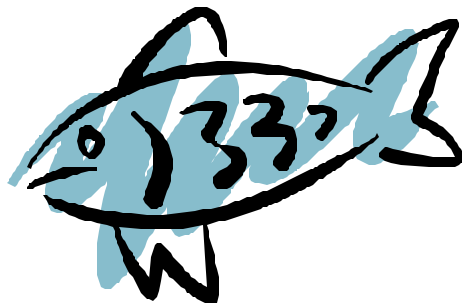


**The Clean Water Challenge:
Improving Tennessee's Water Quality
By Reducing Nonpoint Source Pollution in its
Rivers, Lakes and Streams**



One in a series of three papers on environmental issues facing Tennessee produced by the Vanderbilt Center for Environmental Management Studies (VCEMS) with the support of the Vanderbilt Institute for Environmental Risk and Resources Management and the Tennessee Conservation League. The views expressed are those of the authors and not necessarily those of any sponsoring organizations.

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Overview

Tennessee's rivers, streams, and lakes provide many benefits to the State's citizens, including drinking water, recreational opportunities, and water for agriculture and industry. They also provide habitat to richly diverse aquatic, plant, and wildlife. Many of Tennessee's surface waters are clean enough for fishing and swimming and other uses for which they have been designated by the State, such as irrigation, industrial water supply, livestock watering and drinking water supply. However, thousands of river and stream miles and thousands of lake acres can only partially support the uses for which the State has designated them. These water quality problems are distributed throughout the State. In addition, fishing and swimming advisories have been issued for over one hundred river and stream miles and thousands of lake acres. Furthermore, aquatic species such as mussels are severely threatened by water pollution.

So-called "nonpoint sources" contribute the largest amount of pollutants to Tennessee's rivers, streams, and lakes. Nonpoint source pollutants include fertilizers and pesticides from agricultural lands and residential areas; oil, grease, and toxic chemicals from urban runoff; eroded sediment from construction sites, crop fields, forest lands, and overexposed stream banks; and bacteria and nutrients from livestock, pet wastes, and faulty septic systems. Nonpoint sources of water pollution are not typically regulated by federal or state governments and, therefore, will require leadership and innovation to address. This paper suggests several possible approaches for the State to consider, including: increased training, education, and incentives for urban land owners; State-sponsored incentives and training for localities on land-use practices; creative and inclusive implementation of the federal Clean Water Act's Total Maximum Daily Load Program; State support for local incentive programs; participation in federal programs; and assessment of Tennessee's current programs and authorities for additional opportunities to address nonpoint source water pollution.

Problem

Tennessee's rivers, streams, and lakes are rich in aesthetic beauty and biological diversity. They provide drinking water, recreational opportunities for residents and tourists and habitat for Tennessee's abundant aquatic life, which is some of the most biodiverse in the nation.¹ Although many of Tennessee's waters are clean enough for fishing and swimming and can support aquatic life, such as shellfish, many of them are not. In 2000, swimming advisories were issued for more than 110 river miles due to bacterial contamination. In addition, advisories were issued for over 84,000 lake acres and 150 river miles due to contaminated fish.² Furthermore, species such as mussels are severely threatened by water pollution.³

The State of Tennessee recently assessed the quality of its waters, as required every other year under the federal Clean Water Act. Based on an assessment of approximately 40% of Tennessee's stream miles, the State found that over 1,800 stream miles, or 7.6%, were unable to support one or more of the uses for which the State had designated them, such as recreation, irrigation, industrial water supply, livestock watering, aquatic life, and drinking water supply, because of severe water quality impairment. An additional 5,700 miles, or 23.5%, of Tennessee's streams and rivers could only partially support all of the uses for which the State had designated them. Based on an assessment of over 98% of Tennessee's lake acres, over 90,400 lake acres, or 17%, were unable to support one or more of their designated uses due to severe water quality



impairment. An additional 27,600 lake acres, or 5.2%, could only partially support all of their designated uses. Tennessee's water quality problems are distributed throughout the State and include stream segments from the North Fork Forked Deer watershed near Dyersburg in West Tennessee to the Harpeth Watershed near Franklin in Middle Tennessee to the Hiwassee Watershed near Athens in East Tennessee.⁴

The primary impairments to Tennessee's rivers and streams are silt, habitat alteration (physical alteration of a stream that causes a loss of habitat), pathogens, and nutrients. Nonpoint sources contribute the largest amount of these pollutants to Tennessee's rivers and streams.⁵ Nonpoint sources are typically diffuse, unlike point sources such as industrial and sewage treatment plants. Such sources include, but are not limited to, agriculture, urban runoff, mining runoff (in the Cumberland Plateau Region), land development, and failing septic systems. Nonpoint source pollution occurs when rain moves over and through the ground, picking up pollutants and depositing them into lakes, rivers, and groundwater. Nonpoint source pollutants include fertilizers and pesticides from agricultural lands and residential areas; oil, grease, and toxic chemicals from urban runoff; eroded sediment from construction sites, crop fields, forest lands, and overexposed stream banks; and bacteria and nutrients from livestock, pet wastes, and faulty septic systems.⁶

Nonpoint source pollution traditionally has not been regulated under federal and state laws, but rather has been addressed primarily through non-regulatory means such as planning, incentive and cost share mechanisms, voluntary best management practices, and similar approaches. States across the country are now grappling with how to better use such tools and develop new approaches to address the problem that the Environmental Protection Agency has called the "the last major impediment to clean water."⁷ Creative approaches and cooperative solutions that address nonpoint source water pollution, as well as leadership at the highest levels of State government, are needed to meet the challenge of making Tennessee's waters safe for recreation and wildlife.

Although this paper focuses on nonpoint source pollution, it does not intend to suggest that point sources of pollution are not an equally important factor in Tennessee's water quality problems.

Why Tennessee Must Meet the Challenge

Public Health

Runoff that contains human and animal fecal matter can carry pathogens into sources of drinking water and into waters that are used for recreation. Such pathogens can cause gastrointestinal illness and skin diseases.⁸ Consumption of fish that have been contaminated with pollutants, such as pesticides, is also associated with a range of serious health risks.⁹ In addition to the importance of clean water from a physical health perspective, studies indicate that water also has a strong positive effect on individuals' sense of well-being. For example, people derive pleasure from recreational activities, such as boating and fishing, and find comfort in knowing that the water they drink is clean.¹⁰

Environment

Aquatic life in Tennessee's rivers, streams and lakes is some of the most biologically diverse in the nation.¹¹ Nonpoint source pollution can result in fish kills and harm other aquatic organisms. For example, silt, the single largest contributor to river and stream pollution in Tennessee, can restrict or prevent light penetration, alter temperature patterns, stifle oxygen, fill streams, clog the gills of fish, and accelerate the growth of certain aquatic plants.¹²



Economy

Water quality affects major economic sectors including recreation and tourism, fisheries, agriculture, real estate, and other industries. Industry and communities in the State incur increased costs for cleaning water from public sources for their intended uses. For example, the cost to utility districts of processing drinking water increases as a result of silt and bacteria. Recently, the Turnbull Creek Utility District was temporarily shut down because of an influx of silt from road construction.¹³

In addition, from white water rivers to calm lakes, water resources contribute significantly to recreation and tourism in the state. These bodies must support swimming and fishing uses to maintain their recreational value. A major portion of recreational spending is tied to fish and wildlife that require clean water for habitat, such as small-mouth bass and migratory waterfowl. In 2000, for example, revenue from hunting, fishing and boating licenses generated over \$5.7 million, which is only a fraction of the revenue generated from related expenditures, such as food and lodging.¹⁴ Clean water is also necessary for fisheries and mussel harvesting in the State. Tennessee farmers need clean water for irrigating crops, watering livestock, and maintaining habitat for aquaculture or fish farming. Irrigating crops with water contaminated with certain pollutants can stunt plant growth and lower crop yields. Water resources also play a key role in the real estate sector. Lake or riverfront properties often sell or rent for several times the value of similar properties that are not near water.¹⁵

Possible Approaches to Meeting the Challenge

There are many approaches that Tennessee could take to address the challenge posed by nonpoint source water pollution. The following are some possible directions that the State should consider. Additional research could help determine the appropriateness of these and other approaches.

Increased Training, Education, and Incentives

Through its implementation of the federal Clean Water Act's so-called "Section 319" program¹⁶ and the Tennessee Agricultural Resources Conservation Fund program, Tennessee's Department of Agriculture has made considerable strides in educating landowners about how to manage their land in a manner that minimizes the impact of its use on nearby waters. The programs, which are funded by the United States Environmental Protection Agency and a portion of the Tennessee real estate transfer tax, focus primarily on farmers and foresters, although efforts have recently been expanded to include urban nonpoint sources.¹⁷ Continued support for these education efforts is essential, as agriculture is the leading cause of river impairment. For example, education programs such as the no-till farming programs in West Tennessee have been successful in addressing nonpoint pollution.¹⁸

Tennessee could consider further extending its education, incentive, and training efforts to other groups, including suburban homeowners, road builders, and developers. Although runoff from some of these sources may be covered by point source storm water permits issued in some areas of the State,¹⁹ the sources are discussed in this paper because they share many of the attributes of nonpoint sources and have traditionally been treated as such.

The Department of Environment and Conservation estimates that urban runoff impacts over 1,000 miles of rivers and streams in Tennessee.²⁰ Chemicals and fertilizers from lawns, gardens, parks, and other sites as well as oil, antifreeze, paints, battery acid, pet wastes, household cleaning products, and other pollutants are



transported by runoff from driveways, parking lots, and lawns into receiving waters. The State could consider developing new approaches to educating suburban residents about how their activities affect water quality. For example, State efforts to educate consumers on such topics as proper application of chemicals and fertilizers, the importance of soil testing to determine the levels and types of fertilizer needed, and proper storage and disposal of contaminated bottles could help improve water quality. Such education objectives could be achieved with minimal State funding. The State could also consider establishing a voluntary initiative for private businesses that sell related products, such as fertilizer and herbicides. These retailers may be willing to include additional information on best practices with the products they sell or offer training on proper pesticide and fertilizer application at their stores. In addition, community groups such as garden clubs and civic associations could provide training to their members. Finally, any education program should consider the possibility of using economic incentives to increase the likelihood of success.

The activities associated with construction of subdivisions, shopping centers, and roads can impair water quality, particularly if the sites are not stabilized properly and best management practices are not used effectively. The most common adverse effects of these activities are siltation and habitat alteration. Eroded sediment from land development is the leading source of silt in Tennessee streams. For example, according to the Tennessee Department of Environment and Conservation, highway, road, and bridge construction impaired over 800 miles of rivers in Tennessee between 1998 and 2000.²¹ The State could consider new approaches to and ways of improving the effectiveness of its current training programs and erosion control certification requirements under storm water permits for road building and development sites. For example, the State could consider best practices from other states, which might include: increased (mandatory or voluntary) training in erosion control practices for State Department of Transportation contractors, as well as for private developers; training that includes hands-on field demonstrations; the use of “train the trainer” models that allow trade associations and other organizations to train members in erosion controls practices; and incentives to individual workers, such as free fishing licenses, to participate in training activities, if permitted under state laws and regulations. In addition, the State could consider training and education with respect to highway and bridge design, in order to minimize flow alteration and water quality impacts at stream crossings.

State-Sponsored Incentives and Training on Land Use Practices for Localities

Land development typically creates paved and other impervious surfaces. Rainwater moving across these surfaces flows directly into Tennessee’s rivers, streams, and lakes, rather than filtering through the ground where many of the pollutants it contains can be removed. In addition, development close to streams and lakes can leave little or no vegetation to prevent soil erosion. Runoff from developed land is a particular concern for Tennessee because of the State’s rapid rate of land development – the seventh highest in the nation.²²

States across the country are taking a variety of approaches to address the water quality impacts of urban development. For example, some states provide incentives to localities where development authorities take into account water quality. Possible incentives include offering high-priority status for highway construction and other State grants to localities that utilize best management practices near open water resources such as: 1) zoning land use to prevent or minimize the creation of impervious surfaces; or 2) retaining and/or requiring natural vegetation for buffer zones. Implementing such practices, rather than solely constructing storm sewers to facilitate contaminated runoff directly into surface waters, could significantly improve Tennessee’s water quality. Tennessee could consider establishing a vehicle, such as a governor-appointed task force, to identify such opportunities. The State also could continue to draw on



the tremendous resources of its many universities to develop and provide additional training and education to local governments about available tools and approaches to guiding growth in a manner that helps preserve water quality.²³

Implementation of the Total Maximum Daily Load Program

Tennessee, like many other states, is in the process of setting so-called total maximum daily loads (TMDLs) under the federal Clean Water Act for its impaired waters. A TMDL is a study that quantifies the amount of a pollutant in an impaired stream; identifies the sources of the pollutant; determines the amount of the pollutant that the stream can assimilate without violating water quality standards; and recommends regulatory or other actions that may be needed to address stream pollution.²⁴ In many cases, the water impairment is due to nonpoint source pollution. The TMDL requirements provide an opportunity to work with sources of nonpoint pollutants to address impaired waters in the State.

The State has substantial flexibility with respect to how it implements the TMDLs it establishes and could explore a variety of implementation approaches with representatives of both nonpoint and point sources. For example, a multi-stakeholder group could be convened to help the Department of Environment and Conservation and the Department of Agriculture develop an implementation approach that could be applied State-wide.

Tennessee could also bring all of the parties in a small watershed together to implement the TMDLs that have been developed and work with the nonpoint sources to install best management practices. The watershed could then be monitored to determine the effectiveness of the best management practices. This type of small-scale pilot could allow regulators and interested parties to determine the effectiveness of best management practices in improving water quality in a particular watershed. Such a pilot project also would bring together the affected parties, including regulators, citizens, farmers, foresters, environmental non-profit groups, and developers. Lessons learned from the pilot then could be applied in larger watersheds, as appropriate.

State Support for Local Incentive Programs

Another opportunity that the State has to improve the control of nonpoint source pollution is to collaborate with local entities, such as Tennessee utility districts responsible for water and wastewater treatment. For example, reducing nonpoint source pollution from utility district customers can reduce the costs of processing wastewater and, therefore, localities may be interested in providing incentives to their customers to use best management practices. In Florence, Alabama, the City is collaborating with the U. S. Natural Resources Conservation Service, the State environmental agency, local land owners, and others to fence livestock out of a stream. The City and the federal government are contributing to the incentive payments to land owners who participate in the program. Both of these agencies are also paying for a portion of the costs of the fences and native hard woods to be planted along the stream.²⁵ The State could play an important role by bringing together utility districts at a summit or similar event and providing them with educational materials and incentive models.



Participation in Federal Programs

Given the State's fiscal constraints, the State may want to establish a mechanism, such as an interagency task force, for assessing on a regular basis whether it is effectively leveraging available federal dollars to address nonpoint source water pollution. For example, the State does not currently participate in the United States Department of Agriculture's Conservation Reserve Enhancement Program (CREP) or Farmland Protection Program. The Farmland Protection Program provides funds to state governments to help purchase development rights to keep productive farmland in agricultural use. The program helps ensure that land remains vegetated even if all the land surrounding it has been covered with impervious material due to development. Kentucky participates in the federal program and has set up its own implementing program, the Purchase of Agricultural Conservation Easements (PACE) program.²⁶ CREP is a state-federal conservation partnership program targeted to address specific state and nationally significant water quality, soil erosion and wildlife habitat issues related to agricultural use. The program uses financial incentives to encourage farmers and ranchers to enroll voluntarily in contracts of 10 to 15 years in duration to remove lands from agricultural production.²⁷ These and similar programs could be assessed to determine whether it makes sense for the State to participate.

Assessment of Tennessee's Current Programs and Authorities

Tennessee may be missing opportunities to address nonpoint source water pollution more effectively through current programs and authorities. The State could consider initiating an evaluation of its programs and compliance assistance and assurance activities to identify such opportunities. For example, Tennessee has broad authority under its Aquatic Resource Alteration Permit program to require any person who conducts an activity that involves the alteration of waters of the State to acquire a permit. It may be possible to implement the program in a manner that requires greater attention to impacts from nonpoint source pollution. There may be other programs as well that could be used to address nonpoint source pollution more effectively.

In addition, Tennessee could consider devoting additional resources to monitoring compliance with current requirements, such as preventing erosion and siltation during road construction and other development activities. Recent erosion control problems that caused the Turnbull Creek Utility District to shut down temporarily during the construction of state route 840 in Dickson County highlight the importance of ensuring compliance with such permit requirements.



This paper is part of a series of white papers on environmental issues in Tennessee. The three papers discuss public lands, nonpoint source water pollution, and contribution of motor vehicle miles traveled to ozone pollution. These three issues are illustrative of the environmental challenges that Tennessee faces in the coming decade. The focus on these topics, however, is not intended to suggest that these are the only or the most important environmental issues that the State must address. The papers highlight some possible approaches that could be examined further, based on information gathered during a series of over two dozen interviews with representatives from State and local government, businesses, and nonprofit organizations. While potential solutions are offered, they are by no means exhaustive of potential solutions that might be considered and they should not be taken as specific recommendations without further analysis on the costs and benefits of each alternative. These papers were produced by the Vanderbilt Center for Environmental Management Studies (VCEMS) with the support of the Vanderbilt Institute for Environmental Risk and Resources Management and the Tennessee Conservation League. The views expressed are those of the authors and not necessarily those of any sponsoring organizations. Contributing authors and researchers include: Linda Breggin, Mark Cohen, Meghan Lockman, Ann Olsen, and Kristen Shepherd. Electronic versions of the papers in this series, as well as additional information about the authors, are available on the VCEMS web site at www.vanderbilt.edu/vcems.

Endnotes:

- ¹ The Nature Conservancy, "10 Things You Should Know About Tennessee," <http://nature.org/wherewework/northamerica/states/tennessee/about/art227.html> (accessed June 2002).
- ² Tennessee Department of Environment and Conservation, Division of Water Pollution Control, "The Status of Water Quality in Tennessee: Year 2000 305(b) Report," at 43 (December 2000).
- ³ The Nature Conservancy, "Press Release 8/14/02," <http://nature.org/wherewework/northamerica/states/Tennessee/press/press170.html> (accessed May 2002).
- ⁴ Tennessee Department of Environment and Conservation, Division of Water Pollution Control, "The Status of Water Quality in Tennessee: Year 2000 305(b) Report" at 106, 155, 201 (December 2000).
- ⁵ Tennessee Department of Environment and Conservation, Division of Water Pollution Control, "The Status of Water Quality in Tennessee: Year 2000 305(b) Report" at 33 (December 2000).
- ⁶ Tennessee Department of Agriculture, "Frequently Asked Questions about Nonpoint Source Pollution: Who Causes Nonpoint Source Pollution." www.state.tn.us/agriculture/nps/npsfaq.html (accessed March 2002).
- ⁷ Hale, Mandi, "*Pronsolino v. Marcus*, The New TMDL Regulation, and Nonpoint Source Pollution: Will the Clean Water Act's Murky TMDL Provision Ever Clear the Waters?" Environmental Law 981, 982 n.1 (2001-2002)(citing "Scientific and Technical Hurdles Will Slow Progress From EPA's Total Maximum Daily Load (TMDL) Proposal," Pesticide and Toxic Chemical News (Food Chemical News, Inc.), March 16, 2000 at 1).



⁸ Environmental Protection Agency, “National Primary Drinking Water Regulations,” www.epa.gov/safewater/mcl.htm (accessed April 2002).

⁹ Environmental Protection Agency, “Fish Advisories: Reports and Chemical Fact Sheets,” <http://www.epa.gov/watersceince/fish/reports.html> (accessed may 2002).

¹⁰ Environmental Protection Agency, Office of Water, “Liquid Assets 2000: America’s Water Resources at a Turning Point,” EPA-840-B-00-001 (May 2000) (*citing* National Water Research Institute) (available online at <http://www.epa.gov/water/liquidassets/index.html> (accessed March 2002)).

¹¹ The Nature Conservancy, “10 Things You Should know About Tennessee,” <http://nature.org/wherewework/northamerica/states/tennessee/about/art227.html> (accessed June 2002).

¹² Tennessee Department of Environment and Conservation, Division of Water Pollution Control, “The Status of Water Quality in Tennessee: Year 2000 305(b) Report” at 27-28 (December 2000).

¹³ Telephone interview with Elmo Lund, Director of White Bluff/Turnbull Water Treatment Plant (March 26, 2002).

¹⁴ Telephone interview with Susie Spriggs, Revenue Office, Tennessee Wildlife Resources Agency (March 23, 2002).

¹⁵ Environmental Protection Agency, Office of Water, “Liquid Assets 2000: America’s Water Resources at a Turning Point,” EPA-840-B-00-001, at 8 (May 2000)(available online at <http://www.epa.gov/water/liquidassets/index.html> (accessed March 2002)).

¹⁶ Clean Water Act, Section 2319, 33 U.S.C. Section 1329.

¹⁷ Tennessee Department of Agriculture, “About Water Resources,” <http://www.state.tn.us/agriculture/nps/about.html> (accessed May 2002).

¹⁸ In 1977, the National Resources Inventory showed Tennessee leading the nation in soil erosion with 14.1 tons per acre per year. In 1992, the NRI reported that Tennessee farmers’ use of no-till technology reduced erosion to 7.1 tons per acre per year. *See* Blick, Larry; SCS Public Affairs, “Tennessee’s Producers Star in ‘Team Effort’” *Stewards of the Land* (newsletter) at 1 (1995). In 1985, no-till accounted for about 18 percent of the acres planted in the State, but in 1995 that percentage had increased to 46 percent. *See* Tennessee Agri Science: Contributing to the Development of Tennessee Agriculture, Number 179 (Summer 1996).

¹⁹ Tennessee Department of Environment and Conservation, Division of Water Pollution Control, “Storm Water Discharges Permitting,” <http://www.state.tn.us/environment/wpc/stromh2o/MS4.htm> (accessed May 2002).

²⁰ Tennessee Department of Environment and Conservation, Division of Water Pollution Control, “The Status of Water Quality in Tennessee: Year 2000 305(b) Report” at 33 (December 2000).



²¹ Tennessee Department of Environment and Conservation, Division of Water Pollution Control, “The Status of Water Quality in Tennessee: Year 2000 305(b) Report” at 27-28, 33 (December 2000).

²² United States Department of Agriculture, “Summary Report 1997 National Resources Inventory” at 16 (Revised December 2000).

²³ *See, e.g.*, The Municipal Technical Advisory Service, <http://mtas-notes.ips.utk.edu> (accessed June 2002)(an agency of the University of Tennessee’s Institute for Public Service that provides technical assistance to city and town officials across the State).

²⁴ Tennessee Department of Environment and Conservation, Division of Water Pollution Control, TMDL web site: www.state.tn.us/environment/wpc/tmdl.htm (accessed June 2002).

²⁵ Phone Interview with Russell Harper, Florence Alabama Natural Resources Conservation Service, March 26, 2002

²⁶ The PACE Program: www.uky.edu/Ag/AgEcon/ra9805ci.html (accessed June 2002).

²⁷ United States Department of Agriculture, “The U.S. Department of Agriculture’s Natural Resources Programs: Financial, Technical, and Educational Assistance for Landowners,” (May 1998).

