

STORMWATER MANAGEMENT

This chapter examines potential risks to the environment and your health from stormwater runoff. Two areas are covered:

1. *Reducing Pollutants in Runoff.* Pollutants can include pesticides and chemicals, automotive wastes, grass clippings and yard waste, pet and animal wastes, and winter salt and deicers.
2. *Landscaping and Site Management to Control Runoff.* Some ways to help control runoff are preventing soil erosion, providing basement flood protection, landscaping, providing proper roof drainage, and minimizing paved surfaces.

Completing this chapter will help you evaluate how stormwater affects the environmental quality of your property and properties “downstream.” You will also learn ways to reduce pollution risks.

What is stormwater, and why should you be concerned?

Stormwater is water from rain or melting snow that does not soak into the ground. It flows from rooftops, over paved areas and bare soil, and through sloped lawns. As it flows, this runoff collects and transports soil, pet waste, salt, pesticides, fertilizer, oil and grease, leaves, litter, and other potential pollutants. You do not need a heavy rainstorm to send pollutants rushing toward streams, wetlands, lakes, and ultimately oceans. A garden hose alone can supply enough water.

Even if your house is not on a waterfront, storm drains and sewers efficiently convey runoff from your neighborhood to the nearest body of water. Contrary to popular belief, storm sewers do not carry stormwater to wastewater treatment plants (Figure 2.1).

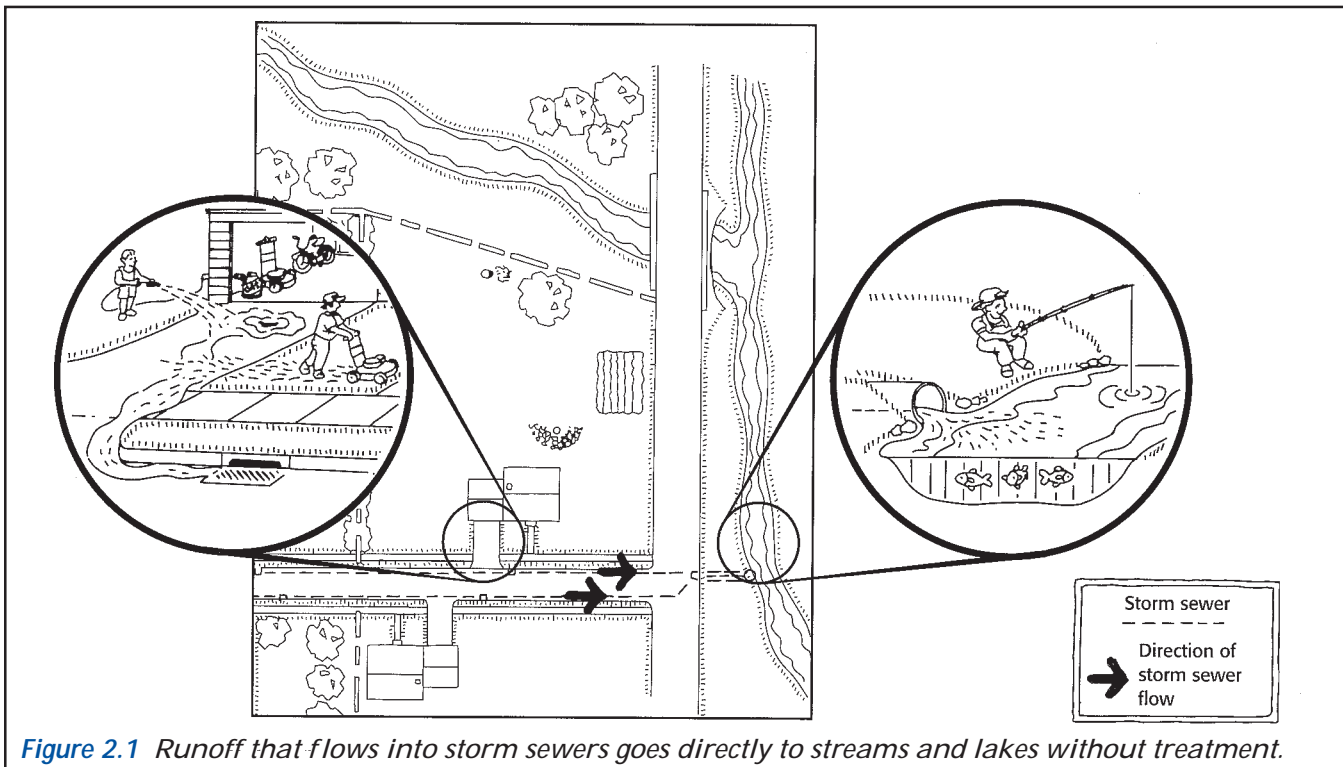


Figure 2.1 *Runoff that flows into storm sewers goes directly to streams and lakes without treatment.*

Polluted stormwater degrades or impairs the use of our Kansas ponds, lakes, rivers, and wetlands. Soil clouds water and degrades habitat for fish and water plants. Nutrients such as phosphorus promote the growth of algae, which crowds out other aquatic life. Toxic chemicals such as antifreeze and oil from leaking cars, carelessly applied pesticides, and zinc from galvanized metal gutters and downspouts threaten the health of fish and other aquatic life. Bacteria and parasites from pet waste can make nearby ponds and lakes unsafe for wading and swimming after storms.

As many people have discovered, stormwater can be a problem closer to home. It can flow into basements and cause damage that is difficult and costly to clean up. Stormwater can also flow down a poorly sealed well shaft and contaminate drinking water. In areas with very porous soils or geology, pollutants in runoff may reach groundwater.

Across the country, public officials are not only continuing monitoring efforts relating to improved wastewater discharge, but also are increasing pollution control efforts to address stormwater. Stormwater pollution, sometimes referred to as nonpoint source pollution, cannot be treated in the same way as water pollution from discharge pipes, because it comes from many sources (see table below). It is carried by stormwater from every street, parking lot, sidewalk, driveway, yard, and garden. The problem can only be solved with everyone's help.

Common Sources of Stormwater Pollutants

Pollutant	Common sources
Silt, sand, and clay particles and other debris	Construction sites; bare spots in lawns and gardens; wastewater from washing cars and trucks on driveways or parking lots; unprotected streambanks
Nutrients	Overused or spilled fertilizers; pet waste; grass clippings and leaves left on streets and sidewalks; leaves burned in ditches
Disease organisms	Pet waste, garbage, surfacing septic systems
Hydrocarbons	Car and truck exhaust; leaks and spills of oil and gas; burning leaves and garbage
Pesticides	Pesticides over-applied or applied before a rainstorm; spills and leaks
Metals	Cars and trucks (brake and tire wear, exhaust); galvanized metal gutters and downspouts

PART 1—Reducing Pollutants in Runoff

Stormwater is unavoidable, but its negative effects can be reduced by keeping harmful chemicals and materials out of the runoff. This section reviews potential sources of contamination and offers ways to minimize them. At the end of Part 1, fill out the assessment table to help identify stormwater risks on your property.

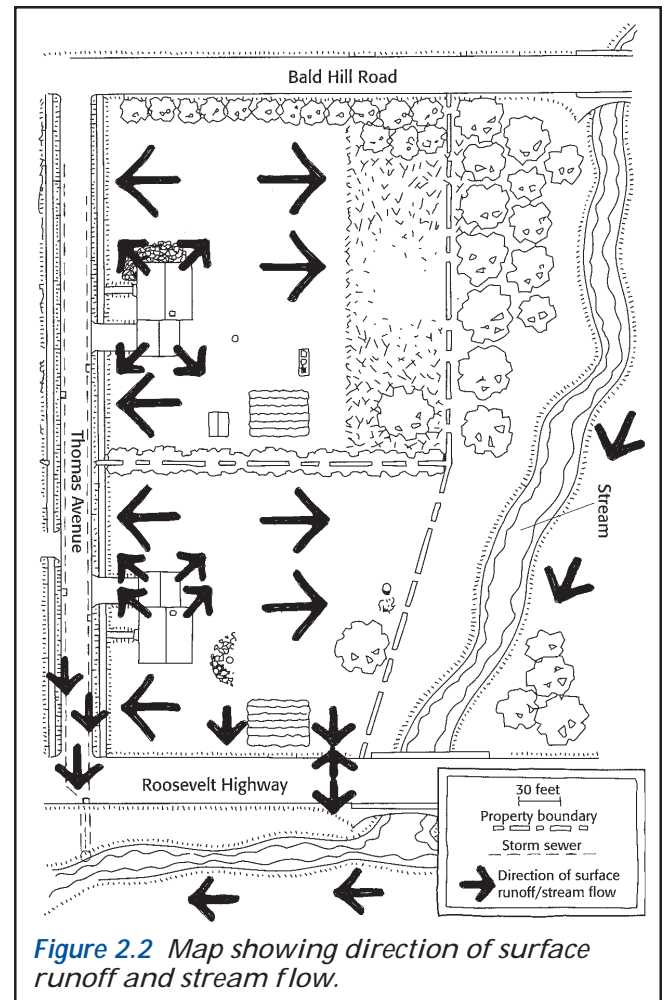


Figure 2.2 Map showing direction of surface runoff and stream flow.

Where does stormwater go?

The next time you are home during a rain shower, head outdoors with your boots and umbrella and watch where the rainwater goes. On a sketch of your property, draw arrows showing the direction that stormwater flows off driveways, rooftops, sidewalks, and yards. A sample map is provided in Figure 2.2. (Instructions for making a homesite sketch can be found in Chapter 1 beginning on page 12.) Does water soak into the ground quickly, or does it puddle in places and flow off lawns and driveways? Your soil type affects water infiltration (soaking into the ground). As you might expect, water infiltrates sandy soil quickly but has a hard time seeping into fine-grained silt or clay soils.

During your walk, note how far it is to the nearest storm sewer, ditch, wetland, stream, or body of open water. Note whether runoff flows onto your

land from adjacent streets, lands, or stormwater systems. If you live at or near the bottom of a hill, you may have special problems. Be sure to go out during more than one rain shower to get a good understanding of runoff flow during small and large storms.

Are any car or truck wastes being carried away by stormwater?

Oil stains on your driveway and outdoor spills of antifreeze, brake fluid, and other automotive fluids are easily carried away by a rainstorm. An oily sheen on runoff from your driveway is a sure sign that you need to be more careful. Pans, carpet scraps, and matting can catch drips. Routine maintenance can prevent your car from leaking and help identify potential leaks. If you change your own oil, be careful to avoid spills and collect waste oil for recycling. Oily car parts and fluid containers should be stored where rain and runoff cannot reach them. Never dump used oil, antifreeze, or gasoline down a storm drain, in a ditch, or on the ground. These wastes will end up in a nearby lake or stream, or they may pollute your drinking water.

Washing your car in the driveway creates runoff without the help of a rainstorm—your hose provides the water. The dirty, soapy runoff drains directly into storm sewers, picking up oil and other pollutants as it goes. Try washing your car on the lawn or, better yet, take it to a commercial car wash or spray booth that sends its dirty water to a wastewater treatment plant.

Are household products stored outside the reach of stormwater?

Most households store lawn and garden products like weed killers, insect killers, and fertilizers. If stormwater or floodwater reaches these products, it can transport them into surface water and possibly your well. Pool chemicals, salt for water softeners, and a wide variety of other chemical products can also cause trouble if they are washed away. Keeping such products in waterproof containers and storing them up high and out of the potential path of runoff or floods is important. You can avoid storage problems by buying only what you need for a particular task and then using up the product.

Do you use and handle chemicals safely?

Safe storage is only the first step in preventing contaminated runoff. When mixing chemicals, try to do it within a washtub so spills will be contained. If you spill chemicals, act quickly to contain and clean up the spill. This is particularly important on paved surfaces. Using more pesticides or fertilizers than you need invites problems. Timing of applications is also important. Do not apply pesticides and chemicals if rain is expected within twenty-four

hours. See Chapter 7, Yard and Garden Care, for more information on the proper use and handling of yard and garden products.

Do you use road salt or other deicing product?

Road salt and deicers eventually wash off paved surfaces and end up in the soil or water. From your driveway or sidewalk, salt can readily flow to storm drains and into streams and lakes. Salt is harmful to wildlife and plants in high concentrations. Use less to keep these chemicals out of natural systems. If you use too much, clean up the excess. Consider sand or regular kitty litter as less toxic alternatives.

How are animal wastes kept from becoming a pollution problem?

Droppings from dogs and cats and from other commonly kept animals like exotic birds, rabbits, goats, and chickens can be troublesome in two ways. First, pet wastes contain nutrients that can promote the growth of algae if they enter streams and lakes. Second, animal droppings are a source of disease. The risk of stormwater contamination increases if pet wastes are allowed to accumulate in animal pen areas or left on sidewalks, streets, or driveways where runoff can carry them to storm sewers. Droppings that are not mixed with litter or other materials should be flushed down the toilet. Or, if local laws allow it, droppings may either be buried or wrapped and put in the garbage for disposal.

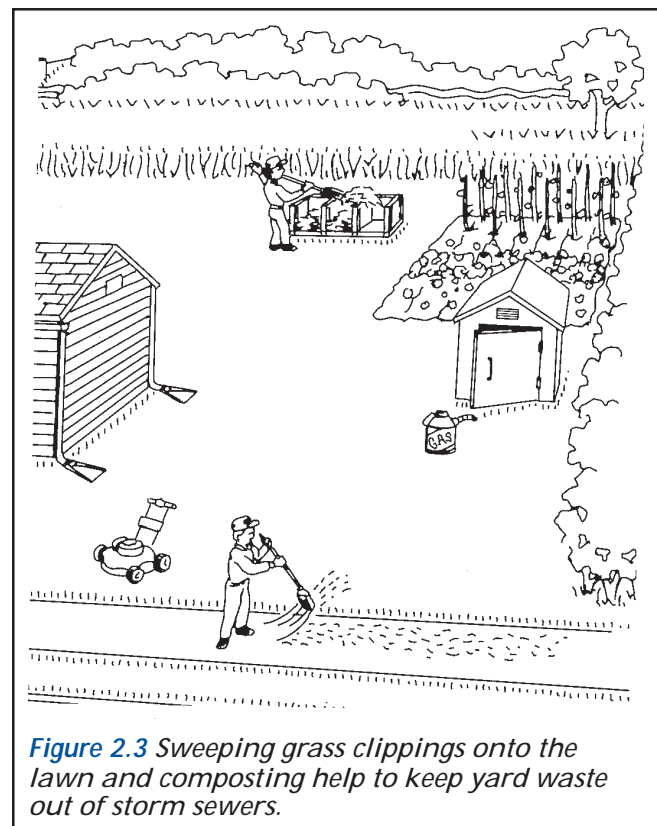


Figure 2.3 Sweeping grass clippings onto the lawn and composting help to keep yard waste out of storm sewers.

Are yard and garden wastes kept out of stormwater?

If left on sidewalks, driveways, or roads, grass clippings and other yard wastes will wash away with the next storm (Figure 2.1, page 16). Although leaves and other plant debris accumulate naturally in streams and lakes, homeowners can contribute excess amounts of plant matter, especially in areas with many homes. This can lead to water that is unattractive or green with algae and unsuitable for recreation.

Burning yard waste is not an environmentally friendly alternative—and in some areas, it's illegal. Hydrocarbons and nutrients released by burning leaves contribute to water pollution as well as air pollution. Rain washes smoke particles out of the air, and runoff picks up dust and ashes left on pavement or in ditches. Avoiding the problem is easy—sweep clippings back onto the grass, and compost leaves and garden wastes on your property to recycle nutrients (Figure 2.3).

Assessment 1—Reducing pollutants in runoff

Use the table on the following page to rate your stormwater pollution risks. For each question, indicate your risk level in the right-hand column. Some choices may not correspond exactly to your situation. Choose the response that best fits. Refer to the sections above if you need more information.

Responding to risks

Your goal is to lower your risks. Turn to the action checklist on page 23 to record medium- and high-risk practices. Use the recommendations in Part I to help you make plans to reduce your risks.

PART 2—Landscaping and Site Management to Control Runoff

Silt and sediment from erosion is the number one water pollutant in the United States. In addition, the loss of naturally occurring topsoil reduces the land's ability to grow healthy plants. These processes are a fact of nature; however, man's activities can speed up the process. Some examples are:

- removing protective cover such as vegetation or mulch, leaving bare soil
- creating or directing water flow or increasing velocity beyond natural flow
- removing natural barriers such as wooded stands or wetlands along streams and lakes
- poor timing with regard to exposing soil during seasons of high rainfall
- putting dirt close to a water way with little protective cover and filtering separation

Sources include unprotected or improperly managed stream banks, dams, cropland and land disturbance activities from major highways, shopping malls, channel changes, bridge construction, or even building a house or other structure on your

property. Anywhere you remove groundcover, trees, shrubs, etc. a potential for erosion exists. Whether the eroded sediment goes through a storm sewer, ditch, or directly into a waterway, it still is a problem. Millions of dollars are spent each year dredging lakes, ponds, and rivers; cleaning out storm sewers; and treating the water for drinking. Wet sediment (mud) deposits on driveways, parking lots, or streets become a safety hazard.

Measures can be taken when dealing with exposed soil, which control sediment run-off and the related environmental and safety concerns. One source for information is the Natural Resource Conservation Service (NRCS). Each Kansas county has a Conservation Office with an NRCS representative.

In many Kansas communities local codes require a permit for certain construction activities. Contact your county or city public works department for details. The Kansas Department of Agriculture—Division of Water Resources is required by law to regulate any activity, which has the potential to stop or change flow direction, yield, or speed of the waters in Kansas. Activities which alter land in the flood plain may be included. The U.S. Department of Army, Corps of Engineers has a similar permit program for waters of the nation, including wetlands. Most streams and lakes in Kansas are eligible. Any nonagricultural construction activity involving five acres or more, requires a clearance from the Kansas Department of Health and Environment (KDHE). KDHE also has information to assist those working on tracts of less than five acres. The end of this chapter lists the Kansas offices for these agencies.

Some stormwater risks can be controlled by making changes to buildings, paved surfaces, the landscape, and soil surfaces. This section reviews some easily addressed problems, as well as major landscape alterations you might want to consider.

Are there areas of bare soil around your home?

Areas of bare soil often exist in vegetable and flower gardens, on newly seeded lawns, and around construction projects. Even on gentle slopes, water from rain and snow can remove large amounts of soil and carry it to wetlands, rivers, and lakes. Planting grass or other ground covers is the best way to stop erosion. Putting a straw or chip mulch over gardens or newly seeded areas will slow erosion. Straw bales, diversion ditches, and commercially available silt fences around construction sites can help slow runoff and trap sediment on-site. If you are working with a contractor, insist that precautions are taken to control runoff and erosion during construction.

Can you eliminate paved surfaces or install alternatives?

Concrete and asphalt roads, driveways, and walkways prevent rainwater from soaking into the ground. When you have the choice, consider

ASSESSMENT 1—Reducing Pollutants in Runoff

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Automotive wastes	Oil drips and fluid spills are cleaned up. Dirty car parts and other vehicle wastes are kept out of reach of stormwater runoff.	Drips and spills are not cleaned up. Car parts and other vehicle wastes are left on unpaved areas outside.	Used oil, antifreeze, and other wastes are dumped down the storm sewer, in a ditch or on the ground.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
Car washing	Cars and trucks are taken to a commercial car wash or spray booth.	Cars, trucks, or other items are washed on a lawn or gravel drive.	Cars, trucks, or other items are washed on a driveway, street, or other paved area.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> Low
Storage of pesticides, fertilizers, and other potentially harmful chemicals	Chemicals are stored in waterproof containers in a garage, shed, or basement that is protected from stormwater	Chemicals are stored in waterproof containers but within reach of stormwater.	Chemicals are stored in non-waterproof containers outdoors or within reach of stormwater.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
Handling and use of pesticides, fertilizers, and outdoor chemicals	Spills are cleaned up immediately, particularly on paved surfaces. Minimum amounts of chemicals are applied according to label instructions. Applications are delayed to avoid rain.	Applications are not delayed to avoid rain.	Spills are not cleaned up. Products are used in higher amounts than what is recommended on the label.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
Pet and animal wastes	Animal and pet wastes are flushed down the toilet, buried away from gardens, wells, ditches, or areas where children play; or wrapped and placed in the garbage for disposal.*	Animal wastes are left to decompose on grass or soil. Wastes are scattered over a wide area.	Animal wastes are left on paved surfaces, concentrated in pen or yard areas, or dumped down a storm drain or in a ditch.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
Grass clippings, leaves, and other yard waste	Grass clippings, leaves, and other yard wastes are swept off paved surfaces and onto lawns away from water flow routes. Leaves and other yard wastes are composted.	Leaves and other yards wastes are piled on the lawn next to the street for collection.	Grass clippings, leaves and other yard wastes are left on driveways, streets, and other paved areas to be carried off by stormwater. Yard waste is burned on-site.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High

* Be sure to check local regulations regarding burying or landfilling pet and animal wastes.

alternative materials such as gravel or wood chips for walkways. Avoid paving areas such as patios. Where you need a more solid surface, consider using a “porous pavement” made from interlocking cement blocks or rubber mats that allow spaces for rainwater to seep into the ground. If you must pour concrete, keep the paved area as short and narrow as possible.

Is your basement protected from stormwater seepage or flooding?

Stormwater in your basement can be a hazard in two ways: first, if water carries contaminants or

disease organisms into your home, and second, if water picks up chemicals stored in your basement and carries them into the sewer or ground. Basement windows or doors are common stormwater entry points and should be sealed against leaks. It is best if window and door sills are at least a foot above ground level. If windows are at or below ground level, they can be protected with clear plastic covers available in building supply stores. Window wells that extend above ground level can help divert stormwater. Your yard should be sloped away from the foundation to prevent water from pooling near the house and leaking into the basement.

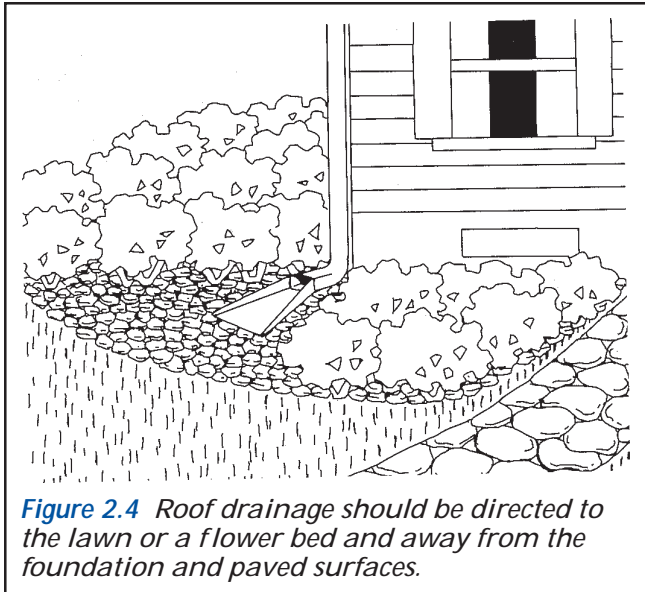


Figure 2.4 Roof drainage should be directed to the lawn or a flower bed and away from the foundation and paved surfaces.

Does roof water flow onto pavement or grass?

Your house roof, like pavement, sheds water. If downspouts from roof gutters empty onto grassy areas, the water will have a chance to soak into the ground. Aim downspouts away from foundations and paved surfaces (Figure 2.4). For roofs without gutters, plant grass, spread mulch, or use gravel under the drip line to prevent soil erosion and increase the ground’s capacity to absorb water. Consider using cisterns or rain barrels to catch rainwater for watering lawns and gardens in dry weather.

Can you change the layout of your landscape to reduce runoff?

An essential part of stormwater management is keeping water from leaving your property, or at least slowing its flow as much as possible. Many home lawns are sloped to encourage water to run off onto neighboring property or streets. Instead, you could provide low areas landscaped with shrubs and flowers

to encourage water to soak into the ground. If your yard is hilly, you can terrace slopes to slow the flow of runoff and make mowing and gardening easier. If you have a large lot, consider “naturalizing” areas with prairie, woodland, or wetland plants. If your property adjoins a lake or stream, one of the best ways to slow and filter runoff is to leave a buffer strip of thick vegetation along the waterfront (Figure 2.5). Good sources for ideas are your county K-State Research and Extension, county Conservation District, or Natural Resources Conservation Service offices.

Assessment 2—Landscaping and site management to control runoff

For each question in the assessment table on the following page, indicate your risk level in the right-hand column. Select the answer that best matches your situation. Refer to Part 2 above if you need more information to complete the table.

Responding to risks

As before, your goal is to lower your risks. In the Action Checklist on page 23, record your medium- and high-risk practices. Use the recommendations in Part 2 to help reduce your risks.

ACTION CHECKLIST

Go back over the assessment tables to ensure that all medium and high risks you identified are recorded in the checklist on page 23. For each medium and high risk, write down the improvements you plan to make. Use recommendations from this chapter and other resources to decide on actions you are likely to complete. A target date will keep you on schedule. You don’t have to do everything at once, but try to eliminate the most serious risks as soon as you can. Often it helps to tackle the inexpensive actions first.

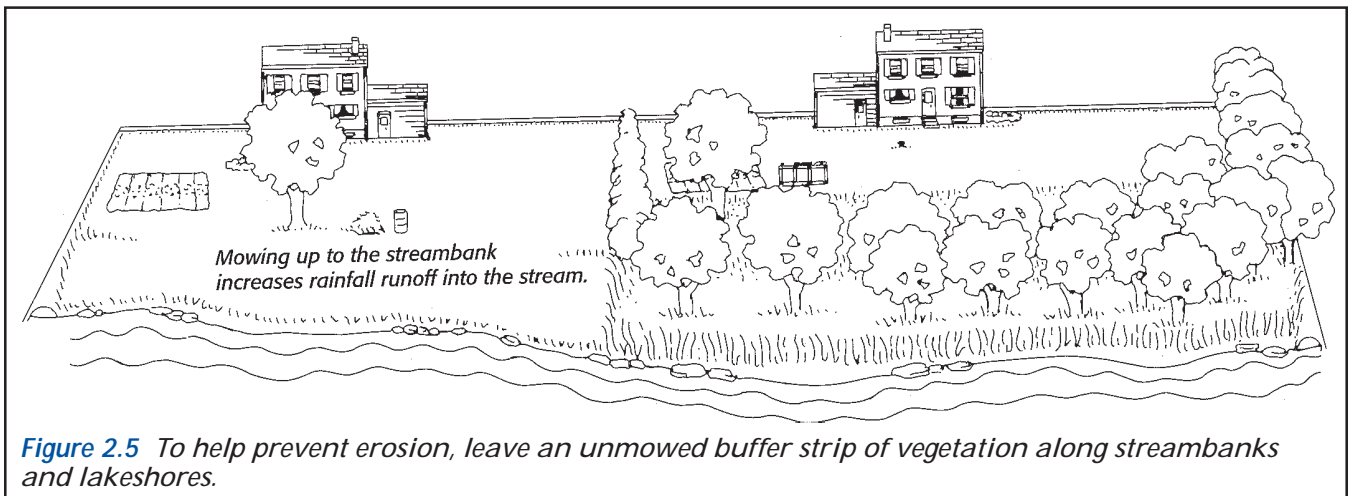


Figure 2.5 To help prevent erosion, leave an unmowed buffer strip of vegetation along streambanks and lakeshores.

Assessment 2—Landscaping and Site Management to Control Runoff

	LOW RISK	MEDIUM RISK	HIGH RISK	YOUR RISK
Bare soil in lawns and gardens	Bare spots in the lawn are promptly seeded and topped with a layer of straw or mulch. Bare soil in gardens is covered with mulch.	Grass or other ground cover is spotty particularly on slopes.	Spots in the lawn or garden are left exposed without mulch or vegetation for long periods.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
Bare soil during construction	Bare soil is seeded and mulched as soon as possible (before construction is done). Sediment barriers are used until grass covers soil.	Soil is left bare until construction is completed. Sediment barriers are installed and maintained to detain muddy runoff until grass covers soil.	Soil is left bare and no sediment barriers are used.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
Paved surfaces	Paved surfaces are minimized. Alternatives such as wood chips or paving blocks are used for walkways, patios, and other areas.	Some small areas are paved for patios or basketball courts.	Paved surfaces are used extensively.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
Basement protection	Stormwater is diverted from basement windows by window well covers and other devices. Yard is sloped away from the foundation. Downspouts direct roof away from the house.	No special water diversion methods are installed, but stormwater has never entered the basement.	No water diversion methods are attempted. Stormwater runoff has entered the basement or flows near the foundation.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
Roof drainage	Downspouts and drip lines direct roof drainage onto a lawn or garden where water soaks into the ground.	Some downspouts and drip lines discharge water onto paved surfaces or grassy areas where water runs off.	Most or all drip lines or downspouts discharge onto paved surfaces, or downspouts are connected directly to storm drains.	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High
Landscaping and buffer strips	Yard is landscaped to slow the flow of stormwater and provide areas where water soaks into the ground. Unmowed buffer strips of thick vegetation are left along streams or lakeshores.	No areas are landscaped to encourage water to soak in, but yard is relatively flat and little runoff occurs. Mowed grass or spotty vegetation is next to a stream or lake.	There is no landscaping to slow the flow of stormwater especially on hilly, erodable properties. Erosion along streams or lakeshores	<input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High

For More Information

Contact your county K-State Research and Extension office for information on landscaping, nonpoint source pollution, and stormwater management techniques. The following agencies are also resources:

- Kansas Department of Health and Environment—Bureau of Water (785) 296-5573
- Kansas Department of Agriculture—Division of Water Resources (785) 296-2933
- U.S. Department of Army Corps of Engineers (816) 983-3990
- Natural Resource Conservation Service, Kansas office (785) 823-4568

The following stormwater-related publications are available from the University of Wisconsin Extension Publications, Room 170, 630 West Mifflin Street, Madison, WI 53703–2636; (608) 262-3346. Up to five copies are free; call for price information if you want more than five copies.

- *Storm Sewers: The Rivers Beneath Our Feet* (GWQ004)
- *Cleaning Up Stormwater Runoff* (GWQ016)
- *Beneficial Landscape Practices* (GWQ008)
- *Car Care for Cleaner Water* (GWQ019)
- *Lawn and Garden Fertilizers* (GWQ002)
- *Lawn Watering* (GWQ012)
- *Pet Waste and Water Quality* (GWQ006)
- *Practical Tips for Home and Yard* (GWQ007)

*Kansas Home*A*Syst*, an environmental risk-assessment guide for the home, is a cooperative project of the Pollution Prevention Institute, K-State Research and Extension Service, Kansas Department of Health and Environment, U.S. Environmental Protection Agency, and the Environmental Department, Conservation District, and Natural Resources Conservation Service of Johnson County, Kansas, and Johnson County/K-State Research and Extension Office.

Illustrations used in this publication are taken from *Home A Syst: An Environmental Risk-Assessment Guide for the Home* developed by the National Farm*A*Syst/Home*A*Syst Program in cooperation with NRAES, the Northeast Regional Agricultural Engineering Service. Permission to use these materials was granted by the National Farm*A*Syst/Home*A*Syst Office.

Special thanks are due to all those who so graciously reviewed the materials. They are listed at the end of each chapter. It is appropriate to also acknowledge the staff of the national Farm*A*Syst/Home*A*Syst office who originally coordinated development of the original materials at the University of Wisconsin–Extension.



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