



A Common Sense Guide To Rural Environmental Protection



**United States Environmental Protection Agency
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345 Courtland Street, N.E.
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A COMMON SENSE GUIDE TO RURAL ENVIRONMENTAL PROTECTION

INTRODUCTION

In the past, most attention has focused on solving urban environmental problems. However, rural environments, despite their open spaces and peaceful lifestyle, have their own unique problems. Some of these problems concern homeowners who rely upon wells for drinking water and septic tanks for disposal of wastes. They must take extra care to protect underground water sources that supply their wells, especially in areas where rapid growth can compound existing problems if not managed properly. Other problems concern farming operations. Runoff carrying fertilizer and pesticides from agricultural crops, gardens, and lawns can deliver excessive nutrients and toxins into lakes, rivers, and groundwater. Wastes from concentrated animal operations also require special management.

This guide has been developed to provide farmers and the rural homeowner with some practical help in addressing their common environmental problems. It does not provide all the answers, but will guide the user toward a solution. Many references are given throughout the guide to other agencies and organizations that may have information or program responsibilities in a particular area. You are encouraged to take the initiative and seek out information from these sources.

We hope that you will find the guide useful. Remember that it is the collective impact of all of our actions that causes major environmental problems. We must, therefore, work together to correct the problems that already exist and protect our environment for the future.

September 1992

A COMMON SENSE GUIDE TO RURAL ENVIRONMENTAL PROTECTION

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Part I — Around the House

Protecting Your Drinking Water Supply

Why You Should Care

Twenty million people, in 45 major agricultural areas, get their drinking water from private wells. You may be one of them, and if you are, you should be asking yourself if your water is safe to drink.

It's a good question. Wells, cisterns, and springs rely upon underground sources of water. Although we tend to think of them as protected, they can easily be contaminated from activities on the surface. In fact, ground-water contamination has been documented in every single state in our nation.

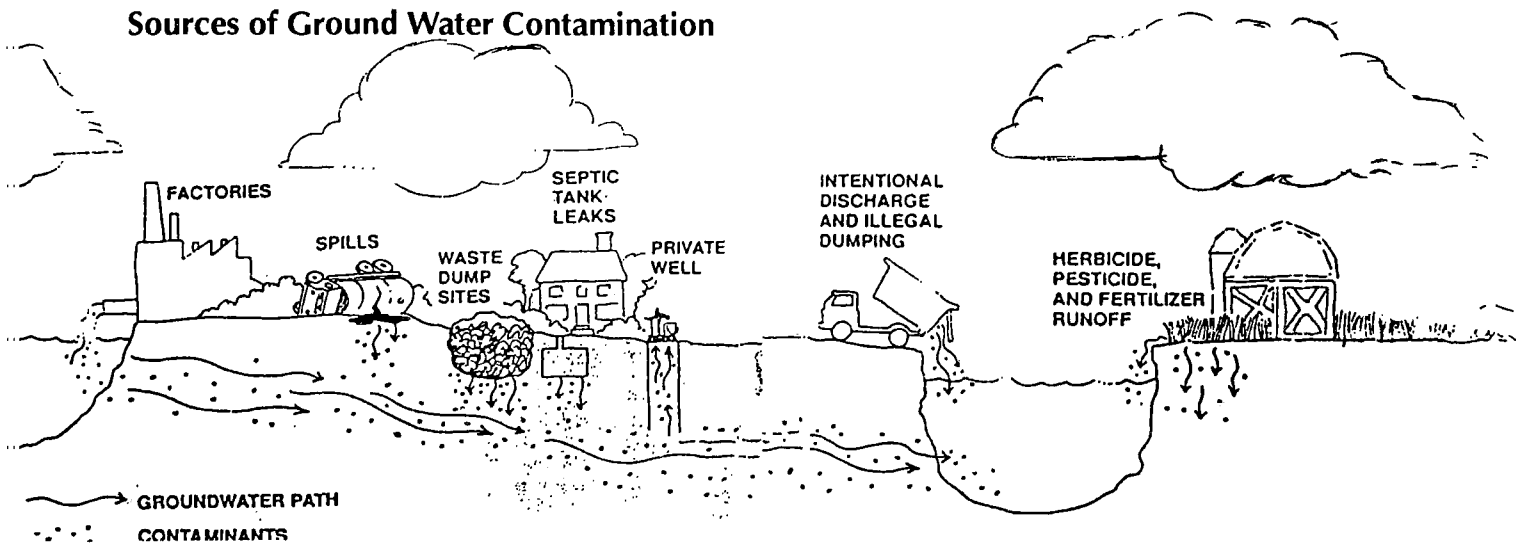
A recent five year EPA survey found that nitrates (from failing septic systems or manure applications) are one of the most common contaminants in private wells. Pesticides — including corn herbicide and other agricultural or weed-control chemicals — were also found in some wells.

What You Should Know

Public water suppliers are regulated by state and federal agencies to ensure that the water they supply is safe to drink. Public water supplies must meet federal standards established by the U.S. EPA under authority of the federal Safe Drinking Water Act passed by Congress in 1974.

In 1986, in response to citizen concerns about the quality of drinking water, Congress passed major new amendments to the Safe Drinking Water Act. Under these new amendments, the number of contaminants to be regulated increases dramatically — to more than 200 by the year 2,000. The amendments also require states to adopt

Sources of Ground Water Contamination



Is Your Ground Water Vulnerable?

Chemicals on Hand:

- ☐ If spilled on the soil, would your products leach?
- ☐ If spilled, would your products break down slowly in the soil?

Site Characteristics:

- ☐ Is the water table (ground water) near the surface?
- ☐ Are there abandoned or unsafe wells on your property?
- ☐ If spilled, would your products run off toward wells and other water supplies?

Soil Properties:

- ☐ Is your soil texture porous so large quantities of water move through it rapidly?
- ☐ Is soil organic matter and clay content insufficient to bind spilled chemicals and slow movement in the soil?

Management Factors:

- ☐ Are your agricultural chemical storage, mixing, and loading areas properly located away from wells and other water sources?
- ☐ Are you properly rinsing and disposing of containers and rinse water?
- ☐ Have you planned for emergencies and rehearsed your response?
- ☐ Do you inspect your well and test your well water periodically?

Source: Alliance for a Clean Rural Environment

ground-water protection programs and ban the use of lead materials in water systems. The law also requires many small water systems to comply for the first time with the new regulations. This may be difficult for many small systems that lack the money and/or technical expertise needed for compliance. They will need significant help from state water protection agencies.

Most rural homeowners are not protected by the new provisions of the Safe Drinking Water Act because the federal regulations apply only to public water suppliers. The regulations do not apply to owners of private wells.

If your drinking water comes from your own well, making sure that it remains safe to drink is your responsibility. This guide will provide you with information you need to actively protect your ground-water supplies.

Wells. There are several types of wells. Many older wells were dug by hand. These *dug wells* draw water from just below the water table, and frequently go dry during periods of drought. Because they are shallow and lack a continuous casing, they are the most easily contaminated.

Driven wells are also shallow wells, and are usually found in shallow sand or gravel. Like dug wells, they can be easily contaminated from surface sources.

Drilled wells use modern equipment to tap water sources deep below the surface. These wells have a continuous casing that extends above the soil surface and is sealed to prevent surface contamination from seeping into the wells. For this reason, drilled wells are less susceptible to contamination.

Sources of contamination.

Bacteria. Fecal coliform and other bacteria associated with human or animal wastes are the most common problem for people with rural wells. High bacteria counts may be caused by runoff from a feed lot, a failing septic system located too near the drinking water well, or an animal that has fallen into a well and contaminated the water supply. High coliform counts indicate the presence of harmful bacteria that can cause serious health problems.

Agricultural or barnyard runoff. Excess manure applications, or barnyard wastes, can raise both bacteria and nitrate levels in your wells, making the water unfit to drink.

Pesticides. While pesticides increase crop yield, they can also seriously contaminate a drinking water supply, even years or decades later. This is sometimes the case for homes that are built on former cropland. Farmers must take care that pesticides and other potentially hazardous substances are applied and disposed of properly.

Underground or Above Ground Oil Tanks. Spills or leakage from an oil tank located near your well can eventually contaminate your water. Usually, the only remedy is to drill a new well.

What You Can Do

Action steps for private well owners:

1. Test your water. Bacteria levels should be checked at least once a year, or after periods of intense rain or flooding. Nitrate levels should also be checked once a year to prevent problems for small children or young farm animals. If tests show high levels of nitrates, you may want to test for pesticides as well. Contact your county

health department for help with testing. If they can't help, contact your state Department of Health or the regional EPA office in Atlanta. (See references at the end of this chapter.)

2. Locate your well properly. Location can mean the difference between a contaminated water supply and a quality one. Be sure to install your well upslope of *all* potential sources of contamination — the barnyard, feedlot, fuel tank, chemical storage area, and septic system. Also, if you have your own garbage area, be especially careful to dispose of household or farm chemical containers and waste properly.

3. Inspect your well carefully. Inspect the casing surrounding your well to make sure that no surface water can enter the system and contaminate your water. The casing and locking cap on your well should extend at least a foot above the soil surface, and the seal should be tight. Cracks in the seal or grout must be repaired to prevent surface water (and potential contaminants) from running down the side of the casing and entering the well below the casing. To find out how deep your casing extends, contact the driller to see if the original records are available.

4. Store/Dispose of chemicals properly. Store and mix your agricultural chemicals as far away from your well as possible. Rinse containers and equipment and dispose of empty containers away from your wells. Rinse water can be saved and re-applied to crops, or used to dilute additional applications. Never use an abandoned well or a sinkhole to dump wastes or empty containers.

Where to Get More Help

The following agencies can provide help with a specific question or problem involving your well, cistern, or spring:

county or state health depts.	state water resources depts.
state natural resources agencies	state land-grant colleges
state conservation departments	Cooperative Extension Service.

For general information on drinking water standards or other drinking water topics and issues, contact:

**The EPA Safe Drinking Water Hotline
Toll-Free: 1-800-426-4791**

The hotline operates Monday through Friday from 8:30 a.m. to 4:30 p.m. EST

U.S. EPA Region 4
Drinking Water Branch
345 Courtland Street, N.E.
Atlanta, Georgia 30365
404-347-2913

For information on well construction or general information on protecting agricultural water supplies, contact:

The American Ground Water Trust
6375 Riverside Drive
Dublin, OH 43017
614-761-2215

Alliance for a Clean Rural Environment (ACRE)
P.O. Box 413708
Kansas City, MO 64179-0386
800-545-5410

For a list of certified well drillers in your area, contact:

The National Water Well Association
614-761-1711

For information on home water treatment units, contact:

The Water Quality Association
Consumer Affairs Department
P.O. Box 606
Lisle, IL 60532
312-369-1600

The National Sanitation Foundation
3475 Plymouth Road
P.O. Box 1468
Ann Arbor, MI 48106
313-769-8010

Publications:

Two fact sheets published by the Alliance for a Clean Rural Environment (ACRE) provided valuable information for this section. They are:

- ☐ *Protecting Rural Wells from Contamination* (ACRE fact sheet number twenty)

- ☐ *Testing Well Water for Contamination* (ACRE fact sheet number nineteen)

The following publications also provided valuable information for this report and are recommended to the reader. They are:

- ☐ *Ground Water and the Rural Homeowner* (U.S. Dept. of the Interior/Geological Survey; Federal Center, Box 25425; Denver, CO 80225)
- ☐ *What You Need to Know About Water Wells in Georgia* (Georgia Department of Natural Resources, Environmental Protection Division; Room 400; 19 Martin Luther King Jr. Dr., SW; Atlanta, GA 30334; 404-656-3214)
- ☐ *Citizen's Guide to Ground-Water Protection* (EPA brochure)
- ☐ *Citizen Monitoring: Recommendations to Household Well Users* (EPA brochure)
- ☐ *Drinking Water from Household Wells* (EPA brochure)
- ☐ *Your Drinking Water: From Source to Tap* (EPA brochure)

On-Site Sewage Disposal

Why You Should Care

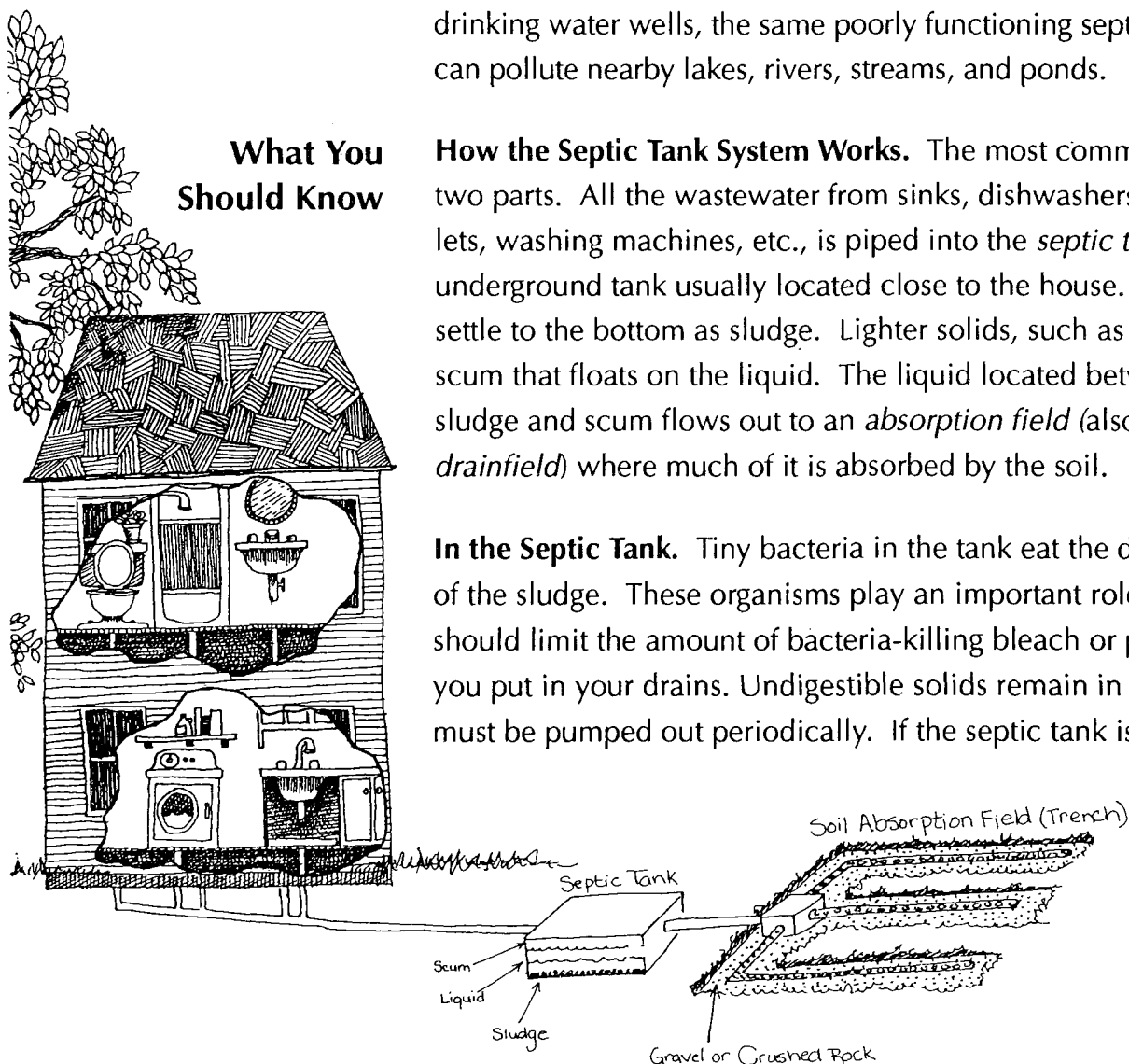
Nearly one-third of all American citizens — and most rural residents — dispose of human and household wastes on their own property, usually with a septic tank/soil absorption system. Septic systems generally do a good job of protecting people and the environment from contamination. However, a system that is poorly located, poorly constructed, or poorly maintained can seriously contaminate the ground water that supplies the family's drinking water wells. In fact, wells contaminated with bacteria or viruses are considered a leading cause of water-borne diseases, including gastrointestinal illnesses that are sometimes misdiagnosed as an upset stomach or the flu.

Bacterial contamination is most likely where shallow wells are located too close to a septic system. In addition to contaminating nearby drinking water wells, the same poorly functioning septic system also can pollute nearby lakes, rivers, streams, and ponds.

What You Should Know

How the Septic Tank System Works. The most common system has two parts. All the wastewater from sinks, dishwashers, showers, toilets, washing machines, etc., is piped into the *septic tank*, a large underground tank usually located close to the house. Heavy solids settle to the bottom as sludge. Lighter solids, such as grease, form scum that floats on the liquid. The liquid located between the sludge and scum flows out to an *absorption field* (also called a *drainfield*) where much of it is absorbed by the soil.

In the Septic Tank. Tiny bacteria in the tank eat the digestible part of the sludge. These organisms play an important role, and you should limit the amount of bacteria-killing bleach or pesticides that you put in your drains. Undigestible solids remain in the tank and must be pumped out periodically. If the septic tank is not pumped



out, solids will continue to collect and will eventually clog the drainfield. The system will then fail. When that happens, the drainfield must be replaced — at substantial cost to the owner.

The Soil Absorption Field. The drainfield is most often a network of perforated pipes set in trenches with gravel above and below. Every time wastewater enters the septic tank, some liquid is forced out into the field. The liquid is filtered by the gravel before entering the surrounding soil, which acts as the final barrier against pollution. Some of the liquid is taken up by plants and grasses. The majority is filtered slowly through the soil to the underlying ground water.

The size of the drainfield depends on the amount of water used in the home or facility. The more water used, the greater the area required. Other factors, such as soil permeability and land features (trees, property lines), must also be considered because some soils are simply not suitable for septic tank systems. High ground water, impervious soils (clay), or a very thin layer of soil over bedrock indicate poor conditions for septic systems. In these areas, foul odors from septic tank backup or ponding in yards is common.

Where to locate your septic system. Assuming that the soil characteristics are favorable for a septic system, other considerations must be taken into account when selecting a location. Generally, the system should be located downhill from wells and springs, and at least 50 feet from any water supply, stream, or lake. Care should also be taken to prevent the roots of nearby trees or bushes from clogging the drainfield.

What You Can Do **Do's and Don'ts for a healthy septic system.** If properly installed and maintained, a septic system can serve you well for many years. Here are some suggestions to make sure that *yours* remains a trouble-free wastewater disposal system.

Do's:

1. Do check with your county health department before building in an area that does not have sewers. Most counties require a permit to build a septic system.
2. If you are buying a home in a subdivision, do check to be sure that the developer obtained all the necessary permits.
3. Do pump your septic tank every 2 or 3 years.
4. Do conserve water. Repair all leaky fixtures and install low flow toilets, showerheads, and faucet aerators. Studies show that the use of low-flow fixtures can increase the life of your system. You will also save on your total energy costs, especially if you pump water from a private well.

Don'ts

1. Don't use a garbage disposal. This only adds to the solids the septic tank must handle. If you do use a disposal, have your tank pumped *at least* once a year.
2. Don't throw kitchen grease, chemicals, acids, or large items down your drains or toilets. Make sure that any drain cleaners you use are labeled "safe for use in septic tanks."
3. Don't plant trees or bushes near the drainfield where roots can clog your system.
4. Don't cover the drainfield with asphalt or other hard surface.
5. Don't drive a car or other heavy machinery over the drainfield.

Where to Get More Help

Homeowners who have questions or a problem with their septic system should call their local public health office first. If they are unable to solve the problem, contact the county or state health department, or the EPA Region 4 office.

For more information, contact:

U.S. EPA National Small Flows Clearinghouse
West Virginia University, P.O. Box 6064
Morgantown, WV 26506-6064
Toll-Free: 1-800-624-8301

U.S. EPA Region 4
Small Community Outreach and Education Coordinator (SCORE)
345 Courtland Street, N.E.
Atlanta, Georgia 30365
404-347-3633

Publications:

The following publications provided valuable information for this report and are recommended to the reader. They are:

- ❑ *Small Wastewater Systems: Alternative Systems for Small Communities and Rural Areas* (EPA Brochure)
- ❑ *Septic Tanks and Soil Absorption Systems: An Owners Guide to Care and Maintenance* (Tennessee Valley Authority. Distributed by the Division of Environmental Sanitation; Tennessee Department of Public Health; Ben Allen Road; Nashville, Tennessee 37216)
- ❑ *Understanding Your Septic System* (The Freshwater Foundation. 2500 Shadywood Road; Box 90; Navarre, Minnesota 55392; 612-471-8407)
- ❑ *Septic Tank Systems: Function and Maintenance* (Rural Community Assistance Corporation, Environmental Services Division. 2125 19th St., Suite 203; Sacramento, CA 95818; 916-447-2854) .
- ❑ *Manual of Instruction for Sewage Treatment Plant Operators* (New York State Department of Public Health. Health Education Service; P.O. Box 7238; Albany, NY 12224)

Reduce Waste By Buying Smart

Why You Should Care

Over the last four decades, "throw-away" behavior has become increasingly common. At the same time, many areas of our country are facing a solid waste crisis. The amount of trash is growing, but there are fewer places to put it.

Common sense tells us that the first step in solving the problem is to produce less waste to begin with. Any activity that does this is called source reduction. Reducing, reusing and re-manufacturing are all forms of source reduction,. For example, the container that began its life as a peanut butter jar can be washed and reused to store something else. Relying on a durable coffee mug that is cleaned and reused hundreds of times will cut down on the need for disposable cups. Not only can activities such as these save landfill space, but they help conserve natural resources and prevent some of the pollution that may accompany manufacturing.

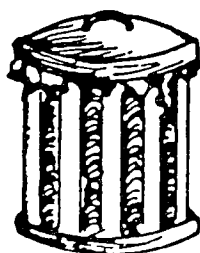
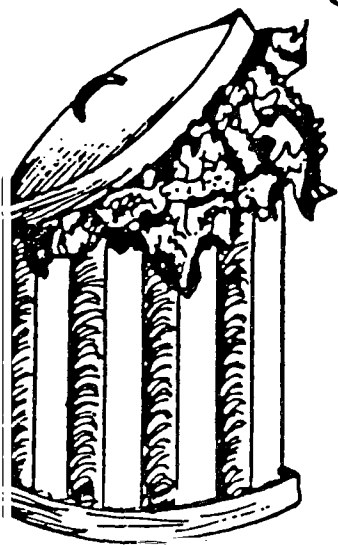
Source reduction also includes reducing the toxicity of products. Look for ways to reduce their use.

What You Should Know

What's in our trash. Containers and packaging make up about 30 percent of the waste we generate. Non-durable goods — paper and plastic food service products, disposable products, newspapers, and magazines — make up another 30 percent. The remainder of our trash includes glass, metals, yard and food wastes, plastics, wood and other substances.

What You Can Do

We can all help by evaluating our daily waste-producing and shopping habits to determine which ones are really necessary and which are not. Source reduction can be as simple as reaching for a sponge instead of a paper towel, sharing a magazine with a friend, or donating old clothes and appliances to charity. The charts on the next page give some suggestions for practical steps you can take to reduce waste and at the same time save money, resources, and the environment.



Where to Get More Help

Most state environmental departments have a recycling or solid waste division. The phone numbers of state recycling offices are listed at the end of chapter 4.

For more information about source reduction, contact:

The EPA RCRA/Superfund Hotline
toll free: 800-424-9346

U.S. EPA Region 4
Office of Solid Waste
345 Courtland St
Atlanta, Georgia 30365
404-347-2091



Recycle It!

Why You Should Care

Each year Americans throw away about 2.9 million tons of cans, 9.9 million tons of glass bottles, 14.2 million tons of plastics, 53.4 million tons of paper and paperboard, and 1.8 million tons of tires. In fact, we make enough garbage every year to fill a convoy of trash trucks reaching halfway to the moon.

Recycling this trash makes sense. It saves energy. It saves our natural resources. And it protects the quality of our air and water.

What You Should Know

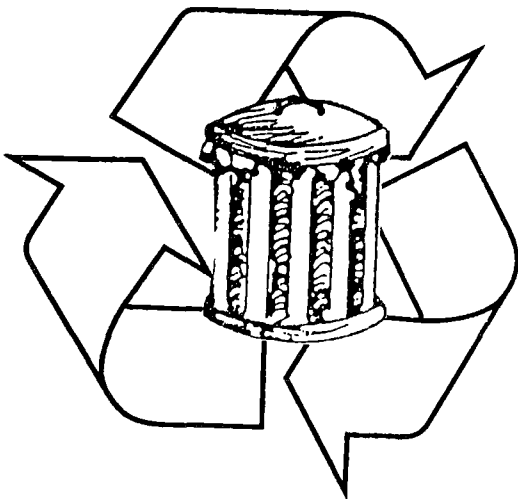
What is recycling? Recycling is a three-step process that involves:

- collecting and separating materials that can be recycled
- using the materials to make new products
- reusing the new product

The first step — sorting and collecting recyclable glass, cans, and other products — is too often the last step for many people. The individual consumer, as well as businesses, must buy products made from recycled goods. This will guarantee a steady market for the materials you collect and will make it profitable for businesses to use recycled materials for their packaging.

What can be recycled? When people think of recycling, they usually think first of paper or aluminum cans. But many other things can be recycled as well, including yard and kitchen wastes and used oil. The chart on the next page lists some of the items readily recycled.

Composting. Composting is nature's original recycling project. Composting is cheap, easy, doesn't require a lot of space, and can provide nutrient-rich soil for your gardening projects. And it can cut down significantly the amount of trash you must dispose of, because household organic wastes and yard wastes — leaves, grass clippings, food scraps — can be as much as 25-50 percent of your total garbage.



What's Recyclable?

Construction Waste & Tires

Reprocessed for Pressed
Board, Roads, and Other
Construction Projects

Plastics, Drink Bottles

Reprocessed for Auto
Parts, Fiberfill, Strapping

Aluminum Cans

Reprocessed for Can
Sheet and Casings

Yard Waste

Composted for Garden-
ing, Landscaping

Other Metals

Cleaned & Reprocessed
as Scrap & Structural
Products

Glass

Refilled or Cullet for Jars,
Bottles, Construction
Material

Furnishings & Clothing

Reused by Another
Person

Animal Waste

Used as Fertilizer

Paper

Reprocessed as
Newsprint, Paperboard,
Insulation

Homeowners can compost in their backyard. Farmers can compost on a much larger scale to produce a commercial product for use on croplands or by landscapers and nurseries.

How to set up a compost pile. Setting up a compost pile in your yard is neither difficult nor time consuming. The compost bin can be made from lumber, plywood, chicken wire, etc.

- 1) At the bottom of the pile, put a 6-10 inch layer of bulky materials (straw, corn stalks, leaves, or wood chips).
- 2) Next, add a 2-3 inch layer of grass clippings, garden scraps, manures, and kitchen wastes (egg shells, fruit and vegetable scraps and coffee grounds). Do not add meat, bones, or fatty foods such as cheese, oils or grease.
- 3) Make sure that all materials stay moist, but not wet.
- 4) Turn the pile once a week to provide the oxygen the bacteria need to break down the wastes.
- 5) The compost should be ready for use within 2-6 months. The composting process is quicker during the warmer months of the year.

If you don't have the space for a compost pile, see if a neighbor can use your yard waste, or talk with community officials about setting up a town-wide project. The listings at the end of this chapter include publications that provide detailed information on what and how to compost as well as case studies of cities and towns that successfully operate composting programs.

Used oil. While most oil used in industrial processes is routinely recovered, the used automotive oil of do-it-yourselfers poses a real threat to the environment. But used oil can be successfully recycled.

General collection programs. Many communities have established general curbside collection programs or drop off centers to encourage recycling. These typically take separated glass, paper, plastics, metals, and other recyclable materials to a central facility where they are processed for transport to processors and manufacturers.

What You Can Do

Everyone can participate in recycling.

- Contact your local solid waste management authority to find out what kind of recycling opportunities exist in your community.
- Take your old car battery and used motor oil to an automotive service center that collects them for recycling.
- Encourage local businesses and merchants to recycle office paper, corrugated cardboard, aluminum cans, bottles, and other materials.
- Buy products made from recovered materials or packaged in recycled materials.
- Set up your own food and yard waste compost pile in your backyard.

Where to Get More Help

There is a great deal of information and assistance available to local communities and individuals interested in recycling.

STATE RECYCLING OFFICES:

Alabama

Solid Waste Section
Land Division
Dept. of Environmental Management
1751 Congressman W.L. Dickinson Dr.
Montgomery, AL 36130
205-271-7726

Florida

Solid Waste
Dept. of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Rd.
Tallahassee, FL 32399-2700
904-922-6104

Georgia

Dept. of Community Affairs
1300 Equitable Building
100 Peachtree St.
Atlanta, GA 30303
404-656-3836

Kentucky

Resource Conservation Branch
Division of Waste Management
Dept. for Environmental Protection
Fort Boone Plaza, 18 Reilly Rd.
Frankfort, KY 40601
502-564-6716

Mississippi

Waste Reduction/Waste Minimization
Dept. of Environmental Quality
Bureau of Pollution Control
P.O. Box 10385
Jackson, MS 39289-0385
601-961-5171

North Carolina

Office of Waste Reduction
Dept. of Environment, Health, and
Natural Resources
P.O. Box 27687
Raleigh, NC 27611-7687
919-571-4100

South Carolina

Facility Engineering
Bureau of Solid and Hazardous
Waste Management
Dept. of Health and Environmental
Control
2600 Bull St.
Columbia, SC 29201
803-734-5200

Tennessee

Dept. of Environment and Conservation
701 Broadway
Customs House, 4th Floor
Nashville, TN 37243-1535
615-741-3424

STATE RECYCLING ASSOCIATIONS:

Kentucky

Kentucky Recycling Association
P.O. Box 90005
Bowling Green, KY 42101-9005
502-781-2381

North Carolina

North Carolina Recycling Association
P.O. Box 25368
Raleigh, NC 27611-5368

South Carolina

South Carolina Recycling Association
c/o South Carolina Clean and Beautiful
Dept. of Parks, Recreation, and Tourism
1205 Pendleton Street, Suite 517
Columbia, SC 29201
803-734-0143

Tennessee

Tennessee Recycling Coalition
615-255-0123

NATIONAL ORGANIZATIONS:

National Recycling Coalition

1101 30th Street, NW
Washington, DC 20007
202-625-6410

Environmental Defense Fund

128 East Hargett St.
Raleigh, NC 27601

FEDERAL GOVERNMENT:

EPA RCRA/Superfund Toll-free Hotline: 800-424-9346

U.S. EPA Region 4

Office of Solid Waste
345 Courtland Street, N.E.
Atlanta, Georgia 30365
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PUBLICATIONS:

- ☐ *If You're Not Recycling You're Throwing It All Away*
(Environmental Defense Fund flyer)
- ☐ *Waste Reducer's Checklist* (King County Solid Waste
Division, Seattle, Washington flyer)
- ☐ *Recycling Works!* (Case studies, EPA brochure)
- ☐ *Recycle* (EPA flyer)
- ☐ *Environmental Fact Sheet: Yard Waste Composting* (EPA
brochure)
- ☐ *Why Waste a Second Chance?: a small town guide to recycling*
(National Association of Towns and Townships, Wash-
ington, D.C. 20005, 202-737-5200)
- ☐ *Composting in Your Own Back Yard* (GA Dept of Natural
Resources fact sheet, 1-800-33-GA-EPD)

Household Hazardous Waste

Why You Should Care

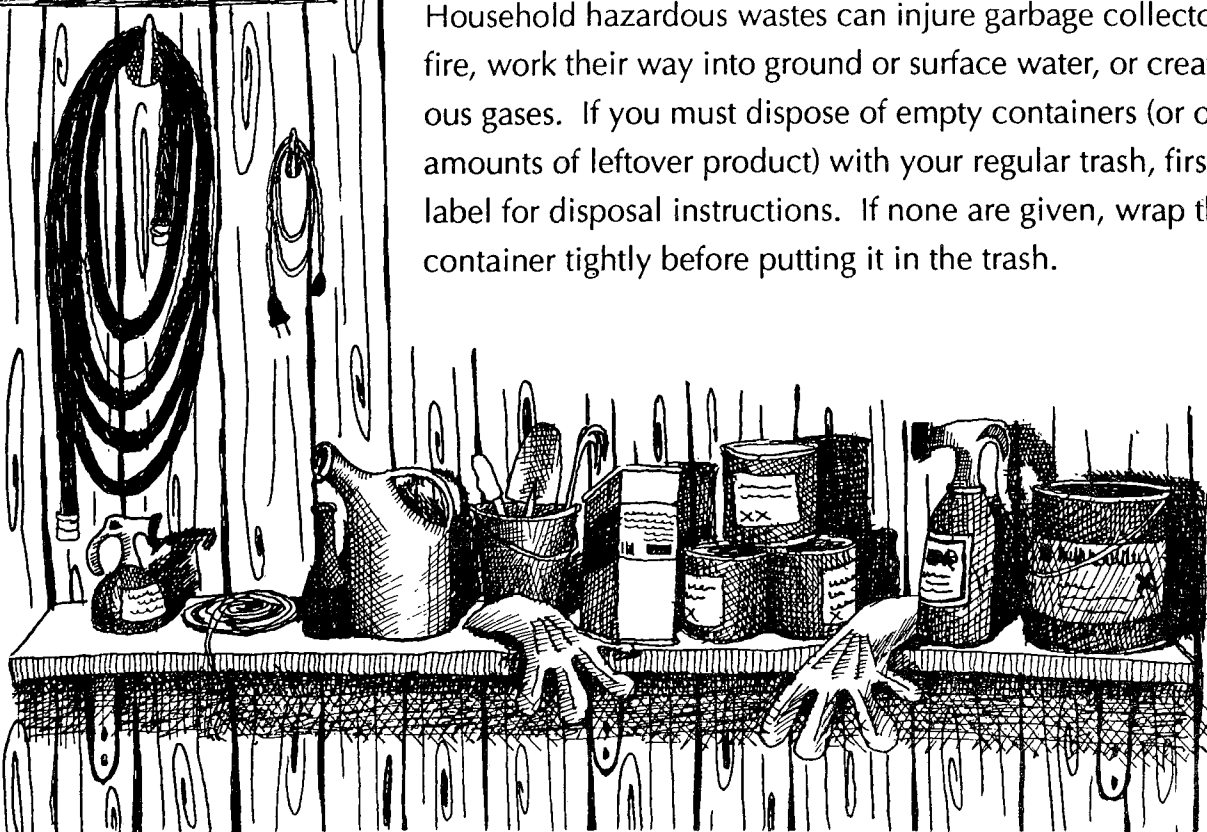
Some of the things you buy in a supermarket and use around your home may contain hazardous substances that are known to cause health problems in humans. They can also be harmful to ground water and the environment in general, even in very small amounts. These everyday products include such things as motor oil, some pesticides, paint, mothballs, flea collars, weed killers, some household cleaners, and even some medications. Some of these products, such as used motor oil, can be successfully recycled.

What You Should Know

Disposing of household hazardous wastes requires special care. Before you throw that can of used oil in the trash, before you pour that left-over nail polish remover down the drain, consider the following:

Read the product label carefully. The label should tell you whether the product is poisonous, corrosive, or flammable, and often will give instructions for disposing of any leftover product or the empty container. Of course, the best disposal method is to *use up the product* or give it to someone who can.

Don't put it in the trash. Household hazardous wastes should only be thrown out with the rest of the household trash as a last resort. Household hazardous wastes can injure garbage collectors, catch fire, work their way into ground or surface water, or create dangerous gases. If you must dispose of empty containers (or of small amounts of leftover product) with your regular trash, first check the label for disposal instructions. If none are given, wrap the closed container tightly before putting it in the trash.



Landfills just can't take it. Many municipal landfills are not designed to handle hazardous materials. As rain and snow-melt filters through the trash in a landfill, a liquid called leachate is formed. If the landfill is unlined, this leachate may eventually carry the hazardous substances from your trash to both ground and surface waters.

Don't pour it down the drain. Small amounts of some wastes, such as toilet bowl or bathroom cleaners, may be poured down the drain with plenty of water. However, most other products should not be disposed of this way because anything you pour down your drain or flush down your toilet will enter your septic system or your community's sewer system. You risk damaging your septic system and contaminating the ground water. Substances entering a sewer system may eventually contaminate rivers, lakes, or streams.

Don't dump it on the ground. Substances you dump or bury in the ground can contaminate the soil, the ground water, or be carried into a nearby lake or stream by runoff during rainstorms. They can also harm birds and small animals who come into contact with them.

Don't throw out your used oil. While most oil used in industrial processes is routinely recovered, the used automotive oil of do-it-yourselfers can be a real threat to the environment. One gallon of used oil from a single oil change can contaminate a million gallons of water.

What You Can Do

There are very few options for disposing of hazardous products used in your home, so the first step may be to avoid buying such products or limit your use of them. You can:

- Ask your merchants what non-toxic alternatives are available *and then use them* (see page 12 for a list of safer substitutes for many household products).
- Check your local library or bookstore for guidebooks containing non-toxic household tips.

If you must buy a product containing toxic substances, you can:

- Purchase only the amount you can use at one time.
- Dispose of product containers properly.

- Check to see if your town sponsors Hazardous Household Waste Collection days. If they don't, ask them to sponsor one.

How it can work — a success story. In 1977, the state of Alabama decided to do something about the problem of used oil. First, the state set up a non-profit program known as Project Rose. It conducted surveys to find out where the used oil would come from and how it could be collected. Then it identified sponsors for pilot collection projects. Finally it educated the public about the goals of the program. The result? In 1986 Alabamians recycled 8.2 million gallons of used oil, saving money and protecting the environment.

Where to Get More Help

For more information on household hazardous waste, contact the RCRA director for your state:

STATE RECYCLING OFFICES:

Alabama

Land Division
Dept. of Environmental Management
1751 Congressman W.L. Dickinson Dr.
Montgomery, AL 36130
205-271-7730

Florida

Bureau Waste Planning & Regulation
Dept. of Environmental Regulation
2600 Blair Stone Rd.
Tallahassee, FL 32399-2700
904-488-0300

Georgia

Land Protection Branch
Department of Natural Resources
Floyd Towers East, Room 1154
205 Butler St., S.E.
Atlanta, GA 30334
404-656-2833

Kentucky

Division of Waste Management
Dept. for Environmental Protection
Fort Boone Plaza, Building #2
18 Reilly Rd.
Frankfort, KY 40601
502-564-6716

Mississippi

Groundwater Division
Dept. of Environmental Quality
Bureau of Pollution Control
P.O. Box 10385
Jackson, MS 39289-0385
601-961-5171

North Carolina

Div. of Solid Waste Management
Dept. of Environment, Health, and
Natural Resources
P.O. Box 27687
Raleigh, NC 27611-7687
919-733-2178

South Carolina

Bureau of Solid and Hazardous
Waste Management
Dept. of Health and Environmental
Control
2600 Bull St.
Columbia, SC 29201
803-734-5200

Tennessee

Div. of Solid Waste Management
Dept. of Health and Environment
701 Broadway
Customs House, 4th Floor
Nashville, TN 37219-5403
615-741-3424



**Before disposing of any of these
common household hazardous substances,
be sure to check the label for
disposal requirements and/or instructions.**

**In many cases,
it may be illegal to dispose of the product
in a manner which is inconsistent with the label.**

Cosmetics

nail polish & remover

Housecleaning Supplies

some cleansers, furniture & floor
polish, metal polish, some rug
cleansers, drain openers
some toilet bowl cleaners

Laundry Supplies

dry cleaning solvents
moth balls and flakes
spot removers

Medicines

chemotherapy drugs
mercury from a broken thermometer
shampoo for lice

Other Products

aerosol cans containing any
pressure or fluids, butane lighters
lighter fluid, some flea powder
some pet shampoo
shoe dye and polish

Automotive Supplies

aluminum cleaner, auto body
filler, transmission fluid
brake fluid, carburetor cleaner
car wax, chrome polish, diesel fuel
engine degreaser, gasoline, kerosene
lubricating oil, used motor oil

Building Supplies

asbestos, fluorescent lamps
some glues, cements, wood
preservatives

Garden Supplies

some fungicides, herbicides
insecticides, rat poison
snail & slug poison
weed killer, vegetation killer

Painting Supplies

latex-based paint, oil-based paint
model airplane paint
paint stripper, paint thinner
turpentine, mineral spirits

Hobby Supplies

acrylic paint, chemistry sets
oil paint, epoxy, resins
photographic chemicals/solutions
fiberglass, rubber cement thinner

STATE PUBLICATIONS:

Florida

Amnesty Days Information Packet. Department of Environmental Regulation, Bureau of Operations, 2600 Blair Stone Road, Tallahassee, FL 32399 (904-488-0190). Free information on the state-sponsored collection.

North Carolina

Household Hazardous Waste: Collection and Disposal Options for North Carolina Communities. Outlines procedures on how to organize a collection program. Institute for Environmental Studies, 311 Pittsboro St. 256H, University of North Carolina, Chapel Hill, NC 27514 (919-966-3332)

FEDERAL GOVERNMENT:

U.S. EPA Region 4

Office of Solid Waste
345 Courtland Street, N.E.
Atlanta, Georgia 30365
404-347-2091

FEDERAL PUBLICATIONS:

The following publications are available free by calling

EPA RCRA/Superfund Toll-free Hotline: 800-424-9346

- ☐ *How to Set up a Local Program to Recycle Used Oil*
(EPA/530-SW-89-039A)
- ☐ *Recycling Used Oil: 10 Steps to Change Your Oil*
(EPA/530-SW039D)
- ☐ *Recycling Used Oil: What You Can Do* (EPA/530-SW039B)

The following publication is available free by calling the

EPA Safe Drinking Water Toll-free Hotline: 800-426-4791

- ☐ *Citizen's Guide to Ground-Water Protection*
(EPA/440/6-90-004)

Other publications of interest:

- ☐ *Household Hazardous Waste Management News*
(The Waste Watch Center, 16 Haverhill St., Andover, MA 01810)
- ☐ *Disposal: Do It Right, Managing Household Wastes*
(The Household Products Disposal Council, 1201 Connecticut Ave., N.W., Suite 300, Washington, DC 20036)
- ☐ *Complete Trash: The Best Way to Get Rid of Practically Everything Around the House* (by Norm Crampton)

Lawn Care That Protects Water Quality

Why You Should Care

Leaves, lawn clippings and debris, and pesticides and fertilizers help contribute to the beauty of your home and yard. Unfortunately, they can also pollute lakes, streams, and rivers—and the ground water that may be your water supply.

What You Should Know

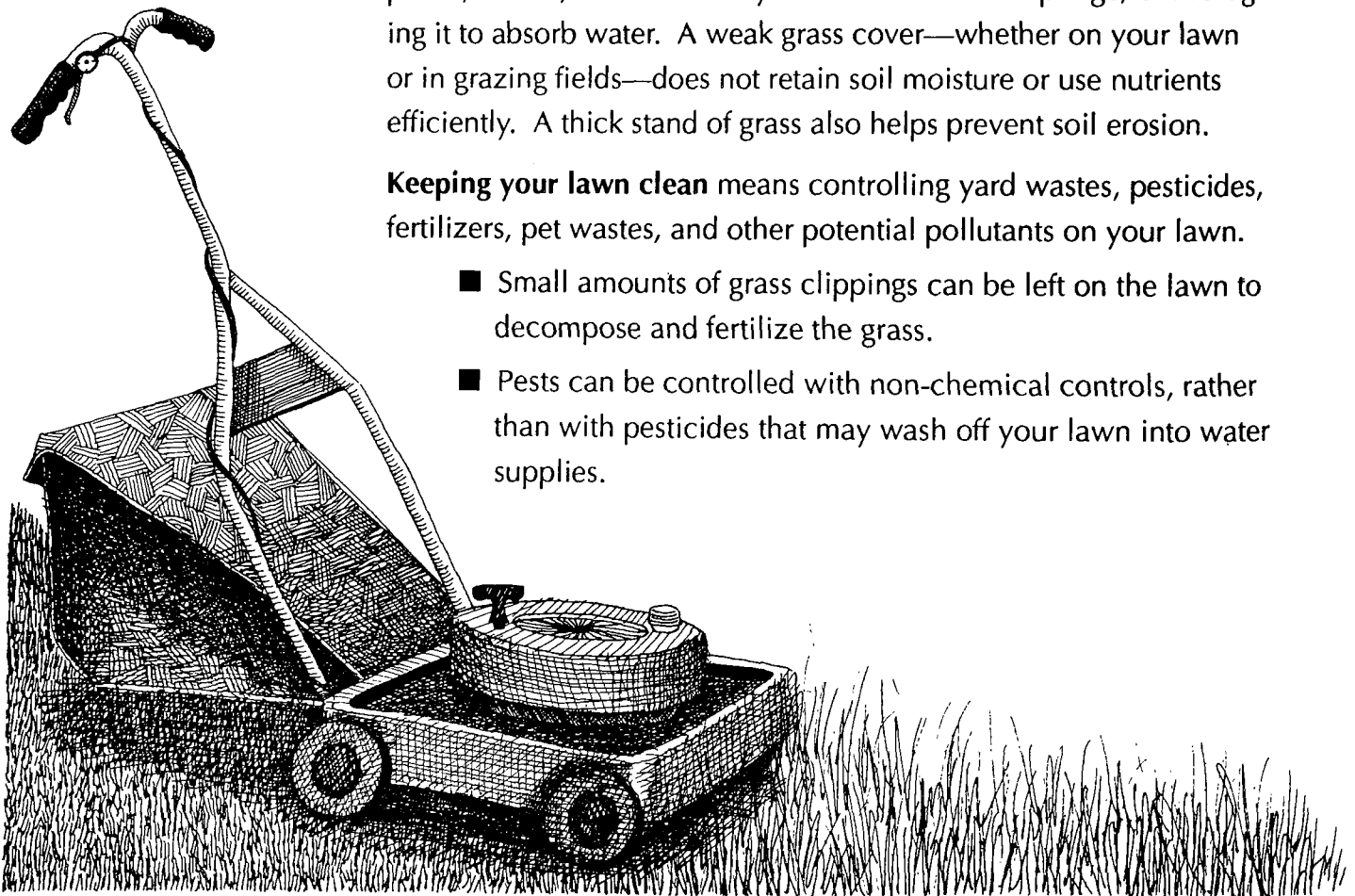
If you maintain a healthy lawn and garden, you can protect your water supply, prevent soil erosion, reduce pest problems, and reduce or eliminate the use of pesticides. The basic prescription for a healthy lawn involves :

- reducing runoff, and
- keeping your lawn clean.

Reducing runoff. Water is supposed to soak into the ground, not run off the top. Runoff should be controlled, not only to conserve limited water supplies, but also to prevent the most common way pollution reaches our lakes and streams. Dense grass, ground cover, plants, shrubs, or trees make your soil more like a sponge, encouraging it to absorb water. A weak grass cover—whether on your lawn or in grazing fields—does not retain soil moisture or use nutrients efficiently. A thick stand of grass also helps prevent soil erosion.

Keeping your lawn clean means controlling yard wastes, pesticides, fertilizers, pet wastes, and other potential pollutants on your lawn.

- Small amounts of grass clippings can be left on the lawn to decompose and fertilize the grass.
- Pests can be controlled with non-chemical controls, rather than with pesticides that may wash off your lawn into water supplies.



- Fertilizers should be used sparingly. While the nutrients they contain (nitrogen, phosphorous, and potassium) nourish plants and encourage healthy growth, they can also encourage weed growth and algae in lakes, rivers, and streams.
- Pet wastes can be buried to prevent disease-causing bacteria and other organisms from contaminating water.

What You Can Do Practice the basics of good lawn care.

1. When you cut the grass, remove only the top third of the leaf, and leave the grass clipping on the lawn. Always remember to direct your lawn mower chute away from paved areas so that the clippings do not wash into storm sewers.
2. If you bag your grass clippings, use them as a mulch around plants or compost them to use in gardening projects later. Do not place fresh or green clippings around plants.
3. Water only if needed, to a soil depth of about six to eight inches. This amounts to about one inch of water, enough for most turf grasses. This watering pattern will encourage deep, healthy root growth.
4. Water your lawn between sunset and sunrise to reduce the amount of water lost through evaporation. Early morning is the next best time to water your lawn.
5. Use insect and disease-resistant varieties of grass.
6. Decide what level of pests you can live with before you apply pesticides to your lawn. If you need to use pesticides to control a pest problem, choose the proper pesticide for your lawn and your pest, purchase only the amount you need, and *always follow label directions*. You may also choose a pesticide with a less toxic chemical.
7. Pesticides have a short shelf life and disposal of any left-over product can be a problem. Follow directions carefully, and don't apply when rain is forecast, as the rain may wash the pesticide into sewers or natural drains.

8. Have your soil tested every few years to see how much and what kind of fertilizer you need. Then use the least amount possible. Water your lawn lightly after applying fertilizer so that is quickly absorbed by the lawn. As with pesticides, don't apply if heavy rain is predicted within 24 hours.

**Where to Get
More Help**

Contact your **county extension agent** for more information on lawn care. Homeowners interested in reducing their exposure from pesticides should obtain a copy of

☐ *Citizen's Guide to Pesticides* (EPA brochure, #20T-1002)

The guide is available from

U.S. Environmental Protection Agency
345 Courtland St., NE
Atlanta, Georgia 30365
404-347-4216

Information is also available from:

National Pesticides Telecommunications Network Hotline
800-858-7378

Protect Your Indoor Air from Radon and Asbestos

Why You Should Care

The air you breathe may contain radon or asbestos. You cannot see radon gas in your air. You cannot see asbestos fibers in your air. But both are potentially deadly.

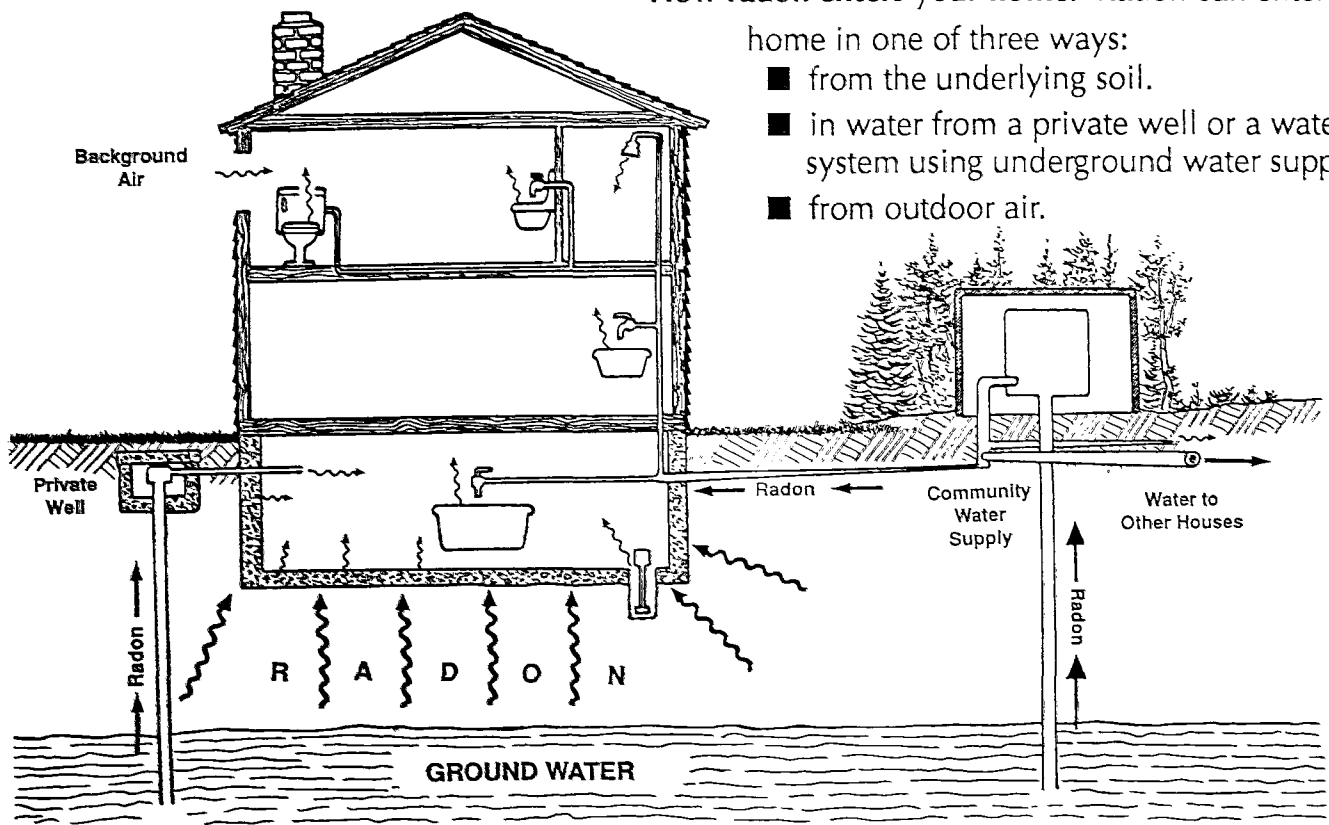
Radon is a colorless, odorless, and tasteless radioactive gas produced in nature through the radioactive decay of radium in soil and rocks. It can dissolve in water and be released into the air. Outdoors, radon is present at very low levels in air and is generally not a problem. However, when trapped in an enclosed space such as a home, radon can accumulate and can increase your risk of developing lung cancer.

Asbestos is a mineral composed of small thin fibers. It was common in building materials and was used in many, many farm homes from the early 1900's to the mid-1970's. In fact, it was once regarded as a wonder material because it was such an effective insulator and because it retarded fire. Later, this same material was found to increase people's risk of developing lung cancer, asbestosis (a serious lung disease), and mesothelioma (a cancer of the lining of the lung or abdominal cavities).

What You Should Know

How radon enters your home. Radon can enter your home in one of three ways:

- from the underlying soil.
- in water from a private well or a water system using underground water supplies.
- from outdoor air.



What You Should Know About Asbestos

Usually, radon enters a home by seeping through walls and floors from the underlying soil. Radon can seep into a home through dirt floors, cracks in concrete floors and drains, sumps, joints, and tiny cracks or pores in hollow-block walls.

Radon can also enter your home through your household water if your water comes from your own well or from a public water supply system using wells. Because radon is a gas, some radon is released to the air when water is agitated during such normal household activities as showering, washing clothes and dishes, and preparing food.

The amount of radon entering a home from the outdoor air (i.e., the “background level”) is usually small. Exposure to this small amount of radon is unavoidable.

Where asbestos may be found in your home. There are two types of asbestos materials:

1. **friable** materials can be crumbled, pulverized, or reduced to powder by hand pressure. Examples include:
 - sprayed-on surfacing materials that are very fibrous and fluffy; pipe insulation; and
 - troweled-on surfacing materials that are granular and cement-like;
2. **nonfriable** materials are hard and some are cement-like in appearance. Examples include:
 - cement asbestos board siding or shingles
 - vinyl asbestos floor tile and sheet vinyl.

Any room in your home may contain asbestos materials.

Walls and Ceilings may have sprayed-on or troweled-on surfacing materials.

Furnaces, Boilers, Heaters, Pipes, and Ducts may be covered with asbestos insulation materials.

Floor Coverings such as sheet vinyl (including the backing or underlayment), vinyl tile, and vinyl tile adhesive may all contain asbestos.

Exterior surfaces such as cement board siding or shingles may contain asbestos.

What You Can Do About Radon

Test your home's air for radon. Radon levels in air can vary greatly from house to house on the same street due to differences in bedrock, soil, and housing construction. Your next door neighbor's home could have very high radon levels, while your house may have no radon problem. The only way to find out if your home has high levels of radon is to test your home's indoor air. If indoor air levels are high, you may want to test your water if you have your own well or are served by a water system using wells.

The level of radon in household air is usually measured as the number of picocuries of radon in each liter of air (pCi/L). The greater the number of pCi/L in air, the greater the risk of lung cancer. The goal is to reduce radon in household air to as near the outside air level as possible. EPA believes that levels in most homes can be reduced to about 4 pCi/L.

Since you cannot see or smell radon, special equipment is needed to detect it. The most common radon detectors are the charcoal canister and the alpha track detector. These are exposed to the air in your home for a period of time and sent to a laboratory for

WHAT THE RADON TEST RESULTS MEAN

In deciding whether or how quickly to take action to reduce radon levels, you may find the following guidelines useful. You should try to permanently reduce your radon levels as much as possible. Based on currently available information, EPA believes that levels in most homes can be reduced to about 4 pCi/L.

If your results are:

200 pCi/L or higher:

Exposures in this range are among the highest observed in homes. EPA recommends that you take action within several weeks to reduce levels as far below 200 pCi/L as possible. If this is not possible, you should determine, in consultation with appropriate state or local health or radiation protection officials, if temporary relocation is appropriate until the levels can be reduced.

20 to 200 pCi/L:

Exposures in this range are considered greatly above average for residences. You should take action within several months to reduce levels as far below 20 pCi/L as possible.

4 pCi/L to 20 pCi/L:

Exposures in this range are considered above average for residences. You should take action to lower levels to about 4 pCi/L or below within a year or two—or sooner, if levels are at the upper end of this range.

4 pCi/L or lower:

Exposures in this range are considered average (1 pCi/L) or slightly above average for residences. Although exposures in this range do present some risk of lung cancer, reductions of levels this low in household air may be difficult, and sometimes impossible, to achieve.

Remember:

There is increasing urgency for action at higher concentrations of radon. The higher the radon level in your home, the faster you should take action to reduce your exposure.

analysis. If an elevated radon level is found, a follow-up test should be taken to confirm the result.

How to get rid of the radon. If test results indicate that you have a problem with radon in your home, you will need to take action to reduce the levels. Effective measures include sealing off radon entry routes and installing one of several systems to capture the radon before it enters the house and exhaust it to the outside. You may want to consider hiring a professional to help design the system for your home, or call your state radon office (listed at the end of this chapter) for more information.

What You Can Do About Asbestos

By taking the right actions, you can reduce your risk of exposure to asbestos. But — by taking the wrong actions, you can seriously increase your risk of exposure.

1. Identify materials in your home that are likely to contain asbestos. Examine walls, tiles, ceilings, and floors to see if they are in good condition. Do not undertake *any* renovations in your home without first being sure that the materials do not contain asbestos.

2. Do not try to remove asbestos materials yourself. Asbestos fibers can linger in the air and be breathed in by you or members of your family. If you do decide to remove materials containing asbestos, you should seek out a professional who has been certified to remove asbestos.

Sometimes asbestos materials may be left safely in place. The key here is to be sure that the asbestos-containing surfaces remain intact. For example, the asbestos insulation around pipes may be sealed with a safer material. As long as the covering remains undisturbed, there is no danger to people from the asbestos.

3. Do not touch or disturb asbestos materials on walls, ceilings, pipes, or boilers. This includes any activity that could permit asbestos fibers to enter the air:

- drilling holes,
- hanging plants from ceilings,
- hanging pictures on walls,
- sanding floor tiles or backing materials,
- hanging curtains, drapes or dividers.

Where to Get More Help

RADON:

STATE RADON OFFICES

Alabama

Department of Public Health
Radiological Health Branch
State Office Building
Montgomery, AL 36130
1-800-582-1866

Florida

HRS Office of Radiation Control/Radon
1317 Winewood Blvd.
Tallahassee, FL 32499-0700
1-800-543-8279

Georgia

Dept. of Human Resources
878 Peachtree St.
Room 100
Atlanta, GA 30309
404-894-6644

Kentucky

Cabinet for Human Resources
Radiation Control Branch
275 E. Main Street
Frankfort, KY 40621
502-564-3700

Mississippi

Dept. of Health
Division of Radiological Health
P.O. Box 1700
Jackson, MS 39215-1700
601-354-6657

North Carolina

Dept. of Environment, Health, and
Natural Resources
Radiation Protection Division
P.O. Box 27687
Raleigh, NC 27611-7687
919-571-4141

South Carolina

Dept. of Health & Environmental Control
Bureau of Radiological Health
2600 Bull St.
Columbia, SC 29201
803-734-4700/4631

Tennessee

Div. of Air Pollution Control
Custom House
701 Broadway
Nashville, TN 37243-1531
615-741-4634

ASBESTOS:

EPA has published a number of helpful documents. For copies,
phone the

**EPA ASBESTOS HOTLINE
202-554-1404**

Or contact

U.S. Environmental Protection Agency
Regional Asbestos Coordinator
345 Courtland Street, NE
Atlanta, Georgia 30365
404-347-5014

Part II — Around the Farm

The Importance of Smart Nutrient Management

Why You Should Care

Much of the fertilizer applied by farmers each year is wasted. Not only are farm profits reduced, but some of the fertilizer ends up in our lakes or drinking water—where it can cause serious problems.

Smart nutrient management begins with basic soil erosion control. High rates of soil erosion from crop fields means that excessive amounts of soil, water, and precious nutrients are simply being washed away each time it rains. A mixture of traditional conservation practices and crop management adjustments might be needed to reduce high rates of erosion.

After excessive soil erosion is checked, the smart farmer will apply the right amount of fertilizer, at the right time, for the best result. He will test his soil and manure for nutrient content before adding fertilizer and will use planting and application methods that conserve water and reduce soil erosion. He will also know that applying too much of even a good thing is a waste of money. *By applying only the amount of nutrients the plants can use, costs are kept down, while crop yields remain steady or increase.*

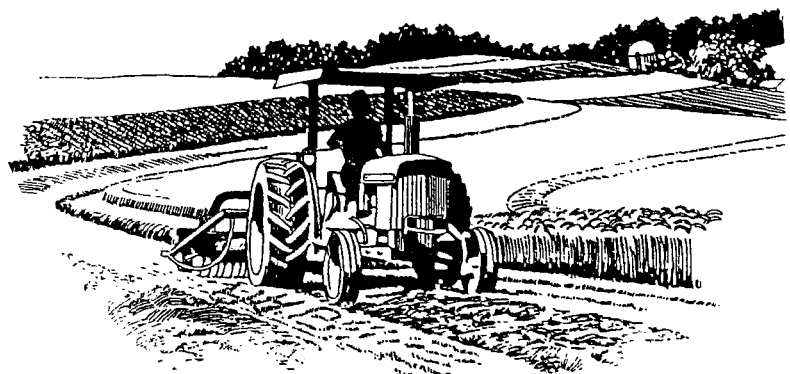
What You Should Know

Using Nitrogen Wisely. Nitrogen is essential for plant growth. In the soil, nitrogen is converted into nitrates which dissolve easily in water, making them readily available to plants. But research shows that *average crop uptake of nitrogen fertilizer is only about 50%.* What happens to the remaining nitrogen? Much of it is lost, either through leaching below the root zone or to the air.

SOUND NUTRIENT MANAGEMENT

means using

- ✓ the right amount of fertilizer
- ✓ in the right place
- ✓ at the right time
- ✓ for the highest economical yield
- ✓ with the smallest loss of nutrients to ground or surface waters.



Ground-Water Contamination. Some of that lost nitrogen can contaminate the ground water. Since most people in rural areas drink untreated ground water from wells and springs, preventing nitrate contamination of ground water is very important. Contamination most often occurs either because 1) too much nitrogen is applied; or 2) the fertilizer is applied at the wrong time, before the crop can use it; or 3) the fertilizer is applied to sandy or limestone soils that cannot hold it.

A Serious Health Threat. Nitrate contamination of drinking water is a health threat, especially to children. The most serious documented effect of nitrate contamination is known as “blue baby disease.” In this condition, nitrates react chemically with the baby's blood and can, in extreme cases, result in suffocation.

Using Phosphorus Wisely. Similar arguments can be made for the smart use of phosphorus, another nutrient essential for plant growth. Phosphorus helps plants convert sunlight into food. How much phosphorus is available to plants usually depends on the type of soil, not on the type of plant. This is because phosphorus, unlike nitrates, does not dissolve in water. It is usually “tied up” with soil, and is lost either through crop uptake or erosion.

For this reason, applying phosphorus at the right time and in the right way is very important, and can save you money. In fact, most plants don't need large amounts of phosphorus. Manure may provide most of your crop's phosphorus needs.

Surface Water Contamination. The single most important source of pollution of lakes and ponds today is sediment from non-point sources, such as agricultural fields. Sediments containing phosphorus add nutrients to water. This encourages the growth of algae and aquatic plants and speeds up the natural aging process of lakes and ponds.

What You Can Do

Conservation Plans. Get the most for your money. Develop a Plan for your farm that combines needed conservation practices and improved management into Resource Management Systems (RMSs). RMSs protect all natural resources, including soil, water, air, plants, and animals from degradation while maintaining or improving farm income. A few considerations are listed here.

1. Control Soil Erosion and Runoff to reduce potential contamination of lakes and streams while retaining nutrients and soil. **Use Filter Strips between fields and open bodies of water to trap nutrients before they contaminate surface water.**

2. Set Realistic Yield Goals, taking into account soil texture and drainage characteristics, weather, and previous field yields. **Keeping accurate records for each field** over a number of years can be a big help. Take the actual yield for a particular field for each of the last five years, drop the poorest year, and average the remaining four yields. Keep track also of the type of crop planted and the amount and types of manure or other fertilizer applied.

3. Test Both Soil and Manure to determine nutrient content. Soil should be tested in the early spring, for pH as well as residual nutrient content. Manure should be tested every three years or whenever feed mixture or bedding is changed. You may be able to reduce the amount of nitrogen and phosphorus needed from other sources.

4. Apply Manure or Fertilizer When They Are Of Most Use to the Crop. Once the crop has passed the stage of highest nitrogen uptake, applied nitrogen will not benefit the plants.

5. Apply Manure or Fertilizer Where They Are Of Most Use to the Crop. *Incorporate nitrogen applications into the soil* to prevent surface runoff and cut down on losses to the air. About 50% of the nitrogen in manure is available the first year if it is incorporated within 3 days. *Place phosphorus next to rows for greatest plant uptake.* Banding, sub-surface injection, and split application can also increase the availability of the phosphorus to the plant.

6. Use Crop Management that includes rotations, proper variety and hybrid selection, appropriate seeding rates, planting times, pest control, and water management to help ensure yield goals are met and applied nutrients are used. Apply cover crops to "scavenge" for unused nutrients.

7. Establish or manage vegetation along the banks of streams and drainage ways. These buffers have many benefits including filtering and uptake of water pollutants before they reach the stream. A plan that includes a designed sequence of trees, shrubs, and grassy plants works best. These areas can be managed as multipurpose environmental corridors.

Soil and Water Conservation Practices Slow and Control Runoff and Reduce Soil Erosion

- | | | |
|-----------------------------------|----------------------------|---------------------------|
| 1. Grassed Waterways | 2. Contour Strip Cropping | 3. Diversions |
| 4. Terraces | 5. Conservation Tillage | 6. Grass/Legume Rotations |
| 7. Cover Crops | 8. Buffer or Filter Strips | 9. Tile Outlet Terraces |
| 10. Water/Sediment Control Basins | | |

Recommended Separation Distance for Surface Application of Organic Wastes by Type of Application Method			
	Surface Spreading	Incorporation or Injection	Irrigation
Streams	100-300 ft.	50 ft.	200 ft.
Lakes	100-300 ft.	100 ft.	300 ft.
Water Wells	200 ft.	200 ft.	200 ft.
Sinkholes	100 ft.	50 ft.	200 ft.

Where to Get More Help

For more information, contact:

U.S. EPA, Region 4
Watershed Unit Chief
345 Courtland Street, N.E.
Atlanta, Georgia 30365
404-347-2126

or the

USDA Soil Conservation Service

The following publications provide valuable information. They are available from the Regional EPA office or from the organizations listed below.

- ☐ *Treasure of Abundance or Pandora's Box.* (Soil and Water Conservation Society. 7515 Northeast Ankeny Road, Ankeny, Iowa 50021. 505-289-2331)
- ☐ *Fact Sheets on Nitrogen, Pesticide, Phosphorus.* (Conservation Technology Information Center, 1220 Potter Drive, Room 170, West Lafayette, IN 47906-1334, 317-494-9555)
- ☐ *Alternative Agriculture* (Board on Agriculture, National Research Council, National Academy Press, 2101 Constitution Avenue, NW, Washington, DC 20418)
- ☐ *Protecting our Groundwater: A Grower's Guide.* (American Farm Bureau Federation, National Agricultural Aviation Association, National Agricultural Chemicals Association, U.S. Dept. of Agriculture, Extension Service)
- ☐ *Riparian Forest Buffers, Function and Design for Protection and Enhancement of Water Resources.* NA-PR-07-91 (U.S. Dept. of Agriculture, Forest Service)
- ☐ *Field Office Technical Guide* (U.S. Dept. of Agriculture, Soil Conservation Service)

Managing Animal Waste

Why You Should Care

Even a small livestock operation generates substantial amounts of waste products. For example, one 50 cow dairy herd produces the equivalent of 100,000 lbs. of 10-4-8 fertilizer every year. In larger operations, the sheer volume of accumulated wastes can present a major disposal problem. If improperly handled, these by-products can contaminate ground and surface waters, and pollute rivers, streams, and drinking water wells.

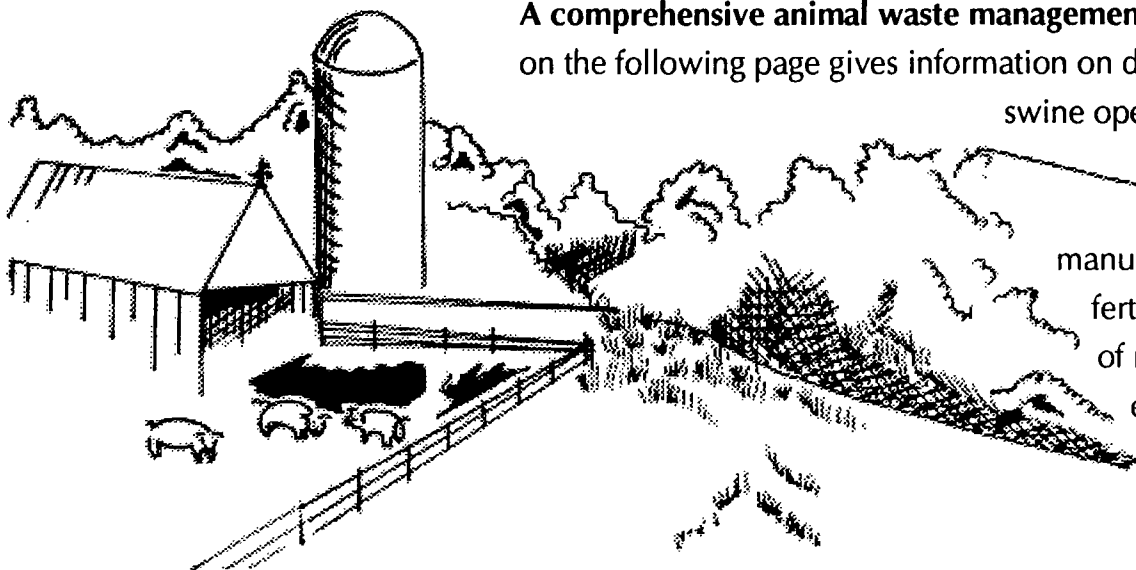
Treating animal wastes as a usable by-product or disposing of wastes properly can save you money and reduce your risk of damaging the environment. In the process, you will also improve your overall operation. Effective management practices will:

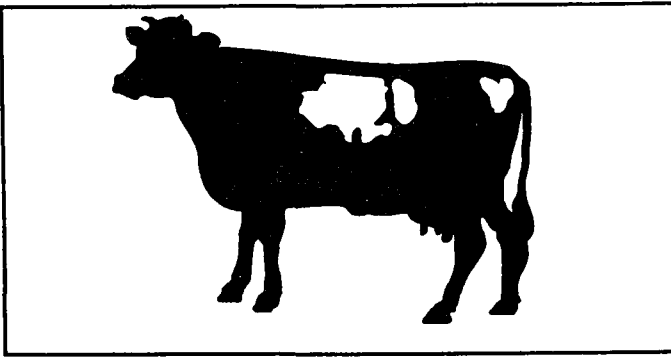
- reduce fertilizer costs
- improve soil quality
- protect water resources, air quality and health.

What You Should Know

More than just manure. Most people immediately think of manure when they think of animal waste, but poultry and livestock operations produce other wastes as well. A total waste management program should take into account all of the sources of waste in an operation. This section focuses primarily on controlling manure, but the organizations and reference materials listed at the end of this chapter can help you improve your management of all your operation's wastes.

A comprehensive animal waste management program. The chart on the following page gives information on dairy, cattle, poultry, and swine operations. It estimates typical waste products, amounts of manure generated, and the fertilizer value of each type of manure. A careful examination of the chart will help you estimate the volume of wastes in your operation.





Dairy Cattle

Manure generated:

1000 pounds live weight = 14 to 15 tons manure/year.

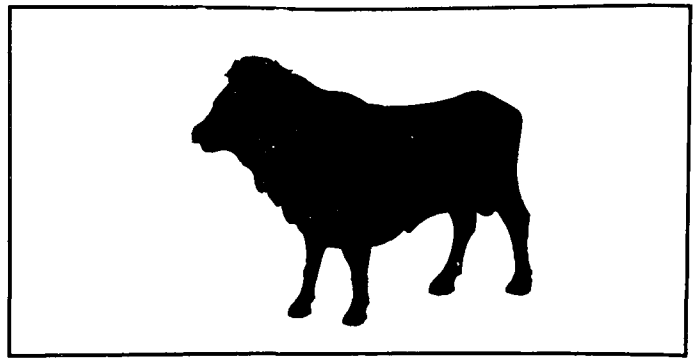
50 cow herd = 1,000 tons/year.

Fertilizer Value:

1 ton of manure = 100 lbs. of 10-4-8 fertilizer

Typical Waste Products:

washwater	polluted rainfall runoff
waste milk	waste feed
manure	milk from fresh cows
cleansers/disinfectants	



Beef Cattle

Manure generated:

1000 pounds live weight = 10 to 11 tons manure/year.

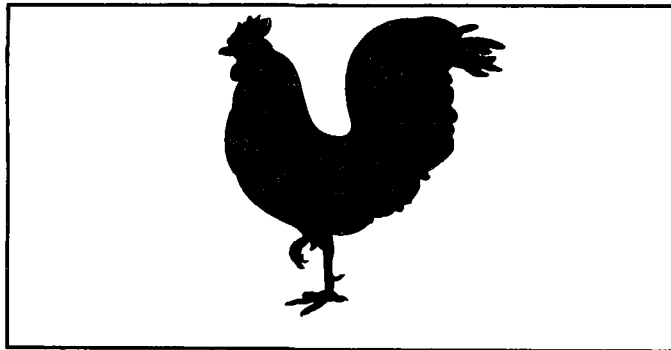
50 cow herd = 500 tons/year.

Fertilizer Value:

1 ton of manure = 100 lbs. of 11-7-10 fertilizer

Typical Waste Products:

manure	waste feed
polluted runoff from	
pastures and holding areas	



Poultry

Manure generated:

100,000 layers = 11 tons manure/day, 3,800 tons/year

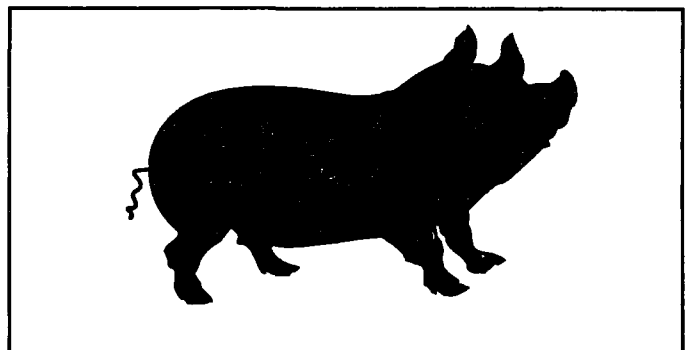
100,000 broilers = 6 tons/day, 2,000 tons/year

Fertilizer Value:

1 ton of manure = 100 lbs. of 15-20-15 fertilizer

Typical Waste Products:

egg washwater	waste feed
bad or broken eggs	dead birds
flush water	manure



Swine

Manure generated:

100 lbs. live weight = 1 gallon manure/day

1 finishing pig = 2 tons/year

Fertilizer Value:

1 ton of manure = 100 lbs. of 10-9-8 fertilizer

Typical Waste Products:

waste feed	manure (feces and urine)
dead animals	washwater
rainfall runoff	leaking watering devices

What You Can Do

Establish a comprehensive waste management system. The four parts of an efficient system are:

1. Collection.
2. Transportation.
3. Storage for use as fertilizer or treatment and disposal.
4. Treatment and utilization

1. Collection. Collection methods include scraping, washing, and flushing, and the use of slotted floors that allow manure to drop into pits for removal. In poultry operations, scrapers on cables beneath cages are common. In swine production, sloping floors and collecting/flushing gutters are often used. Regardless of the method used, the system must be properly operated and maintained.

2. Transportation. The type of system you use to transport manure depends primarily on whether you are storing waste temporarily for use as a fertilizer or are treating and disposing of it.

Depending upon the operation, manure can be moved by manure spreaders, pumps, cross conveyors, or augers. In some operations, movement is through a liquid system such as gravity flow, flushing pits or pumping.

3. Storage for later use as fertilizer. The purpose of storage facilities is to conserve nutrients and make the waste a better soil conditioner and fertilizer. The type of storage system — wet or dry — will depend on your operation and your nutrient needs. Regardless of which method is used, care must be taken to operate and maintain the system properly. If manure is stored improperly or for too long, it will decompose and nutrients will be lost.

Wet storage systems use storage ponds, concrete pits, and above ground tanks to store liquid wastes for a short time — up to 60 days. When needed, sludge and liquid are mixed and spread on the land. Advantages of a wet system include lower construction costs and a smaller required land area.

Dry storage systems allow longer term storage — up to six months. The systems consist of a dry, covered stack, and a separate storage pond to collect washwater from a milking parlor and/or runoff from feedlots. It is essential that the dry stack be covered and gutters and curbs installed to keep rain water out of the storage area.

4. Treatment and Utilization. Apply animal wastes in proper amounts and at appropriate times to meet the needs of growing crops. If over-fertilizing is a problem, especially in fields located near streams or lakes, consider treating animal wastes in a lagoon system. Lagoons lower the nutrient value of manure and other wastes and reduce the risk of water pollution. Phosphorus is reduced by as much as 90 percent; nitrogen by as much as 60 to 90 percent.

Both solids and liquids, such as runoff or wastewater, are collected in the lagoon, which can be anaerobic or aerobic. *Anaerobic* lagoons break down animal wastes without using oxygen or aeration. These lagoons are small, but very deep, and odor is sometimes a problem. They can not handle human waste. *Aerobic* lagoons use oxygen to break down animal wastes. They are shallower than anaerobic lagoons and need a larger land area. They also create less odor. Sludge from both types of lagoons must be removed periodically, and can be applied to the land as needed.

Operation and Maintenance. Whether you raise cows, swine, or poultry, one thing is certain. The success of your waste management system will depend in part on how well you maintain and operate it. To get the most value from your system:

- incorporate waste utilization into your crop nutrient management plan.
- establish collection schedules.
- apply waste on land at the right time, in the right place, and in the right amounts.
- manage surface water runoff.
- control odors and pests.
- apply wastes away from streams and waterways.
- use sound safety guidelines.
- maintain grass filter strips.
- sample nutrient content of the waste and the soil regularly and keep accurate records.
- repair leaks to watering devices.
- ventilate properly to prevent buildup of toxic vapors or excess humidity.
- check weather conditions before applying. Do not apply wastes before a predicted rain or when the humidity is high.
- upgrade size of waste management facilities consistent with size of the animal operation.

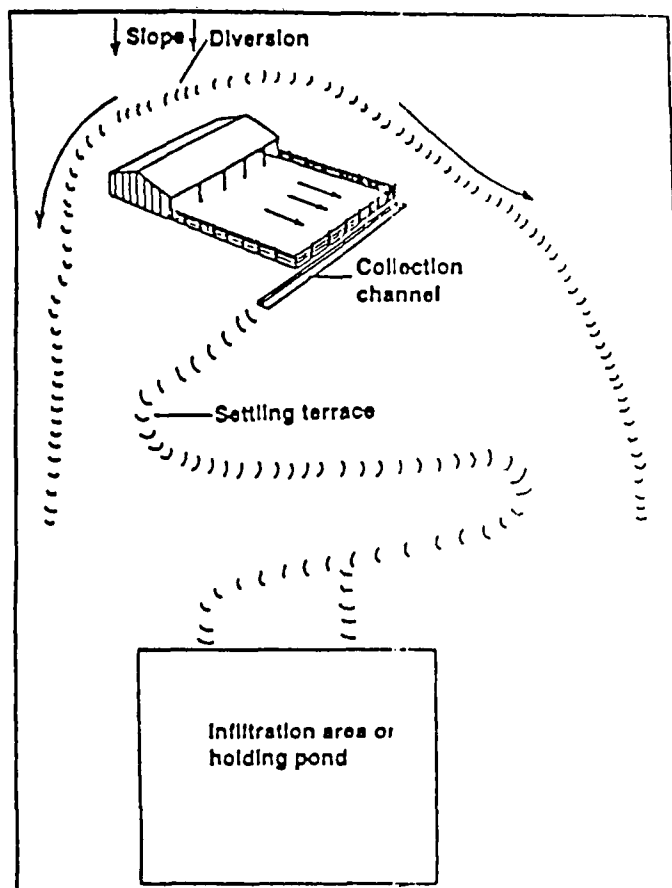
Other Considerations

A comprehensive waste management system will take these important things into consideration.

Land application. To obtain the greatest value from your animal wastes, first calculate how much nutrient the crop needs. Apply nutrients during the period of maximum crop uptake. This chart gives examples of nitrogen, phosphate, and potash removal from soil by various crops. For a more detailed discussion of this topic, see chapter 8 of this Guide.

Crop	Units	lb removed per unit production		
		N	P ₂ O ₅	K ₂ O
Corn, grain	bu	1.0	0.4	0.3
Corn, stover	ton	20.6	7.5	37.2
Corn, silage	ton	7.4	2.9	8.9
Soybeans, grain	bu	—	1.0	1.3
Soybeans, residue	ton	—	6.5	15.8
Wheat, grain	bu	1.3	0.5	0.3
Wheat, straw	ton	13.0	3.6	24.6
Oats, grain	bu	0.7	0.3	0.2
Oats, straw	ton	12.4	4.6	32.9
Barley, grain	bu	1.0	0.4	0.3
Barley, straw	ton	13.5	4.7	31.0
Rye, grain	bu	1.0	0.5	0.3
Rye, straw	ton	10.0	6.0	16.9
Alfalfa	ton	—	11.0	50.0
Orchard grass	ton	50.0	16.6	62.5
Brome grass	ton	33.2	13.2	50.8
Tall fescue	ton	38.6	18.6	52.9
Blue grass	ton	25.8	18.3	60.0
Clover-grass	ton	41.0	13.3	38.9
Timothy	ton	37.5	13.8	62.5
Sorghum-Sudangrass	ton	39.9	15.3	55.9

Source: University of Delaware, College of Agricultural Sciences
Cooperative Bulletin # 25



Source: University of Delaware, College of Agricultural Sciences
Cooperative Bulletin # 25

Runoff control. The runoff from a barnyard must be controlled to prevent pollution of surface and ground water. The amount of rainfall or snowfall is more important than the size of the barnyard when it comes to calculating potential pollution.

Begin by taking a close look at the ways water enters the barnyard — from gutters, roofs, or up-slope fields. Clean water should be channeled away from the barnyard. Water that flows through the barnyard must be diverted to a central settling basin or other treatment area. Up to 80 percent of manure solids can be removed in this way.

Protecting streams and ponds. Runoff from fertilized fields or livestock areas can seriously contaminate nearby streams and ponds with nutrients, bacteria, and organic matter. Consider putting up a fence to restrict livestock, or plant a barrier strip of native grasses or trees to reduce sediment flow. Water quality will be protected and wildlife habitat will be improved.

**Where to Get
More Help**

The Tennessee Valley Authority's excellent pamphlets on animal waste management provided much of the information for this chapter. To obtain copies of *Cattle Waste Management*, *Dairy Waste Management*, *Swine Waste Management*, *Poultry Waste Management*, or *Constructed Wetlands for Wastewater Treatment*, contact:

The Tennessee Valley Authority (TVA)

Citizen Action Line

1-800-362-9250

(Tennessee)

1-800-251-9242

(Alabama, Arkansas, Georgia, Kentucky, Missouri, Mississippi, N. Carolina, Virginia)

Another exceptional series that provided valuable information is published by the University of Delaware's College of Agricultural Sciences. For copies of *Manure Management for Environmental Protection*, *Field Application of Manure*, *Beef Manure Management*, *Dairy Manure Management*, *Poultry Manure Management*, *Dead Poultry Disposal*, *Swine Manure Management*, or *Horse-Sheep-Goat and Small Animal Manure Management*, contact the

Agricultural Experiment Station, Cooperative Extension
University of Delaware
Newark, Delaware 19717

Additional help is available from:

your local conservation district

U.S. Department of Agriculture (USDA)

Your Local Soil Conservation Service (SCS)

Your local agricultural Extension Service

**Your local Agricultural Stabilization and Conservation Service
(ASCS)**

or

U.S. EPA Region 4

Water Management Division

345 Courtland Street, N.E.

Atlanta, Georgia 30365

404-347-2126

Pesticide Use on the Farm

Why You Should Care

Many farm families live close to croplands treated with pesticides, and get their drinking water from wells located near these fields. If not properly applied, these pesticides can contaminate the ground water that supplies a farm's drinking water well, or be blown towards people and animals on windy days. The health effects of long-term exposure to the chemicals in pesticides can be significant, especially for individuals who are particularly sensitive to them.

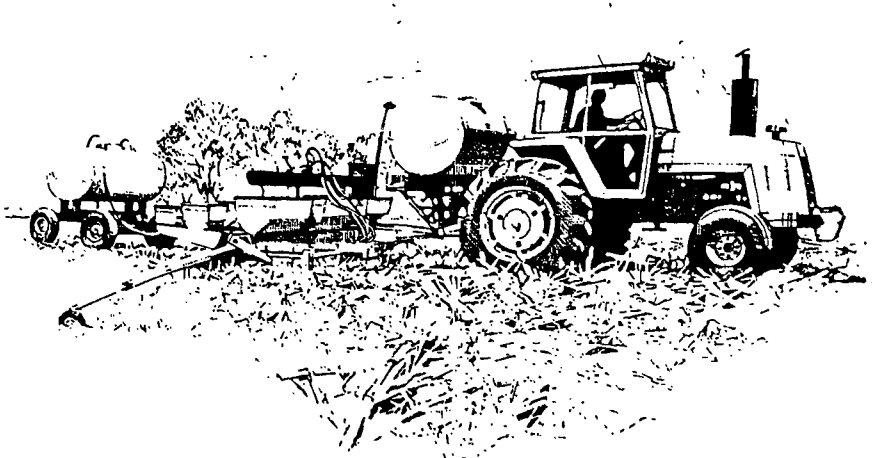
What You Should Know

Federal registration of pesticides. No pesticide may be distributed or used legally in the United States unless its label has an EPA registration number. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) governs the registration of pesticides. This law prohibits the use of any pesticide product except as indicated on the product label, and requires that all persons who purchase and/or apply certain pesticides (those with a restricted use) be certified. EPA labels a pesticide for restricted use based upon its potential harm to humans or the environment.

Material Safety Data Sheet. Best Management Practices (BMPs) are necessary to see that no potentially harmful exposure occurs while pesticides are being transported, mixed, applied, or disposed of. The manufacturer of each pesticide you use should provide you with a Material Safety Data Sheet (MSDS). An MSDS gives detailed information on the product's ingredients, the chemical characteristics of its active ingredient(s), fire and explosion hazard information, health data, protective procedures to use while handling the product, environmental data (including important waste and container disposal methods), and requirements for shipping.

Transporting pesticides. Care should be taken to secure pesticide containers before moving them to prevent damaging containers.

Mixing and loading pesticides. Unfortunately, many farmers mix their pesticides at the water source, usually a



well. If the well is not sealed properly, any residue can travel down the side of the well and immediately contaminate the farmer's water. For this reason, mixing and loading of a pesticide should be done as far away as practical from your well. Remember also to use an approved anti-backsiphoning device to protect your water supply.

Maintaining your equipment. Calibrating your equipment for the exact amount of pesticide required to do the job is very important. Applying too much pesticide not only wastes your money, but can damage crops and increase pesticide runoff during heavy storms.

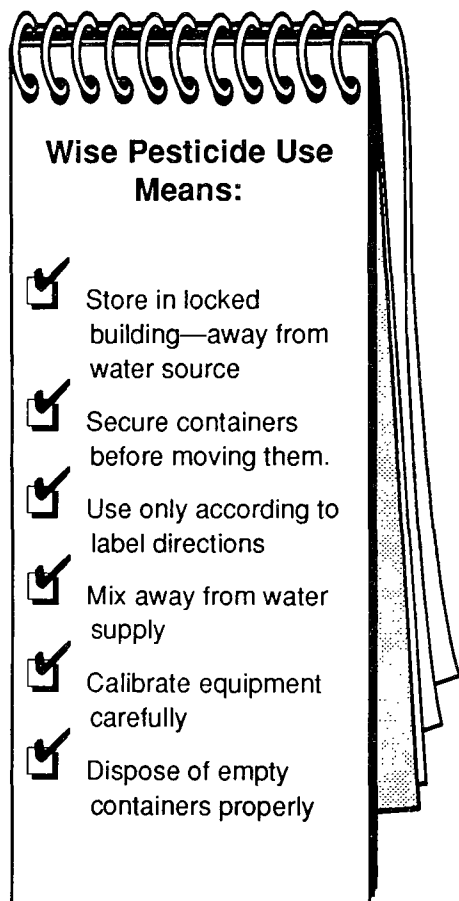
Storing pesticides. Buy only as much pesticide as you need at any one time. If you must store pesticides for longer periods, be sure to keep them in their original containers, properly labeled, in a locked area—away from your water supply source. Heavy winds, or simply corrosion from age, can damage containers and the resulting leakage can seep into soil and contaminate ground water or be carried by storm runoff into surface water supplies.

Disposing of pesticide containers. The empty containers from pesticides, machinery chemicals, or fertilizers are not really empty. They may contain the residue of powerful substances that can injure people or animals and seriously contaminate ground water. Disposing of them is not something to take lightly.

Follow Label Directions. By law, pesticide labels must include instructions for container disposal.

Containers should usually be triple rinsed immediately after emptying to remove any residues, and the rinse water should be added to the spray tank to avoid contamination of other waters. The empty containers should then be returned to the pesticide manufacturer for reuse or refilling or taken to a sanitary landfill.

Mini-bulk systems. Mini-bulk systems should be considered by all farmers using pesticides or herbicides on a large scale. Using mini-bulk systems eliminates the problem of container disposal because all containers are returned to the supplier. On the other hand, the farmer may need to build a catch basin or use some other protective measures to prevent the potential for greater harm from larger spills.



What You Can Do

When applying pesticides, remember these Best Management Practices:

- **Do** evaluate the potential for water contamination before making the decision to use a specific pesticide.
- **Do** evaluate the practicality of safer alternatives to chemical pesticides.
- **Do** read and follow all label directions.
- **Do** post the MSDS in a place where it can be easily seen by workers.
- **Do** comply with all federal and state pesticide regulations.
- **Do** be certain that applicators are trained and certified.
- **Do** maintain and calibrate your equipment carefully.
- **Do** mix and load pesticides away from wells or other water sources.
- **Do** store the pesticides in a safe, locked area, away from your water supply.
- **Do** dispose of pesticides and empty containers properly.

Where to Get More Help

Contact your soil or water conservation district office or your county extension agent for help in planning improved pest management. You can also contact the following:

State Pesticide Agencies

Alabama

Agricultural Chemistry/Plant
Industry Division
Dept. of Agriculture & Industries
P.O. Box 336
Montgomery, AL 36193
205-242-2656

Florida

Bureau of Pesticides
Dept. of Agriculture
3125 Conner Blvd. MC-1
Tallahassee, FL 32301
904-487-2130

Georgia

Georgia Dept. of Agriculture
Entomology & Pesticide Division
Capitol Square, Suite 550
Atlanta, GA 30334
404-656-4958

Kentucky

Division of Pesticides
Dept. of Agriculture
700 Capitol Plaza Tower
Frankfort, KY 40601
502-564-7274

Mississippi

Division of Plant Industry
Dept. of Agriculture & Commerce
P.O. Box 5207
Mississippi State, MS 39762
601-325-3390

North Carolina

Pesticides
Food & Drug Pesticide Section
Dept. of Agriculture
State Agriculture Building
Raleigh, NC 27611
919-733-3556

South Carolina

Pesticides
Dept. of Fertilizer/Pest Control
256 Poole Agriculture Center
Clemson University
Clemson, SC 29634-0394
803-656-3171

Tennessee

Plant Industries Division
Dept. of Agriculture
P.O. Box 40627, Melrose Station
Nashville, TN 37204
615-360-0130

Federal Agencies

National Pesticides Telecommunications Network Hotline
800-858-7378

U.S. Environmental Protection Agency
345 Courtland St., NE
Atlanta, Georgia 30365
404-347-3222

Publications

Note: This chapter relied heavily on information in an excellent publication entitled *Nutrient and Pesticide Best Management Practices for Wisconsin Farms* (University of Wisconsin-Extension and the Wisconsin Department of Agriculture, June 1989)

Other Publications

The following publications are available from the National Academy Press, 2101 Constitution Ave., NW, Washington, DC 20418.

- ☐ *Pesticide Resistance: Strategies and Tactics for Management* (1986, ISBN 0-309-03627-5)
- ☐ *Pesticides and Groundwater Quality: Issues and Problems in Four States* (1986, ISBN 0-309-03649-9)
- ☐ *Regulating Pesticides in Food: The Delaney Paradox* (1987, ISBN 0-309-03746-8)

Farm Machinery Maintenance

Why You Should Care

One gallon of used oil from a single oil change can contaminate a million gallons of fresh water. Other products used in farm machinery maintenance, such as antifreeze and hydraulic fluid, contain hazardous ingredients such as ethylene glycol or methanol, which can harm streams, lakes, and rivers and ruin water supplies and related recreational activities.

The by-products of farm machinery maintenance include used oil, old tires, worn-out parts, anti-freeze and lead-acid batteries. By using proven disposal and recycling techniques for these by-products, you can reduce the amount of pollution that reaches the environment, increase efficiency, and save money.

What You Should Know

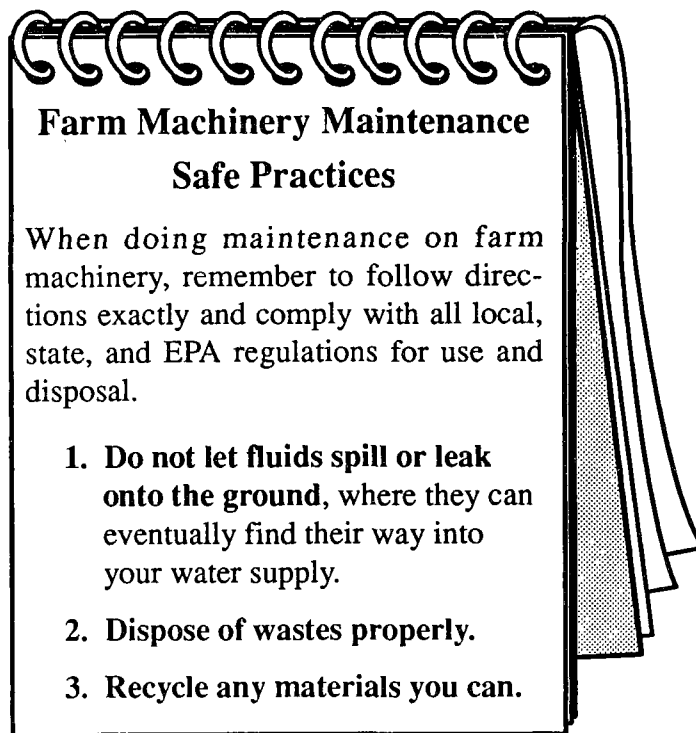


Maintenance. When doing maintenance on farm machinery, keep environmental protection in mind. Don't allow fluids to leak onto the ground or pavement, where they can wash off and contaminate streams or lakes.

Disposal of farm machinery by-products can involve expensive and sometimes environmentally unsound options. If disposed of in unlined landfills, by-products can break down and leach pollutants into the soil, eventually contaminating the ground water. Worn-out machine parts and tires also take up large amounts of scarce landfill space.

Recycle whenever possible. This not only eliminates disposal problems, but can save money and generate new businesses. It takes only one gallon of used oil to yield the same 2.5 quarts of lubricating oil provided by 42 gallons of crude oil. In fact, recycling used oil could save the United States more than one million barrels of oil per day, and reduce our dependence on foreign oil supplies.

Problems with **Underground Storage Tanks** are common and sometimes severe. Storage tanks should be examined regularly for leaks that could contaminate ground water. It costs much less to prevent a problem than to clean it up.



EPA and state regulations. Finally, remember that many states and the federal government have issued regulations that you must follow when disposing of, recycling, or cleaning up spills of potentially hazardous fluids.

What You Can Do Information on maintenance, disposal and recycling of some common by-products follows. For more detailed information, consult the sources listed at the end of this chapter.

Waste Oil. When you are changing the oil in your vehicle, collect the used oil, and take it to a service station or other collection facility for disposal or recycling. Do not dump it in the sewer or on the ground.

Old Tires. Tires cannot be safely landfilled. Bring your old tires to a local tire recycling facility or to a tire dealer. All tire dealers accept old tires when you purchase new ones.

Worn-out parts. Farm machinery generates a large number of worn-out parts. Do not put them aside to rust and deteriorate. Metal salvage dealers buy worn-out parts, or you can use local public recycling services. You can also recycle steel cans. Steel mills and detinners buy scrap metal.

Antifreeze. Some auto dealers and service stations now collect antifreeze for recyclers. Do not dump used antifreeze on the ground or down the drain.

Batteries (lead-acid). The only safe way to dispose of a battery is to bring it to a recycling facility. When batteries are disposed of in solid waste landfills, lead, a toxic metal, can leach into soil and ground water. Most states have legislation requiring wholesalers and retailers to accept used batteries for recycling (there may be a fee).

Leaking tanks. Most leaks come from tank failure or from leaks in piping or fittings. The most important thing you can do is prevent leaks. If you detect a leak, clean up the contaminated area immediately. Tanks may be subject to EPA regulations, and you should be familiar with them (see chapter 12).

Spill control. Spills are caused by over-filling tanks or by improperly disconnecting the fill pipes from the delivery trucks. Use effective controls when filling your tanks to prevent contamination of surface and ground water. Make sure the volume available in the tank is more than the amount of the product to be transferred. Watch the transfer operation carefully, and use equipment that limits spills and over-fills.

How it can work—success stories. In Florida, Georgia, and Kentucky, government, volunteers and private businesses are working to establish and maintain used oil recycling programs.

In 1988, the Governor's Energy Office (GEO) of the state of Florida transferred \$18.5 million in oil overcharge funds to the state's Dept. of Environmental Regulation (DER). The money is being used for recycling and education, with \$2.5 million of it specifically designated for used oil recycling. Grants totalling \$1 million were distributed to local governments to set up public used oil collection facilities. By June 1989, 200 of these centers had been established.

Dade County used its grant to purchase four 280-gallon used oil tanks that do-it-yourselfers could easily use. Public response was so great that the tanks were almost half-filled before the program officially began.

Hernando County used its grant money to set up a curbside collection program that serves 25,000 households. And service stations throughout the state have volunteered to serve as collection stations for used oil.

In Georgia and Kentucky, partnerships of government, business, and volunteers are also working to set up collection centers and educate the public about the dangers of improper disposal of oil.

Where to Get More Help

The following publications on recycling used oil are available free by calling the **EPA RCRA/Superfund Toll-free Hotline: 800-424-9346**

- ☐ *How to Set up a Local Program to Recycle Used Oil* (EPA/530-SW-89-039A)
- ☐ *10 Steps to Change Your Oil* (EPA/530-SW039D)
- ☐ *Recycling Used Oil: What You Can Do* (EPA/530-SW039B)

Another publication, especially useful for farmers concerned about underground storage tanks, is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

- ☐ *Musts for USTs* (EPA/055-000-00294-1, cost \$2.50)

Information is also available from:

State Agencies

Georgia

GA Dept. of Natural Resources
Environmental Protection Division
404-656-2833 or 800-33-GA-EPD

Florida

Dept. of Environmental Regulation
904-488-0300

Kentucky

Division of Conservation
Department of Natural Resources
502-564-3080

Federal Agencies

U.S. EPA

Office of Underground Storage Tanks
P.O. Box 6044
Rockville, MD 20850

U.S. EPA, Region 4

345 Courtland Street, NE
Atlanta, Georgia 30365
404-347-7603

Underground Storage Tanks

Why You Should Care

Several million underground storage tanks systems in the United States contain oil or hazardous chemicals. According to current estimates, 15 to 20 percent of these tanks, including their piping, may be leaking. Many more are expected to leak in the future.

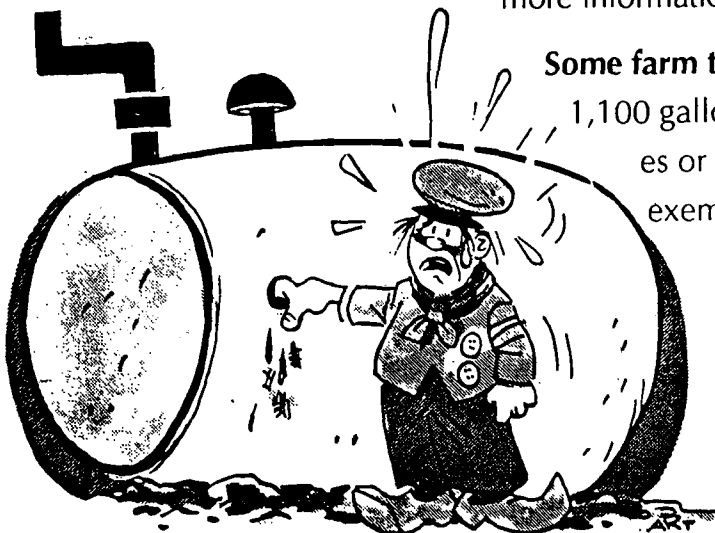
Leaks and spills can be a serious threat to human health and safety. Petroleum can contaminate soil, drinking water, and air. Petroleum and its resulting vapors can also accumulate in nearby confined spaces, such as septic tanks and the basements of homes. These vapors are poisonous and can cause fire or explosion.

A leaking underground tank on a farm can be a serious threat to underground water sources and water supply wells. A leak of only one gallon of gasoline can make one million gallons of water undrinkable. Farms that depend upon water wells could find themselves without usable ground water and the results could drastically affect farm operations.

What You Should Know

What are underground storage tanks? An underground storage tank (UST) is any tank, including underground piping connected to the tank, that has at least ten percent of its volume underground. The United States Environmental Protection Agency (EPA) regulates only USTs storing either petroleum or certain hazardous chemicals. However, your state or local authority may have regulations that are somewhat different or more strict. Contact your local fire department or one of the state agencies listed at the end of this chapter for more information.

Some farm tanks are exempt. Farm or residential tanks holding 1,100 gallons or less of motor fuel for noncommercial purposes or heating oil for use on the premises where stored are exempt. A farm tank is a tank located on a tract of land



WHY DO USTs CAUSE PROBLEMS?

No Corrosion Protection

Most of the UST systems already in the ground have tanks and piping made of bare steel. When unprotected steel is buried in the ground, it can be eaten away by corrosion. The UST regulations require corrosion protection for all USTs.

Spills and Overfills

In addition to leaks from tanks and piping, spills and overfills cause many UST releases. When more petroleum is delivered into the tank than it can hold, an overfill happens. When a delivery truck's hose is disconnected incorrectly, a spill results.

Installation Mistakes

Tanks and piping also leak if they are not installed properly. Installation includes excavation, tank system siting, burial depth, tank system assembly, backfilling of the tank system, and surface grading. Many mistakes can be made during installation. For example, if poorly selected or compacted backfill material is used when covering the UST, or if pipe fittings are inadequately attached to the UST, then leaking can result. You can avoid mistakes made during installation by using an installer who carefully follows approved installation procedures.

Piping Failures

EPA studies show that most leaks result from piping failure. Piping is smaller and less sturdy than tanks. It is assembled in the field with numerous connections and usually is installed near the ground's surface. As a result, piping suffers much more than tanks from the effects of installation mistakes, excessive surface loads, the stress of underground movement, and corrosion. Using a skilled installer is even more critical to the proper installation. It is important to remember that the regulations apply to the entire UST system—both tanks and piping.

devoted to the production of crops or raising animals, including fish, and associated residences and improvements. A farm tank must be located on the farm property. "Farm" includes fish hatcheries, rangeland, and nurseries with growing operations.

Other exemptions. Other kinds of storage tanks that are not covered by the EPA regulations are :

- tanks on or above the floor of underground areas, such as basements or tunnels.
- septic tanks and systems for collecting storm water and wastewater.
- flow-through process tanks.
- tanks holding 1,110 gallons or less.
- emergency spill and overfill tanks.

What You Can Do

Contact your state or local agency for information on minimum standards for your state. Remember that all USTs that hold more than 1,100 gallons are regulated, including those located on farms. Farm owners of these USTs must meet minimum standards, which may vary by state.

Evaluate your existing USTs for leakage. This will protect valuable ground-water sources. Here again, state and local agencies can provide information and guidance on leak detection as well as information on how to install new underground storage systems.

Where to Get More Help

For further information, contact your local fire department or:

STATE AGENCIES:

Alabama

AL Dept. of Environmental Management
Ground Water Section, Water Division
1751 Congressman W.L.Dickerson Drive
Montgomery, AL 36130
205-271-7832

Florida

FL Dept. of Environmental Regulation
Twin Towers Office Building
Room 403
2600 Blair Stone Road
Tallahassee, FL 32399-2400
904-488-3935

Georgia

Underground Storage Tank
Management Program
4244 International Parkway
Suite 100
Atlanta, GA 30354
404-362-2687

Kentucky

Underground Storage Tank Branch
Hazardous Waste Branch
KY Dept. of Environmental Protection
Fort Boone Plaza, Building #2
18 Reilly Road
Frankfort, KY 40601
502-564-6716

Mississippi
Bureau of Pollution Control
MS Dept. of Environmental Quality
P.O. Box 10385
Jackson, MS 39209-0385
601-961-5142

North Carolina
Pollution Control Branch
NC Dept. of Environment, Health &
Natural Resources
P.O. Box 27687
Raleigh, NC 27611-7687
919-733-8486

South Carolina
Groundwater Protection Division
Bureau of Drinking Water Protection
SC Dept. of Health and Environmental
Control
Columbia, SC 29201
803-734-4613

Tennessee
Division of Underground Storage Tanks
TN Dept. of Health and Environment
Doctors Building, Suite 200
706 Church Street
Nashville, TN 37247-4101
615-741-4081

PUBLICATIONS:

The following EPA publications are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, (202) 783-3238:

- ☐ *Musts for USTs: A Summary of the Regulations for Underground Storage Tank Systems* (stock no. 055-000-0294-1,)
- ☐ *Normas y Procedimientos para T.S.A.* (Spanish language version of *Musts for USTs*)
- ☐ *Dollars and Sense: A Summary of the Financial Responsibility Regulations for Underground Storage Tank Systems*

These EPA publications are available at no cost from the Office of Underground Storage Tanks, U.S. Environmental Protection Agency, P.O. Box 6044, Rockville, MD 20850:

- ☐ *Leak Lookout: Using External Leak Detectors to Prevent Petroleum Contamination from Underground Storage Tanks.*
- ☐ *Straight Talk on Tanks: A Summary of Leak Detection Methods for Petroleum Underground Storage Tank Systems.*
- ☐ *Oh No! Petroleum Leaks and Spills: What Do You Do?*

Farm Ponds — An Important Water Resource

Why You Should Care

A pond can be an important water resource for a farmer. When well-constructed and maintained, a pond can provide a clean watering place for livestock and a dependable irrigation supply. Warm water ponds can provide excellent fishing, swimming, and boating and sometimes extra income for the farmer as well.

What You Should Know

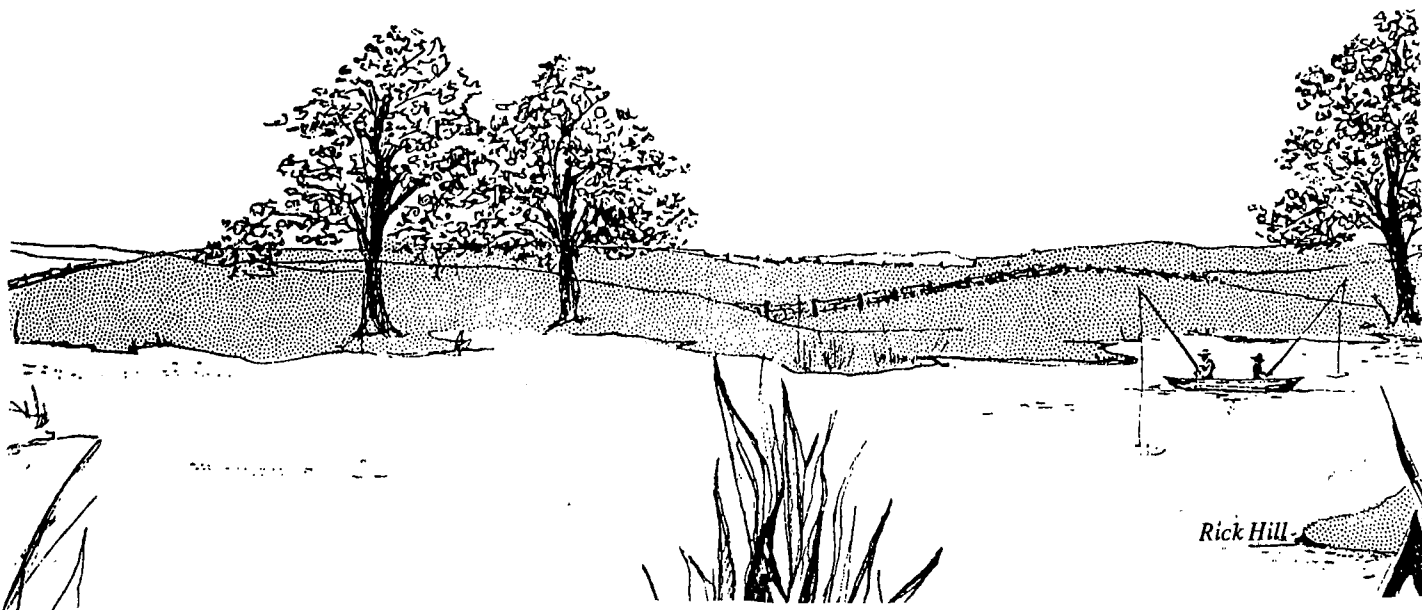
Designing and constructing a farm pond properly is not an easy task. You may want to get professional help from county, state, or federal agencies. Resources are listed at the end of this chapter.

Before building any type of pond, you must answer some important questions:

- What is the best location for my needs?
- Is the soil suitable?
- How big must the pond be? How deep?
- How should it be constructed?
- What must I do to maintain my pond?

Location. If the farm pond is to be used for watering livestock, it should be located near the pasture. In fact, you may want to consider constructing a pond for each major grazing area to protect both livestock and pastures.

If the farm pond is to be used for watering crops, locating the pond near the fields it will irrigate will reduce pumping costs.



Soil Suitability. Some soils are simply not suitable for pond construction. These include soils above limestone containing crevices, sinks, or channels. A non-porous clay-type soil is the most suitable because it will hold water and prevent water loss through seepage.

It is a good idea to bore a number of test holes to help evaluate the soil. Fill the test holes with water. If the water seeps out quickly, the soil is probably too porous for your needs. To be certain, you may want to have the soil tested.

If you are excavating a pond that will be fed by an underground aquifer, the borings will help you calculate how quickly the pond will replenish itself. If the water rises too slowly, the area may not be suitable for an irrigation pond.

Size and depth. The size and depth of ponds will vary, depending on the intended use. A livestock water supply must take into account the number and kind of animals that will depend on it: beef cattle and dairy cows need about 15 gallons of water per head per day; swine require four gallons per head per day.

An **irrigation pond** must be able to supply water throughout the growing season. When determining the size of an irrigation pond, you must take into account the water needs of the intended crop, expected rainfall, and the rate at which water flows into the pond from springs, a well, or an underground aquifer.

A **fish pond** should have a surface area of at least one acre for good largemouth bass and bluegill production. (A good rule of thumb is one acre of pond per 10 to 20 acres of watershed.) It should be at least three to four feet deep — deeper if located in an area subject to winter freeze.

Pond construction. How you construct your pond will depend largely on its size, function, and soil type. Although every embankment pond has certain common elements — a dam, an emergency spillway and an overflow pipe — how these are built requires engineering expertise for all but the simplest projects. The wise farmer will consult one of the resources listed at the end of this chapter for assistance.

What You Can Do

Maintain your pond to prevent damage to dams and spillways and increase fish yield. Establish and maintain strong vegetative cover on all disturbed areas.

- 1. Inspect your pond periodically,** especially after heavy rains. Repair damage to dams and spillways immediately to prevent costly repairs later.
- 2. Control erosion.** Planting trees, grasses and shrubbery around the pond will not only make the pond a more pleasant place, but will prevent soil loss and protect water quality. Do not allow woody plant growth on dams or spillway areas. In some cases, it may be necessary to divert storm runoff from barnyards, feedlots, and fertilized fields. Contour farming and other soil erosion techniques can help. Fish ponds may need to be fenced to protect them from grazing stock.
- 3. Maintain water quality.** Check the oxygen level of the pond to make sure that decaying plant matter is not robbing the water of oxygen. Check the pH to make sure that the water is not too acidic to support fish. (Along coastal plains in the southeast, excavated ponds may have pH levels of 4.0 or less.)
- 4. Fertilize for maximum fish production.** You may need to add fertilizer to a pond to increase the number of microscopic plants on which certain insects and fish feed. However, you must be careful not to over-fertilize a fish pond.
- 5. Fence livestock out of the pond.** Bacteria from wandering livestock can contaminate your pond. If using the pond to provide water, install a supply pipeline and a watering trough below the pond. This will keep your water clean and protect the water quality.
- 6. Consider constructing a wetland to improve water quality in your fishpond.** In Hattiesburg, Mississippi, a constructed wetland is successfully removing ammonia, phosphorus and other contaminants from a four acre catfish pond. Wetland plants filter and purify the water, which is then returned to the pond. The owner's savings over conventional systems have been substantial. Energy costs are less, odor is reduced, and the improved water quality has resulted in a 40 percent increase in fish production.

Where to Get More Help

Your local soil conservation district, Soil Conservation Service, or state department of fish and wildlife can assist you in planning and constructing your farm pond.

For additional information, contact the:

U.S. Environmental Protection Agency
345 Courtland St., NE
Atlanta, Georgia 30365
494-347-2126

The following publications provided valuable information for this section and are recommended to the reader. They are:

- ☐ *Ponds — Planning, Design, Construction* (U.S. Department of Agriculture, Soil Conservation Service, Agriculture Handbook Number 590)
- ☐ *Kentucky Farmponds* (Kentucky Fish and Wildlife Resources)
- ☐ *Warm Water Fishponds* (U.S. Department of Agriculture, Farmers' Bulletin No. 2250)

Wetlands Protection and the Farmer

Why You Should Care

More than half of America's wetlands in the lower 48 states have been destroyed since the 1600's. Of the remaining wetlands, one-third are located in the eight southern states of Alabama, Kentucky, North Carolina, South Carolina, Florida, Georgia, Mississippi and Tennessee.

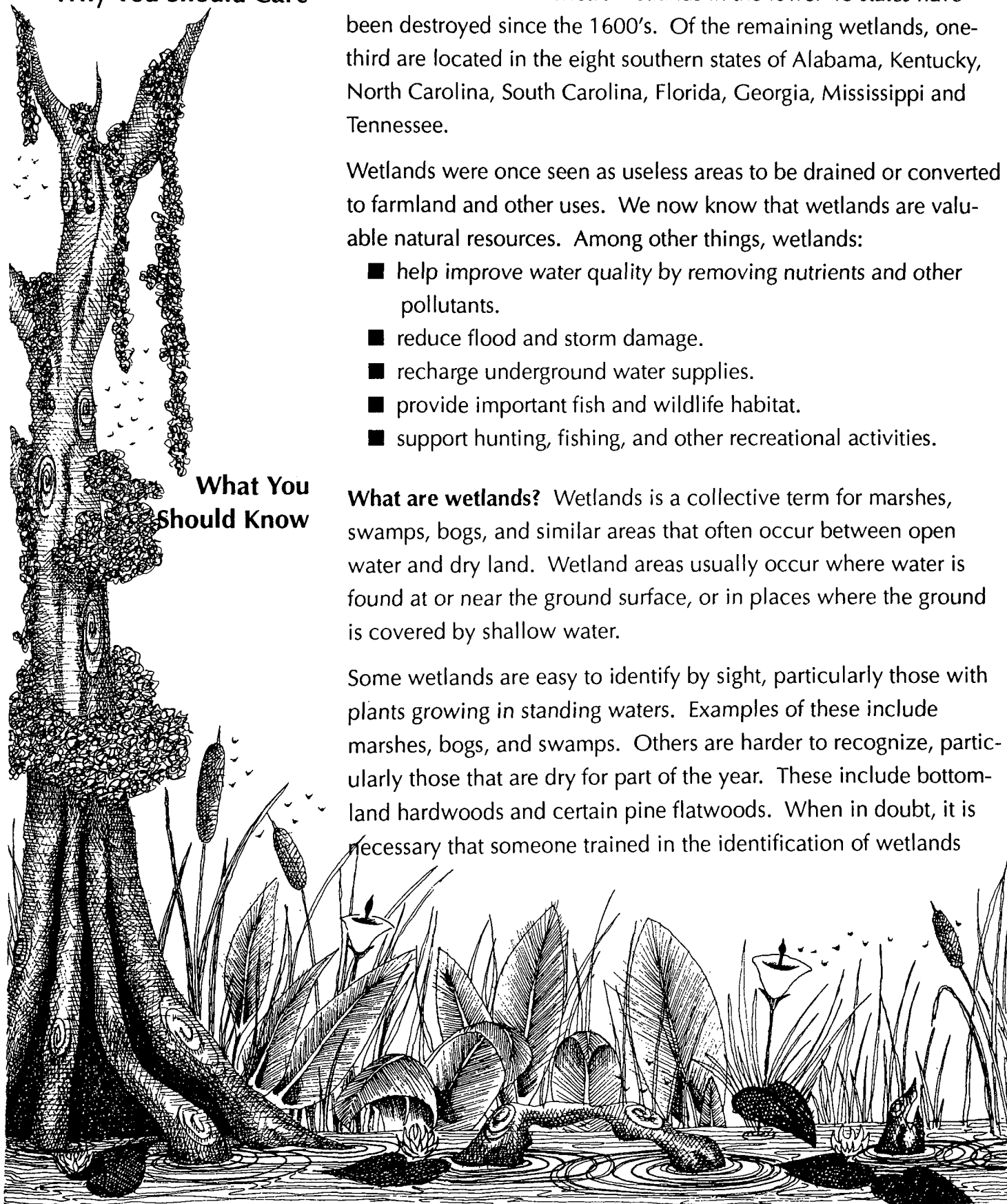
Wetlands were once seen as useless areas to be drained or converted to farmland and other uses. We now know that wetlands are valuable natural resources. Among other things, wetlands:

- help improve water quality by removing nutrients and other pollutants.
- reduce flood and storm damage.
- recharge underground water supplies.
- provide important fish and wildlife habitat.
- support hunting, fishing, and other recreational activities.

What You Should Know

What are wetlands? Wetlands is a collective term for marshes, swamps, bogs, and similar areas that often occur between open water and dry land. Wetland areas usually occur where water is found at or near the ground surface, or in places where the ground is covered by shallow water.

Some wetlands are easy to identify by sight, particularly those with plants growing in standing waters. Examples of these include marshes, bogs, and swamps. Others are harder to recognize, particularly those that are dry for part of the year. These include bottom-land hardwoods and certain pine flatwoods. When in doubt, it is necessary that someone trained in the identification of wetlands



Federal Programs Protecting Wetlands

Section 404 of the Clean Water Act

examine the area carefully for three major indicators — vegetation, soil, and surface and ground water characteristics. If the area is determined to be a wetland, authorization from the U.S. Army Corps of Engineers may be needed in order to conduct certain activities in these areas.

Two federal programs protect wetlands. The two federal laws that protect wetlands from some types of farming activities are Section 404 of the Clean Water Act and the Swampbuster Provisions of the Food Security Act. The laws are discussed separately below.

Section 404 of the Clean Water Act.

Some activities that take place in "jurisdictional" wetlands are regulated under Section 404 of the Clean Water Act. Jurisdictional wetlands are those that meet the criteria for vegetation, soil, and surface and groundwater characteristics as established in the *Federal Manual for Identifying and Delineating Section 404 Jurisdictional Wetlands*. Section 404 is jointly administered by the U.S. Army Corps of Engineers (COE) and the U.S. EPA.

Under this program, any activity that involves the discharge of dredged or fill material into a water of the U.S., which includes rivers, streams, and jurisdictional wetlands, requires authorization from the COE before the activity can take place. A discharge of dredged or fill material generally involves the physical placement of soil, sand, gravel, or dredged material into waters or wetlands.

Agricultural exemptions to Section 404. Many activities are specifically exempted in the Section 404 regulations, and require no authorization from the COE before proceeding. These include normal farming, ranching, and silviculture (forestry) activities. As long as an activity is part of an established on-going farming operation, such as seeding, plowing, cultivating, harvesting, and other normal activities, a farmer can continue these activities in a wetland. He does not need a permit or any type of authorization from the federal government. Maintenance of drainage ditches and construction of farm ponds associated with an established on-going farming operation are also exempted from regulation. Exempt farm ponds are typically less than 10 acres in size.

Normal Farming Activities Exempted from Section 404 Requirements	Farming Activities Not Exempted from Section 404 Requirements
<ul style="list-style-type: none"> ■ plowing ■ seeding ■ cultivating ■ harvesting ■ cropping pastured/hayed wetlands ■ maintaining drainage and irrigation systems ■ constructing and maintaining ponds required for farming operations (usually 10 acres or less) ■ construction of farm roads using Best Management Practices ■ emergency repairs of dams, levees, and dikes 	<ul style="list-style-type: none"> ■ movement of earth during land-clearing activities ■ redistribution of soil to fill in wetland areas ■ rock plowing ■ placement of dikes or berms ■ discharge of materials alongside major ditches

If a discharge will bring a wetland into new agricultural or silvicultural production, the discharge will require authorization from the COE prior to conducting the work.

“Prior Converted Wetlands” Are Not Jurisdictional Wetlands. In addition to the farming exemptions that are specified in the Section 404 regulations, the COE made a determination in 1990 that wetlands which were both drained and cropped before December 23, 1985 — to the extent that they no longer exhibit important wetland values — are not jurisdictional wetlands for the purposes of the Section 404 program. These areas are flooded with surface water for no more than 14 consecutive days during the growing season and are called “prior converted wetlands.” This exemption from regulation affects a large amount of historic cropland. This means that a farmer can conduct any activity on these prior converted wetlands without needing authorization from the federal government.

Prior converted cropland that has been abandoned for more than five consecutive years since December 23, 1985, and where wetland conditions have returned, is not included in the exemption, and is subject to regulation by Section 404. An area is considered

abandoned if there has been no cropping, management, or maintenance activities related to agricultural production for five consecutive years.

Croplands remaining under Section 404 jurisdiction. The croplands which remain under Section 404 jurisdiction are those which were converted to farming uses prior to December 23, 1985, and which continue to exhibit important wetland values — in other words, those croplands where the hydrology has not been significantly altered. These are called “farmed wetlands” — areas that are inundated with surface water for 15 or more consecutive days (or 10 percent of the growing season, whichever is less). Even though these croplands fall within 404 jurisdiction, normal, on-going farming activities such as those described above are exempt from regulation. This means that a farmer can continue his normal farming activities on farmed wetlands.

When a farmer needs authorization under Section 404. Authorization from the COE is required when:

- a farmer wants to change the use of a “farmed wetland” from a farming use to another type of use, such as a residential or commercial development.
- a farmer wants to alter or modify a farmed wetland by increasing the drainage or raising the elevation of the land so that it no longer exhibits wetland functions.
- a farmer wants to use mechanized land-clearing equipment to convert a wetland area to cropland or to any other uses.
- a farmer wants to convert a cropped wetland that has been abandoned for more than five consecutive years since Dec. 23, 1985, to any use — farming, residential, commercial, or industrial.

Swampbuster Provisions of the Food Security Act

Swampbuster Provisions of the Food Security Act.

Another federal law, the 1985 Food Security Act, contains a provision regarding wetland conversion. It is known as Swampbuster.

Swampbuster denies eligibility for *all* USDA farm programs to farms who convert wetlands to croplands. This provision applies to *all commodity crops* produced by those farmers, not just those produced on the converted wetlands. Programs covered by Swampbuster

regulations are USDA price and income supports, disaster payments, crop insurance, Farmers Home Administration loans, Commodity Credit Corporation storage payments, farm storage facility loans, Conservation Reserve Program payments, and other programs under which payments are made with respect to commodities produced by the farmer. Under Swampbuster provisions:

- farmers who apply for certain USDA programs must certify that they will not produce agricultural commodities on land that was converted from wetland after December 23, 1985. Each farm is professionally evaluated by the Soil Conservation Service.
- farmers who plant agricultural commodities on land that was converted from wetlands after the effective date will lose program eligibility for *all commodity crops* they produce on *any* land they own or operate. Agricultural commodities are those that are seeded annually, including sugarcane.
- artificial wetlands created by irrigation are exempted from the Swampbuster policy. Also, in years of officially declared drought, wetlands may be farmed if no steps are taken to improve drainage.

What You Can Do

Contact the District Office of the Corps of Engineers. They can help you identify whether you have wetlands on your property and tell you if a proposed activity requires authorization. Just because an activity requires authorization does not necessarily mean it will be prohibited. Some activities that significantly alter or modify a wetland may not be allowed.

Contact the Soil Conservation Service. You can avoid jeopardizing your USDA program eligibility by checking with your local Agricultural Stabilization and Conservation Service (ASCS) and SCS offices about wetland conversion.

Contact the Cooperative Extension Service and your **State Wildlife Agency** for help in managing the natural resources associated with wetlands.

Where to Get More Help

For more information about wetlands, contact:

Alabama
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, AL 36628-0001
205-690-2511

Florida
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019
904-791-2242

Georgia

U.S. Army Corps of Engineers
P.O. Box 889
Savannah, GA 31402
912-944-5133

Mississippi

U.S. Army Corps of Engineers
P.O. Box 60
Vicksburg, MS 39180-0060
601-631-5276

South Carolina

U.S. Army Corps of Engineers
P.O. Box 919
Charleston, SC 29402
803-677-4229

Kentucky

U.S. Army Corps of Engineers
P.O. Box 59
Louisville, KY 40201
502-352-5608

North Carolina

U.S. Army Corps of Engineers
P.O. Box 1890
Wilmington, NC 28402
919-251-4501

Tennessee

U.S. Army Corps of Engineers
P.O. Box 1080
Nashville, TN 37202
615-852-5181
or
B-202 Federal Building
Memphis, TN 38103-1894
615-222-3221

Publications:

The following wetlands publications are available through the **EPA Toll-Free Wetlands Hotline, 1-800-832-7828** or from

U.S. EPA Region 4

Wetlands Regulatory Section Chief
345 Courtland Street, N.E.
Atlanta, Georgia 30365
404-347-4015

- ☐ *What is a Wetland?* (EPA Fact Sheet)
- ☐ *Wetlands Protection* (EPA Fact Sheet)
- ☐ *Section 404 Permit Process of the Clean Water Act -- What Farmers Should Know About Agricultural Activities in Wetlands* (EPA Fact Sheet)
- ☐ *Clean Water Act Section 404 Regulatory Program and Agricultural Activities* (U.S. EPA and U.S. Dept. of Army Memorandum for the Field, 3 May 1990) .
- ☐ *Wetlands are Wonderlands* (EPA Poster/Student Activity Page)
- ☐ *America's Wetlands: Vital Link Between Land and Water* (EPA Booklet)
- ☐ *EPA's Wetlands Advance Identification Program* (EPA Fact Sheet)
- ☐ *American Wetlands* (EPA Brochure)
- ☐ *Recognizing Wetlands* (U.S. Army Corps of Engineers Brochure)

Managing Forestlands for Environmental Protection

Why You Should Care

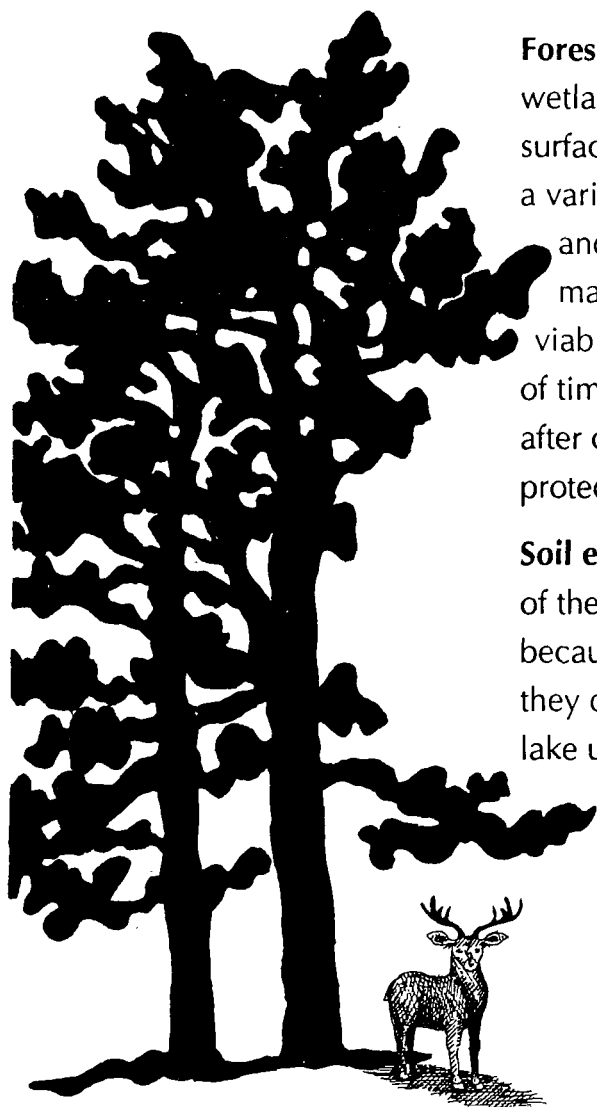
Forests supply us with high quality water, wood products, wildlife resources, and recreational enjoyment. But water pollution from improperly managed forests can damage drinking water supplies, aquatic habitat, and recreational activities that help support local economies.

What You Should Know

Best Management Practices. There are land management practices that will protect water quality and related recreational values, preserve the productive capacity of your land, and actually reduce operation and maintenance costs. These Best Management Practices (BMPs) are the accepted standards for road building, timber harvesting, and other forest operations. They are designed to keep streams and lakes clean by controlling soil erosion, chemical pesticides, and tree removal near streams.

Forested Wetlands. Forested wetlands require special care. These wetlands provide diverse habitat for fish and wildlife and protect surface and groundwater quality. They can be managed to produce a variety of products, but because of their unique soils, vegetation, and hydrology characteristics, they must be very carefully managed — perhaps more than other forests. Their continued viability and diversity must be carefully protected, and harvesting of timber and related management practices should be done only after consultation with professional foresters and water quality protection agencies. (See chapter 14.)

Soil erosion. Not only does erosion affect the future productivity of the land, but it can damage nearby streams and ponds. This is because sediment-bearing runoff harms fish and the aquatic insects they depend upon for food. Muddy water also makes a stream or lake undesirable to swimmers and fishermen.



Forestry operations that can result in avoidable soil erosion are:

- poorly designed and maintained forest roads.
- steep and unstabilized skid trails.
- intensive mechanical site preparation.
- clear cuts on steep, erosive slopes.

Chemical applications. Pesticides and fertilizers that are used to promote desirable species, discourage competition, and control pests can pollute water if washed into streams and lakes, or if allowed to come in direct contact with streams and lakes during application.

Tree removal from stream banks reduces the amount of shade a stream receives on hot summer days and can increase the water temperature to levels that are harmful to some fish. Also, leaves, twigs, and large woody debris are valuable food for insects that form a critical part of the aquatic food chain.

What You Can Do

There are BMP's for access roads and skid trails, site preparation, tree planting, pesticide use, forest harvesting, fire control, and streamside management zones. Each of these practices is discussed briefly here. For details, contact your county forester or any of the references listed at the end of this chapter.

Access roads and skid trails. When building access roads and skid trails, plan the road layout in advance, and never build straight up a hill. Keep road grades between 2% and 10%. Keep skid trails at 15% or less. Never allow logs to be skidded in or near streams. Roads should approach streams only at crossings. Roads and skid trails should be properly drained with waterbars, turnouts, culverts, etc. to keep them useful and to protect streams and lakes below. Skid trails and temporary roads should be seeded in grass or other vegetation to prevent gullyng.

Site preparation. When preparing land for tree planting, the three important things to consider are fire lines, choice of mechanical equipment, and use of herbicides. Minimize the slope of fire lines and waterbars and reseed them after use. Use mechanical equipment on contours, and do not remove topsoil when moving woody

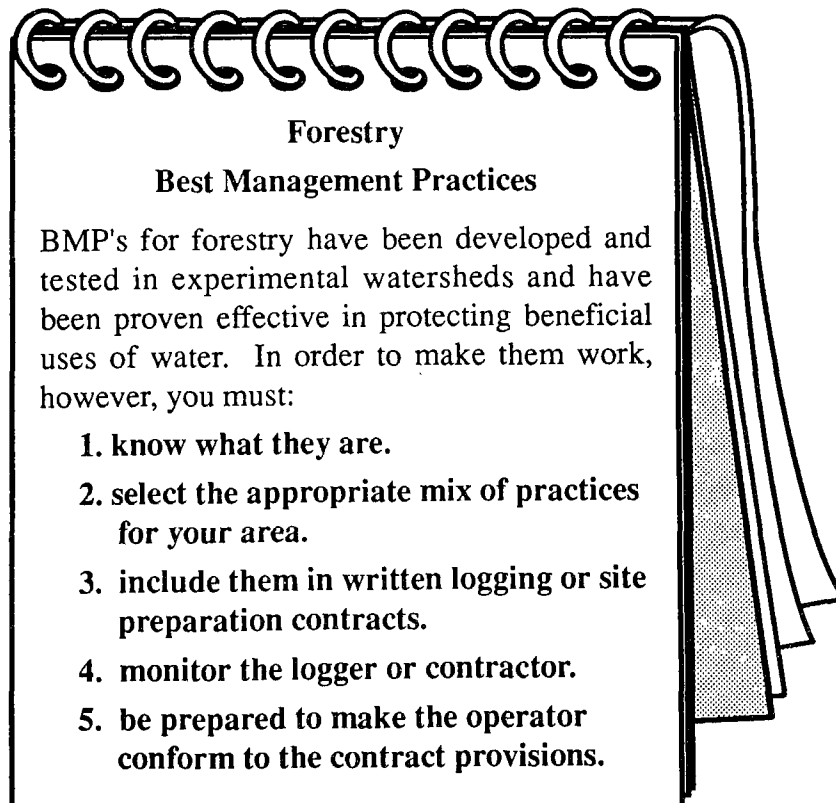
debris into piles. Use only registered herbicides, and only when herbicides are clearly necessary to meet overall objectives for your woodland.

Tree planting. When planting seedlings, plant by hand if possible. If machine planting, plant on the contour.

Pesticide Use. When using chemicals to control insects or disease, use only the appropriate pesticide for the insect or disease you are targeting, and only the minimum amount necessary. Follow directions on the label carefully, both for application and disposal of any excess product and the empty container. (See chapter 10.)

Forest Harvesting. Logging equipment (skidders, shears, cable systems) should be compatible with slope, soil, and moisture conditions. Rutting and soil compaction lead to erosion and can be avoided by choosing the proper logging equipment and by not logging during wet weather. Leave buffer strips alongside bodies of water and remove tree tops placed in streams during logging.

Revegetation. When planting vegetation to stabilize roads, skid trails, and fire lines, prepare the seedbed by smoothing, disking, or raking. Select a suitable seeding mixture for the location. Use mulch after seeding on highly erosive soils, and protect the site from grazing and unauthorized traffic.



Wildfire control. When controlling wildfires, try to keep fire lines off steep slopes and avoid drainages. Don't apply chemical retardants directly to open water. Stabilize and revegetate firelines after the suppression effort is complete.

Streamside management zones. Buffer strips are relatively undisturbed areas along drainages and streams that remove pollutants from runoff and provide other fish and wildlife benefits. Roads, skid trails, and log decks should not intrude into these areas, except at necessary stream/road crossings. Do not broadcast pesticides or fertilizer within these strips.

Where to Get More Help

For specific information on Best Management Practices and their applications, contact

State Forestry Agencies:

Alabama

Alabama Forestry Commission
513 Madison Avenue
Montgomery, AL 36130-0601
205-240-9304

Florida

Florida Division of Forestry
3125 Conner Blvd.
Tallahassee, FL 32399-1650
904-488-4274

Georgia

Georgia Forestry Commission
P.O. Box 819
Macon, GA 31298-4599
912-744-3237

Kentucky

Kentucky Division of Forestry
627 Comanche Trail
Frankfort, KY 40601-1798
502-564-4496

Mississippi

Mississippi Forestry Commission
301 N. Lamar Street
Suite 300
Jackson, MS 39210
601-359-1386

North Carolina

North Carolina Div. of Forest Resources
Dept. of Environment, Health and
Natural Resources
Box 27687
The Archdale Building, 10th Floor
512 N. Salisbury St.
Raleigh, NC 27611
919-733-2162

South Carolina

South Carolina Commission of Forestry
P.O. Box 21707
5500 Broad River Road
Columbia, SC 29221
803-737-8800

Tennessee

Tennessee Division of Forestry
Department of Conservation
701 Broadway - Custom House
Nashville, TN 37203
615-742-6615

Federal Agencies:

U.S. Department of Agriculture

Forest Service

Cooperative Extension Service

Soil Conservation Service

U.S. Department of the Interior

Bureau of Land Management

or

U.S. EPA, Region 4

345 Courtland Street, NE

Atlanta, Georgia 30365

404-347-2126

Publications:

- ☐ *Managing Forested Watersheds* (PA 919)
(Forest Service, U.S. Dept. of Agriculture)
- ☐ *Managed Forests and Clean Water* (Program Aid No. 1429,
Forest Service, U.S. Dept. of Agriculture)
- ☐ *Landowner's Guide to Best Management Practices for Forestry
Operations that Improve Water Quality* (Publication No. 420-
140, Extension Division, VA Polytechnic Institute, Blacksburg,
VA 20461)
- ☐ *Seeding Logging Roads to Prevent Erosion* (Soil Conservation
Service, Morgantown, West Virginia)
- ☐ *Logging Roads: Keeping Mud Out of the Streams* (Soil Con-
servation Service, Morgantown, West Virginia)
- ☐ *Permanent Logging Roads for Better Woodlot Management*
(Forest Service, U.S. Department of Agriculture, Broomall, PA)
- ☐ *Forest Owners and their Logging Roads* (West Virginia Forestry
Association, Ripley, WV 25271, 304-273-8164)
- ☐ *Forestry Best Management Practices Manual* (State Forestry
Agency)

Sinkholes and Abandoned Wells

Why You Should Care Sinkholes can pose a significant threat to water quality. They can be a direct pathway for surface contaminants and sediments to pollute the ground water that supplies your drinking water well. They can also be a danger to people, livestock, and farm machinery.

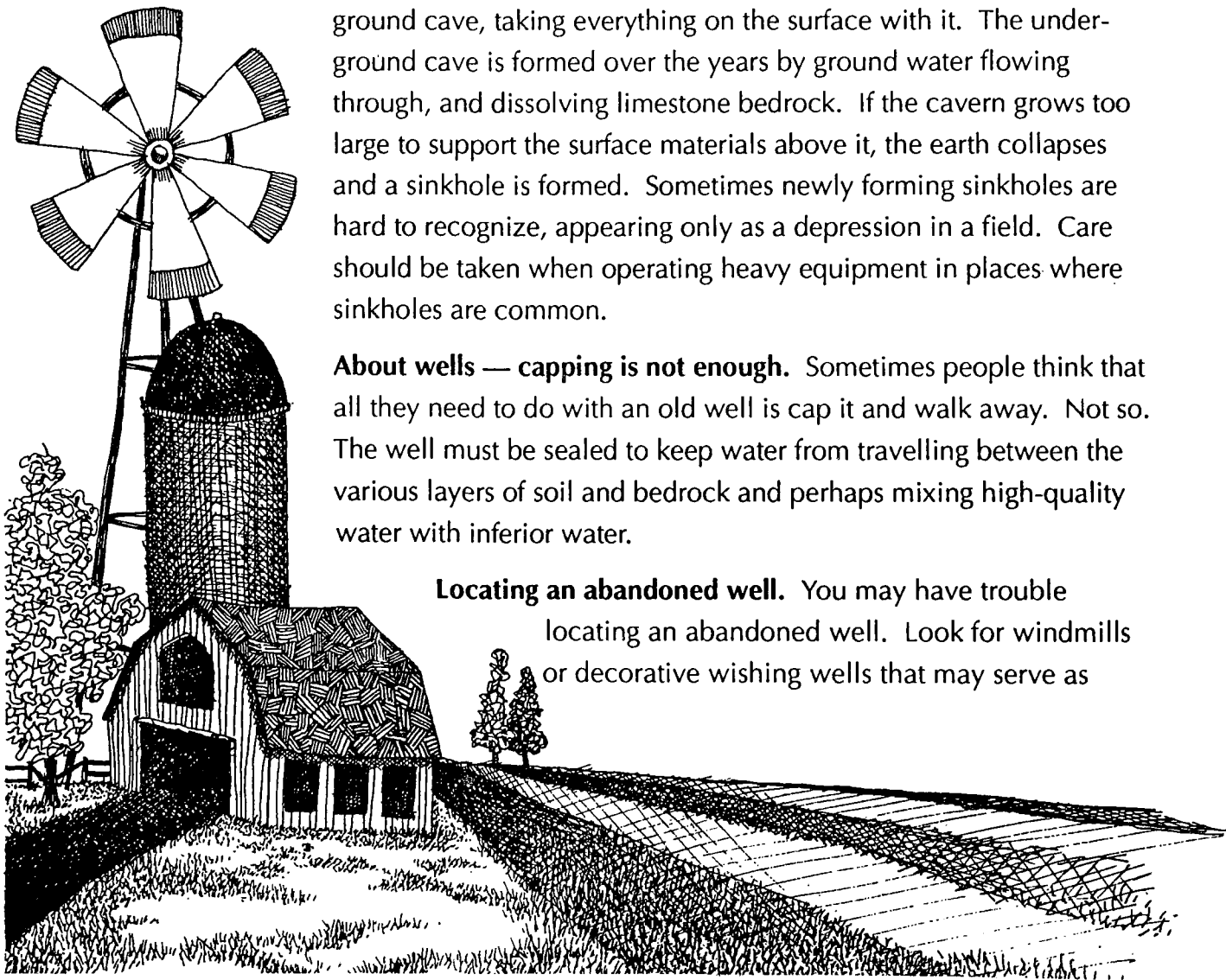
Abandoned wells are also a problem. Years ago, wells were often just abandoned when farmers built a new well. Sometimes, it is hard to locate these old wells, but the effort is worth it. Abandoned wells must be properly sealed to protect children and small animals from falling into them, and to prevent surface water contamination from entering the well pipe and flowing directly to an underground aquifer.

What You Should Know

About sinkholes — how they are formed. The name "sinkhole" describes the hole created when the earth collapses into an underground cave, taking everything on the surface with it. The underground cave is formed over the years by ground water flowing through, and dissolving limestone bedrock. If the cavern grows too large to support the surface materials above it, the earth collapses and a sinkhole is formed. Sometimes newly forming sinkholes are hard to recognize, appearing only as a depression in a field. Care should be taken when operating heavy equipment in places where sinkholes are common.

About wells — capping is not enough. Sometimes people think that all they need to do with an old well is cap it and walk away. Not so. The well must be sealed to keep water from travelling between the various layers of soil and bedrock and perhaps mixing high-quality water with inferior water.

Locating an abandoned well. You may have trouble locating an abandoned well. Look for windmills or decorative wishing wells that may serve as



cover for old wells. Poke around an old shed or barn, even the basement of your home, and you may find a ring of stones or bricks covering an unsealed and unsafe well. You can also ask neighbors or others familiar with the property if they remember any old wells, examine old photos of the area, and consult fire insurance plan drawings or geological surveys that might indicate the location of wells. Ask well drillers who have been in business for a long time if they have any record of wells on your property. Sometimes these sources will yield clues to the existence of a buried or hidden well.

What You Can Do

Fortunately, you can do a lot to protect water quality — and ensure the safety of your family and livestock — by managing sinkholes properly and by finding and sealing old abandoned wells.

Do's and Don'ts of sinkhole management.

- **Don't** use a sinkhole as a convenient dumping place for household trash, empty chemical containers, dead animals, or other potential pollutants. These materials can contaminate the ground water that supplies your drinking water, even if your sinkhole dump is a half mile or more away from your well.
- **Don't** locate your septic tank or animal waste lagoon near a sinkhole. Bacteria can eventually contaminate the ground water, making the water unfit to drink.
- **Do** create a grass barrier strip to filter sediments and agricultural runoff before they reach the sinkhole.
- **Do** divert heavy water flow away from the sinkhole by building berms or channels.

Do's and Don'ts of sealing a well.

- **Don't** try to plug the well with tree stumps or brush.
- **Do** contact your state environmental office. Plugging a well may be too complicated to be a "do-it-yourself" job.
- **Do** remove any debris that has fallen into the well before you seal it.
- **Do** remove the well casing, if possible, before you seal the well.

- **Do** plug the old well with cement or other material (such as clay) that will not filter water easily. This will prevent migration of water between underground soil layers.
- **Do** call your county or state health department or water management district for help.

Where to Get More Help

Contact your soil or water conservation district officer or your county extension agent for assistance in managing a sinkhole or locating and sealing an abandoned well. Your state geological survey or environmental office may also be able to help.

Two fact sheets published by the Alliance for a Clean Rural Environment (ACRE) provided valuable information for this section and are recommended to the reader. They are:

- *The Importance of Sealing An Abandoned Well* (ACRE fact sheet #6, Alliance for a Clean Rural Environment, 1-800-545-5410); and
- *Sinkhole Management Protects Groundwater* (ACRE fact sheet #18, Alliance for a Clean Rural Environment, 1-800-545-5410)

The following publications may also be of interest to the rural homeowner:

- *Citizen's Guide to Ground-Water Protection* (U.S. EPA pamphlet, April 1990)
- *Wellhead Protection Programs: Tools for Local Government* (U.S. EPA booklet, April 1989)
- *Progress in Ground-Water Protection and Restoration* (U.S. EPA booklet, February 1990)

They are available from the:

U.S. Environmental Protection Agency
345 Courtland St., NE
Atlanta, Georgia 30365
404-347-3866