

Practical BMPs for Watersheds

W. O. Thom, Extension Specialist

Watersheds and watershed activities are now the major focus of water-related educational programs. Land use in many watersheds can be quite varied. Whether land is used for agricultural, recreational or residential activities, it is important that surface and groundwater within the watershed not be polluted as a result of these activities. Residents within a watershed are often unaware of the potential to pollute water with every day activities. The installation and use of simple Best Management Practices (BMPs) can reduce the pollution of water within and leaving watersheds.

This publication contains ten sections that were written by various professionals to increase awareness and encourage adoption of BMPs in a watershed to reduce the potential for polluted water to leave the watershed. The first section outlines a watershed followed by nine sections describing activities that can increase the potential to pollute water, and BMPs or habits that can be adopted by watershed residents to greatly reduce potential pollution of water.

This publication may not cover all pollution issues in a particular watershed. They were written by concerned professionals in Boyle and Mercer Counties to reflect the important issues in the Mocks Branch and Spears Creek watersheds of those two counties. They appeared in the *Danville Advocate-Messenger* in June, July and August of 2001. The Environmental and Natural Resource Issues (ENRI) Task Force would like to extend the timely information contained in these articles to others across the state in the form of this publication. It is our hope that others will use this information in discussions with residents, in face-to-face meetings, in electronic-based media, or in newspaper articles as part of an overall educational effort.

The ENRI Task Force would like to thank the following individuals for their interest, time and expertise in developing the information contained in these sections:

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What is a Watershed?

Joseph A. Montgomery, Jr., NRCS Mercer County, Kentucky

- **We all live in a watershed** - Everything we do in our watershed affects the soil, water, air, plants and animals. Let's work together to keep our watersheds healthy.
- **On the farm** - Keep plant residue on the surface of sloping land. This reduces runoff and prevents sediment, fertilizers, and pesticides from entering streams, rivers, lakes and ponds.
- **At home** – Landscape the yard with plants that need a minimum of water and fertilizer. Use only the amount of fertilizers and pesticides that plants need.
- **In the community** – Protect wetlands that serve as natural buffers against pollution, soil erosion, and flooding.

We are all familiar with boundaries and travel ways, such as city limits and roads. Well, nature has her own boundaries and travel ways, and some of the most important are watersheds and waterways (e.g. a stream).

A watershed is a land area where the water within its boundary flows or drains to a common point, like a stream, river, lake, and eventually to the ocean. Since water always flows downhill, land elevation determines the watershed boundary. Therefore, the highest elevations, or points in a landscape, are the watershed divide or its boundary.

The largest watershed in the United States ends where the Mississippi River flows into the Gulf of Mexico. This watershed receives water from 1.2 million square miles of land that drains into this one point. Are you aware that a Dead Zone exists in the Gulf of Mexico that was created by pollution entering through the Mississippi River? Fish and sea animals cannot live in this Dead Zone because of the low water oxygen levels resulting from the high concentrations of pollutants in the water.

Why is this Dead Zone important to me? This large Mississippi River watershed contains thousands of smaller watersheds that interconnect and eventually drain into this river. What happens in a smaller watershed can directly affect what happens in the larger watershed. For example, all streams from smaller watersheds in Kentucky drain into a larger river (e.g., the Kentucky River, the Green River, the Salt River, the Cumberland River, etc.), which flows to the Ohio River, which in turn flows into the Mississippi River.

The Earth is a beautiful place and maintaining this image starts with what each person does near their home. Dead Zones, whether they exist in streams, lakes, ponds or the Gulf of Mexico due to pollution, should not be a part of it.

We all know that the land within a watershed is used for many different purposes including farms, homes, businesses, parking lots, factories, golf courses, and many other uses. All human uses of the land can impact our water quality. We need to be constantly aware of how our individual activities can disturb the soil or contribute to unwanted materials reaching streams and other water bodies. Each person needs to be constantly aware of ways to reduce the amounts of soil, trash, chemicals, fertilizers, sewage, and any other material that may runoff or soak into the land, and eventually pollute our water. The Internet contains much information on using good conservation and maintaining water quality in a watershed (One example is the Center for Watershed Protection [www.cwp.org]).

Streams and rivers draining some of Kentucky's watersheds are already impacted by high levels of pollutants from the lack of using good conservation and management practices with such land uses as farmland, lawns, gardens, wastewater treatment systems, parking lots, recreation areas, roads, and streets. Each resident can reduce these potential impacts to water quality through watershed awareness and in realizing that either large unmanaged areas or many small, unmanaged areas can create water quality problems in streams exiting the watershed.

Managing Hazardous Household Products

Joseph A. Montgomery, Jr., NRCS Mercer County, Kentucky

- **Proper selection** – Before purchasing or using a product, take the time to read the label, even the small print.
- **Don't buy more than needed** – If more is bought than needed, household products will accumulate and create storage problems.
- **Ventilation is important** – If ventilation is not adequate, fumes from a stored product could be harmful or toxic.
- **Safe containers and safe storage** – Always store in original container and away from children and pets.
- **Disposing of leftover products** – Disposal should be the last option. Recycle or reuse according to the label.

The words household and hazardous wastes do not seem to go together, but in today's society many household chemicals may create hazardous wastes. Everyday cleaning products and similar substances have the potential to be harmful not only to our health, but also to the environment if they are not handled and stored properly. Many individuals and groups are concerned that we are polluting the inside of homes as has often happened outside the home. Recently, at a Congressional Hearing, there was testimony about concerns for public safety, especially for children exposed to common household chemicals on a daily basis. A good example could be using a strong cleaner on a kitchen floor and then allowing small children to play on the floor soon after cleaning. Questions have arisen as to what the effects of long-term exposure may have on human health. For a health emergency involving exposure to a potentially hazardous product, call the Kentucky Regional Poison Center at 1-800-722-5725.

What can residents do to protect families and the environment? First, always read the labels completely before purchasing and using any chemical product or cleaner. Second, do not buy more of the product or cleaner than is needed for each use. If products are not used completely, then they will need to be stored in the original containers and in a safe and secure location. Third, always ensure there is adequate ventilation when using household products. Fourth, never store household chemicals next to or in the same area as food. Lastly, if products are left in storage for long periods, see if someone else could use the product according to its labeled directions. If no one can be found to use the remaining product, recycle if possible. Disposal should be your last option. Pouring or dumping any unused household chemical down an inside drain or flushing it through the bathroom facilities greatly increases the potential of pollution.

Several household chemicals cannot be adequately treated by either municipal wastewater treatment systems or septic systems. When not adequately treated, these products are discharged directly into streams or the groundwater. Household chemicals introduced into septic systems may not only result in a reduction of system operation but may also result in complete system failure. For disposal of other hazardous products, contact your local recycling centers or local government officials for help or referrals.

The Unwanted Pesticides Collection and Disposal Program is located within the Kentucky Department of Agriculture (Call 1-800-205-6543) and should be contacted before disposing of any unused pesticides. Many counties have a Rinse and Return Program that is a program of the Kentucky Department of Agriculture and coordinated through the county extension office.

The same amount of concern shown inside the home must carry over to outside the home for household chemicals. For residents who live in towns that have storm water drains, remember they are for storm water runoff only. These drains are not like sanitary sewers that go to treatment

plants. Storm water drains flow directly into a nearby stream or river. It is very important that people not use storm water drains for disposal of any household chemical. Such products as used motor oil and antifreeze are accepted at many auto repair shops or at local recycling centers for a small fee.

More information can be obtained from the local county extension office. While you are there, ask them about getting information and materials for doing a self-assessment for pollution prevention with the Home-A-Syst program for homeowners and the KY-A-Syst program for farmers.

Benefits of Conservation Buffers

Mary Ann Sharp, NRCS Boyle County, Kentucky

- **Cleaner water** – Buffers provide a good filter for both surface and shallow ground water before it enters streams and lakes.
- **Keeps productive soil** – Decreasing soil losses from fields maintains topsoil with high organic matter levels that provides sustainable long-term productivity, and improved soil moisture.
- **Greater on-farm profits** – Sharpening management skills and using the latest conservation technology results in higher levels of economic efficiency and cropland productivity.
- **Brighter future** – Protecting our soil and water resources is vital to the continued success of agriculture.

Conservation buffers are best described as strips or other areas of land established and maintained in permanent vegetation along the borders of fields or water bodies. The vegetation may be grass, trees, shrubs, or a combination of these. Buffer widths may range from 20 to 100 feet although 30 to 45 feet applies to many situations. This use of vegetation slows surface runoff and traps sediment, nutrients, pesticides, pathogens, and other potential pollutants to keep them from reaching a stream, river, or lake. For homeowners in residential areas, a narrow grass strip of 5 to 10 feet above a storm drain can serve to reduce pollutants. Remember, storm water is usually piped directly into a nearby stream or river.

Without conservation buffers, pollutants can flow freely into streams, rivers, and lakes. This would allow contamination of the same water bodies where we fish, swim, and frequently obtain our drinking water. Often times we observe that a grassed strip exists or trees and shrubs are being planted around a water body but we are not always sure of the purpose for its existence. Conservation buffers are a common sense, economical practice that can be installed to prevent pollution from entering our water bodies.

Buffers that are properly designed, installed and maintained have the capacity to remove 50% or more of the nutrients and pesticides, 60% of pathogens, and 75% of sediment from surface runoff. Not only can buffers filter pollutants; they also help slow storm water runoff, reduce downstream flooding, stabilize stream banks, reduce water temperature, and provide food, nesting cover, and shelter for wildlife.

The most common examples of buffers are grassed filter strips, field borders, waterways, and riparian forest buffers. Filter strips are simply strips of grass that slow water runoff from an area while trapping pollutants before they reach a stream, river or lake. Field borders are strips of vegetation established at the edge of fields. Waterways are grassed areas where runoff water is concentrated as it runs through or off fields. Waterways control gully erosion and act as a filter by trapping sediment and other pollutants. Riparian forest buffers are stream-side or lake-side plantings of trees, shrubs, and grasses that intercept pollutants from both surface runoff and shallow groundwater. The grasses serve as barriers and the extensive root systems of the shrubs and trees take up nutrients from the shallow ground water before entering a water body.

Conservation buffers are beneficial in a number of sites. Any crop field, street, road or parking lot area that potentially contributes some type of water pollutant is a prime candidate for having a buffer installed. Sometimes buffers in urban areas may be installed in conjunction with a temporary water holding area to handle storm water.

Maintaining the effectiveness of these conservation buffers requires some management. Grassed filter strips are most effective when clipped to maintain grass height at 6 inches. Allowing any filter along a water body to be used as a field road will encourage erosion in the wheel tracks thus severely reducing its effectiveness, in fact they could become a source of sediment.

One good act of stewardship for land having surface runoff would be to install conservation buffers. To find out more about conservation buffers, contact the local conservation district office for assistance in assessment or design. For more general information about establishing and managing conservation buffers, contact your county extension office.

Important Information for Livestock Watering Systems
 Jerry Little, County Extension Agent Boyle County, Kentucky

- **Access to water** – Livestock must have free access to plenty of clean, fresh water at all times to be productive.
- **Lack of water shouldn't be a barrier** – Don't allow the lack of existing water to be a barrier to the development of a good grazing system.
- **Location of water tanks** – Deliver water to animals rather than force them to walk long distances.
- **Quantities and supply rates** – Water requirements depend on temperature, stage of growth, and water content of the diet.
- **Water quality** – Good quality of drinking water promotes adequate consumption, good growth and production.
- **Ensuring access** – Allow at least enough space at drinking locations for 5% of herd to drink at the same time.

The availability of clean, fresh drinking water for livestock will have a major impact on the design and management of a grazing system. Using alternative watering systems with intensive livestock grazing are needed when limiting access to streams.

A supply of water does not always need to be present in each pasture, but it certainly needs to be available within a reasonable distance ranging from 100 to 1200 feet. Many options are available that can be developed into good watering systems. Some options may include solar driven pumps, ram pumps, cattle operated pumps, developed springs, drilled wells, gravity flow systems, and connections to municipal water sources.

Two considerations must be met in providing adequate water for livestock. First, the total water requirement must be met. Actual consumption will depend on factors such as temperature, animal size, species, age, and type of feed consumption.

<u>Livestock</u>	<u>Water Consumption for Various Animals</u> <u>Average Consumption</u> <u>Gallons/day</u>	<u>Hot Weather</u> <u>Gallons/day</u>
Milking cow	20-25	25-40
Dry dairy cow	10-15	20-25
Calves	4-5	9-10
Beef cow	8-12	20-25
Sheep	2-3	3-4
Horse	8-12	20-25

Secondly, water must be available when the animals want to drink. If the water flow rate is adequate, then water can be supplied on demand. If, however, the flow rate is low, then adequate storage capacity must be provided at or near the drinking location. For example, a water source that trickles over a 24-hour period will require storage capacity so that adequate water will be available when needed.

If water is located outside of a fenced pasture or paddock so that the animals must leave the area through a gate or opening, the entire herd will tend to go for water at the same time. When animals do not have to leave the confines of a pasture or paddock, they tend to drink one or two at a time. In the latter case, a lower flow rate and fewer drinking spaces are required.

To ensure access to water and to increase animal performance, adequate space should be available at the drinking area to allow at least 5% of the herd to drink at the same time. If water is outside the pasture area, provide more than 5% drinking space, or as much as possible, to reduce fighting and waiting time to get a drink.

Don't allow the lack of existing water to be a barrier to the development of your grazing system. There are several options available and many of them can be cost-shared. Contact the county extension office for more information on options and needs, and contact the local conservation district for information on designing a particular practice.

**Reducing the Risk of Ground Water Contamination
From Agricultural Chemical Storage and Use**
Jerry Little, County Extension Agent Boyle County, Kentucky

- **Buy only what is needed** – This eliminates long-term storage.
- **Do not dump into sinkholes** – The groundwater, which in many instances is linked to drinking water, can be contaminated.
- **Cleanup spills** – Promptly sweep up spills of dry materials and reuse pesticides or fertilizers. For liquid spills, recover as much as possible and reuse as intended.
- **Use sealed surfaces for mixing and loading chemicals** – When using a sealed surface such as concrete for mixing and loading, pesticides and fertilizers can be contained and thus reused.
- **Some contamination may occur even with small quantities.**

When stored in a secure location, agriculture chemicals (pesticides and fertilizers) pose little danger to groundwater or the environment. Common sense suggests keeping agricultural chemicals in their original containers with their labels attached. Keep pesticides and fertilizers dry and out of the pathway of activities that might rip or puncture a bag or container.

- ✓ Do not store pesticides and fertilizers in the same area.
- ✓ Do not store containers on earthen floors or in places of frequent use.
- ✓ A sealed concrete floor with a raised curb on the edges is desirable for pesticide and fertilizer storage. If a spill does occur, this type of floor will virtually eliminate the potential for release of chemicals into surface or ground water.
- ✓ A mixing and loading pad provides for secondary containment during the transfer of fertilizers and pesticides to application equipment.
- ✓ Store bulk fertilizer on an impermeable surface under a cover or in a building.
- ✓ Use proper storage recommendations even if chemicals are on site only for a short period. Even “seasonal” storage can result in spills or leaks that can pollute the groundwater.

Mixing, Loading and Spill Cleanup

Groundwater contamination can result from small quantities of chemical spilled regularly in the same place. Spills of dry pesticides and fertilizers should be promptly and completely cleaned up. Small quantities spilled regularly on the soil can go unnoticed as most will penetrate into the soil and eventually reach groundwater. By mixing and loading on an impermeable surface, the fertilizer and pesticide is contained, and most of it can be recovered and reused.

Management of Existing Mixing and Loading Sites

Pesticide and fertilizer spills and leaks may occur from time to time. Even if there is not an impermeable mixing and loading pad, contamination can be minimized by following some basic guidelines:

- Avoid mixing or loading any chemicals near a well, spring, cistern, sinkhole, or stream. One way to do this is to use a nurse tank to transport water to the field for mixing and loading.
- Avoid mixing and loading on gravel driveways or on other permeable surfaces that allow spills to sink quickly into the soil. A packed clay surface is much better than sand.
- Install an anti-backflow device on the water source used for mixing. Never put the loading hose into the sprayer tank. Provide an air gap of 6 inches between the loading hose and the top of the sprayer tank opening.
- Always have someone with the tank when filling with water.
- Only a trained and certified applicator should perform filling operations.

- Whenever possible, mix fertilizers and pesticides at the site of application. Rotate mixing areas to avoid the possibility for a pesticide buildup in any one location.
- When a rinse pad is not available, rinse and flush application equipment over a labeled/recommended crop, take precautions not to exceed the recommended rate of material application, and rotate these areas.

Lawn and Garden Tips
How to Prevent Your Lawn and Garden from Creating Pollution
Tony Shirley, County Extension Agent Mercer County, Kentucky

- **Potential homeowner pollution is not minor** – Homeowners use 10 times as much chemical per acre as farmers do.
- **Fertilizer and your lawn** – Test your soil every 3 to 4 years to make sure its fertility is being maintained.
- **About pesticides** – Apply them ONLY when pests occur.
- **Composting and yard waste** – Composting is a natural way to handle leaves, grass clippings and other yard waste.
- **Watering your plants** – Water slowly and deeply to develop healthy deep roots.

Lawns and gardens can be a source of pollution and affect water quality in a watershed. Keeping a healthy, actively growing lawn and garden may require about 10 times more chemical fertilizers and pesticides per acre than are used by farmers on farmland. With this amount of material being applied, any improper application can result in a greater chance of these chemicals finding their way into nearby streams, lakes and thus into our drinking water supplies.

Other problems may arise in establishing and maintaining lawns and gardens such as leaving bare soil exposed to heavy rainfall any time during the year. This can result in soil being washed away and becoming sediment in our waterways. Also, excessive watering of lawns and gardens may waste large amounts of water each year. While each individual's lawn and garden may make a small contribution to a watershed pollution problem, the total contribution from the many homes in a watershed can really add up.

So what can homeowners do to lessen the potential pollution from lawns and gardens in a watershed? Some important aspects of fertilization, pesticide application, composting and watering are considered below. Individual homeowners can use these practices to reduce harmful impacts on water quality within their watershed.

Applying fertilizer without testing the soil is like taking a trip to an unfamiliar state without a road map. Soil testing will let a homeowner know if any additional plant nutrients are needed. The Cooperative Extension Service in each county can offer information needed to take and interpret results of a soil sample.

Often when we see sick plants in the lawn or garden our first reaction is to spray it with something. Many times the problem is the result of either weather or soil conditions. Plant disorders can be caused by weather extremes, too much or too little water, too hot or too cold, lawnmower damage, soil compaction or overuse of some material or product. Identifying any problem associated with plant growth is the first step. If possible bring a sample of the plant problem to the county extension office or arrange for a visit to the home by a county extension agent. When the problem is correctly identified, the extension agent can recommend the proper action to be taken. If pesticides of any type are recommended, be sure to read and follow all label directions before application.

Composting is a cost effective, natural way to handle leaves, grass clippings, and other yard waste. The composting process creates a great product to use on gardens or in landscapes. Composting reduces the amount of yard waste going into landfills, provides mulch that reduces water loss during summer months from the soil, and supplies needed organic matter and nutrients when mixed into the soil. To do composting, simply put yard waste in a pile, or install homemade or store bought bins to contain the material. Plans for developing a composting site, and helpful hints for successful composting are available from your county extension office.

Lastly, watering should be timed to meet the plants' biological needs. Watering slowly and deeply with larger amounts of water is better for the plant than a quick every other day watering with small amounts. Over watering wastes water and can injure some plants. Shallow watering, more common with frequent, short-term watering, may only encourage the germination and growth of unwanted weeds in the garden, lawn or landscape.

Increase the Life of Your Septic System
Your septic system – Out of sight, out of mind.....Until there's a problem
Tony Shirley, County Extension Agent Mercer County, Kentucky

- **A well-sited, properly sized and installed system will fail if not properly maintained.**
- **General maintenance tips** – Inspect and pump your system on a regular basis, practice water conservation, and keep harmful substances out of the system,
- **Pump your septic tank regularly** – Pumping your septic tank regularly is the single most important practice to maintain the system.
- **Maintaining the drain field** – Avoid planting deep-rooted shrubs and trees near the drain field and do not drive over the drain field.
- **Reduce the flow of wastewater** – Less water in the drain field means greater soil aeration for treatment, and decreases the tank load, which increases the life of the septic system.

Household wastewater is usually out-of-site and out-of-mind until problems occur. When these problems do occur, runoff from an improperly working septic system can allow bacteria and nutrients to enter streams, lakes and local wells which will affect their water quality. To prevent any future problems, each septic system owner should know some basics about the household waste water system and take some simple precautions.

Homes located outside cities and towns usually have a septic system to treat household wastewater. Wastewater in the home is collected and enters the septic tank through a pipe. In the tank, solids settle to the bottom, where bacteria feed on the organic based solids, breaking them down. Other non-organic solids are not decomposed and will buildup in the tank bottom. Grease, fats and oils float on top of the water creating a scum layer. A baffle in the tank prevents solids and scum from leaving the tank until they are broken down. The liquid leaving the tank flows through a pipe into a distribution box. The distribution box directs the flow into the drain field. The drain field uses the soil to provide final treatment of the wastewater, which greatly reduces the nutrients and harmful pathogens.

Homes within cities and towns are usually connected to a municipal sewage treatment system. With this system, wastewater is moved away from your home through large sewer pipes. It eventually reaches a wastewater treatment plant, where it is treated before the water is returned to a stream or river. Individual homes can reduce the impact that wastewater has on a community and the environment by conserving water and being careful not to put harmful products down the drain. Using the municipal wastewater treatment system wisely saves taxpayer dollars and protects our water resources.

For the septic tank system, proper maintenance is essential to its long life. Regular pumping of the tank is the most important thing each homeowner can do to maintain the system in good working order. When solids are allowed to accumulate in the tank beyond a normal depth, more solids will flow out of the tank and into the drain field, which plugs the small holes of the pipes in the soil. This can lead to plugging and stoppage of the entire system, which will then backup into the house. The best method to prevent drain field plugging and determine when to pump is to have the tank inspected annually. A general rule is to have a septic tank pumped by a licensed pumper every 3 to 5 years.

Substances that have the potential to reduce normal activity of bacteria in the septic tank or in the soil of the drain field should not be poured into a basin or other household device leading to the septic tank. Substances potentially hazardous to good operation of a septic system include such items as grease, fats, cooking oils, paints, organic solvents, glues, engine fuels, and pesticides.

A properly working drain field is the most important part of a well-functioning septic system. Water must be able to diffuse into the soil of the drain field. Any obstruction or soil compaction will disrupt this water movement. Avoid driving vehicles or any type of heavy equipment over the drain field. Avoid planting deep-rooted trees or shrubs near the drain field, as their roots will plug the lines.

If any foul odors are detected in the home or yard, the drain field or other parts of the septic system may have problems. In addition to foul odors, other problems can include a slow or backed-up house drain, spongy ground around the drain field, lush plant growth over or near the drain field, or even repeated intestinal illness in the family.

Any observed problems require a quick response. Part of that response is having the system repaired or modified to help prevent future problems. What may seem to be the least expensive option now may not be economical in the long run. The septic system owner should make decisions based on lowering risks to health and the environment.

When the flow of wastewater through the septic system is reduced, this allows more time for the solids to settle within the tank, providing less chance for solid particles and scum to be carried into the drain field. When less water goes to the drain field, the soil has greater aeration resulting in a higher degree of treatment for the wastewater.

These conservation practices will help reduce wastewater volume: install low-flow toilets, take shorter showers, repair leaks shortly after discovery, run the clothes washer and dishwasher only when full, and turn off water while brushing teeth or shaving.

Following the suggestions listed above will increase the life of a working septic system. Overall water quality in a watershed is not likely to be impacted with careful attention to good operation and maintenance of properly installed septic systems.

Agriculture Water Quality Plans

Kimberly R. Medley Boyle County Conservation District

- **Ag water quality plan needed** – all landowners in Kentucky with 10 or more acres of agricultural land should have a water quality plan fully implemented.
- **Several parts to the plan** – the plan covers six different areas of land use: silviculture, farmsteads, pesticides and fertilizers, livestock, cropland, and streams.
- **Many landowners already using BMPs** – most landowners are finding that many of the suggested Best Management Practices (BMPs) in the state plan are already in use on their farms.

The deadline of October 23, 2001 is long gone for developing and fully implementing Ag Water Quality Plans across Kentucky. If a plan has not been developed, if land has just been purchased or if revisions are needed, assistance is still available at conservation district offices in your county. The major reasons for offering assistance even after the deadline is to make sure each landowner has a workable plan to comply with state laws, or that the current plan is working satisfactorily for the landowner. These Plans should be reviewed periodically and revisions may be necessary to keep them current.

The Kentucky General Assembly passed the Ag Water Quality Act in 1994 creating the Ag Water Quality Authority. They specifically directed the Authority to develop a statewide Ag Water Quality Plan that applied to each 10 or more acres of agricultural land. The Plans developed by each landowner should have a major goal of protecting surface and groundwater resources from pollution. Each farm plan selects BMPs from a list in the state plan that will maintain and in many cases improve water quality. Improving water quality will also encourage better farm management.

The specific farm plans cover six different sections related to water quality: silviculture, farmsteads, pesticides and fertilizers, livestock, cropland, and streams. The plan development process involves answering yes/no questions in the six areas. For each question answered yes, there is a list of appropriate BMPs that landowners select from. Implementing these will greatly reduce the potential of polluting the surface or groundwater. All county conservation districts and county extension offices have computer software that will help landowners go through the six questions and then reproduce a list of appropriate BMPs that can be selected for implementation in the six different areas on the farm.

Some farmers may lease farmland. In other cases the landlord lives outside the county or the state, or the landowner may be elderly and not able to visit one of the offices for assistance. In these cases, the tenants can fill out the plan for the owner when given permission to do so.

Most landowners who have completed and implemented their plan are finding that most of the recommended BMPs from the state plan (when questions are answered yes) are already being implemented on their farms. The plan gives greater attention to implementing conservation measures for water quality improvement by the landowner and/or farmer and is not used in a regulatory manner.

Landowners that still need Ag Water Quality Plans, or that need to review and revise their plans are asked to contact their local conservation district office. If the selected BMP's of a current plan have not been fully implemented, assistance for design and implementation is available from the same office.

In the past, landowners have been reluctant to inform conservation districts that a plan has been developed for their farm. Recently passed state legislation allows landowners to inform conservation districts that a plan has been developed without that plan being a public record. Landowners seeking cost-share funding may have to submit a copy of their plan with the application.

Sinkholes in Our Watersheds

John D. Overing, RC & D Coordinator USDA/NRCS

- **Sinkholes may be common** – Sinkholes are present in many areas of Kentucky as depressions in the landscape or even open holes in the land.
- **Depressions in the land may be a sinkhole** – Sinkholes covered with soil on the surface will have a hole through the limestone to a cavern below.
- **They connect land surface to groundwater** – These landscape depressions or holes provide a direct connection to underground streams of water.
- **Throwing trash or waste in sinkholes pollutes groundwater** – Any waste or debris in sinkholes will provide a source of pollution to groundwater.

Sinkholes are common where the rock below the land surface is limestone or rocks that can naturally be dissolved over millions of years by ground water circulating through them. In the limestone areas of Kentucky there are an estimated 600,000 sinkholes, varying in depth from just 3 to 6 feet to as much as 125 feet below the surface. A sinkhole may form when an underground cavern roof collapses, or may develop ever so slowly as the rock is gradually dissolved away leaving the large underground hole.

Imagine an old, abandoned, two-story, wooden farmhouse. Over a period of time, the wooden crossbeams and joists supporting the house dry out and begin to deteriorate. As time goes on, the framework loses its integrity, the support is lost, and the floor sags. If this process is allowed to continue, the house eventually collapses from support loss. Although the actual deterioration process may have taken many years, the final collapse can occur very rapidly.

Sinkhole development is similar to this process except that deterioration occurs over millions of years. The support (rock) for the land surface is gradually removed by dissolving the rock causing the land to sag and finally to collapse, leaving an open hole or an underground cavity. When overlying surface material (soil) fills the top of the underlying rock hole, this leaves a surface depression.

Sinkholes occur in karst areas of Kentucky. They connect the land surface with underground stream systems and caves. Soil, nutrients, pathogens, organic debris, and other pollutants can move underground rapidly through sinkholes during rainstorms. These materials are then transported through the underground stream system and finally appear as springs either on the surface or under stream bottoms.

A sinkhole is an important part of the water system in much of Kentucky. It is estimated that 60% of the land area is underlain by underground caverns. Maintaining the high quality of water in underground streams and the resulting springs means the quality of water entering sinkholes must be protected. Using conservation practices, such as filter strips, around a sinkhole is just as important as using them along streams, rivers or lakes. Animal access to sinkholes should be restricted as one way to reduce potential pollution from nutrients and bacteria contained in the manure.

Sinkholes have long been used by many residents as dumps for waste materials. Dumping wastes into sinkholes is a major hazard to groundwater resources. Liquid wastes dumped into open sinkholes can enter the groundwater system undiluted or unfiltered. **Never** put anything into a sinkhole (depression or open) that you would not want to be in your drinking water.

Why Disposal of Used Oil is Important

(Handling Used Oil in our Watersheds)

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- **Oil can affect our fresh water** – one gallon of oil can ruin a million gallons of fresh water, a year's supply of fresh water for 50 people.
- **Consumers generate used oil** – at least 200 million gallons each year are generated and 120 million gallons of recoverable oil are thrown away each year.
- **Used oil can be re-refined** – refining used oil requires only about $\frac{1}{4}$ the energy of fresh crude oil. One gallon of used oil provides the same 2.5 qt. of lubricating oil as a 42-gallon barrel of crude oil.
- **Recycling used oil saves crude oil** – about 1.2 million barrels of crude oil would be saved each day.

Be careful with that used oil! Oil placed in the garbage container or dumped on the ground can eventually find its way into our drinking water supply. When allowed access to fresh water, used oil from a single oil change (about 1 gal) can ruin 1 million gallons – a year's supply for 50 people. One quart of oil can form an oil slick on water of nearly 2 acres in size. Just a little oil finding its way into our streams and rivers may coat several miles with an oil slick.

Used oil contains many harmful chemical wastes and additives, some of which are potentially hazardous to human health. Heavy rains can transport oil dumped on the ground into our waterways. Oil dumped into storm water drains goes directly to the streams and rivers.

“Do-it-yourselfers” who change their own oil generate at least 200 million gallons of used oil each year. Reliable estimates indicate that these consumers throw away 120 million gallons of used oil by dumping it on the ground, pouring it down storm drains, or putting it in trash cans. This oil can be recovered.

Recycling the “do-it-yourselfers” oil would save the U. S. about 1.2 million barrels of crude oil per day. One gallon of used oil provides the same 2.5 quarts of lubricating oil as a 42-gallon barrel of fresh crude oil. Re-refined oil is as good as new oil; in addition, used oil can be re-refined with $\frac{1}{4}$ the energy required to produce lubricating oil from crude oil.

To recycle used oil, simply drain the oil into a suitable container, and transfer it into an unbreakable, sealable container. Seal the container and take it to a collection center, a service station, or other location that collects used oil for recycling.

In today's society, individual consumers change almost 60% of the nation's automotive oil. Recycling used oil from cars, trucks, boats, motorcycles, recreational vehicles, and lawnmowers will keep it from getting into our fresh water bodies.