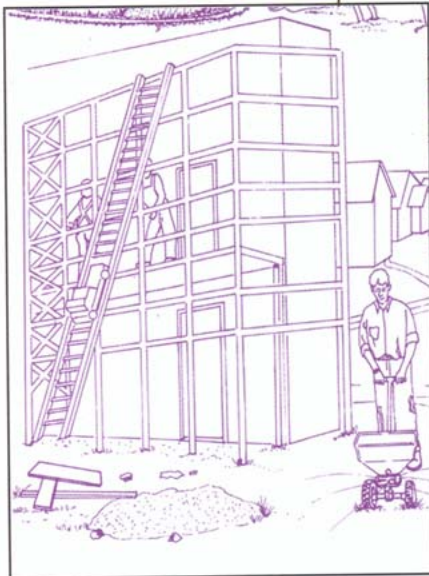
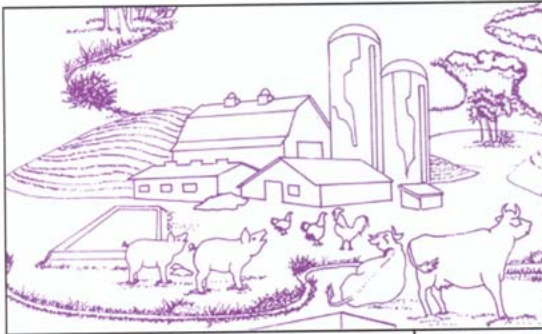



# Water Quality

*We All Play A Part*



N.C. Department of Environment and Natural Resources



## How important is clean water?



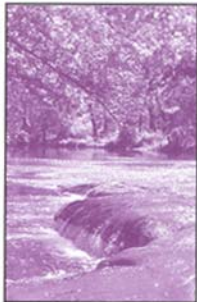
Clean water is essential to our existence. Two-thirds of the human body is water. In fact, every living thing is made of water and needs it to survive. While water covers more than 70 percent of the planet's surface, the avail-

able fresh water is only four-tenths of 1 percent. Americans drink more than 1 billion glasses of water each day. Besides this use, almost everything we do requires water. We use it to grow, process and cook our food; to grow cotton and other fibers for clothing; and to clean ourselves and our houses, cars, clothes and dishes. We depend on it for travel and recreation like swimming, boating and fishing.



## Where does water come from?

With such a heavy demand for water, you would think we would run out of it. In reality, the amount of water on Earth never varies. The same volume of water is present today as was here 3 billion years ago. Water is one of the few natural resources that is recycled automatically. It transpires through plants or evaporates from the ground, re-enters the atmosphere as vapor, then falls again as rain or snow. The water that comes from a well or flows from a tap may taste brand new, but someone or something has likely used it before. And whether we flush or wash it down the drain or watch it disappear across our lawns and parking lots, we'll see it again. So it is important to keep our water clean. How can you better care for this precious public resource? Recognize where water comes from, how people make it dirty or clean, and how its condition affects living things.



## Why is a watershed important to clean water?

The area of land draining to a body of water is called a watershed. The watersheds of large river systems are known as river basins. North Carolina has 17 major river basins.

No matter where you are, you're in a watershed, and everything you do affects the quality of the water downstream. The



water that empties from your tub or flows across your yard eventually enters a stream or other waterway. So does all the material we intentionally or unintentionally add to it—household chemicals, oil and gasoline, detergent, fertilizer, pesticides, animal waste, eroded soil and other pollutants. If that water isn't properly used and treated, it can pollute or poison surface waters and groundwater. Although the government adopts standards and policies to protect water resources, individuals must also responsibly use water and the land over which it travels.

## How do we define water quality?

Water quality means different things to different people, depending on how they want to use it. They may want to eat fish or shellfish harvested from the waters. They might wish to swim, paddle a boat, or draw water for drinking or irrigating crops. State government agencies determine whether North Carolina's streams, rivers, lakes and sounds support specific, designated uses. All waters should protect growth and reproduction of aquatic animals and secondary recreation, which includes wading and boating. Other possible uses may include primary recreation, shellfish harvesting, water supply and fish consumption.



## How do we measure water quality?

The state monitors water quality with a variety of techniques. Surveys of the numbers and kinds of bottom-dwelling macroinvertebrates (animals lacking backbones and visible to the naked eye) are good monitoring tools. Because many of these aquatic bugs stay in one place and are sensitive to changes in water quality, they are effective early indicators of water



quality problems. Fish, mussels and algae are also good indicators of what's happening in the water. Biologists harvest fish and analyze their tissue to assess the health of the aquatic ecosystem. The state also looks at chemical data (including toxins, metals, dissolved oxygen content and nutrient levels) and physical characteristics like water clarity, rate of streamflow and quality of habitat.



## What are the major sources of pollution?

Many types of substances can decrease water quality. An early step in battling degraded water quality is to pinpoint the source of pollution. Sometimes the source is easily traceable; other times the trouble seems to come from all over the watershed. Depending on its origin, water pollution in North Carolina is placed in one of two broad categories: "point source" or "nonpoint source."



## Point Source Pollution

Point source pollution refers to a discharge that enters surface waters through a pipe, ditch or



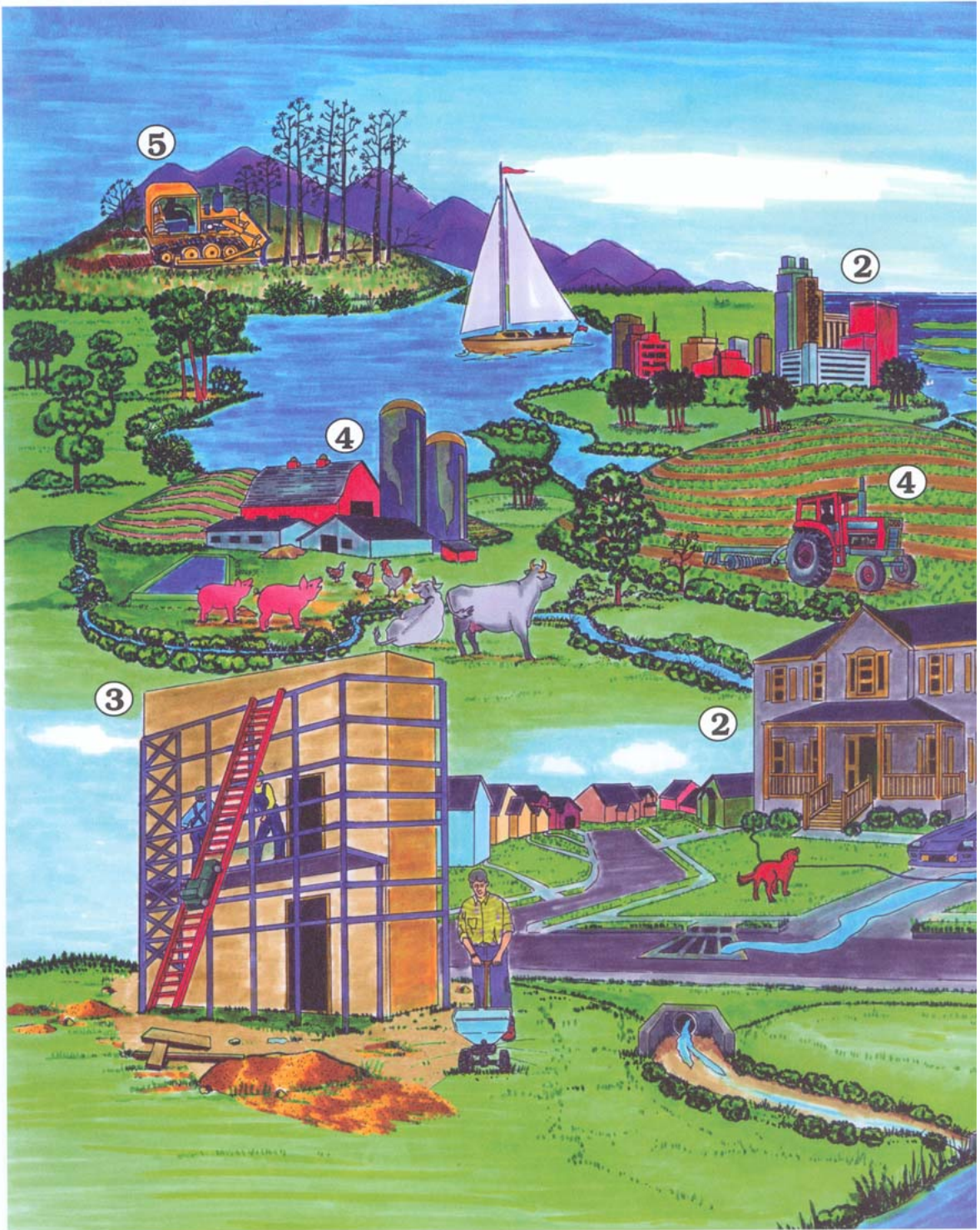
other well-defined location. Point source pollution comes mostly from municipal (city and county) and industrial wastewater treatment plants. It also originates from small, domestic wastewater treatment systems that serve schools, commercial offices, residential subdivisions and individual homes. Stormwater from cities and industrial sites also is permitted as a point source.

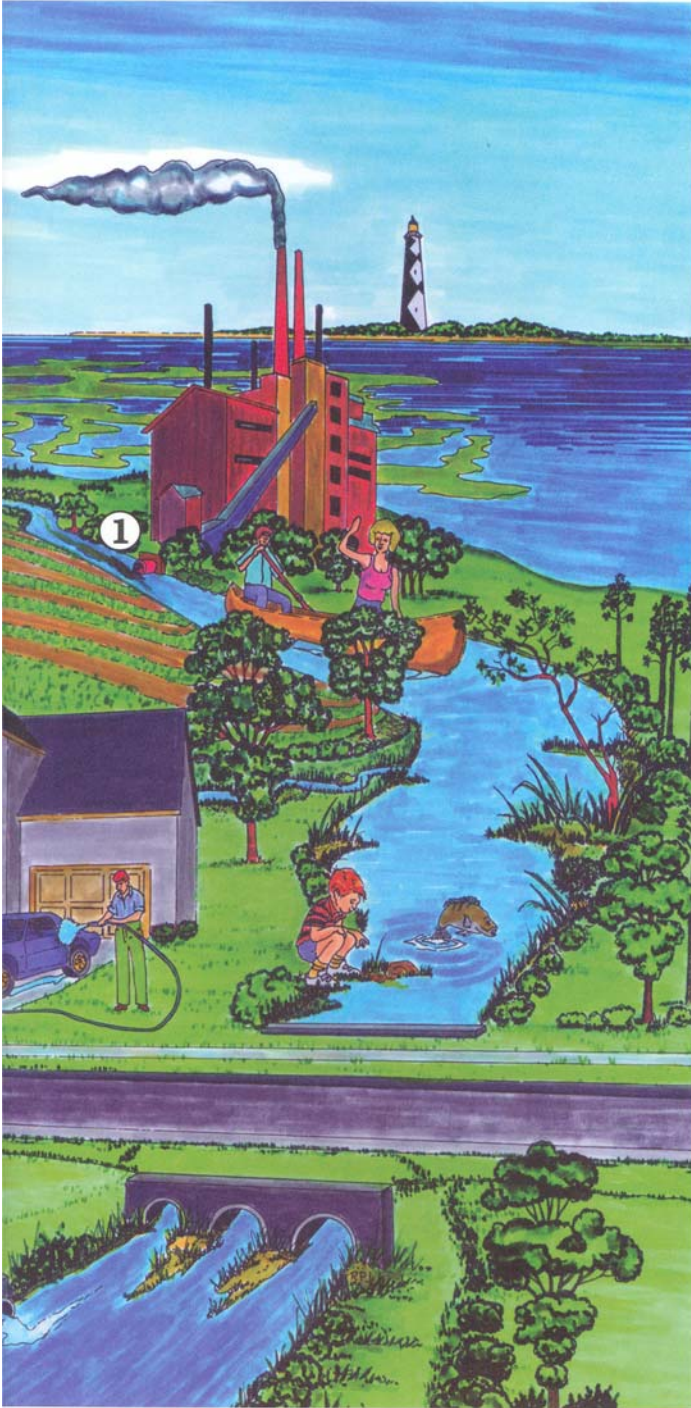
The primary pollutants in point source discharges may include nutrients, color, toxic substances like chlorine, ammonia and metals, and wastes that deplete the water of oxygen necessary to sustain fish populations.



State and federal regulations set strict standards for the treatment of wastewater that enters streams, lakes and other surface waters. Most point source dischargers in North Carolina must obtain a state permit. The types and amounts of pollution at a point source can be monitored and regulated rather easily.

# We all Play a Part in Water Quality





**1. Point Source Pollution** comes mainly from wastewater and stormwater discharges from municipal (city and county) and industrial wastewater treatment plants. It also originates from small, domestic wastewater treatment systems that serve schools, commercial offices, residential subdivisions and individual homes.

**Nonpoint Source Pollution** comes from all activities in a watershed, including: development, construction, maintained landscapes, forestry, mining, agriculture practices such as crop and animal production, malfunctioning septic systems, landfills, roads and parking lots. Habitat degradation (including sediment) and nutrients are the major causes of nonpoint source pollution in North Carolina.

**2. Urban** stormwater runoff from developed areas carries soil, silt, fertilizer, lawn and garden chemicals, pet waste and other pollutants to storm drains and into streams. Septic systems can release nutrients and other pollutants into groundwater and surface water.

**3. Construction** pollution, including soil, chemicals and trash, can wash from exposed construction sites to streams in runoff.

**4. Agricultural** practices, such as producing row crops, confined animal operations and livestock grazing, drain sediment, nutrients and pathogens into streams.

**5. Forestry** operations can drain sediment into nearby streams by leaving bare soil after harvesting trees and by removing stabilizing vegetation along streambanks.

North Carolina  
Department of  
Environment &  
Natural Resources

Division of  
Water Quality  
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## Nonpoint Source Pollution

Nonpoint source pollution is water contamination that cannot be attributed to a single discharge point. This type of pollution enters surface waters through stormwater, melted snow or atmospheric deposition such as acid rain. More than half the water pollution in North Carolina and across the country comes from nonpoint sources.



Water running across land is as old as time, and as natural. But as the population has grown and land has been increasingly altered, that runoff picks up too many hitchhikers along the way—dirt, trash, oil, grease, chemicals and waste left on the ground or pavement by automobiles, people and animals. All of the following may contribute to nonpoint source pollution:

- land development
- construction
- maintained landscapes
- forestry
- mining
- agriculture practices like crop and animal production
- malfunctioning septic systems
- landfills
- roads
- parking lots



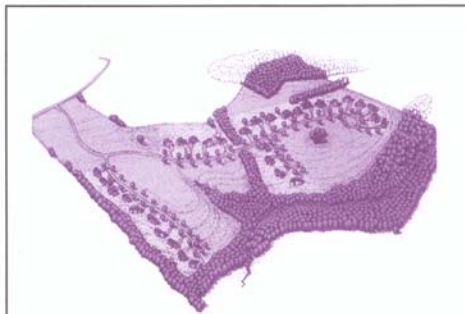
Sediment and nutrients are the major causes of nonpoint source pollution in North Carolina. Other major pollutants include fecal coliform bacteria (associated with the wastes of warm-

blooded animals, including humans), heavy metals, oil and grease. Because it doesn't stem from a single discharge, nonpoint source pollution is more difficult to find and manage. Contaminated runoff only recently has become a major target of pollution control efforts.

## Categories of Nonpoint Source Pollution

### Urban Stormwater

Because rainwater can't soak through impervious asphalt and concrete, it flows over roads, sidewalks and parking lots and channels massive sheets of untreated runoff quickly into storm drains, ditches and other artificial structures. Storm drains typically do not deliver this water to a waste treatment plant; it goes directly to streams, rivers and estuaries. This water is the vehicle for all kinds of undesirable "passengers" -oil and grease; excess fertilizers, herbicides and pesticides; and fecal matter from pet waste and malfunctioning septic tanks. The increased conversion of natural land surfaces



Studies have documented serious declines in surface water quality when as little as 10 to 15 percent of a watershed is covered by impenetrable surfaces.

into nonporous ones has two major consequences. First, there is an increase in the rate and flow of stormwater, which causes erosion and sedimentation in streams that it enters. This rapid, increased flow diminishes or destroys aquatic habitat and can accelerate downstream flooding. Second, the stormwater is a superhighway for those hitchhiking pollutants.

**Management Solutions:** Reducing the amount of rainfall that runs off and increasing infiltration of water into the ground are key to reducing pollution from urban stormwater. It is also important to decrease the use of substances that can pollute water. Management strategies to reduce urban

nonpoint source pollution include natural buffers composed of trees and other plants, water-friendly



landscaping, wise use of fertilizers and pesticides, constructed wetlands, stormwater retention ponds, proper disposal of chemicals, and increased use of surfaces that let water soak into the ground. These "best management practices" (BMPs) for stormwater are implemented through local ordinances, state regulatory programs and by educated property owners.

## Construction

Tons of sediment are washed each year from bare construction sites, causing the same problems for aquatic systems as dirt eroded from farmfields [See Agriculture section]. Construction and grading destabilizes the soil and makes it subject to erosion. The resulting pollutant is primarily sediment. The volume of soil washing from such sites can be 5,000 times greater than soil runoff from forested land. Although construction activity is relatively short-lived, its effects on the environment can be felt for many years.



**Management Solutions:** The North Carolina Division of Land Resources and delegated local governments regulate construction performed by contractors. Management involves proper design,

installation and maintenance of BMPs (best management practices) on a site-by-site basis until the land is stabilized.

## Agriculture

Agriculture includes three major types of production: row crops, confined animal operations and livestock grazing. The primary pollutant that runs off farmland is **sediment** from tilling, ditching, irrigation and livestock trampling. Sediment damages streams by burying aquatic organisms, clogging fish gills, reducing water clarity, and blocking light to aquatic plants. Sediment is also a vehicle for transporting nutrients (like excess fertilizer), pathogens and pesticides, which cling to soil particles washed from fields and feedlots. **Excess nutrients** from fertilizer and animal waste are the second biggest farm-related contribution to water quality problems. Although nutrients are beneficial to aquatic life in proper amounts, excessive nutrient concentrations can stimulate overgrowth of algae, depleting the water of dissolved oxygen and causing serious problems, including fish kills. Other problems include:

- **accelerated flow** of runoff through drainage ditches, which can erode streambanks
- **bacteria and pathogens** from animal wastes and carcasses, which can contaminate shellfish beds and swimming areas
- **pesticide drift or runoff**, which can kill aquatic animals and persist in soil and water

**Management Solutions:** Through best management practices (BMPs), farmers reduce runoff, save soil, and lose fewer nutrients and chemicals. Reduced tilling, contour planting, terracing, cover crops, planted buffers, and exclusion of livestock from streams help curb erosion and retain nutrients. Streamside fencing and alternative water sources are just two BMPs that can make livestock grazing more environmentally friendly. Nutrient management, including the careful timing and application of fertilizers and chemicals, also reduces polluted runoff from farms. Cost-sharing, technical assistance and education for farmers are available from the N.C. Division of Soil and Water Conservation, N.C. Department of Agriculture and Consumer Services, USDA agencies, N.C. Cooperative Extension Service, and local Soil and Water Conservation Districts.

## Timber Harvesting

Construction and use of logging roads, particularly beside streams, can cause **sediment pollution** in waterways. The construction of stream crossings, skid trails (man-made pathways on which logs are moved by machinery) and logging decks may also increase sedimentation. The removal of shoreline and bordering vegetation can also limit shading of streams, resulting in higher water temperatures and lower dissolved oxygen.

**Management Solutions:** Retaining vegetation along the water's edge can filter runoff, reduce sediment loss and provide cooling shade. Forestry operations can preserve streamside management zones (SMZs) to protect streambanks and water quality. The N.C. Division of Forest Resources encourages the use of best management practices, as defined in their Forest Practice Guidelines, to meet federal requirements regarding control of sediment pollution.

## What part can I play?

### At Home:

Learn more about voluntary best management practices, or BMPs, that you can implement on your farm, in your home and yard, or at your office.

- Cooperative Extension Service North Carolina Home\*A\*Syst; <http://ces.soil.ncsu.edu/soilscience/publications/farmassist/homeindx.html>
- Division of Pollution Prevention and Environmental Assistance; <http://www.p2pays.org>
- EPA Pollution Prevention; <http://www.epa.gov/p2/>
- Consider donating property for conservation purposes in exchange for tax credit. Contact the N.C. Conservation Tax Credit Program at (919) 715-4191.

### In My Watershed or Basin:

Get involved with watershed and local land use planning and conservation efforts in your river basin.

- N.C. Basinwide Planning Program, (919) 733-5083, <http://h2o.enr.state.nc.us/basinwide>
- Stream Watch Program, N.C. Division of Water Resources, (919) 733-4064, <http://www.ncwater.org>

### In General:

- *A Citizens Guide to Water Quality Protection in North Carolina* describes water quality issues, problems and programs in North Carolina. Download a copy from Division of Water Quality, Basinwide Planning; <http://h2o.enr.state.nc.us/basinwide/>.
- N.C. Division of Water Quality administers voluntary, regulatory and planning programs for point and nonpoint sources. Contact DWQ at (919) 733-5083; <http://h2o.enr.state.nc.us>.
- N.C. Division of Coastal Management carries out planning and regulatory programs in North Carolina's 20 coastal counties. Contact DCM at (919) 733-2293 or 1-888-4RCOAST; <http://dcm2.enr.state.nc.us>.
- N.C. Office of Environmental Education is a clearinghouse for environmental education activities and information in North Carolina. Call (800) 482-8724 or (919) 733-0711; <http://www.ee.enr.state.nc.us>.
- N.C. Division of Land Resources, Land Quality Section, regulates construction and mining activities. Contact DLR at (919) 733-4574; <http://ww.dlr.enr.state.nc.us>. Call toll-free, 1-866-STOPMUD, to report possible violations of the Sediment Pollution Control Act.
- N.C. Division of Forest Resources provides forest management assistance to private landowners and forestry education. Contact their central office at (919) 733-2162, or <http://www.dfr.state.nc.us/>.
- N.C. Division of Environmental Health, On-site Wastewater Section, oversees the regulation of septic systems by local governments. Contact DEH at (919) 733-2895, or <http://www.deh.enr.state.nc.us/oww/>.
- N.C. Division of Soil and Water Conservation provides cost-share and other assistance to farmers, landowners, local Soil and Water Conservation Districts and the general public. Contact DSWC at (919) 733-2302, or <http://www.enr.state.nc.us/DSWC>.
- Several U.S. Department of Agriculture agencies help farmers and landowners to conserve their land and water. Contact the USDA Natural Resources Conservation Service at (919) 873-2100, or <http://www.nc.nrcs.usda.gov>.

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