

Home*A*Syst

NORTH CAROLINA



Environmental Stewardship for Homeowners - 6

Stormwater Management for Homeowners

Are groundwater and surface water protected from drainage from your home?

Many homeowners use fertilizer or pesticides on lawns, gardens, shrubs, and trees. Improperly storing and applying these products may result in fertilizer or pesticides moving through the soil into the groundwater or washing off into surface waters. It is important to know how to maintain your yard while still protecting surface water and groundwater. Proper application of fertilizers and pesticides, safe storage practices, and correct watering are all part of the overall protection plan.

Surface waters also need to be protected from lawn and garden activities that cause soil erosion. Land-disturbing activities, uncovered soil surfaces, and the absence of water-retaining structures may cause soil to move into streams, lakes, and estuaries. Excess sediment and nutrients from fertilizer in surface waters can kill important food sources for fish and harm the water quality. It is important that you keep your soil, fertilizers, and pesticides on your property.

How can you help?

This publication will help you understand how your actions could pollute lakes, streams, estuaries, coastal waters, and groundwater. After you have read this publication, walk around your property and answer the questions in the margins. Your answers will help you see any potential problems.

- If you answer a question with a, you have few problems with household activities.
- If you answer a question either b or c, there may be a problem with the way you care for your property.
- If you answer a question either b or c, you will want to consider making changes in your caring for

North Carolina Home*A*Syst Publications

- Protecting Water Supply - #1
- Improving Fuel Storage - #2
- Improving Storage and Handling of Hazardous Waste - #3
- Improving Septic Systems - #4
- Improving Lawn Care and Gardening

your property in order to protect water resources.

If you would like further help in assessing the condition of your lawn care or gardening activities, please contact your nearest Cooperative Extension center and talk with your Extension agent.

*What is the North Carolina Home*A*Syst Program?*

- #5
- Stormwater Management for Homeowners - #6
- Indoor Air Quality - #7
- Lead - #8

The North Carolina Home*A*Syst program has a series of publications that can help you to be a good environmental steward and also protect the health and well-being of your family. This series leads you through an evaluation of your home and property to determine the pollution and health risks of your water supply protection practices, your indoor air quality, and the effects on surface water supplies from stormwater management. If there is a problem or a potential problem, the Home*A*Syst publications have information about how to solve the problems. The publications also list the North Carolina state agencies responsible for helping you solve your particular problem.

The goal of the North Carolina Home*A*Syst program is to help protect the health of you and your family and the environment of North Carolina.

How safe is your drinking water?

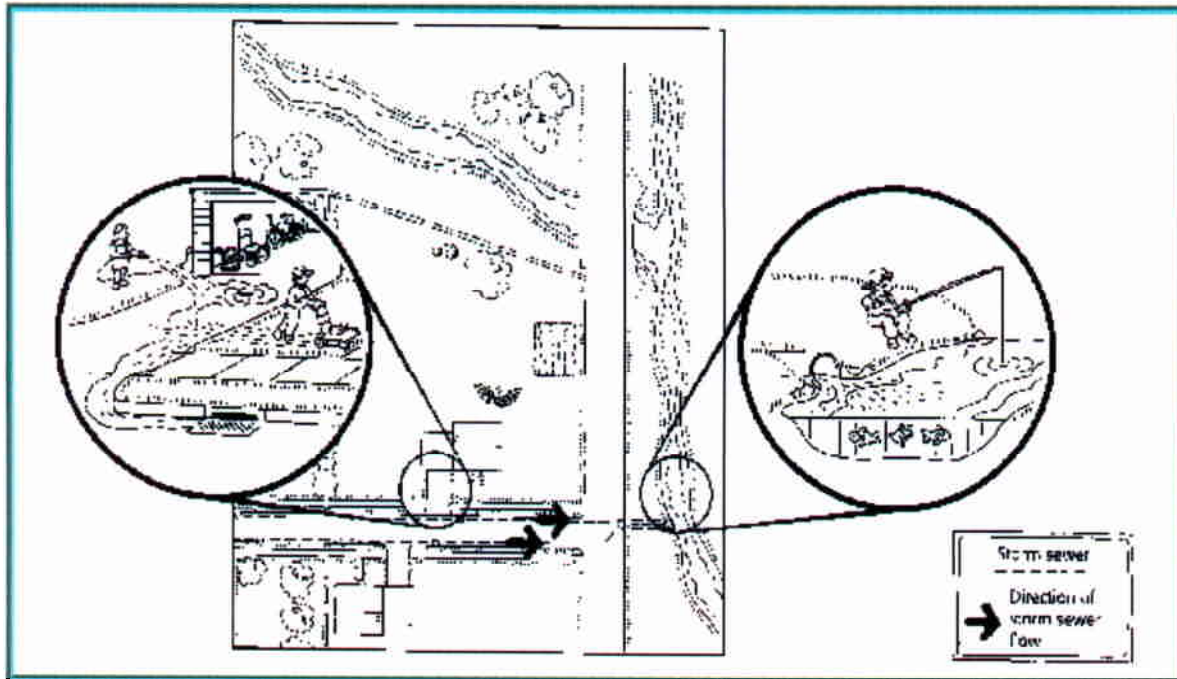
It is important to protect our home environment as well as our natural environment. If you drink water, it comes from a well or spring (groundwater sources) or a river or lake (surface water sources). Drinking water in North Carolina is generally safe, but it can become polluted if we are not careful. Many of the things you do at home can pollute our water and the environment. Poorly maintained or designed septic systems can pollute surface and groundwater. Pesticides, fertilizers, fuels, and cleaning products can contaminate your water when they are not stored and handled properly. Not only can these substances affect your family's drinking supply, they also can affect the health of wildlife and aquatic organisms.

It is nearly impossible to get pollutants out of our water or our homes once they get there. Clearly, it is much more effective to keep pollutants out than to try to clean them up afterward.

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 stormwater runoff collects and transports the following pollutants:

- sediment
- pet waste
- pesticides
- fertilizer
- automobile fluids (oil, grease, gasoline, antifreeze)
- deicing products (road salt and fertilizers)
- grass clippings, leaves, and other yard waste
- cigarette butts and other litter



Runoff that flows along the "stormwater superhighway" goes into storm sewers that flow directly to streams and lakes without treatment.

You don't need a heavy rainstorm or a Hurricane Fran or Hugo to send pollutants rushing toward streams, wetlands, lakes, estuaries, and oceans. A garden hose or sprinkler alone can supply enough water.

Even if your house is not on a waterfront, storm drains and storm sewers efficiently convey runoff from your neighborhood to the nearest body of water. Consider a rooftop connected to a gutter system that is adjacent to a sidewalk. This sidewalk may drain to a concrete-lined storm sewer leading to a stream. This system can quickly transport pollutants into water. This series of connected impervious areas may be thought of as a "stormwater superhighway." Contrary to popular belief, storm sewers do not carry stormwater to wastewater treatment plants — storm sewers directly lead to streams (see figure below).

Polluted stormwater degrades streams, rivers, ponds, wetlands, estuaries, sounds, and bays. Soil clouds water and deteriorates habitat for fish and plants. Nutrients such as nitrogen and phosphorus promote the growth of algae, which crowd out other aquatic life. Large amounts of nutrients can cause a water body to become hypoxic, or lacking in oxygen. This lack of oxygen is believed to be the primary culprit for fish kills in some North Carolina rivers. Another contributor to the millions of dead fish is *Pfiesteria piscicida*. *Pfiesteria*, a microscopic dinoflagellate, appear to thrive in environments with unbalanced nutrients. Toxic chemicals, such as antifreeze and oil from leaking cars, carelessly applied pesticides, and zinc from galvanized metal gutters and downspouts, also threaten the health of fish and other aquatic life. Bacteria and parasites from pet waste and leaking septic tanks can make nearby lakes and bays unsafe for wading and swimming after storms and have caused many tidal waters to be closed to shellfish harvesting.

As many people have discovered, stormwater can be a problem closer to home. Flooding causes damage that is difficult and costly to clean up. Stormwater can 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 redirecting their pollution control efforts from wastewater discharges to stormwater management in urban and rural areas. Stormwater pollution cannot be treated in the same way as water pollution from discharge pipes, because stormwater comes from many sources (see table below). It is carried by runoff along the stormwater superhighway 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	Construction sites; bare spots in lawns and gardens; wastewater from particles and other debris washing cars and trucks on driveways or parking lots; dirt roads and driveways; unprotected streambanks and drainageways
Nutrients	Fertilizers; pet waste; grass clippings and leaves left on streets and sidewalks; leaves burned in ditches; atmospheric deposition
Disease organisms	Pet and wildlife waste; garbage
Hydrocarbons	Car and truck exhaust; leaks and spills of oil and gas; used oil dumping; burning leaves and garbage
Pesticides	Pesticides overapplied or applied before a rainstorm; spills and leaks
Metals	Cars and trucks (brake and tire wear, exhaust); galvanized metal gutters and downspouts; industrial activities

Reducing Pollutants in Runoff

Stormwater is unavoidable, but its polluting effects can be reduced by keeping harmful chemicals and other materials out of runoff. This section offers ways to minimize major potential sources of contamination.

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. Does water soak into the ground quickly, or does it collect in puddles and flow off lawns and driveways? Do you see a stormwater superhighway? Is your rooftop connected to a gutter system that is adjacent to a sidewalk or driveway that drains into a concrete-lined ditch? Soil type affects how water infiltrates (soaks into the ground). As you might expect, water

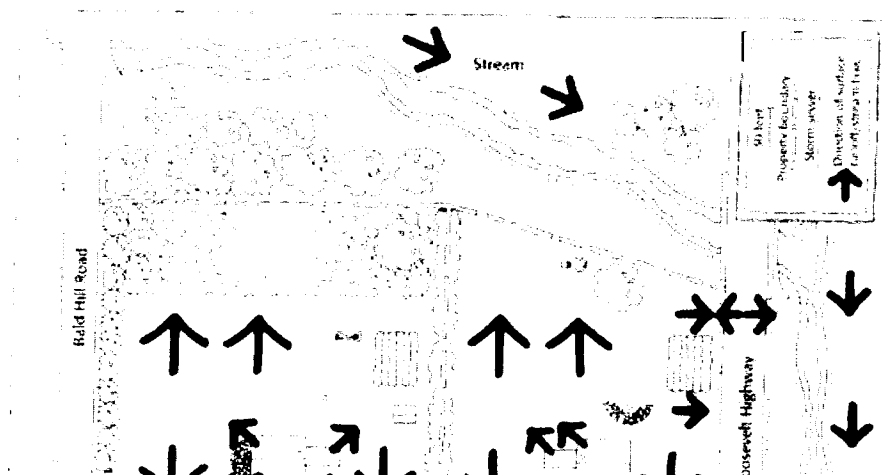
quickly infiltrates sandy soil, such as in the coastal plain or sandhills, but has a hard time seeping into fine-grained clay soils, such as those found in the piedmont or the rocky soils of the mountains.

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, lawns, or stormwater systems. If you live at or near the bottom of a hill, you may have problems unique to your relatively low-lying position. Be sure to go out during more than one rain shower to get a good understanding of runoff flow during small and large storms.

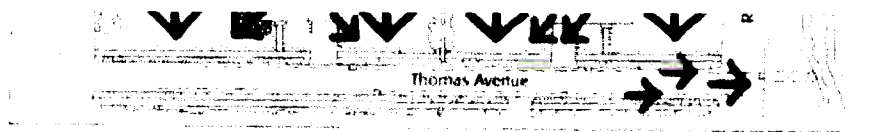
1. Are any car or truck wastes being carried away by stormwater?

Oil stains on your driveway and outdoor spills of antifreeze, brake fluid, and other automotive fluids are easily carried along the stormwater superhighway during 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. The North Carolina Cooperative Extension Service has a *Help the Environment by Recycling Oil (HERO)* program in many counties. Every county in North Carolina has at least one used motor oil collection site available to its citizens. Store oily car parts and fluid containers 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. If possible, try washing your car on the lawn. Better yet, take it to a commercial car wash or spray booth that sends its dirty water to a wastewater treatment plant.



- 1a. Circle the answer that best describes how you handle automotive wastes.**
- a. Oil drips and fluid spills are cleaned up. Dirty car parts and other vehicle wastes are kept out of reach of stormwater runoff.
 - b. Drips and spills are not cleaned up. Car parts and other vehicle wastes are left on unpaved areas outside.
 - c. Used oil, antifreeze, and other wastes are dumped down the storm sewer, in a ditch, or on the ground; OR do not know.
-
- 1b. Circle the answer that best describes how you wash your car.**
- a. Cars and trucks are taken to a commercial car wash or spray booth that sends its water to a wastewater treatment plant.
 - b. Cars, trucks, or other vehicles are washed on a lawn or gravel drive.
 - c. Cars, trucks, or other vehicles are washed on a driveway, street, or other paved area; OR do not know.



Map showing direction of surface runoff and stream flow in a neighborhood.

2. Do you store household products outside the reach of stormwater?

Most people have lawn and garden products like herbicides, insecticides, fungicides, and fertilizers. If stormwater or floodwater reaches these products, it can transport them into surface waters and possibly your well. Pool chemicals, salt in water softeners, and a wide variety of other chemical products are also troublesome pollutants if they wash into stormwater runoff. 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 as much of a product as you need for a particular task. Sometimes you can avoid using these chemicals in the first place. Extension publications such as *Disposal of Hazardous Household Waste* (FCS 368-3/WQWM-62) can help you understand household hazardous waste.

2. Circle the answer that best describes how you store pesticides, fertilizers, and other potentially harmful chemicals.

- a. Chemicals are stored in waterproof containers in a garage, shed, or basement that is protected from stormwater.
- b. Chemicals are stored in waterproof containers but within reach of stormwater.
- c. Chemicals are stored in non-waterproof containers outdoors or within reach of stormwater; OR do not know.

3. Do you use and handle chemicals safely?

Safe storage is only the first step in preventing contaminated runoff. Mix chemicals within a washtub so spills will be contained. If you do 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 lawn and garden chemicals if rain is expected within 24 hours. See Home*A*Syst fact sheet #5, *Improving Lawn Care and Gardening*, for more information on the proper use and handling of yard and garden products that can pollute.

3. Circle the answer that best describes how you handle and use pesticides, fertilizers, and other lawn and garden chemicals.

- a. Spills are cleaned up immediately, particularly on paved surfaces. Minimum amounts of chemicals are applied according to label instructions. Applications are timed to avoid rain.
- b. Spills are cleaned up immediately, particularly on paved surfaces. Minimum

amounts of chemicals are applied according to instructions. Applications are NOT timed to avoid rain.

c. Spills are not cleaned up. Products are used in higher amounts than is recommended on the label; OR do not know.

4. Do you use road salt or other deicing products?

Road salt and deicers eventually wash off paved surfaces and end up in the soil or water. The stormwater superhighway readily carries salt and chemicals into streams and lakes. Salt harms wildlife and plants in high concentrations, so use as little salt as possible. Refrain from using fertilizers as deicers; sand is a less toxic alternative. Chipping ice off pavement is an even better choice, although care must be taken not to damage the pavement surface.

4. Circle the answer that best describes your use of road salt and other deicing products.

a. Sand, road salts, and deicers are not used to facilitate ice melt.

b. Sand is used to deice driveways and sidewalks. Salts and fertilizers are not used.

c. Fertilizers, salts, and sand are used to remove ice from driveways and sidewalks; OR do not know.

5. How do you keep animal wastes from becoming a pollution problem?

Droppings from dogs, cats, and other commonly kept animals, such as 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 wastes enter streams, lakes, and estuaries. Second, animal droppings contain bacteria that can cause disease. The risk of stormwater contamination increases if pet wastes are allowed to accumulate in animal pen areas or left on sidewalks, streets, driveways, or drainage ways from which they can be carried along the stormwater superhighway to water bodies. Instead of allowing pet wastes to accumulate or sending them to a landfill, consider flushing the wastes down the toilet or burying them. Manufacturers have produced a pet waste digester, which they claim to be effective. Some communities may have restrictions on disposing of pet waste. Check with your local health department for any limitations in your area.

5. Circle the answer that best describes how you handle pet and animal wastes.

a. Animal and pet wastes are flushed down the toilet; buried away from gardens, wells, ditches, or areas where children play; digested in an in-ground pet waste digester; or wrapped and placed in the garbage for disposal.*

b. Animal wastes are left to decompose on grass or soil. Wastes are scattered over a wide area.

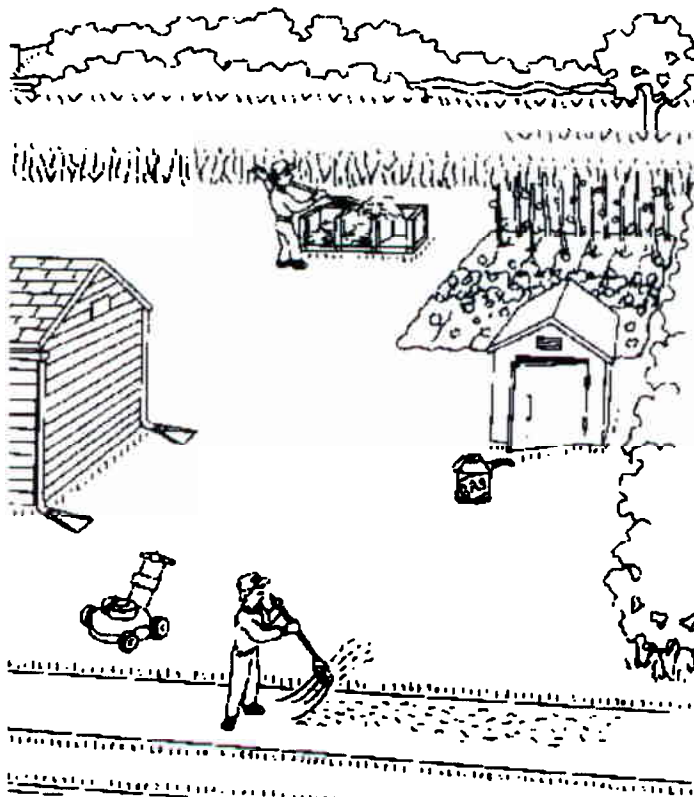
c. Animal wastes are left on paved surfaces, concentrated in pen or yard areas, or dumped down a storm drain or in a ditch; OR do not know.

*Be sure to check local

6. Do you keep yard and garden wastes out of stormwater?

If left on sidewalks, driveways, or roads, grass clippings and other yard wastes will wash away with the next storm. 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, potential fish kills, and make areas unsuitable for recreation because of debris or algae blooms.

Burning yard waste is not an environmentally friendly alternative — and in some areas, it is 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. For more information on composting and grass cycling, see the North Carolina Cooperative Extension publication *Grasscycling and Composting: A Guide to Managing Organic Yard Wastes*.



regulations regarding flushing, burying, or landfilling pet and animal wastes.

6. Circle the answer that best describes how you handle grass clippings, leaves, and other yard waste.

a. 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.

b. Leaves and other yard wastes are piled on the lawn next to the street for collection.

c. 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; OR do not know.

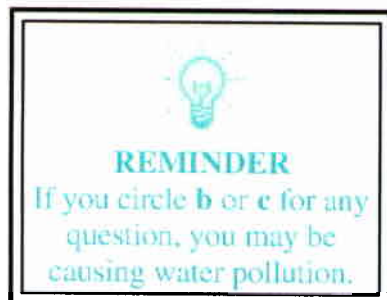
Sweeping grass clippings and fertilizer onto the lawn or composting them helps keep yard waste out of storm sewers.

Landscaping and Site Management to Control Runoff

You can reduce stormwater pollution risks by changing 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.

7. 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, streams, lakes, and sounds. Planting grass or other groundcovers 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 placed around construction sites can help slow runoff and trap sediment on-site. Construction sites can be terraced and construction can be conducted in phases to help reduce erosion and sedimentation. The state of North Carolina and many local governments require the use of these and other erosion control measures on construction sites.



7a. Circle the answer that best describes the bare soil in your lawn or garden.

- a. 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.
- b. Grass or other ground cover is spotty, particularly on slopes.
- c. Spots in the lawn or garden are left exposed without mulch or vegetation for long periods; OR do not know.

7b. Circle the answer that best describes how you handle bare soil during construction.

- a. Bare soil is seeded and mulched as soon as possible (before construction is completed). Sediment barriers are used until grass covers soil.
- b. Soil is left bare until construction is completed. Sediment barriers are installed and maintained to detain muddy runoff until grass covers soil.
- c. Soil is left bare and no sediment barriers are used; OR do not know.

8. Can you eliminate paved surfaces or install alternatives?

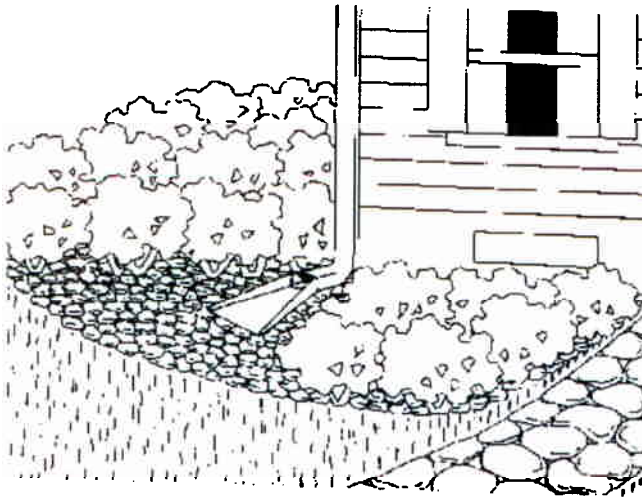
Concrete and asphalt roads, driveways, and walkways are impervious; they prevent rainwater from soaking into the ground. When you have the choice, consider alternative materials such as gravel or wood chips for walkways. Avoid paving areas like patios. Where you need a more solid surface, consider using a "porous pavement" made from interlocking cement blocks, hard plastic grids filled with stone or earth, or rubber mats that allow spaces for rainwater to seep into the ground. If you must pour concrete, keep the paved area as small and narrow as possible.

8. Circle the answer that best describes your use of paved surfaces.

- a. Paved surfaces are minimized. Alternatives such as wood chips or paving blocks are used for walkways, patios, and other areas.
- b. Some small areas are paved for patios or basketball.
- c. Paved surfaces are used extensively; OR do not know.

9. Does your roof water flow onto pavement or grass?

Your house roof, like pavement, sheds water. If downspouts from roof gutters empty onto grassy or natural areas, the water will have a chance to soak into the ground. Aim downspouts away from foundations and paved surfaces. For roofs without gutters, plant grass, spread mulch, or use gravel under the drip line to prevent soil erosion and increase infiltration of water into the ground. Consider using cisterns or rain barrels to catch rain for watering your lawn and garden in dry weather.



Roof drainage should be directed to lawns or gardens and away from the foundation and paved surfaces.

9. Circle the answer that best describes how you handle roof drainage.

- a. Downspouts and drip lines direct roof drainage onto a lawn or garden where water soaks into the ground.
- b. Some downspouts and drip lines discharge water onto paved surfaces or grassy areas where water runs off.
- c. Most or all drip lines or downspouts discharge onto paved surfaces, or downspouts are connected directly to storm drains; OR do not know.

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

An essential part of stormwater management is keeping water on your property, or at least slowing down its flow as much as possible. Many lawns are sloped to encourage water to run off onto neighboring property or streets. An alternative approach is to create rain gardens (described in the following section). If your yard is hilly, you can terrace slopes to slow the flow of runoff. If you have a large lot, consider "naturalizing" areas with 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, which is called a riparian buffer. Many locales in North Carolina, such as counties in the Neuse River Basin, now require riparian buffers in new development. Good sources for ideas are Cooperative Extension, Natural Resources Conservation Service (U.S. Department of Agriculture), or Soil and Water Conservation District offices.

10. Circle the answer that best describes how you use landscaping and buffer strips.

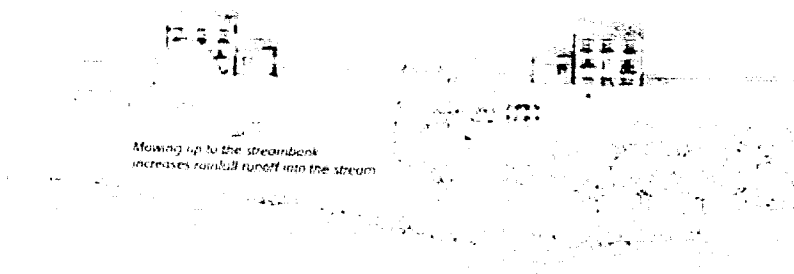
- a. Yard is landscaped to slow the flow of stormwater and utilize rain gardens. Unmowed buffer strips of thick vegetation are left along streams or lake shores.
- b. No areas are landscaped to encourage water to soak in, but yard is relatively flat and little runoff occurs. Mowed grass or spotty vegetation exists adjacent to a stream or lake.
- c. There is no landscaping to slow the flow of stormwater, especially on hilly, erodible properties. Stream banks or lake shores are eroding; OR do not know.

11. Are rain gardens appropriate?

Often runoff can be diverted to localized low spots in your yard. These areas, when planted with water-tolerant vegetation such as redbuds, st. john's wort, cherrybark oak, and sweet pepperbush, are called rain gardens. Rain gardens naturally filter water and provide an effective means for putting surface water back into groundwater. Rain gardens without designed underdrain systems work best in sandy soils, so their use is most appropriate in the coastal plain and sandhills of North Carolina. They can be engineered by adding an underdrain, however, to be used in the piedmont and mountains as well.

11. Circle the answer that best describes how you divert stormwater runoff.

- a. Stormwater is diverted to engineered rain gardens in low-lying areas of your yard. Water is routed into and out of rain gardens.
- b. Stormwater is diverted to low areas without appropriate measures taken to make sure water will leave the site.
- c. Runoff leaves the yard without any treatment; OR do not know.



To help prevent erosion, leave an unmowed buffer strip of thick vegetation along streams, lakes, and estuaries.

Related publications available from Cooperative Extension:

- *Be a HERO: A Guide for Do-It-Yourselfers*
- *Be a HERO: A Guide for Farmers*
- *Carolina Lawns* (AG-69)
- *Composting: A Guide to Managing Organic Yard Wastes* (AG-467)
- *Disposal of Hazardous Household Waste* (FCS-368-3, WQWM-62)
- *Grasscycling*
- *Improving Lawn Care and Gardening* (AG-567-5, WQWM-176A)
- *Improving Fuel Storage* (AG-567-2, WQWM-173)
- *Improving Septic Systems* (AG-567-4, WQWM-175)
- *Improving Storage and Handling of Hazardous Waste* (AG-567-3, WQWM-174)
- *Landscaping to Protect Water Quality: How to Plan and Design a Wise Water-Use Landscape* (AG-508-2, WQWM-124)
- *Landscaping to Protect Water Quality: Wise Water Use in Landscaping* (AG-508-1, WQWM-123)
- *North Carolina Erosion and Sedimentation Pollution Control Program* (AG-439-32)
- *Caring for Your Lawn and the Environment* (AG-597)
- *Protecting Water Supply* (AG-567-1, WQWM-172)
- *Soil Facts: Managing Lawns and Gardens to Protect Water Quality* (AG-439-21)
- *Urban Stormwater Structural Best Management Practices* (AG-588-1)
- *Water Quality and Home Lawn Care* (WQWM-151)

These publications are available at your county Cooperative Extension center. If you order more than five copies of the publication, there will be a small charge. Otherwise, the publications are free. Publications with "AG" or "FCS" numbers may be ordered from Communication Services, Campus Box 7603, North Carolina State University, Raleigh, NC 27695-7603.

Resources and Publications

- *Bay Book: A Guide to Reducing Water Pollution at Home*, 1993, by the Alliance for the Chesapeake Bay, 6600 York Rd., Baltimore, MD 21212 — (800) 662-2747
 - *Site Planning for Urban Stream Protection*, 1995, by the Center for Watershed Protection, 8737 Colesville Road, Suite 300, Silver Spring, MD 20910 — (301) 589-1890
-