the well or spring. If maintenance activities occur closer than this, care should be taken to contain drips and spills. Small amounts of products such as adhesives and paint can sometimes be evaporated where conditions permit.

Other material such as wood preservatives and lead-based paints should be labeled and saved for disposal by a hazardous waste contractor.

Wood preservatives are considered to be pesticides, some of which are categorized as restricted-used pesticides. See the section, **"Assessing your Pesticide Storage & Handling Practices"** for further information about pesticide safety.

4 Are any hazardous products accessible to pets, children, and vandals?

Each year, hundreds of children and pets, often a neighbors, are injured or poisoned because of improperly stored hazardous household products. All household hazardous products and wastes, particularly in outbuildings, need to be secured to prevent unauthorized access to these materials until they can, as intended, be used or properly disposed of. Educate your family on the dangers of these products.

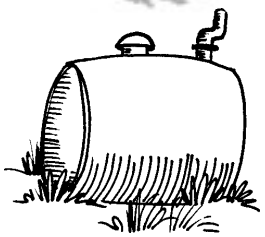
Assessing Your Household Hazardous Waste Management Practices

If you answered "Yes" to the following questions.	What to do	Who to call	Other References	What you did
Question 1,2,3	Inventory all household hazardous materials, pesticides, and containers on your property. Obtain information about proper disposal.	Local Cooperative Extension, Department of Environmental Quality, Health Department, Department of Agriculture and Consumer Services, or local landfill.		
Question 4	Develop a secured storage area.	Local Cooperative Extension or Department of Agriculture and Consumer Services.		

V. Assessing Your Petroleum Product Storage Facilities

Why should you be concerned?

Above ground and underground storage of liquid petroleum products, such as motor fuel and heating fuel, presents a threat to public health and water quality.



While leaking tanks are easier to detect when placed above ground, according to estimates by the U.S. Environmental Protection Agency, nearly 1 out of every 4 underground petroleum storage tanks in the United States may be leaking.

A few quarts of gasoline in ground water may be enough to severely pollute your drinking water supply. Petroleum fuels contain a number of potentially toxic compounds such as ethylene, benzene, and ethylene dibromide (EDB). EDB is a carcinogen (cancer causing agent) in laboratory animals, and benzene is considered to be a human carcinogen.

What can you do?

This fact sheet has been designed to provide information on questions you have answered ***Yes*** to or do not know the answer to in the **Assessing Your Petroleum Product Storage Facilities** worksheet. It will also help you develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply.

1 Do you have a petroleum storage tank(s) on your property?

Typically, petroleum storage is the most frequent high water quality risk identified on farms. If you have a petroleum storage tank on your property, you need to assess your storage system to guard against contamination of soil, ground water and surface water.

Tanks that are no longer in use should be removed from the property. In Virginia, you must contact your local building official or VDEQ to obtain a permit for underground storage tank removal.

2 Is your petroleum storage tank(s) less than 100 feet from your drinking water supply?

To protect your drinking water supply from leaks and spills, your petroleum storage system should be located a minimum of 100 feet down slope from your water supply system. Petroleum storage tanks should also be located at least 25 feet from buildings and heavy traffic areas.

3 Is your petroleum storage tank(s) old and/or underground?

Most underground storage tanks are made out of steel and contain little or no protection from corrosion. Highly corrosive conditions such as saline, wet, or acidic soils can significantly increase the rate of corrosion of these tanks, leading to leaks and tank failure.

4 Do you lack protection against leaks or spills from your petroleum storage tanks (i.e., no catch basin or concrete spill pad)?

Whether you have under ground or above ground storage, you need to develop a system that guards against leaks and spills. Equipment should be fueled on a concrete pad that has secondary containment.

All facilities should be secured from children, pets, and vandalism. Underground tanks should be protected against corrosion. Above ground tanks should be made of high quality steel and have a secondary containment system that holds 125% of the total volume stored. Tanks that are used or designed for underground storage should not be used for above ground storage.

5 Do you need to develop a method of record keeping to keep track of petroleum use?

Develop a monitoring system to keep accurate records of fuel delivery and usage. Regularly monitoring your fuel use and comparing it to the measured amount of fuel in the tank can help you detect a leak. This is one of the easiest ways to detect leaks in underground tanks. Monitoring your fuel use does not require a lot of time or money, and can help you detect a leaking fuel storage tank before significant losses of fuel occur.

An easy way to monitor your fuel use is to have a pre-marked stick to measure the level of fuel in your storage tank. You need to check the level of fuel in the tank before you withdraw fuel, to make sure it has not changed since your last use. If the level changes between withdrawals, then your tank may be leaking.

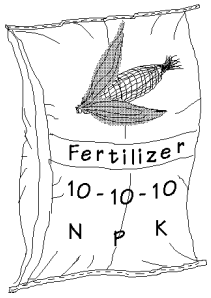
Assessing Your Petroleum Product Storage Facilities

If you answered "Yes" to the following questions.	What to do	Who to call	Other References	What you did
Question 1,5	Develop a regular maintenance program to check tanks for leaks, damage, etc. Install adequate spill and leak protection. Monitor fuel usage.	Virginia Department of Environmental Quality or local building official		
Question 2	Plan to move your tank.	Virginia Department of Environmental Quality		
Question 3	Change to above ground storage.	Virginia Department of Environmental Quality		
Question 4	Construct secondary containment system.	Virginia Department of Environmental Quality		

VI. Assessing Your Fertilizer Storage & Handling Practices

Why should you be concerned?

While fertilizers play a vital role in agriculture, national studies indicate that agricultural pollution adversely affects portions of more than two-thirds of the nation's river basins.



Commercial fertilizer, when applied to fields, lawns, and gardens, is a major source of nitrogen that can impact surface or ground water and, therefore, your drinking water supply. The other major components of commercial fertilizer, phosphorus and potassium, are generally not a ground water contamination concern but can affect surface water quality. This chapter will alert you to practices on your farm that may be putting the ground or surface water in danger.

What can you do?

This fact sheet has been designed to provide information on questions you have answered ***Yes*** to or do not know the answer to in the **Assessing Your Fertilizer Storage & Handling Practices** worksheet. It will also help you develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply.

1 Has it been longer than three years since you had your soil tested ?

You should test your soil for nutrient content at least once every three years and maintain a record of previous soil tests by fields. If you use a more intensive cropping system such as double cropping, you may want to consider testing every year.

2 Is your soil well drained?

Coarse textured soils, such as sands, are susceptible to ground water contamination because of relatively rapid downward water movement. Finer textured soils, such as silt loams and clays, on the other hand, slow water movement and provide greater filtering, allowing bacteria and other soil organisms to break down contaminants before they reach ground water. These types of soils are more susceptible to surface water runoff, though, and may put surface water bodies at risk of contamination.

3 Has it been longer than three years since you updated your nutrient management plan or do you not have one?

If you do not have a detailed nutrient management plan, you should consider developing one. A nutrient management plan is a tool to help you manage nutrients in an economical and environmentally friendly manner specific to your individual farm and should be updated frequently. Your plan should be realistic, and needs to include all potential sources of nutrients (including animal wastes).

Contact your local Extension office to find out who in your locality is certified to write nutrient management plans.

4 Do you apply manure, litter and/or crop residues to your fields?

If you are applying animal manure or poultry litter, or are incorporating residues from a previous crop, you will need to adjust your current nutrient budgets to include these inputs. These materials will affect nutrient availability. Depending upon the source, manure can vary greatly in the nutrient content. After obtaining a manure analysis, be sure to credit nutrients from all manure or litter applications (from this year as well as previous years) in nutrient budgets. Store manure and litter in a facility that will prevent contamination to both ground and surface water. Finally, be sure application equipment is properly calibrated and is functioning properly. See your local Extension office, NRCS, Department of Conservation and Recreation, or crop consultant to adjust for these inputs.

5 Do you make fertilizer applications based on maximum crop yields rather than historical crop yields?

Use realistic yield goals. Yield estimates that are too high will result in soil nutrient levels beyond those needed by the crop and could result in excess nutrient ground and surface water pollution.

6 Do you apply fertilizer for the whole growing season all at one time instead of several applications?

If you over-fertilize your fields with manure, litter, crop residues, and/or commercial fertilizers, you are potentially impacting your drinking water quality. Whenever possible, time your fertilizer applications to meet crop needs. Apply fertilizer when the crop is actively growing. Use split applications of nitrogen on sandy soils.

7 Are fertilizer products stored improperly in an unsecured area in which spills cannot be contained?

You should store all liquid fertilizers on an impermeable floor such as concrete. The floor should have a curb that will hold up to 125% of the volume stored in case of a spill. A mixing and loading concrete pad with secondary containment should be provided for all liquid fertilizers.

Store piles of dry bulk fertilizer on an impermeable surface under cover or in a building. Treat a fertilizer mixed with a pesticide as a pesticide. Locate fertilizer storage areas at least 100 feet downhill from your water supply. Be sure all fertilizer storage is secure from children, animals and vandalism.

Assessing Your Fertilizer Storage and Handling Practices

If you answered "Yes" to the following questions.	What to do	Who to call	Other References	What you did
Question 1	Soil test at least every 3 years.	Local Cooperative Extension or private crop consultant.		
Question 2	Get a detailed soils map of your fields.	Local NRCS or Soil and Water Conservation District.		
Question 3	Obtain or revise your nutrient management plan.	Local Cooperative Extension, NRCS, Soil and Water Conservation District, or DCR nutrient management specialist		
Question 4	Test your manure. Credit all nutrient sources.	Local Cooperative Extension , NRCS, Soil and Water Conservation District, private crop consultant, or DCR nutrient management specialist.		
Question 5, 6	Use realistic crop yield goals. Apply fertilizer based on crop growth needs.	Local Cooperative Extension, NRCS, Soil and Water Conservation District, private crop consultant, or DCR nutrient management specialist.		
Question 7	Develop a properly designed fertilizer storage system.	Local Cooperative Extension Service, NRCS, Soil and Water Conservation District, or VA Department of Agriculture and Consumer Services.		

VII. Assessing Your Pesticide Storage & Handling Practices

Why should you be concerned?

Pesticides play a vital role on farms and other rural properties. Pesticides work by interfering with the life processes of plants and insects. Some pesticides are also toxic to humans and farm animals.

When found in water supplies, pesticides normally are not present in high enough concentrations to cause acute health effects, such as chemical burns, nausea and convulsions. Instead, they typically occur in very small amounts and can cause chronic health problems (such as cancer, birth defects, etc.) from prolonged exposure.

These products must be stored and handled safely to protect both people and water quality. Two major areas of concern related to pesticides are (1) storage practices and (2) handling practices that include mixing, loading, application, and disposal.

What can you do?

This fact sheet has been designed to provide information on questions you have answered ***Yes*** to or do not know the answer to in the **Assessing Your Pesticide Storage and Handling Practices** worksheet. It will also help you develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply.

1 Are your pesticides stored on wood, gravel, soil, or on a concrete pad without a curb?

If you store pesticides on a regular basis, you should consider building a properly designed storage system with a concrete floor, secondary containment, and a temperature and humidity-controlled environment. Containment is very important in the event of an accidental spill.

The floor of the storage site should be made of sealed concrete or some other easily cleaned, non-permeable material. It should hold a minimum of 125% of total stored volume. Carpeting, wood, soil, and other absorbent floors should not be used because they are difficult or impossible to decontaminate in the case of a leak or spill.

For easier clean-up, shelving and pallets should be made of non-absorbent material such as plastic or metal. If wood or fiberboard materials are used, they should be coated or covered with plastic, polyurethane or epoxy paint.

In all cases, make sure your pesticides are protected from vandalism and secured from children and animals.

2 Do you have pesticide containers that are damaged, leaking and/or rusting?

A major concern about the condition of pesticide containers is the potential for leaks and spills. If you have containers that are rusting or have holes or tears, the pesticide should be used or disposed of immediately. You should monitor your pesticide storage for leaks.

Be careful to keep all pesticides in their original containers with their proper labels. Information on the pesticide label is invaluable for proper cleanup, disposal, and emergency action if the pesticide is spilled or leaked. Information about pesticide disposal programs for old and unused pesticides can be obtained from your local Cooperative Extension office.

3 Do you mix, apply, or store pesticides without reading the label first?

Before buying, storing, or applying pesticides, read the label to make sure the product will do what you expect. Be sure it can be applied safely, and that you have all the necessary safety equipment.

Always follow the instructions on the label for proper use and storage of the product. The label also provides additional information such as the re-entry period (how long you must keep people and animals out of the field), first aid, and other hazards.

4 Do you mix, apply or store pesticides within 100 feet of a drinking water supply (well, spring, etc.)?

Mixing, loading, storing, or applying pesticides near or directly uphill from your drinking water supply system is not recommended. Use a secondary water source on a properly constructed mixing and loading pad, or field mix and load with a nurse tank to reduce contamination risks. Pesticides should always be stored in a secured, spill-proof facility downhill from your water supply.

5 Do you fill your sprayer tank with a hose that does not have a check valve, or put the hose in the tank so that it is in contact with solution being mixed?

Always keep your water hose or pipe above the level of the pesticide mixture. This will prevent water and pesticides from being drawn back into your water supply if the pump fails or is shut off. An anti-siphon device or check valve should always be used when filling a pesticide tank. These can be found at a farm supply and hardware stores. They are relatively inexpensive and reduce the risk of contamination to your drinking water supply.

6 Do you leave your sprayer tank unattended while filling?

You are responsible for the proper mixing and loading of all the pesticides you use. When a sprayer tank is left unattended, it increases the risk of contamination from spills or over-filling. Repeated spilling of pesticides due to tank overflow allows pesticides to concentrate in the soil and increases their potential to leach into the ground water. Also, there is a risk of back-siphoning pesticides directly into the water source if the pump should stop while filling the tank. Careful loading and mixing of pesticides will reduce the risk to ground and surface water.

7 Do you apply pesticides without recalibrating your sprayer?

The use of calibrated equipment can be as important as the selection of the pesticide you are applying. Calibrating your equipment will reduce problems such as drift, non-uniform coverage, failure of the pesticide to reach a targeted organism, and exposure of non-target organisms.

Before calibrating your sprayer, make sure your equipment can apply the product according to the label rate. Each spray nozzle should be within 5% of the volume required. Proper calibration of appropriate equipment ensures that pesticides are

applied uniformly according to label rates.

8 Do you rinse out your sprayer tank near your drinking water supply (well, spring, etc.)?

After pesticide applications, clean all equipment. Cleaning should be done away from your drinking water supply and surface water bodies. The rinse water should be used in the next spray mix or it should be applied to the field you just finished spraying. A clean water tank or nurse tank on the sprayer is a convenient way to have clean water in the field to wash out your sprayer.

9 Are pesticides applied to your fields by a non-licensed applicator?

Certain pesticides can only be legally applied by a ***licensed pesticide applicator.*** However, it is a good idea to have all pesticides applied by a licensed pesticide applicator. If you are not a licensed pesticide applicator, contact your local Cooperative Extension Office to learn how to become one.

Assessing Your Pesticide Storage and Handling Practices

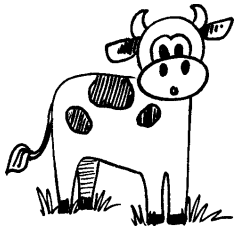
If you answered "Yes" to the following questions.	What to do	Who to call	Other References	What you did
Question 1, 2	Develop a storage and handling plan. Dispose of unused products according to their labels.	Local Cooperative Extension, NRCS, Soil and Water Conservation District, or Department of Agriculture and Consumer Services.		
Question 3	Always read & follow the label.	Local Cooperative Extension or private crop consultant.		
Question 4	Try not to fill directly from your well. Use a hydrant (located at least 150 feet from your well), or a water holding tank.	Local farm supply or hardware store.		
Questions 5, 6, 7, 8	Make sure your fill hose is not below the water tank level and is equipped with a backflow device. Always calibrate sprayer prior to appl ying pesticides. Check your equipment on a regular basis. Never leave sprayer tank unattended. Spread rinse water out in a crop field.	Local Cooperative Extension or private crop consultant.		
Question 9	Get training and become certified.	Local Cooperative Extension.		

VIII. Assessing Your Livestock & Poultry Operations

Why should you be concerned?

Livestock and poultry operations on your property can generate large amounts of manure and waste. Sometimes this can serve as a valuable resource; however, when improperly managed, nutrients, bacteria, and other pollutants can contaminate your drinking water supply. When livestock manure is concentrated, as it is in barnyards, holding areas, and feedlots, the risk of polluting surface and ground water often increases.

Improper field application of manure and other wastes will also increase the risk to both surface and ground water.



What can you do?

This fact sheet has been designed to provide information on questions you have answered ***Yes*** to or do not know the answer to in the **Assessing Your Livestock and Poultry Operations** worksheet. It will also help you develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply.

1 Do you house livestock and/or poultry within 100 feet of a water supply (well, spring, etc.), or is your livestock and/or poultry facility located upslope from a water supply system?

All livestock and poultry operations should be located at least 100 feet downhill from private water supplies (including abandoned wells) and 500 feet from public water supply systems.

Runoff from livestock and poultry areas can transport animal manure to locations that may cause water contamination. Your facility should be located downhill from water supplies so that runoff will not drain toward them. Surface water runoff should be diverted around the facility.

If you have a animal operation on your property you should be testing your drinking water annually for bacteria and nitrate.

2 Do you wait more than a week before scraping or cleaning your yard?

You should scrape and clean your livestock yard on a regular basis, at least once a week. In some cases, you should clean it on a daily basis. This will help to reduce odors, prevent disease, and reduce runoff pollution.

You should also divert all clean water to prevent it from entering the yard area. Collect or contain all runoff from the yard. Consider concreting or paving all heavy use areas.

3 Do you store manure or litter within 200 feet of a drinking water supply?

Manure is generally stored in either liquid, semi-solid or solid forms. Each of these can be stored safely, but require proper management to prevent water contamination. Storage facilities should be designed to prevent unplanned off-site movement of manure. Reducing the volume of stored manure with regular application helps to reduce pollution risks.

Short-term storage systems may be applicable for those operations, such as small dairies, which often have to stack manure in fields, particularly during periods of bad weather or between cropping cycles. Field stacking is not a recommended practice. No matter how it is done, it may pose a contamination threat to surface water and groundwater. If manure is frequently stacked in fields, cover it with plastic sheets or consider constructing a short-term runoff detention pond at the storage site.

Of particular concern are existing wells that can provide a direct path for contaminated surface water to reach the ground water. Long distances between manure storage sites and your drinking water supply are the best preventive measure that can be taken. Avoid manure storage within 200 feet of your well or spring.

Contact your local NRCS, Soil and Water Conservation District, or Cooperative Extension office for information on proper storage practices.

4 Do you treat your milking center wastewater differently than your manure?

Combining milking center wastewater with manure has several benefits. It allows you to use a common disposal system for both wastes instead of having two systems. Also, the nutrients in the milking center wastewater can be utilized for crop growth.

If properly land applied, milking center wastewater presents little risk of water contamination. However, care must be taken to prevent nitrogen and phosphorous levels in the soil from becoming too high. Your nutrient management plan should account for the extra nutrients contained within the milking center wastewater.

5 Do you stack or store manure or litter on soil that has a coarse texture (such as sands or sandy soils), or that has a shallow bedrock, or a high water table within 10 feet of the surface?

Soil types are very important in determining whether a contaminant breaks down and leaches into ground water. Sandy or coarse textured soils allow manure and other contaminants to more readily leach into the ground water.

Bedrock geology also influences ground water pollution. Soils that are over fractured bedrock (like limestone), or areas of karst geology, have a high potential to contaminate ground water. Sites that have high seasonal water tables also present a high risk to ground water.

If you do not know the type of soil that you have, and its properties, contact your local NRCS, Soil and Water Conservation District, or Extension Office.

6 Do you spread manure, litter, wastewater, and/or silage leachate from your livestock or poultry operation without a nutrient management plan?

Proper use of manure and litter as a nutrient source can reduce fertilizer purchases, improve soil quality, and reduce pollution risks. Ground and surface

waters can be polluted if too much waste is applied, or if the nutrients available in manure are not counted in the crop's nutrient budget.

If you do not have a manure management plan for your livestock or poultry operation, contact your local DCR, Soil and Water Conservation District, or Cooperative Extension Office.

7 Do you land apply your waste without any pretreatment methods?

Pretreatment of wastes will remove some of the pollutants before application. Although soil is effective at absorbing and degrading wastes, it does have limits. Pretreatment of some wastes will extend the effective life of a land application site or allow a smaller field area to be used.

Pretreatment usually consists of a tank or basin, such as a pond or lagoon, that will allow for separation of heavy and light particles. Ponds and lagoons used as settling basins should be lined with an impervious material to prevent groundwater contamination. Settling tanks and basins should be cleaned every few months.

Septic systems should not be used for pretreatment because they will eventually fail.

8 Do you spread wastes on your fields, lawns, and gardens without considering the amount of nutrients it contains?

Manure and other nutrient containing byproducts should be treated as a resource rather than a waste product. Credit nutrients from all wastes in your nutrient management plan. Apply with properly calibrated equipment. Maintain records of your nutrient applications.

9 Do you apply manure, litter, wastewater, or silage leachate to fields when the ground is frozen, covered with snow, saturated with water, or within 100 feet from a drinking water supply, stream, pond, or sinkhole?

The timing of waste application is extremely important if conditions such as the type of soil or the depth to groundwater create an environmental hazard. Manure should be applied within 30 days of planting for annual crops in order for the nutrients to be available for use by the crops.

Many producers apply wastes in the winter. Land application should not be carried out during extended periods of bad weather, which makes application impractical or illegal. Virginia Department of Environmental Quality guidelines discourage application of wastes when the ground is frozen or saturated. If waste is applied to frozen soils and there is runoff from snowmelt or rain, both contaminants and nutrients in the material will be carried away with the runoff.

10 Do you dispose of dead animals on your property?

Dead animal disposal on your property can be a potential water pollution risk if done improperly. Decomposing animals can be a concentrated source of nutrients, bacteria and other potentially harmful micro-organisms.

Develop a plan for proper disposal of dead animals. Small animals can be best disposed of by composting. Contact your local Cooperative Extension or Soil and Water Conservation District office for information on composting. A rendering service is generally better for larger animals. Contact the Virginia State Veterinarian's office for approval of disposal methods.

11 Do you make silage without considering the moisture content?

Silage stored at 65% moisture content or higher can produce leachate. For grass silage, the amount produced varies from a trickle at 75% moisture content, to 79 gallons per ton at 85% moisture content. The most effective way to reduce the amount of leachate produced is to reduce the moisture content of the silage by allowing the crop to wilt for 24 hours. This has been shown to reduce the moisture content of the silage by 10%.

Another commonly used method is adding absorbent materials to the silage. This may also

have the added benefit of increasing the nutrient value of the silage, depending upon what material is used. Common absorbent materials are oat meal, dried sugar beet pulp, dried corn cobs, ground corn, newsprint, and bentonite clay. These materials will absorb between one to three times their weight in moisture.

12 Is your silage stored less than 100-150 feet from wells or waterways?

Storage areas for silage should be as far away from wells and streams as practical. Silos and plastic tubes should be located at least 100 feet downslope of any wells or springs. If you are using earthen trenches, the distance should be increased to 150 feet.

13 Is your silo old, or in poor condition?

The type of silo often has less effect on the potential to contaminate groundwater than the condition of the silo. Older structures can be relined and covered to make them relatively watertight. It is also important to make sure clean water is diverted away from existing silage storage structures. This will protect both groundwater and surface water.

Assessing Your Livestock and Poultry Operations

If you answered "Yes" to the following questions.	What to do	Who to call	Other References	What you did
Question 1,12	Test your drinking water for nitrate and bacteria contamination. Move source of contamination if possible.	Local Cooperative Extension, Health Department, or private water testing laboratory.		
Question 2	Develop a run-off control system or move the feed yard.	Local Cooperative Extension, NRCS, or Soil and Water Conservation District.		
Question 3, 4, 5, 11	Use an approved storage system.	Local Cooperative Extension, NRCS, or Soil and Water Conservation District.		
Question 6, 7, 8, 9	Develop a nutrient management plan that treats manure as a nutrient resource.	Local Cooperative Extension, NRCS office, Soil and Water Conservation District, DCR nutrient management specialist, or crop consultant.		
Question 10	Develop a system for proper disposal of dead animals.	Local Cooperative Extension, NRCS, or Soil and Water Conservation District.		
Question 13	Consider constructing a new silo or using a different method of storage.	Local Cooperative Extension, NRCS, or Soil and Water Conservation District.		

IX. Assessing Your Irrigation Management Practices

Why should you be concerned?

Improper management of agricultural irrigation systems may impact our water supplies in several ways. Mobile and soluble materials such as nutrients, salts, pesticides, or naturally occurring trace elements can also leach or move with the water into either surface or groundwater supplies, particularly if crops are over watered.

Most people recognize water quality as an environmental problem, however, not everyone realizes that water quantity is also a concern. Even in areas which normally receive abundant natural rainfall, such as Virginia, water conservation is becoming more of an issue. In order to continue irrigating, irrigation practices will need to become more efficient.

What can you do?

This fact sheet has been designed to provide information on questions you have answered ***Yes*** to or do not know the answer to in the **Assessing Your Irrigation Management Practices** worksheet. It will also help you develop an **Action Plan** to establish practices that reduce the risk of contamination to your drinking water supply.

1 Does your irrigation system apply water to areas other than the plant rooting zone?

As water needs increase, it is important to develop and use the most efficient irrigation system possible. If you don't already do so, consider using an irrigation system, such as a drip irrigation, that applies water only to the plant rooting zone. If you have a sprinkler irrigation system, it should spray only onto intended application areas. Good irrigation water management practice involves routine evaluation of the irrigation system's application efficiency and uniformity, as well as measurement of water applied.

2 Does your irrigation system distribute water in uneven patterns?

In addition to detrimentally impacting crop yield and quality, runoff and water quality problems may result if irrigation water is unevenly applied.

Have your irrigation system evaluated for irrigation efficiency and uniformity. For overhead irrigation systems, use a regular maintenance system for checking pressures and nozzles.

3 Do you irrigate without knowing the soil moisture level in the field?

Having soil moisture sensors placed in the field will help you to avoid water when it is not needed. Two proven field methods for measuring soil moisture are tensiometers and electrical resistance meters. Typically these devices are installed in pairs, one at the midpoint of the plant root zone and one at the bottom. The shallow sensor is used to determine when irrigation is needed, while the deeper one indicates when the soil has been sufficiently wetted.

Another method for scheduling irrigations is based on water balance. The amount of water needed will depend principally on the plant available water-holding capacity of the soil, the soil profile depth, and the crop grown. Inputs to this plant available water include both rainfall and irrigation. Outputs, or water removal, are primarily in the form of evapotranspiration - water removed by the crop (transpiration) and water loss due to evaporation from the soil. Water removal can be determined using either crop water use curves or pan evaporation data.

4 Do you apply pesticides and fertilizers through your irrigation system?

Storing, mixing, and injecting pesticides and fertilizers next to your well or water supply system is not recommended. When adding pesticides and fertilizers, be sure all back flow devices are in place and are operating. If you apply pesticides or fertilizers through your irrigation system, you should review the corresponding sections: ***Assessing Your Fertilizer Storage and Handling Practices***, and ***Assessing Your Pesticide Storage and Handling Practices.*** All wellhead/water source protection equipment and management plans should be in place and thoroughly maintained. Records must be kept on the amount of pesticides and fertilizer applied. All equipment should be calibrated and monitored during the entire period of use.

5 Do you irrigate with liquid waste?

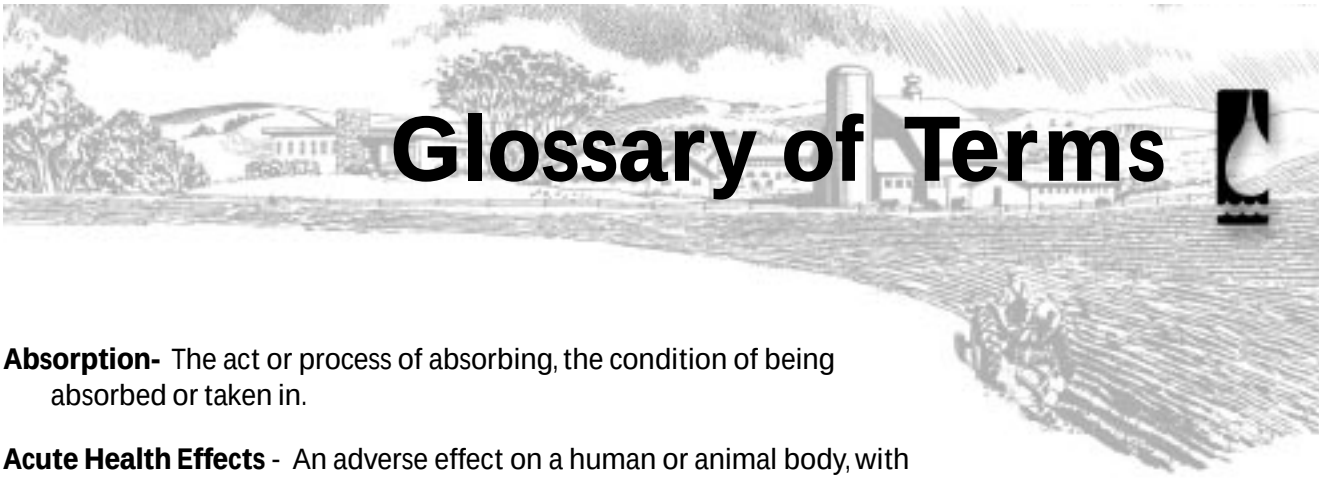
Manure and other wastes can be valuable resources to reduce fertilizer purchases. However, they can become a pollutant when applied improperly. Prior to land application by irrigation, consult with local specialists about application rates and timing. See the section, ***Assessing Your Livestock and Poultry Operations*** for more information.

6 Do you irrigate without keeping updated field-by-field records of the amounts of water, pesticides, and fertilizers applied?

Record-keeping is a very important part of your overall irrigation system operation. Records are a decision-making tool that will help you manage and evaluate the efficiency of your irrigation system. Your records for irrigation management should be kept on a field-by-field basis and added to your other conservation plan materials.

Assessing Your Irrigation Management Practices

If you answered "Yes" to the following questions.	What to do	Who to call	Other References	What you did
Questions 1-3	Develop an irrigation scheduling system; establish a regular maintenance plan; evaluate system for efficiency and uniformity.	Local Cooperative Extension, NRCS, or Soil and Water Conservation District.		
Questions 4-6	Calibrate all equipment; analyze liquid manure nutrient content; install and maintain check valves; develop and implement a nutrient management plan and Integrated Pest Management plan; maintain proper distance from water supply; maintain accurate records on a field-by-field basis.	Local Cooperative Extension, NRCS, Soil and Water Conservation District, or irrigation equipment supplier		



Glossary of Terms

Absorption- The act or process of absorbing, the condition of being absorbed or taken in.

Acute Health Effects - An adverse effect on a human or animal body, with symptoms developing rapidly.

Acute Toxicity - The ability of a substance to cause poisonous effects resulting in severe biological harm or death soon after a single exposure or dose. Also, any severe poisonous effect resulting from a single short-term exposure to a toxic substance. See also Acute health effects, Chronic toxicity

Aquifer - A soil or rock formation which contains water and is a source that can be pumped for surface uses such as drinking water, irrigation water, etc.

Assess - To evaluate, appraise or determine the condition, in this case, all of the management practices surrounding your drinking water supply and how these practices may affect your drinking water.

Back-Siphoning - Drawing liquid from one container to another accidentally when the mouth of the tube or conduit is left below the water surface level. See Check Valve.

Bacteria - Microscopic organisms that live in the soil, water, and organic matter that perform a variety of biological decomposition processes. Bacteria can be beneficial and harmful. Bacteria is the number one source of contamination to drinking water wells.

Bedrock - The solid rock underlying all soil, sand, clay, gravel, and loose material on the earth's surface.

Bentonite - A type of clay that swells tenfold when wetted with water.

Benzene - A clear, colorless, highly flammable liquid made from **petroleum** and used in the manufacture of agricultural products such as detergents, insecticides (DDT), and motor fuels. It was used as an ingredient for some grain fumigants years ago. Benzene is a known carcinogen.

Biological Pest Control - Controlling pests using beneficial insects or plants, or other biological methods.

Best Management Practice (BMP) - A method, measure, procedure or practice used to control or reduce point and nonpoint source pollution.

Borehole - The hole that is made from drilling or boring a hole in the ground. A borehole will usually have a small diameter and be very deep.

Carcinogen - Something that can cause cancer.

Catch Basin - A receptacle used to collect or store water.

Cathodic - The negative pole of a battery or other source of electric power. Cathodic protection is the protection of ferrous metals against rust.

Check Valve - A valve permitting liquids or gases to flow in one direction only.

Chemical Pest Control - Chemicals used to kill undesirable pests (including weeds, insects, fungus, and rodents).

Chlorine - A gaseous element used in water purification, as a disinfectant and as a bleaching agent. Used to treat drinking water wells and cisterns contaminated with bacteria.

Chronic Health Effects - An adverse effect on a human or animal body with symptoms that develop slowly over a long period of time and persist or that recur frequently. See Acute Health Effects.

Chronic Toxicity - The ability of a substance to cause long-term poisonous human health effects, usually resulting from repeated doses of or exposures to the substance over a prolonged period of time.

Cistern - A tank for catching and holding liquids (usually rainwater).

Coliform - A group of bacteria, which may include bacteria from fecal matter, that is tested in drinking water systems and used to indicate the cleanliness of the water.

Compost - A controlled process of decomposition of organic matter by microorganisms.

Contaminant - A substance which makes another substance impure or unsuitable for its original use.

Conservation District - A subdivision of state government that addresses land, water and other natural resource problems at the local level. They are managed by local citizens who know local problems and is staffed by professionals from several natural resource agencies.

Corrosion - Dissolving or eating away by a chemical process, i. e., rusting of underground petroleum storage tanks.

Cover Crops - A crop of close-growing grasses, legumes, or small grain that is grown mainly to protect or improve soil.

Crop Residue - The portion of the crop that is left after harvest has occurred.

Crop Rotation - A planned sequence of changing the crops grown on a particular field. Used to reduce erosion or to control pests and/or diseases.

Debris - Litter, discarded waste, or remains of garbage.

Degrade - To reduce or lower the quality of something.

Domestic Well - A well for household or private use, usually to supply drinking water.

Double Cropping - Growing more than one crop on the same piece of land in one growing season.

Drain Field - An area following a septic tank that allows water to percolate through the soil to remove, filter or process bacteria and other contaminants contained in wastewater.

Economic Threshold - Levels of pest population that, if left untreated, would result in losses of revenue that exceed treatment costs. The use of economic thresholds in making pesticide treatment decisions requires information on pest infestation levels from scouting.

Effluent - The outflow of a sewer, septic system, or other household wastewater discharge.

Erosion - The process in which water or wind moves soil from one location to another. It occurs naturally from weather or runoff, but is often intensified by human activities.

Ethylene Dibromide (EDB) - Fumigant, insecticide or nematocide usually in the form of a wettable powder which is no longer registered in the U.S.

Fecal Coliform Bacteria - Variety of organisms common to the intestinal tracts of man and animals. Their presence in water is an indicator of pollution and potential dangerous bacterial contamination.

Feed Lot - Confined land area for raising animals. Feedlots concentrate large amounts of animal waste in a small area of land.

Filter Strips - Strips of grass or other close-growing vegetation intended to remove sediment or other pollutants from runoff.

Galvanized - A coating used on iron or steel to resist rust. It is a source of zinc and other contaminants when the roof is used as apart of a rain water catchment system.

Ground water (also groundwater) - All water below the surface of the land. Ground water usually refers to subsurface water in a zone of saturation that can be pumped from a well or that flows from a spring or seep.

Grout - A thin mortar for filling cracks and crevices in masonry.

Gullies - Erosion of the soil caused by water being concentrated and removing the soil in channels. The channels are large enough that annual tillage would not remove the channels.

Hazardous Products - In a broad sense, any substance or product or mixture of these which have properties capable of producing adverse effects on the health or safety of a human. Included are substances that are carcinogens, toxins, irritants, corrosives, sensitizers, and agents which damage the lungs, skin, eyes, or mucous membranes.

Household Waste Water - Water that is discarded from your kitchen and/or bathroom.

Impervious - Material that does not allow another substance to penetrate or pass through it.

Impermeable - Having a texture that does not permit water or air to flow through easily.

Infiltration - The movement of water into and through the soil.

Integrated Pest Management (IPM) - The combination of different methods to reduce buildup of pests, including crop rotation to reduce insect buildup, cover crops, enhancement of beneficial insect populations, determination of economic pest thresholds, adjusting planting and harvest periods, and field scouting for pest problems.

Irrigation Scheduling System (ISS) - Controlling the rate, timing and amount of irrigation water so that crop moisture requirements are met while minimizing water losses and soil erosion.

Laundry Additive- Substance added to laundry detergent to improve performance of cleaning agents

Lead - A heavy, rather soft, malleable metal commonly used for making pipes. Lead used to be in many paint products commonly used in households. It can cause acute and/or chronic health effects.

Licensed Pesticide Applicator - An individual who has been trained and certified to properly handle and apply pesticides.

Mechanical Pest Control - A method of tillage or mowing or some other method of physically removing pests.

Microorganism - Microscopic plants or animals, invisible or barely visible to the naked eye.

Nitrates - A necessary compound for plant growth but can produce health risks when excess amounts reach drinking water supplies.

Nonpermeable Material - A material that does not allow the flow of water or another substance through it.

Nonpoint Source Pollution - Pollution caused by water running over and through the land surface, picking up pollutants and carrying them to surface and ground waters.

Nurse Tank - Large tank used as a secondary source to provide water, fertilizers, and other agricultural products for use in application equipment, water troughs, etc.

Nutrient Management Plan - Site specific plan that accounts for all nutrient inputs (manure, commercial fertilizers, crop residues, etc.) and outputs (crop harvest, leaching, etc.).

Pesticide - A chemical product used for controlling pests such as insects, weeds, or diseases. **Banned pesticides** are pesticides which have been outlawed by the Environmental Protection Agency (EPA) and/or other regulatory agencies.

Petroleum - An oily, thick, flammable, usually dark-colored liquid that is used in a natural form or a refined form as fuel, or separated by distillation into gasoline.

Restricted Use Pesticides - Pesticide that can only be purchased and applied by a licensed applicator.

Riparian Areas - Natural vegetation types and sites along watercourses and around water bodies considered critical areas for protecting water quality.

Risk- The chance of personal injury or loss, potential impacts from management practices that may cause adverse health effects, contamination of drinking water, and/or detrimental impacts to natural resources.

Rotational Grazing - A grazing system involving intermittent periods of grazing and rest for the vegetation.

Runoff - The amount of water (from precipitation or irrigation water) that flows over the surface of the land without sinking into the soil.

Secondary Containment - A container that is used to contain products if there is a leak in the primary container. This could be as simple as portable swimming pool or as elaborate as a concrete pad with walls. It should be minimum of 125% of volume being stored.

Septic System - A system designed to treat household wastewater in which solid organic sewage is decomposed and purified by anaerobic bacteria. Standard components consist of a septic tank and a drain/leach field.

Stagnant Water - Water that has been settled for a long time without input of additional fresh water.

Stewardship - To care for areas of environmental or cultural significance.

Sump - A pit or well where water or other liquids are collected; a chamber at the bottom of a machine, pump or circulation system into which a fluid drains before recirculation or in which waste gathers before disposal.

Surface Water - Water that is above ground such as a river or lake.

Toluene - A colorless, water insoluble, flammable liquid used as a solvent in the manufacture of benzoic acid and other organic compounds.

Toxicity - The capability of being toxic or poisonous to either humans, plants, or animals.

Toxins - A chemical or material that can cause acute or chronic health effects.

Virus - An infectious agent which may cause disease when it infects humans, plants or animals.

Water Diversion - A channel or ridge constructed across the slope of the land to divert water away from an area.

Watershed - The area of land, delineated by a ridgeline or basin divide, contributing runoff to a specific stream, river, or body of water.

Well Casing - A pipe or tube constructed of PVC or metal used to line the borehole of a well to prevent contamination of a drinking water supply system.

Wetlands - A lowland area, such as a marsh, swamp, fen, or bog that is saturated with water, has hydric soils, and/or hydrophytic vegetation.

Xylene - Any of three oily, colorless, water-insoluble, flammable, toxic material used in the manufacture of dyes.

Zinc - A metal used in making galvanized iron, and alloys such as brass and die-casting metal. It can cause acute and/or chronic toxicity in animals.

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