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Achieving the Nonpoint Source Pollution Reduction Goal for the Shenandoah and Potomac Rivers in Virginia

Report prepared by the
Virginia Department of Conservation and Recreation
Commonwealth of Virginia, Richmond
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Department of Conservation and Recreation
Division of Soil and Water Conservation
203 Governor Street, Suite 206
Richmond, VA 23219-2094

(804) 786-2064



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A significant milestone has been reached in Commonwealth of Virginia's efforts to clean up the Chesapeake Bay and its tributaries. The 1987 Chesapeake Bay Agreement signed by the states of Pennsylvania, Maryland and Virginia, the District of Columbia, and the Environmental Protection Agency (EPA), established a 40 percent nutrient reduction goal for the main-stem of the Chesapeake Bay. Technically, the goal for the Shenandoah and Potomac Rivers was approximately 37.5 percent with the balance to be achieved through unspecified voluntary implementation. Virginia has met this ambitious nonpoint source (NPS) pollution reduction commitment for the Shenandoah and Potomac Rivers.

To meet the 40 percent nutrient reduction goal for the Shenandoah and Potomac Rivers, Virginia developed and implemented a watershed restoration action strategy, the *Shenandoah and Potomac River Basins Tributary Nutrient Reduction Strategy*. This basin-scale strategy addresses both point source and nonpoint source pollution control. However, this report focuses on the reduction of nonpoint source pollution loads.

Watershed Restoration Action Strategy Development and Implementation

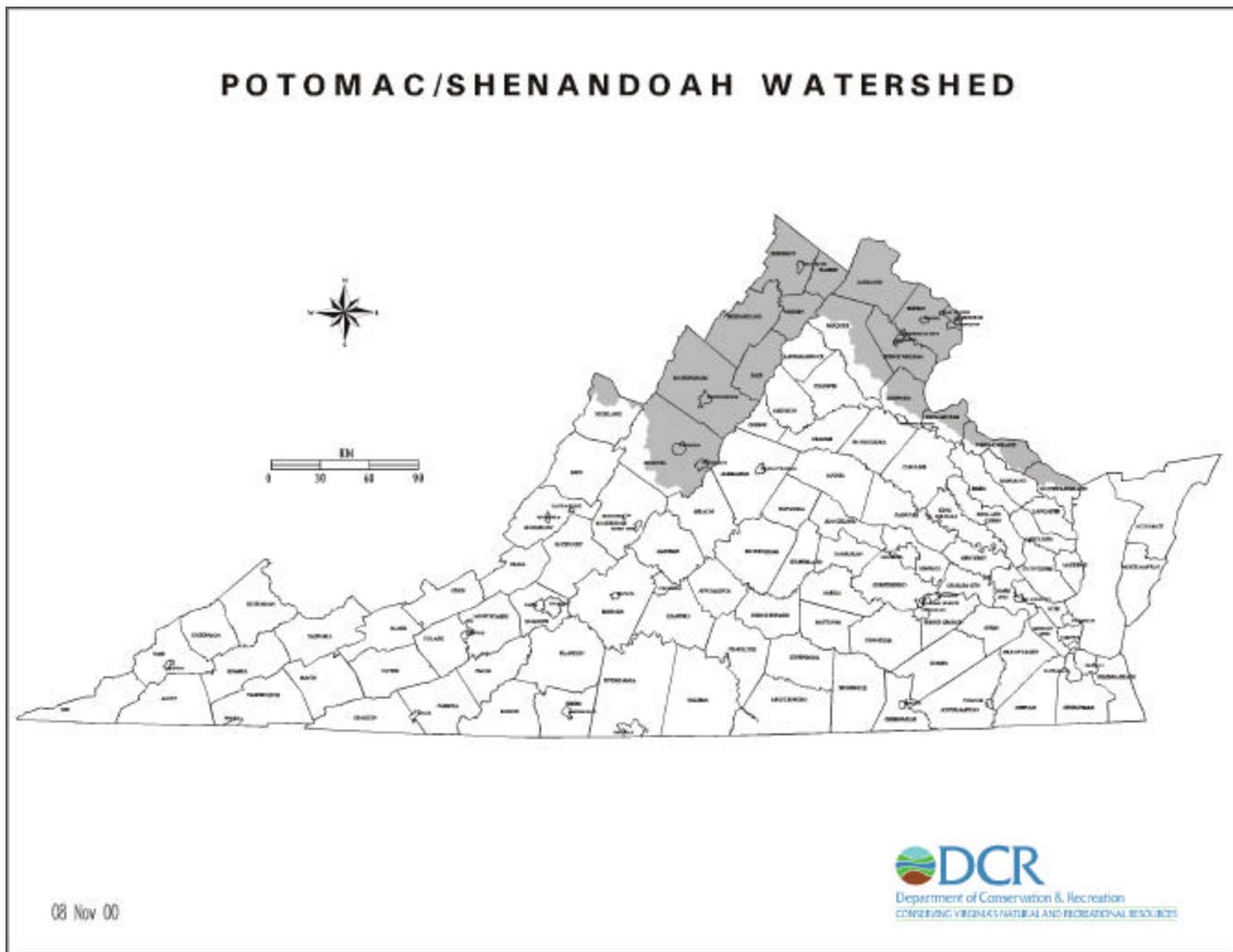
The Chesapeake Bay and its tributaries are a national treasure and a vital natural resource to the citizens of Virginia. Despite declines in some fish and shellfish populations, the Chesapeake Bay and its tributaries continue to support one of the most important fisheries in the nation. In 1995, dockside commercial sales of fish and shellfish were estimated to be \$73.8 million. In addition, the Chesapeake Bay and its tributaries offer some of the best recreational fishing in America.

Restoration of water quality and living resources in the Chesapeake Bay watershed is the primary goal of the Chesapeake Bay Program. This goal is being met in the Shenandoah and Potomac Rivers through a voluntary, cooperative partnership. In December 1996, numerous stakeholders, including local governments, soil and water conservation districts, planning district commissions, citizen groups, industry associations, conservation groups, farmers, university staff, state legislators and others completed a detailed strategy to achieve a 40 percent nonpoint source nitrogen and phosphorus reduction goal. As the lead state agency for nonpoint source pollution management, the Department of Conservation and Recreation led implementation efforts to meet the nonpoint source nitrogen reduction goal of 3.47 million pounds and the nonpoint source phosphorus reduction goal of 560,000 pounds. A ten-fold increase in the level of nonpoint source program implementation was required to meet these goals by the year 2000 implementation time-line.

Thanks to the enormous commitment of farmers, local governments, conservation groups and others in the Shenandoah Valley, Northern Virginia, and Northern Neck, Virginia met the nonpoint source pollution commitments in the *Shenandoah and Potomac River Basins Tributary Nutrient Reduction Strategy* by the December 31, 2000 goal established in the Chesapeake Bay Agreement. Virginia's success with the strategy implementation resulted from modifying and intensifying the existing approaches and relationships to improve nonpoint source pollution control. The infrastructure to employ these approaches was the result of a

decade long Chesapeake Bay restoration effort. In particular, the Shenandoah River portion of the watershed had been identified as a significant nonpoint pollution source due to intensive agriculture, especially livestock. A variety of NPS programs geared to land uses existed. These programs included financial incentives to install agricultural best management practices (BMPs), nutrient management planning, NPS prevention projects, local erosion and sediment control programs, stormwater management, NPS educational activities, and forest management programs.

The Shenandoah and Potomac Rivers drain to the Chesapeake Bay and have been a central focus of the Chesapeake Bay Program Tributary Strategies because the watershed of these rivers is shared by several jurisdictions and has a significant effect on the bay's overall water quality. In Virginia, the basin contains more than 300 river miles, covering a land area of 8,300 square miles (see the watershed map below).



Nonpoint Source Pollution Reductions

Agricultural nutrient reductions were the primary focus of strategy implementation, because costs per unit of nutrient reduction on agricultural land were less expensive than other land uses. Implementation efforts also included urban nonpoint sources. The following examples

describe the key best management practices (BMPs) implemented in the Shenandoah and Potomac River basins.

Conservation Tillage This method of crop production can be done by either planting crops into existing cover without tillage (no-till) or by utilizing tillage implements that leave most crop residue on the soil (minimum tillage).



Soil Conservation and Water Quality Planning
These plans are comprehensive natural resource management plans, but the focus is typically on the use of control practices to reduce sediment loss from cropland.

Nutrient Management Planning Nutrient management is a comprehensive plan to manage the amount, placement, timing and application of animal wastes, fertilizer, sludge or residual soil nutrients to minimize nutrient loss potential while maintaining farm productivity.

Agricultural Land Retirement Land retirement of either highly erodible or other sensitive lands is the practice of taking agricultural land out of crop production and/or grazing and converting it by planting with a permanent vegetative cover such as grasses, shrubs and/or trees. This practice stabilizes the soil and reduces the movement of sediment and nutrients from the land.

Grazing Land and/or Stream Protection from Livestock These measures are used to minimize the impacts of agricultural animals on the land. Grazing land protection uses rotational grazing practices to protect pastureland and some type of watering facilities to minimize direct access to live streams. Stream protection efforts can include streambank stabilization, measures to exclude livestock from streams by fencing or other devices, or installing livestock stream crossings.

Cover Crops Planting of cover crops, such as rye, wheat or barley, without fertilizer in the early fall traps leftover nitrogen so it will not leach into the soil and groundwater. It also reduces wintertime erosion of the soil.



Grass Filter Strips or Woodland Buffers
 Vegetative buffers are established adjacent to streams and other receiving waters to filter runoff of sediment and nutrients from adjacent land uses.

Forest Harvesting Best Management Practices This measure uses erosion and sediment control measures during forest harvesting activities. It is assumed that under proper implementation of this measure all eroding sediment is stopped and stabilized before reaching any receiving surface waters.

Livestock Waste Management Through the use of storage structures or lagoons to store animal waste, the waste can be used as a fertilizer source in crop production. This process reduces nutrient loads that would otherwise enter the landscape without an opportunity for further and more efficient plant uptake of the nutrient source.





Poultry Waste Management

This measure uses storage sheds to stockpile poultry litter from partial clean-outs required after each flock of birds is removed.

Animal Confinement Runoff (Loafing Lot) Management The measure includes the use of roof runoff control, diversions, grass filters, etc. to reduce nutrient loss from water flowing through animal confinement operations.

Erosion and Sediment Control This control measure is implemented throughout the Chesapeake Bay watershed and uses various practices such as silt fences, sediment basins, check dams, diversions, etc. to reduce sediment runoff during construction activities associated with land development.

Retrofits for Urban Best Management Practices Modifying existing stormwater management (SWM) facilities to enhance water quality and/or retrofitting stormwater drainage systems to



add water quality components in already developed areas can slow runoff, remove sediment and nutrients, and provide a basis for restoring eroded stream channels.

Urban Nutrient Management Reductions under urban nutrient management are dependent on efficiency of educational efforts to modify lawn fertilizer use by homeowners and others.

Septic System Management Septic system management within the context of the Chesapeake Bay Program includes three specific practices to reduce nutrient losses from septic systems. They include regular pumping of the system, installation of nitrogen removing (denitrification) components, and bypassing a septic system by connecting to a sanitary sewer.

Shoreline Erosion Control This control measure uses structural (riprap, revetments, etc.) and/or nonstructural (marsh grass, vegetative buffers, etc.) components to reduce the direct loss

of sediment into tidal waters.



The following table lists the nonpoint source reduction goals that have been accomplished in the Shenandoah and Potomac Rivers watershed. Additional reductions achieved through landowner-initiated and funded activities are anticipated to exceed the 40 percent reduction target.

Shenandoah and Potomac Nutrient Reduction Goals

		Year 2000 Goal		Reductions (lbs/year)	
Agricultural BMPs	Units	Coverage	Percent	Nitrogen	Phosphorus
Agricultural Land Retirement	acres	27,445	100.00%	282,530	45,165
Grazing Land Protection	acres	65,964	100.00%	190,187	12,821
Stream Fencing	linear feet	246,370	100.00%	15,635	3,891
Streambank Stabilization	linear feet	34,895	100.00%	13,834	4,971
Cover Crops	acres	45,699	100.00%	205,411	17,934
Grass Filter Strips	acres	2,013	100.00%	20,932	2,571
Woodland Buffer Filter Area	acres	1,586	100.00%	32,981	4,641
Animal Waste Control Facilities	systems	422	100.00%	464,333	102,060
Poultry Waste Control Facilities	systems	669	100.00%	126,264	25,355
Loafing Lot Management	systems	59	100.00%	9,348	2,058
Total Reductions for Agricultural BMPs:				1,361,456	221,466
Other Agricultural BMPs					
Conservation Tillage	acres	195,933		172,449	15,805
Farm Plans	acres	450,959	100.00%	266,715	74,315
Agricultural Nutrient Management	acres	429,187	100.00%	1,207,809	168,799
Total Reductions for All Agricultural BMPs:				3,008,430	480,385
Non-Agricultural BMPs					
Urban Land BMPs	acres	12,908	100.00%	23,057	2,283
E&S Control	acres	8,063	100.00%	100,988	51,148
Forest Harvesting BMPs	acres	12,012	100.00%	170,421	3,412
Septic Pumping	systems	167		38,924	0
Shoreline Erosion Control	linear feet	76,000	100.00%	51,680	20,520
Unassigned Reductions				61,012	3,693
Total Reductions for All BMPs:				3,454,512	561,441
Adjustment for Land Use Changes:				-449,857	-33,344
Adjustment for Poultry Growth:				47,630	10,681
Adjusted Total Reductions:				3,856,739	584,104
Nonpoint Controllable Base Loads:				10,343,159	1,556,300
Percent Reduction:				37.3%	37.5%

In addition to the substantial nutrient reductions that have been achieved through tributary strategy implementation, BMPs implemented within the Shenandoah and Potomac Rivers have provided considerable sediment reductions. Suspended solids remain a significant concern within the Chesapeake Bay and its tributaries. The reductions achieved through BMP implementation within the Shenandoah and Potomac River basins will help ensure that the commonwealth meets sediment reduction commitments in the *Chesapeake 2000 Agreement*.

Funding Tributary Strategy Implementation

State sources and landowner and local government contributions provided most of the funding for tributary strategy implementation. Between 1998 and 2000, more than \$15 million from Virginia's Water Quality Improvement Fund was targeted toward agricultural BMPs and nonpoint source pollution control implementation projects, such as stormwater management retrofits. In addition, approximately \$1 million in state funds were spent on technical assistance to promote, design and oversee installation of agricultural BMPs. During that same time frame, significant federal funding was provided for strategy implementation.

Approximately \$2.5 million in Clean Water Act, Section 319 funding from the Environmental Protection Agency (EPA) was provided for agricultural BMP implementation. In addition, more than \$800,000 in Section 319 funding was used for nonpoint source pollution control implementation projects. Section 319 funding also supported nutrient management and stormwater management program implementation within the Shenandoah and Potomac Rivers. During this period, EPA also provided approximately \$2.4 million in Clean Water Act, Section 117 Chesapeake Bay Implementation Grant funds for implementation efforts within the Shenandoah and Potomac river basins. The U.S. Department of Agriculture also provided substantial additional funding for agricultural BMPs within the basin. And by providing their portion of agricultural cost share, farmers in the basins spent approximately \$5 million in developing agricultural BMPs.

Nutrient management plan preparation was supported through significant funding. The strategy set an ambitious target for development of nutrient management plans on 90 percent of the cropland in the Shenandoah River watershed. In order to meet this target, attention focused on the agricultural operations that would yield the largest nutrient reductions. Certified nutrient management plan writers, both public and private sector, were challenged to actively address unplanned acreage through several innovative programs.

Accomplishment of the Tributary Strategy objectives was bolstered by passage of statutes requiring better management of animal waste operations. New regulations that require manure management systems to be covered by nutrient management plans nearly matched deadlines associated with the Tributary Strategy. These regulatory changes enhanced farmer interest and participation. The availability of significant levels of WRAS funding through Section 319 of the Clean Water Act and the Virginia Water Quality Improvement Fund eased the burden of the new laws while improving participation in the Tributary Strategy.

Measurable Environmental Results

Not only will nutrient reductions benefit the main stem of the Chesapeake Bay, but also numerous benefits will result within the basin estuary. These benefits include reductions in excess algal growth; improved levels of dissolved oxygen, which increases habitat for fin fish and shell fish; increased light penetration into the water that, in turn, provides increased area and improved quality of submerged aquatic vegetation (SAV) habitat.

The benefits that will be derived from protecting and restoring water quality in the Potomac River and the Chesapeake Bay include both measurable economic benefits to businesses and less tangible cultural benefits, such as aesthetics, increased quality of recreational and fishing opportunities, and quality of life.

Capping Pollutant Loadings

Now that nonpoint source pollution reduction goals for the Shenandoah and Potomac Rivers have been met, the challenge facing the commonwealth will be to maintain pollution reductions in the face of population growth and development. In order to meet this challenge, the commonwealth is developing and will implement a nutrient cap strategy for these river basins. The nutrient cap strategy is the next important step in Virginia's nutrient reduction program in the Shenandoah and Potomac Rivers. A draft of the cap strategy is currently available for public comment. The public comment period will run through May 2001, with three public informational meetings scheduled for late April and early May.