

Water Quality and You

Charleston Area League of Women Voters

by Margaret Murphy, MSc.

2007

More than half of the U.S. population live in coastal communities and it is expected that 25 million more people will move to the coast within the next 15 years.¹ A rising coastal population can lead to increased stress on the coastal environment. South Carolina has a coastline stretching 187 miles with numerous estuaries, bays, rivers and creeks that combine to create an actual shoreline of almost 3,000 miles. These rivers, creeks and coastal waters offer a variety of habitats, which are home to a bounty of species and play a vital role in the quality of life for South Carolinians and our many visitors.

Most people have had some introduction to the importance of keeping our rivers and coastal waters healthy. Multiple news stories about beach closings due to high levels of fecal coliform bacteria or rivers contaminated with unsafe levels of mercury have caught our attention in recent years. However, many of us may not be aware of the importance of watershed protection as it pertains to water quality. Every stream, creek, wetland or river has an associated watershed. Watersheds can be large or small. The term watershed describes an area of land where all the water under it or draining off it goes into a common place such as a river, lake, estuary, wetland or ultimately the ocean.^{2,3} Watersheds are nature's boundaries for water resources.²

South Carolina is divided into eight major watersheds though for permitting purposes, the South Carolina Department of Health and Environmental Control (DHEC) has combined them into five groups. Berkeley, Charleston and Dorchester Counties are located in two watersheds: the Saluda-Edisto Watershed and the Catawaba-Santee Watershed. The upper half of Dorchester County and the southwestern edge of Charleston County are included in the Saluda-Edisto Watershed with the remaining portion of the tri-county area located in the Catawaba-Santee Watershed.⁴

Watersheds perform three very important functions to maintain clean and healthy water: catch, store and safely release water.² For a watershed to perform these functions well, its land area must be in a healthy state.

The Connection Between Land-Use and Water Quality

Can a watershed be steadily developed without adverse effects to our lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water?

Population growth in South Carolina continues to increase. The entire population of Charleston, Berkeley, and Dorchester

counties is currently estimated to be over 600,000, up from 423,410 in 2000.⁵ Current trends show Charleston as the fastest growing principal city in South Carolina. Accompanying human growth is the building of infrastructure such as roads, homes, and businesses that alters our landscape and often results in undesirable impacts to our water resources. Sprawling development patterns are a growing source of pollution to our Low-country waterways.⁶

Adding to the problem, particularly in coastal ecosystems, is the creation of impervious surfaces. Roads, parking lots, rooftops and other hard surfaces typically make up 40% of the surface area of suburban development.⁷ Impervious surfaces create a barrier so that less water is able to filter through the soil thus decreasing groundwater infiltration to replenish aquifers and reducing groundwater contribution to stream flow. This disruption of the natural cycle also increases surface runoff in both volume and speed.⁸ Water flows quickly off roads, parking lots and other harden surfaces rather than seeping into the earth. For example, one-acre of parking lot produces about 16 times the volume of runoff that would come from a one-acre meadow. Studies have shown that when more than 10% of the acreage of a watershed is covered with impervious surfaces, its aquatic biodiversity begins to decline.⁶



Charleston Area League of Women Voters, Post Office Box 32284, Charleston, SC 29417
Phone: 843.766.5416

Email: vote@charleston.sc.lwv.org

Web site: <http://charleston.sc.lwv.org/>

Nonpoint Source Pollution

Many of our daily activities at home, work, or play have the potential to affect water quality in our watersheds.² Human activities can result in the creation of higher volumes of nonpoint source pollution (NPS). NPS pollution comes from diffuse sources rather than from a specific point such as an outfall pipe. Water flowing over land - whether its from rain, washing your car, irrigating crops, or watering lawns - picks up an array of contaminants from roadways, farmland and urban and suburban areas. This polluted runoff finds its way into our lakes, rivers, wetlands, coastal waters and even our underground sources of drinking water either directly or through storm drain collection systems. The Environmental Protection Agency (EPA) has estimated that polluted runoff is the single largest cause of the deterioration of our nation's water quality.⁹

A major contributor to NPS pollution is stormwater runoff - rainwater that washes over lawns, roads, bridges, parking lots – directly into our waterways. Stormwater runoff contributes to water pollution because rainwater picks up pollutants such as oil, grease, heavy metals, and trash from roads, sediment from construction sites, and pesticides and fertilizers from lawns golf courses and agricultural fields. The stormwater is not treated or screened before it enters into a body of water so, whatever goes down the storm drain goes directly into our Lowcountry waters.

Since the Lowcountry lacks major industrial development, the main contributor to NPS pollution comes from residential areas.⁴ The most common type of NPS pollutant measured in South Carolina is fecal coliform bacteria.⁹ Other common pollutants include phosphorus and nitrogen, pesticides, oil and grease, toxic chemicals, and heavy metals.

Common Types of Pollutants^{2,3}

Fecal coliforms: bacteria normally found in the intestinal tract of warm-blooded animals; high fecal coliform bacteria levels can be caused by waste from animals, including household pets, farm animals and wildlife.

Pathogens: disease-causing microorganisms, such as bacteria and viruses that come from fecal waste of humans and animals.

Nutrients: include nitrogen and phosphorus. Nutrients are necessary for plant growth; however, in high concentrations, they can degrade an aquatic habitat by creating excessive algal blooms. Such blooms can deprive the water of dissolved oxygen suffocating fish and other aquatic organisms. Excess nutrients can enter our waterways from runoff polluted with fertilizers, septic systems, lawn products and animal waste.

Toxic Contaminants: Toxins are created by a variety of human practices and products and include heavy metals, pesticides and organic compounds. Many are resistant to breaking down and end up being passed through the food chain. Main sources of toxic contaminants in our waterways come from gas, oil and grease washed off roadways and parking lots and chemicals used in our homes, lawns and gardens and farm crops.

Sediment: include sand, dirt and gravel eroded by runoff. Sediment build up can alter water flow and reduce the availability of healthy aquatic habitat. Excess sediments can enter our waterways by runoff from poorly protected construction sites, roadways and farmland.

Debris: primarily street litter that is washed into our waterways by stormwater runoff.

Economics of Nonpoint Source Pollution

Each year the United States spends millions of dollars to restore and protect areas damaged by NPS pollutants.⁹ Increased stormwater runoff frequently associated with development often leads to increased flooding, erosion, stream channel alteration and ecological damage. This combined with an increase in human-made pollutants, can result in natural systems no longer able to provide adequate drainage, healthy habitats or natural processing of pollutants.⁸ Consequences of urban runoff can include property damage, human illness, impacts to drinking water, harm to aquatic life and, aesthetic losses. Each of these problems bears serious costs: increased spending on health care, higher insurance and drinking water rates, declining stocks of commercial and recreational fish, and loss of revenue from tourism.¹⁰

Wastewater

Over the past few decades, however, we have seen improvement in water quality largely due to increased levels of wastewater treatment. Wastewater treatment cleans water and sewage so it can be returned to the environment. Treatment of wastewater is necessary for both protec-





tion of the environment and public health. Wastewater carries many of the bacteria that are harmful to humans and wildlife. Wastewater comes from your home's pipes and goes into the sewer system that carries it to a wastewater treatment plant. This is not the same as stormwater, which is rainwater runoff that flows into storm drains and runs directly into rivers and streams without any treatment.¹¹

A septic system is like a wastewater treatment plant for individual houses. Most homes in rural and outlying suburban areas depend on individual septic systems for wastewater disposal. If it is working properly, a septic system will dispose of wastes without causing harm to the environment or to human health. Soil plays a major role in cleaning waste. Not all soils can absorb wastewater or provide adequate treatment. Septic systems installed in unsuitable soils usually malfunction. Raw sewage from a failed system can run into waterways, polluting the water and harming fisheries and recreational areas. Wastewater from a septic system can also pollute groundwater and wells. South Carolina requires that the county health department conduct a soil and site evaluation to determine the suitability of a site for a septic system. Individuals must get a permit from DHEC before constructing a septic system and no new permits or replacement permits are issued if the resident has access to public sewer. Improperly working septic systems are believed to contribute greatly to nonpoint source pollution problems in many local drainage basins in our region.^{12,13}

What's in Our Tap Water?

There is no such thing as "pure" water. As water moves over land and through the soil, it picks up minerals, plant matter, and human-made contaminants. Water treatment plants are able to remove many but not all of these compounds. Both the Charleston Water System and the Mount Pleasant Waterworks meet or exceed all drinking water quality requirements (see their respective websites (<http://www.charlestonwater.com/>; <http://www.mountpleasantwaterworks.com/>). Primary standards require water treatment plants routinely test for biological compounds such as coliform bacteria; inorganic compounds (copper, lead, nitrates/nitrogen, fluoride); and organic volatile organic compounds (trihalomethanes, haloacetic acids – both by-products of the drinking water disinfection process). Contaminants for which no standard exists (i.e., unregulated) but must also be monitored include cryptosporidium and giardia (parasites that cause gastrointestinal illness).

The Charleston Water System

- draws surface water from the Edisto River and the Bushy Park Reservoir
- the water is treated at the Hanahan Water Treatment Plant which pumps out an average of 50 million gallons of drinking water every day
- disinfects the treated water with trace amounts of chlorine, then adds trace amounts of ammonia to form chloramines, which protect against bacteria

- also adds fluoride to water
- provides drinking water to more than 400,000 people in parts of Charleston, Berkeley and Dorchester Counties

The Mount Pleasant Waterworks

- draws water from the Middendorf Aquifer, a large body of groundwater between 1,800 to 2,000 feet beneath Charleston, Berkeley and Dorchester Counties
- treats the raw water using reverse osmosis technology
- purchases supplemental water from Charleston Water System

Residential Wells

- approximately 680,000 SC residents receive their household drinking water from a residential well (Residential Well Program DHEC)

Management and Monitoring

During the past 30 years, great advances have been made to clean up the aquatic environment by controlling pollution from industries and sewage treatment plants. Unfortunately, not enough has been done to control pollution from nonpoint sources, which is difficult to measure and control.⁴ Nonpoint source pollution is the main reason that approximately 40 percent of our nation's surveyed rivers, lakes, and estuaries are not sufficiently clean to allow for uses such as fishing or swimming.⁹ A waterbody is impaired if it does not meet state water

quality standards. In South Carolina, the majority of impairments to the state’s surface waters are due to fecal coliform bacteria. These are most likely due to non-point sources since all point source dischargers are required to disinfect their effluent.⁴

The EPA is responsible for implementing the requirements of the Clean Water Act. The Act requires that federal and state agencies, and municipalities and industries cooperatively develop plans that prevent, reduce or eliminate pollution of navigable waters and groundwaters, and to improve the sanitary condition of surface and underground waters.⁴

The EPA develops guidelines and regulations to assist states and regional planning agencies in their water quality management. For South Carolina, DHEC is designated to carry out the mandates of the Clean Water Act and is responsible for water pollution control in the state. In our region, the Berkeley, Charleston and Dorchester Council of Governments (BCD COG) is responsible for coordinating state and local planning programs and works to achieve the objectives of federal, state and local interests to meet their clean water goals.⁴ This integration is supported by BCD COG’s preparation and implementation of a Regional Water Quality Management Plan.

Section 303(d) of the Clean Water Act mandates that every two years each state must compile a list of waters that do not meet water quality standards. In South Carolina, waterways are placed on the 303(d) list when a five-year period of monitoring data indicate that the established state water quality standards are not met. DHEC, which takes a watershed approach to addressing water quality issues, maintains almost 1,000 monitoring stations along South Carolina waterways checking for high levels of fecal



coliform bacteria, turbidity, phosphorous and heavy metals and levels of dissolved oxygen. The data collected from these monitoring stations are used in the creation of a watershed report called the Watershed Water Quality Assessment, which details the watershed health for each individual river basin.² In addition, DHEC collaborates with other agencies to develop or extend monitoring programs throughout the state. Other agencies include the South Carolina Department of Natural Resources, the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service, and SCDHEC’s Office of Ocean and Coastal Resource Management.^{2,4}

Best Management Practices

Since development in watersheds can impair our rivers, lakes, wetlands, marshes and groundwater; it is important to recognize that there are a range of development choices a community can make to better protect our water resources.⁶

How people live, where they live and how they get around can all determine the environmental health of a watershed. Several strategies have been put forth to reduce or eliminate the impact of NPS pollution on a regional, neighborhood and individual scale. Below is a list of suggestion to help prevent, reduce or treat polluted runoff^{2,14,15,16,17,18}.

Regional Scale

- Reduce the rate of sprawl - control the spread of urban areas by regulating development and subdivision densities in rural areas
- Plan development based on natural resources – identify important natural resources and set priorities to protect and preserve undeveloped land
- Focus growth in appropriate areas and use land efficiently - cluster development

reduces the total area of paved surfaces and increases open space

- Identify watersheds that are underdeveloped and center future growth in watersheds where development is already present
- Design communities that have a selection of transportation and housing choices and integrate work and shopping into the neighborhood

- Encourage best management practices on farms that include properly managing



animal wastes, vegetative cover removal, the application of chemicals, and leaving or planting buffers of trees and shrubs along waterways

- Encourage best management practices at construction sites that include the practice of leaving or protecting existing vegetation, using sediment fences, hay bales, and sediment detention ponds, protecting bare soil with mulch, and leaving or planting buffers of trees and shrubs along waterways

- Construction contractors and site inspectors are learning to protect South Carolina’s water resources through Clemson Extension training programs. These programs provide information on best management practices designed to prevent erosion from occurring on construction sites and to keep sediment out of streams and lakes.

- Land use policies are largely decided at the local level. Get involved in the decision-making process of planning and zoning commissions and help ensure that the community water supplies are being considered in land use decisions.

Neighborhood/Subdivision Scale

- Leave natural buffers in place or construct vegetative buffers - avoid direct connections and break up the flow of

polluted runoff by using grass swales, filter strips or other forms of vegetative buffer

- A vegetative buffer between upland development and water protects fish, shellfish and terrestrial wildlife and produces less polluted stormwater runoff
- Dikes and levees just move the water problem somewhere else, causing flooding elsewhere
- Use porous alternatives to concrete driveways and sidewalks, such as paving stones, brick, salvaged cobblestones, gravel, crushed stone or shell
- Construct areas designed to hold rainwater runoff long enough to allow settling or other treatment, such as wetlands, ponds and catch basins
- Both state and local authorities require most new developments to manage stormwater runoff; however, older subdivisions often lack catch basins and runoff dumps directly into rivers. As the Charleston area experiences accelerated growth this problem, if not addressed, will only get worse.

Individual Scale

We all contribute to polluted runoff in one way or another. The good news is that we can all have a hand in helping to reduce it. Here are some of the ways in which we can limit our contribution to NPS pollution.

Around the home

- Keep septic systems well maintained
- Use non-toxic or less toxic products to clean your home
- Properly dispose of cleaners and paints- never pour paint, solvents or other toxic materials down the drain or on the ground
- Buy products with a high percentage of post-consumer recycled content. According to Seventh Generation, if every household in the U.S. replaced just one 4-pack 260-sheet, virgin fiber bathroom tissue with 100% recycled ones, we would

eliminate 60,600 pounds of chlorine pollution, preserve 356 million gallons of fresh water and save 988,200 trees not to mention 2.5 million cubic feet of landfill space.

In the yard

- Use plants native to the area – they often require less water and fertilizer
 - Landscape in a way that allows plants to filter and slow runoff
 - Consider creating a rain garden that is designed to manage stormwater runoff. Rain gardens intercept rainwater on its way to the storm sewer making sure it percolates into the ground to replenish the water table
 - Rain gardens should be constructed on the low point of the property and are not much different from perennial gardens. They can consist of cattails and sedges or a variety of native wetland plants that thrive in moist to wet soils
 - Compost leaves, grass and other yard waste
 - Cover bare soil with vegetation
 - Clean up pet waste and dispose of properly - in Charleston, it's estimated that cats and dogs produce 10,000 pound of waste per day
 - Minimize fertilizer use - only apply fertilizer or pesticides when heavy rain is unlikely and try organic fertilizers
 - Be sure your roof runoff drains into a grassy area, not into a sanitary or storm sewer system
- ### With your car
- Never pour your used motor oil or other automotive fluids into storm drains: 1 gallon of used oil can contaminate a million gallons of clean water
 - Wash your car on the grass or at a car wash to prevent dirty wash water from flowing into storm drains
 - Clean up spills and repair leaks
 - Drive less

Don't forget the boat

- Do not discharge boat sewage directly into waterways
- Clean your boat with biodegradable, phosphate-free soap or just with water
- Avoid overflows when filling the fuel tank
- Bring trash ashore for recycling or disposal

Where To Go For More Information

Berkeley-Charleston-Dorchester Council of Governments
(843) 529-0400
<http://www.bcdcog.com/>

SC DHEC Office Bureau of Water
(803) 898-4300
<http://www.scdhec.org/environment/water/>

SC Sea Grant Extension Program
(843) 727-2078
<http://www.scseagrant.org/Extension/>

Clemson University Extension Service
(843) 722-5940
<http://www.clemson.edu/extension/>

Nonpoint Education for Municipal Officials (NEMO)
(860) 345-4511
<http://nemo.uconn.edu/>

Center for Watershed Protection
(410) 461-8323
<http://www.cwp.org/>

EPA Nonpoint Source Home Page
(800) 241-1754;
<http://www.epa.gov/nps/>

SC DHEC, Bureau of Water, Nonpoint Source Outreach Program.
Turning the Tide: a citizen's guide to reducing runoff pollution. 2004.
www.adeq.state.ar.us/water/branch_npdes/stormwater/construction/pdfs/turn_the_tide.pdf

Water Conservation

A drop saved is a drop earned... It's not only important for us to reduce pollution, we also need to conserve our water.

In the home and Yard ^{2,19}

- Use dishwashers and washing machines only when fully loaded
- For cold drinking water, keep a jug in the refrigerator instead of running the tap
- Fix all leaks – a slow drip can add up to 15-20 gallons a day
- Install a water-saving shower head
- Shorten your shower time – most showerheads pour out between 5 and 10 gallons per minute
- Don't leave the water running while shaving or brushing your teeth
- Save hundreds of gallons of water used on watering your garden by collecting rainwater to use instead

Informational Sources:

1. Population Trends Along the Coastal United States: 1980-2008. 2004. Kristen M. Crossett, Thomas J. Culliton, Peter C. Wiley, Timothy R. Godspeed. National Oceanic and Atmospheric Administration, NOAA's National Ocean Service Management and Budget Office Special Projects. Coastal Trends Report Series.
2. Turning the Tide: a citizen's guide to reducing runoff pollution. SC DHEC, Bureau of Water, Nonpoint Source Outreach Program. 2004.
3. U.S Environmental Protection Agency Nonpoint Source Home Page (<http://www.epa.gov/nps/>)
4. Berkeley-Charleston-Dorchester Water Quality Management Plan Volume I&II 1996 UPDATE. Prepared by the Berkeley Charleston Dorchester Council of Governments. North Charleston, South Carolina. Approved: June 28, 1996, Updated: Sept. 25, 2000.
5. Wikipedia, the free encyclopedia (<http://en.wikipedia.org>)
6. Water and Smart Growth: The Impacts of Sprawl on Aquatic Ecosystems. Funders' Network for Smart Growth and Livable Communities. Translation Paper Number Fourteen. 2004.
7. PEW Oceans Commission Summary Report, 2003.
8. The South Carolina Nonpoint Education for Municipal Officials (SC NEMO) program fact sheets. <http://www.sceagrant.org/scnemo/factsheets.htm>
9. SC NPS Pollution Management Program 2005 Annual Report. A report by the South Carolina Department of Health and Environmental Control on progress toward meeting the goals of the State Nonpoint Source Management Program. Submitted to EPA in fulfillment of the requirements of Section 319 of the Clean Water Act.
10. Quenching Urban Thirst: Growing Cities and their Impacts on Freshwater Ecosystems. 2004. FitzHugh T.W., B.D. Richter. Bioscience 54 (8): 741-754.
11. Just Let Rain Go Down The Drain: No Dumping Drains to Waterways. Charleston County Solid Waste.
12. Septic Systems: A primer on what they are, how they work, and how to keep them working properly to protect the environment. Brochure in a series for Broad Creek Management Plan. December 2001.
13. Septic System Planning Clemson University Extension Service and SC DHEC and Ocean of Ocean and Coastal Resource Management 1/97.
14. A Citizen's Guide to Stormwater Pond Maintenance in South Carolina. SCDHEC Office of Ocean and Coastal Resource Management, SC Department of Natural Resources, SC Sea Grant Consortium and Clemson University Extension Service. 01/05.
15. Backyard Buffers for the South Carolina Lowcountry. DHEC Office of Ocean and Coastal Resource Management. 11/00.
16. Environmental News Network My Garden Guide Daily Dirt Blog <http://www.enn.com/>
17. Linking Land Use to Water Quality in South Carolina. Sea Grant Extension Program.
18. Natural Resources Defense Council 1999 Stormwater Strategies report <http://www.nrdc.org/water/pollution/storm/>
19. Household Guide to Water Conservation. 2005. American Water Works Association

The League of Women Voters, a nonpartisan political organization, encourages informed and active participation in government, works to increase understanding of major public policy issues, and influences public policy through education and advocacy. Visit <http://charleston.sc.lwv.org> to join the League and help keep our communities safe, strong and vibrant.

"Water Quality and You" is a community education project prepared by the Charleston Area League of Women Voters. Funding support has been provided by Tideland Bank.

Credits: Research and writing: Margaret Murphy, MSc.

Contributors: Stephannie Thacker, Donna Robertson, Tessie Fleener, and Barbara Zia. Layout and design: Laura Kasman.