Maryland's Chesapeake Bay Tributary Strategy Statewide Implementation Plan

February 22, 2006
Draft

Who are Maryland's Tributary Teams?

Maryland's 10 Tributary Teams play an important role in the Chesapeake Bay restoration effort. The teams are comprised of people from all walks of life who are dedicated to the restoration and protection of their local tributary and the Chesapeake Bay. They meet in their watershed monthly and focus their efforts on developing and implementing *Maryland's Tributary Strategy*, which includes policy, restoration, outreach, and education activities.

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FOREWORD

The Chesapeake Bay — one of our nation's greatest natural and economic resources — is a source of recreation, commerce and livelihood for many Marylanders. It is an integral component of the State's economy and quality of life and provides unparalleled environmental benefits, including habitat for a myriad of living resources. The restoration of the Bay is an intensive cooperative effort involving all levels of stakeholders, including individuals working to protect and restore local streams and rivers.

The watershed's jurisdictions — six States and the District of Columbia — must cut current nutrient loads to the Bay in half to meet the *Chesapeake 2000 Agreement* water quality goals. This means reducing annual nitrogen and phosphorus loads baywide by 110 million pounds and 6.3 million pounds, respectively, from 2000 levels.

In April 2003, Maryland, Virginia, Pennsylvania, New York, West Virginia, Delaware, and the District of Columbia agreed to continue to work together to achieve these goals and restore the Bay. These kinds of reductions, however, cannot be achieved through Federal and State government actions alone. Local governments, businesses, and private citizens all need to do their part as well.

These nutrient reduction goals are not only necessary to restore the Chesapeake Bay but are also needed to address the requirements of the *Federal Clean Water Act*. In September 2005, the U.S. Environmental Protection Agency published revised State water quality standards that Maryland and Virginia adopted. These standards establish a regulatory framework for the Bay restoration effort through the development of a Total Maximum Daily Load (TMDL) allocation.

TMDLs prescribe the pollutant reduction levels that are necessary to meet the revised water quality standards. Like the Bay nutrient reduction goals, a TMDL sets a limit, or cap, on pollutants that impair water quality and cause violations of water quality standards for a stream, lake, river, or the Bay.

The TMDL for the Bay has not been established yet; however, if the water quality standards are not met by 2010, a TMDL will be developed and will set pollutant loading limits for all sources within the watershed. These sources include discharges from point sources (such as sewage treatment plants, industrial wastewater systems, and urban and suburban stormwater systems), nonpoint sources (such as runoff from farms, rural residential areas, and septic systems), and air deposition (emissions from power plants and motor vehicles).

Because these goals represent a limit on the amount of nutrient loading from each tributary watershed of the Bay, it is in the interest of the State and each local jurisdiction to plan

wisely for the future. All stakeholders need to be engaged in a coordinated strategy to reach and maintain the water quality and habitat improvement goals set forth by the *Chesapeake 2000 Agreement*.

Maryland's Tributary Strategy embodies this coordinated strategy. It provides a potential road map to improve water quality in local streams, rivers, and the Bay through the implementation of point and nonpoint source management practices. Released in April 2004, the strategy identifies the level of effort needed to meet the water quality standards that will restore and maintain the Bay's living resources.

While the strategy's level of implementation practices is challenging, Maryland remains committed to restoring the Bay and meeting water quality standards. Consequently, the State has embarked on a process to develop implementation plans that take a pragmatic approach to setting measurable and achievable implementation goals.

Maryland's Tributary Strategy Statewide Implementation Plan identifies a series of actions to be taken at by the State in the next 2- and 5-year timeframes with corresponding evaluations. Financing the restoration activities will be a key challenge of this effort and will require the support of the public and renewed investment on the part of local and Federal partners, our watershed States, and the private sector. Our estimates on the rate of implementation are based on existing resources and near-term budget projections as well as regulatory requirements. They do not include specific local government implementation activities or potential budget changes that may increase implementation rates statewide. The implementation schedules also reflect continued efforts to fund the most cost effective best management practices included in the Tributary Strategy.

Since it has long been recognized that most of the decisions needed to achieve water quality improvements are made at the local level, the implementation plan also serves as the framework for developing basin plans that will identify local actions to improve water quality. The development of the Statewide Implementation Plan and the Basin Level Plans provide opportunities to improve on Federal, State, and local cooperation and to recognize the hard work of local governments, watershed associations, farmers, landowners, individual citizens, and civic groups.

Maryland's Tributary Teams are charged with coordinating the development of the Basin Level Plans. This process is intended to be dynamic with the plans being updated every 2-years to allow for the inclusion of new practices, programs, and technologies.

The Governor and we, his Bay Cabinet, recently announced several initiatives that will

enhance implementation of *Maryland's Tributary Strategy,* including cost-sharing on manure transport, fostering wetland restoration, expanding the cover crop program to include commodity cover crops, implementing an urban tree canopy program, and establishing a targeted watershed program beginning with the Corsica River watershed. These initiatives, which are consistent with recommendations the State has received from the Tributary Teams and other groups, are included in the Implementation Plan as part of the 2-year action plan for each appropriate agency. In addition, Governor Ehrlich will continue to pursue additional funding at the Federal level to enhance and accelerate the implementation of the Tributary Strategy in Maryland.

Following the lead of the State, we recommend that all local governments begin examining their land use policies and programs to assess their ability to minimize future growth impacts on water quality and to incorporate restoration efforts into their capital and operating budgets. Many programs — such as comprehensive planning, water and sewer planning, watershed management planning, subdivision regulations and approval processes, land preservation, zoning, erosion and sediment control, and stormwater management — can support meeting the nutrient reduction goals. All of these programs, therefore, should be reviewed and their effectiveness optimized.

We look forward to continuing to work with all of the stakeholders in the Chesapeake Bay watershed to accomplish the challenging task of restoring this magnificent estuary.

C. Ronald Franks, Secretary
Maryland Department of Natural Resources

Kendl Philbrick, Secretary
Maryland Department of the Environment

Audrey Scott, Secretary
Maryland Department of Planning

Lewis R. Riley, Secretary
Maryland Department of Agriculture

Background

Since the signing of the first Chesapeake Bay Agreement in 1983, the State of Maryland has been a committed partner in the restoration and protection of the Chesapeake Bay. One of the main avenues through which the State seeks to achieve its Bay restoration goals is the Tributary Strategies Program.

The Tributary Strategies Program was created in 1992 when the Bay Signatories – the U.S. Environmental Protection Agency (EPA), the Chesapeake Bay Commission, the District of Columbia, and the States of Pennsylvania, Maryland, and Virginia – signed the *1992 Amendments to the Chesapeake Bay Agreement*. This agreement established specific nutrient reduction targets for the watersheds of each of the Bay's major tributaries. As a result of this agreement, Maryland divided its State into 10 watersheds and established a Tributary Team in each watershed. Since 1995, these teams – composed of citizens, business leaders, farmers, watershed organizations, and local, State, and Federal government representatives – have been working to meet the Tributary Strategies' goals through policy, restoration, education, and outreach activities.

With the signing of the *Chesapeake 2000 Agreement*, the Bay Signatories committed to use the latest science to revise the Chesapeake Bay restoration goals and establish new goals. These goals will improve the water quality of the Bay and its tidal tributaries sufficiently to sustain their living resources. Once Maryland and the other States achieve the necessary reductions, the goals will serve as caps whereby the States will maintain the designated nutrient levels to preserve the improved water quality in the Bay. By meeting the *Chesapeake 2000* goals, the Bay and its tributaries will be removed from the Federal list of impaired waters.

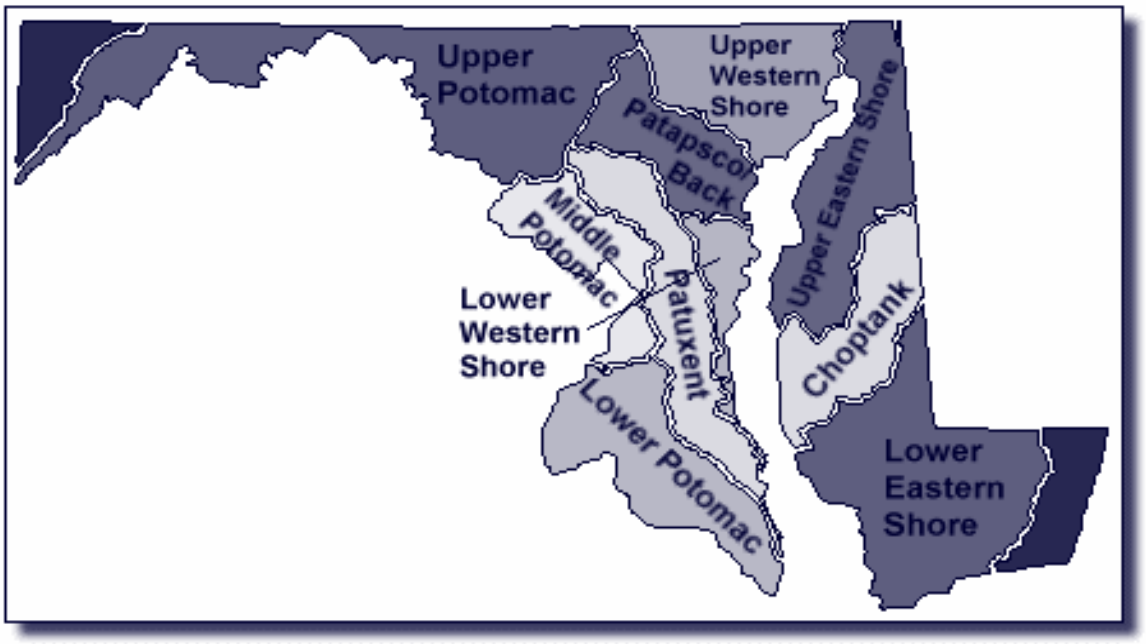
From 2000 through 2004, the State of Maryland and its Tributary Teams worked to revise the Tributary Strategies with the latest *Chesapeake 2000* goals and commitments. The process was extensive and included more than 25 public meetings to obtain input from the Tributary Teams, local governments, scientists, and various stakeholder and citizen groups. The result of all of these efforts was the creation of *Maryland's Tributary Strategy*. The Governor's Chesapeake Bay Cabinet made final revisions to the strategy, and the Governor ultimately approved it. The final strategy was published in April 2004.

Maryland's Tributary Strategy calls for actions that will achieve the water quality standards established for the Chesapeake Bay and its tributaries. The strategy includes specific nutrient and sediment control actions necessary to reduce nutrient pollution from every source, including agricultural fields, urban and suburban lands, and wastewater treatment plants. The baywide nutrient loading caps are 175 million pounds of

nitrogen and 12.8 million pounds of phosphorous. Maryland's allocation of the cap is 37.25 million pounds for nitrogen and 2.92 million pounds for phosphorous. Achieving these caps will require more than a 50% reduction of the 1985 nutrient runoff levels from all sources.

Following the development of the Tributary Strategy, the teams and the State of Maryland began to develop *Maryland's Tributary Strategy Statewide Implementation Plan*. The purpose of this plan is to chart Maryland's course for achieving the Tributary Strategy goals in the areas of point sources, stormwater, septic systems, growth management, agriculture, and air deposition. The plan also includes strategies to achieve, maintain, and monitor water quality goals.

This plan does not identify everything that needs to be done to meet the Tributary Strategy goals but defines realistic, attainable goals in appropriate timeframes. As such, this plan will be updated as new funding sources are available, as new technologies emerge, and as the understanding of the response in water quality to actions taken in the watershed improves. The successful implementation of this plan will require the involvement and commitment of Federal, State, and local governments; the private sector; and individuals living within the Bay watershed.



The Plan and Its Purpose

Maryland's Tributary Strategy Statewide Implementation Plan moves the Chesapeake Bay restoration effort forward by providing critical background information and detailing next steps to implement *Maryland's Tributary Strategy*. The plan consists of two major parts. Part I provides separate implementation strategies for point sources, stormwater, septic systems, growth management, agriculture, and air deposition and identifies other State initiatives to address the implementation gaps. Part II contains strategies to achieve, maintain, and monitor water quality goals. It includes information on coordination between regulatory- and incentive-based programs; the Cap Management Strategy; target areas for additional research, demonstrations, and outreach; and tracking and monitoring progress.

Specifically, this implementation plan strives to achieve the following objectives:

- **Provide an Implementation Schedule:** Each implementation schedule includes an estimate of the Tributary Strategy actions expected to be implemented in the next 2- and 5-year periods.

- **Define Program Coordination:** The plan highlights how State agencies are working collaboratively to implement programs that help achieve the Tributary Strategy commitments.

- **Address Implementation Barriers:** There are many barriers to fully implementing the Tributary Strategy's commitments. This section identifies a number of possible solutions and near-term initiatives led by State agencies to overcome the barriers.

- **Report Implementation Progress:** While this plan does not provide a comprehensive report on progress made to date in the restoration of the Chesapeake Bay, it outlines a plan for reporting progress in the future.

Part I: Statewide Tributary Basin Implementation Plan

Implementation Schedule

Tables are included for each major source area to provide an estimate of the expected implementation of each Tributary Strategy commitment based on existing and near-term budgets and programs. These estimates are derived from a number of guiding principals, including projected funding from known sources, tracked implementation rates as a result of regulation or voluntary participation, and feedback from the local level on the feasibility of implementation in the near-term.

Current Programs

Implementing the Strategy

This section defines the existing State programs working to implement the

Tributary Strategy commitments. Programs are regulatory- and incentive-based and often rely heavily on the work of local governments, Soil Conservation Districts, private landowners, and others to ensure policies and programs result in action.

Implementation Barriers and Possible Solutions

To increase the awareness and understanding of *Maryland's Tributary Strategy*, meetings were held with specific stakeholder groups throughout the State during 2004. The stakeholder groups included Tributary Team members, local government staff, the agriculture community, and local watershed organizations. Meeting attendees reviewed the strategy and identified what the real or perceived barriers were to fully implementing its commitments. In addition, the meeting participants generated a number of potential solutions to overcome the barriers. A summary of these meetings is provided in each section. It is hoped that the stakeholder groups and organizations will use this plan to develop priorities for policy, program, and regulatory changes so that local activities become a solid foundation for meeting local water quality standards and Chesapeake Bay restoration goals.

State Initiatives to Address the Implementation Gaps

While Maryland alone cannot fully restore the Chesapeake Bay's water quality, much has been done and will be done to ensure the State's continued leadership in Bay

Maryland's Tributary Teams conduct field tours to educate their members, local residents, and government officials about important issues facing their local watershed.

Many Tributary Teams conduct hands-on projects, such as this team which is building an oyster bar. These initiatives often involve partnerships and the participation of local residents.

restoration efforts. This section provides a summary of initiatives that demonstrate Maryland's commitment to remain a Bay restoration leader. It includes a list of future actions needed to boost the implementation of practices that reduce the flow of nutrients and sediments to the Chesapeake Bay. These initiatives are broken out into 2-year, 5-year, and long-term increments to set realistic goals in attainable timeframes. As the process moves forward and more knowledge is obtained, these initiatives will be revisited and revised to incorporate the latest information, technology, and Tributary Team recommendations.

Stakeholder Roles in Implementing the Strategy

To some extent, everyone who lives in the Chesapeake Bay watershed is responsible for taking the necessary actions to restore its living resources. This section briefly defines the specific roles or responsibilities of the groups whose policies and decisions will have the most impact on the implementation of the Tributary Strategy goals.

Part II: Strategies to Achieve, Maintain, and Monitor Water Quality Goals

Part II of this plan describes cross-cutting initiatives and challenges that the State must implement and address to facilitate the Tributary Strategy's implementation and to build a framework to maintain water quality in the future. These sections address the coordination between the various regulatory and land use planning processes, nutrient cap management, additional research, and restoration progress monitoring.

Coordination Between Regulatory- and Incentive-Based Programs

This section describes how existing State and local programs and policies are working to implement the Tributary Strategy. This includes future initiatives to improve

coordination between Total Maximum Daily Load (TMDL) requirements, National Pollutant Discharge Elimination System (NPDES) permits, growth management, local planning processes, and the many incentive-based cost-share programs.

Cap Management Strategy

Achieving the nutrient and sediment loading caps will be an unprecedented challenge that will require the efforts of all the people living in the Chesapeake Bay watershed. Maintaining the caps poses challenges that Maryland and its Bay partners will face for decades to come. This implementation plan outlines some of those challenges and provides information on the tools, programs, and collaboration that exists today or will be needed in the future to effectively manage the cap and maintain the Chesapeake Bay's water quality standards.

Focus Areas to Target Additional Research, Demonstrations, and Outreach

It is possible that existing technologies and the programs to implement them will not fully achieve the water quality goals or, at least, achieve them cost effectively. This section will identify the areas where more research and demonstration projects are needed to bring innovative concepts for reducing nutrient loads to the Bay into mainstream application throughout the watershed.

Tracking and Monitoring Progress

In cooperation with the EPA Chesapeake Bay Program, Maryland will provide updates on the progress to meet the Tributary Strategy goals. These updates will include, but not be limited to, tracked implementation of best management practices (BMPs) and water quality and living resource responses and will be done in cooperation with the *EPA Chesapeake Bay Program Indicators Report.*

PART I: STATEWIDE IMPLEMENTATION PLAN

Point Source Strategy

The Point Source Strategy addresses impacts attributed to a specific identifiable end of pipe or "point." The vast majority of nutrient point source discharges are from wastewater treatment plants.

- **Maryland's Point Source Strategy for the Bay is based on a two-part plan to (1) upgrade Maryland's wastewater treatment plants to state-of-the-art Enhanced Nutrient Removal (ENR) technology to meet concentrations of 3.0 mg/l (parts per million) or less total nitrogen and 0.3 mg/l or less total phosphorus and (2) maintain nutrient loading caps as described below. Upgrades of wastewater treatment plants to achieve ENR will be funded under the Bay Restoration Fund Act (BRF), signed by Governor Ehrlich on May 26, 2004. The point source strategy requires wastewater treatment plants with design* capacity of 500,000 gallons per day or greater to upgrade to achieve ENR as soon as possible and to operate the ENR facility in a manner that optimizes its nutrient removal capability. Wastewater treatment plants with design* capacity of 500,000 gallons per day or less, with users that are paying Maryland's Bay Restoration Fee as required by the BRF, will be required to upgrade as needed to maintain their loading caps as described below. Wastewater treatment plants with design* capacity of 500,000 gallons per day or less, with users that are not paying Maryland's Bay Restoration Fee as required by the BRF, are required to maintain ENR levels in their discharge. In addition to the requirements of this point source strategy for Chesapeake Bay, lower limits may also be required for some wastewater treatment plants to meet water quality standards in local receiving waters. The second part of the point source strategy requires all wastewater treatment plants to maintain established nutrient waste load caps within the Chesapeake Bay Watershed. These caps for significant, non-significant and industrial facilities are as follows.**

* Design capacity for significant facilities shall meet the following two conditions:

(1) A discharge permit was issued based on the plant capacity, or the Maryland Department of the Environment (MDE) issued a letter to the jurisdiction with design effluent limits based on the new capacity as of April 30, 2003.

(2) Planned capacity was either consistent with the MDE-approved County Water and Sewer Plan as of April 30, 2003, or shown in the locally-adopted Water and Sewer Plan Update or Amendment to the County Water and Sewer Plan, which were under review by MDE as of April 30, 2003.

- Significant wastewater treatment plants are those with design* capacity of 500,000 gallons per day or greater. Annual nutrient load caps are based on an annual average concentration of 4.0 mg/l total nitrogen and 0.3 mg/l total phosphorus and the approved design capacity of the plant. The combined flow of these facilities comprises more than 95% of the total sewage flow generated in Maryland

- Non-significant wastewater treatment plants are those with design capacity of less than 500,000 gallons per day. Annual nutrient loads are based on design capacity or projected 2020 flow, whichever is less, and concentration of 18 mg/l total nitrogen and 3 mg/l total phosphorus. The 2020 projected flows were based on the county growth rates provided by the Maryland Department of Planning. Expanding non-significant facilities cannot exceed 6,100 lbs/ year in nitrogen and 457 lbs/year in phosphorus.
- **Significant industrial wastewater treatment plants** are those with a minimum total nitrogen discharge of 75 pounds per day or a minimum total phosphorus discharge of 10 pounds per day, which are equivalent loads of 500,000 gallons per day at 18 mg/l total nitrogen or 3 mg/l total phosphorus for a municipal wastewater treatment plant. Annual loads are based on a combination of 1) recent performance levels, after having already achieved significant loading reductions since the initial baselines established in 1985; and, 2) identification and/or negotiation on a case-by-case basis of additional potential loading reductions.

- Where applicable, more stringent load caps may be required to meet local water quality.

Implementation of the ENR Strategy will reduce nutrient loads in the Chesapeake Bay by more than 7.5 million pounds of nitrogen per year and more than 260,000 pounds of phosphorus per year from 2000 levels. Achieving these reductions will account for more than one-third of Maryland's commitment under the *Chesapeake 2000 Agreement*.

Governor Robert Ehrlich helps break ground for the Easton Wastewater Treatment Plant upgrade.

The Hurlock Wastewater Treatment Plant prepares to upgrade to ENR.

Regardless of where their current nutrient loading levels are relative to their cap load, ENR facilities must be operated in a manner that optimizes the nutrient removal capability of the facility in order to achieve ENR performance levels. Facilities that either grow beyond their established loads or are unable to achieve them because of technical limitations, may be eligible to trade or use other nutrient load offsets, subject to the requirements of a National Pollutant Discharge Elimination System (NPDES) permit. MDE is currently working with stakeholders to develop a trading/offset strategy to address growth and maintain load caps achieved as a result of ENR Strategy Implementation.

Implementation Schedule

Publicly owned, significant wastewater treatment plants that discharge to the Chesapeake Bay have priority under the Bay Restoration Fund and will be funded for ENR upgrades first.

ENR upgrades for other wastewater treatment plants may be funded later based on the cost-effectiveness of the upgrade and other requirements of the BRF.

Point Source Implementation Schedule

BMP	Implementation Goal (acres, systems, cap load)	Total Cost ($)	Total Projected Funds ($)	Projected Implementation Based on Existing Resources (acres, systems, mg/l) (2003-2010)	Remaining Implementation (2003-2010) (acres, systems, mg/l)	Remaining Funding Gap ($)
ENR	66 WWTPs	0.75 – 1.00 Billion	0.75 – 1.00 Billion	54 WWTPs	12 WWTPs	0.161-0.411 Billion

Notes:
The estimated ENR schedule is provided as a separate table.

WWTP is the acronym for wastewater treatment plant.

ENR Implementation Schedule

Point Source*	County	Design Capacity (MGD)	2000 TNL (LB/YR)	ENR Strategy Total Nitrogen Load Cap (LBS/YR)	2000 TPL (LBS/YR)	ENR Strategy Total Phosphorus Load Cap (LBS/YR)	Projected Construction Completion Year
Choptank Tributary Basin							
Cambridge	Dorchester	8.100	112,051	98,676	41,284	7,401	By 2011
Denton	Caroline	0.800	12,134	9,746	1,596	731	By 2010
Easton	Talbot	4.000	52,633	48,729	14,411	3,655	By 2007
Total Significant		12.900	176,818	157,151	57,291	11,786	
Total Non-Significant		1.473	40,352	44,454	5,808	6,991	
Total Industrial		0.750	2,874	4,500	1,900	370	
Total Point Sources		15.123	220,045	206,105	64,472	19,147	
Load Cap Point and Nonpoint Sources			4,100,000	2,280,000	380,000	210,000	
Lower Eastern Shore Tributary Basin							
Crisfield	Somerset	1.000	27,044	12,182	3,966	914	By 2007
Delmar	Wicomico	0.850	24,745	10,355	558	777	By 2010
Federalsburg	Caroline	0.750	18,117	9,137	913	685	By 2010
Fruitland	Wicomico	0.800	25,812	9,746	4,302	731	By 2010
Hurlock	Dorchester	1.650	42,327	20,101	22,576	1,508	By 2007
Pocomoke City	Worcester	1.470	24,854	17,908	11,238	1,343	By 2010
Princess Anne	Somerset	1.260	20,092	15,350	268	1,151	By 2010
Salisbury	Wicomico	8.500	332,099	103,549	22,735	7,766	By 2010
Snow Hill	Worcester	0.500	21,632	6,091	4,791	457	By 2011
Total Significant		16.780	536,723	204,418	71,346	15,331	
Total Non-Significant		1.300	44,134	48,800	7,159	8,133	
Total Industrial		0	0	0	0	0	
Total Point Sources		18.080	580,857	253,218	78,505	23,465	
Load Cap Point and Nonpoint Sources			6,700,000	4,110,000	530,000	330,000	

Notes:

* Facilities listed by name are those identified by Maryland as "Significant" (having a planned design capacity of 500,000 gallons per day or greater. See the first page of the Point Source Strategy for more details).

** Schedules for Federal and private facilities are not available.

ENR Implementation Schedule

Point Source*	County	Design Capacity (MGD)	2000 TNL (LB/YR)	ENR Strategy Total Nitrogen Load Cap (LBS/YR)	2000 TPL (LBS/YR)	ENR Strategy Total Phosphorus Load Cap (LBS/YR)	Projected Construction Completion Year
Lower Potomac Tributary Basin							
Indian Head	Charles	0.500	13,639	6,091	2,352	457	By 2010
NSWC — Indian Head (Federal**)	Charles	0.500	6,730	6,091	1,949	457	NA
La Plata	Charles	1.500	16,705	18,273	3,460	1,371	By 2010
Leonardtown	Saint Mary's	0.680	18,598	8,284	3,853	621	By 2010
Mattawoman	Charles	20.000	320,637	243,645	2,890	10,964	By 2010
Swan Point	Charles	0.600	1,741	7,309	290	548	By 2011
Total Significant		23.780	378,050	289,694	14,794	14,418	
Total Non-Significant		0.369	10,377	10,411	1,350	1,755	
Total Industrial		0.486	1,778	1,777	4,451	740	
Total Point Sources		24.635	390,206	301,882	20,595	16,913	
Load Cap Point and Nonpoint Sources			2,900,000	2,060,000	180,000	140,000	
Lower Western Shore Tributary Basin							
Annapolis	Anne Arundel	13.000	165,551	158,369	9,606	11,878	By 2010
Broadneck	Anne Arundel	6.000	68,510	73,093	7,258	5,482	By 2010
Broadwater	Anne Arundel	2.000	15,371	24,364	1,963	1,827	By 2010
Chesapeake Beach	Calvert	1.500	8,950	18,273	1,724	1,371	By 2010
Marlay Taylor (A.K.A. Pine Hill Run)	Saint Mary's	6.000	84,780	73,093	14,260	5,482	By 2011
Mayo Large Communal	Anne Arundel	0.820	13,509	9,989	1,281	749	By 2011
U.S. Naval Academy (Federal**)	Anne Arundel	1.000	3,917	12,182	63	914	NA
Total Significant		30.320	360,587	369,366	36,156	27,702	
Total Non-Significant		0.099	1,589	2,108	303	351	
Total Industrial		0	0	0	0	0	
Total Point Sources		30.419	362,176	371,474	36,396	28,054	
Load Cap Point and Nonpoint Sources			1,700,000	1,400,000	110,000	90,000	

Notes:

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** Schedules for Federal and private facilities are not available.

ENR Implementation Schedule

Point Source*	County	Design Capacity (MGD)	2000 TNL (LB/YR)	ENR Strategy Total Nitrogen Load Cap (LBS/YR)	2000 TPL (LBS/YR)	ENR Strategy Total Phosphorus Load Cap (LBS/YR)	Projected Construction Completion Year
Middle Potomac Tributary Basin							
Blue Plains (MD portion)	District of Columbia	169.600	3,367,631	2,066,108	40,141	92,975	By 2014
Beltsville USDA East (Federal**)	Prince George's	0.620	7,555	7,553	1,357	566	NA
Damascus	Montgomery	1.500	19,999	18,273	3,005	1,371	By 2010
Piscataway	Prince George's	30.000	669,955	365,467	7,517	16,446	By 2010
Poolesville	Montgomery	0.750	16,660	9,137	1,587	685	By 2010
Seneca Creek	Montgomery	20.000	268,698	243,645	25,684	10,964	By 2010
Total Significant		222.470	4,350,498	2,710,183	79,291	123,007	
Total Non-Significant		0.420	8,486	13,367	1,425	2,228	
Total Industrial		0	0	0	0		
Total Point Sources		222.890	4,358,985	2,723,550	80,716	125,235	
Load Cap Point and Nonpoint Sources			7,400,000	5,130,000	330,000	320,000	
Patapsco/Back Tributary Basin							
Back River	Baltimore	180.000	4,529,473	2,192,803	76,814	109,640	By 2012
Cox Creek	Anne Arundel	15.000	627,021	182,734	45,048	13,705	By 2010
Freedom District	Carroll	3.500	65,579	42,638	4,998	3,198	By 2010
Mount Airy	Carroll	1.200	8,883	14,619	798	1,096	By 2010
Patapsco	Baltimore City	73.000	2,388,559	889,304	144,631	66,698	By 2011
Total Significant		272.700	7,619,514	3,322,097	272,289	194,337	
Total Non-Significant		0.430	4,422	10,767	887	1,795	
Total Industrial		4.066	912,288	541,162	44,786	27,369	
Total Point Sources		277.196	8,536,224	3,874,026	317,962	223,501	
Load Cap Point and Nonpoint Sources			11,100,000	5,930,000	590,000	480,000	

Notes:

* Facilities listed by name are those identified by Maryland as "Significant" (having a planned design capacity of 500,000 gallons per day or greater. See the first page of the Point Source Strategy for more details).

** Schedules for Federal and private facilities are not available.

ENR Implementation Schedule

Point Source*	County	Design Capacity (MGD)	2000 TNL (LB/YR)	ENR Strategy Total Nitrogen Load Cap (LBS/YR)	2000 TPL (LBS/YR)	ENR Strategy Total Phosphorus Load Cap (LBS/YR)	Projected Construction Completion Year
Patuxent Tributary Basin							
Bowie	Prince George's	3.300	44,442	40,201	992	3,015	By 2010
Dorsey Run	Anne Arundel	2.000	16,490	24,364	945	1,827	By 2010
Fort Meade (Federal**)	Anne Arundel	4.500	10,331	54,820	1,198	4,112	NA
Little Patuxent	Howard	25.000	366,461	304,556	18,767	22,842	By 2010
Maryland City	Anne Arundel	2.500	20,306	30,456	1,479	2,284	By 2010
Marlboro Meadows (Private**)	Prince George's	0.600	11,654	7,309	873	548	NA
Parkway	Prince George's	7.500	63,213	91,367	5,304	6,853	By 2010
Patuxent	Anne Arundel	7.500	33,265	91,367	4,683	6,853	By 2010
Piney Orchard (Private**)	Anne Arundel	1.200	3,979	14,619	294	1,096	NA
Western Branch	Prince George's	30.000	418,909	365,467	37,990	27,410	By 2010
Total Significant		84.100	989,050	1,024,526	72,526	76,839	
Total Non-Significant		0.817	14,012	20,999	2,075	3,500	
Total Industrial		0.325	17,636	5,431	14,068	543.083	
Total Point Sources		85.242	1,020,699	1,050,956	88,670	80,882	
Load Cap Point and Nonpoint Sources			4,100,000	3,150,000	270,000	220,000	

Notes:

* Facilities listed by name are those identified by Maryland as "Significant" (having a planned design capacity of 500,000 gallons per day or greater. See the first page of the Point Source Strategy for more details).

** Schedules for Federal and private facilities are not available.

ENR Implementation Schedule

Point Source*	County	Design Capacity (MGD)	2000 TNL (LB/YR)	ENR Strategy Total Nitrogen Load Cap (LBS/YR)	2000 TPL (LBS/YR)	ENR Strategy Total Phosphorus Load Cap (LBS/YR)	Projected Construction Completion Year
Upper Eastern Shore Tributary Basin							
Centreville	Queen Anne's	0.500	12,685	3,004	2,628	751	By 2011
Chestertown	Kent	1.500	17,978	18,273	8,437	1,371	By 2007
Elkton	Cecil	3.050	82,662	37,156	5,185	2,787	By 2010
Kent Island	Queen Anne's	3.000	87,899	36,547	3,144	2,741	By 2007
Northeast River	Cecil	2.000	23,023	24,364	1,632	1,827	By 2010
Perryville	Cecil	1.650	10,781	20,101	777	1,508	By 2010
Rock Hall	Kent	0.505	11,933	6,152	414	461	Future
Talbot County Region II	Talbot	0.660	15,766	8,040	3,385	603	By 2010
Total Significant		12.865	262,727	153,637	25,601	12,048	
Total Non-Significant		1.995	42,908	58,360	8,429	9,727	
Total Industrial		0	0	0	0	0	
Total Point Sources		14.860	305,634	211,998	34,030	21,775	
Load Cap Point and Nonpoint Sources			6,300,000	3,520,000	490,000	300,000	

Notes:

* Facilities listed by name are those identified by Maryland as "Significant" (having a planned design capacity of 500,000 gallons per day or greater. See the first page of the Point Source Strategy for more details).

** Schedules for Federal and private facilities are not available.

ENR Implementation Schedule

Point Source*	County	Design Capacity (MGD)	2000 TNL (LB/YR)	ENR Strategy Total Nitrogen Load Cap (LBS/YR)	2000 TPL (LBS/YR)	ENR Strategy Total Phosphorus Load Cap (LBS/YR)	Projected Construction Completion Year
Upper Potomac Tributary Basin							
Ballenger Creek	Frederick	6.000	81,659	73,093	3,590	5,482	By 2010
Brunswick	Frederick	1.400	34,935	17,055	5,822	1,279	By 2010
Celanese	Allegany	2.000	18,422	24,364	7,763	1,827	Complete
Conococheague	Washington	4.100	21,512	50,032	2,780	3,752	By 2010
Cumberland	Allegany	15.000	355,300	182,734	50,434	13,705	By 2010
Emmitsburg	Frederick	0.750	7,575	9,137	2,912	685	By 2011
Fort Detrick (Federal**)	Frederick	2.000	22,788	24,364	3,308	1,827	NA
Frederick	Frederick	8.000	485,460	97,458	82,916	7,309	By 2010
Georges Creek	Allegany	0.600	36,525	7,309	6,087	548	By 2010
Hagerstown	Washington	8.000	265,734	97,458	56,857	7,309	By 2010
Maryland Correctional Institute	Washington	1.600	6,931	19,492	957	1,462	By 2010
McKinney	Frederick	12.000		146,187		10,964	Future
Nicodemus	Washington	Diverted	29,035		5,637		Diverted to Conococheque
Taneytown	Carroll	1.100	15,929	13,400	4,156	1,005	By 2010
Thurmont	Frederick	1.000	9,722	12,182	1,787	914	By 2010
Westminster	Carroll	5.000	70,103	60,911	5,854	4,568	By 2010
Winebrenner	Washington	1.000	12,029	12,182	1,136	914	By 2011
Total Significant		69.550	1,473,657	847,360	241,998	63,552	
Total Non-Significant		6.184	165,554	211,301	29,638	35,217	
Total Industrial		21.500	237,267	120,085	49,663	31,383	
Total Point Sources		97.234	1,876,478	1,178,747	321,299	130,152	
Load Cap Point and Nonpoint Sources			8,500,000	6,330,000	690,000	560,000	

Notes:

* Facilities listed by name are those identified by Maryland as "Significant" (having a planned design capacity of 500,000 gallons per day or greater. See the first page of the Point Source Strategy for more details).

** Schedules for Federal and private facilities are not available.

ENR Implementation Schedule

Point Source*	County	Design Capacity (MGD)	2000 TNL (LB/YR)	ENR Strategy Total Nitrogen Load Cap (LBS/YR)	2000 TPL (LBS/YR)	ENR Strategy Total Phosphorus Load Cap (LBS/YR)	Projected Construction Completion Year
Upper Western Shore Tributary Basin							
Aberdeen	Harford	4.000	28,612	48,729	584	3,655	By 2011
Aberdeen Proving Ground — Aberdeen (Federal**)	Harford	2.800	55,125	34,110	1,064	2,558	By 2010
Aberdeen Proving Ground — Edgewood (Federal**)	Harford	3.000	22,292	36,547	1,323	2,741	NA
Havre de Grace	Harford	2.275	48,125	27,715	3,500	2,079	By 2010
Joppatowne	Harford	0.950	15,465	11,573	1,921	868	By 2010
Hampstead	Carroll	0.900	35,572	10,964	432	822	After 2010
Sod Run	Harford	20.000	391,952	243,645	41,334	18,273	By 2010
Total Significant		33.925	597,143	413,282	50,159	30,996	
Total Non-Significant		1.240	34,165	40,599	4,998	5,728	
Total Industrial		0	0	0	0	0	
Total Point Sources		35.165	631,308	453,882	55,157	36,725	
Load Cap Point and Nonpoint Sources			4,300,000	3,160,000	260,000	210,000	

Notes:
* Facilities listed by name are those identified by Maryland as "Significant" (having a planned design capacity of 500,000 gallons per day or greater. See the first page of the Point Source Strategy for more details).

** Schedules for Federal and private facilities are not available.

Current Programs

Implementing the Strategy

Biological Nutrient Removal (BNR)Program

The Chesapeake Bay Agreement of 1987 specified a nutrient reduction goal of 40% by the year 2000. MDE, in support of Maryland's commitment to reduce the amount of nutrients being discharged to the Bay, developed a strategy for achieving the desired reduction by the upgrade of the significant wastewater treatment plants to remove nitrogen through a process known as BNR. Using BNR processes, more than 90% of pollutants are removed, while achieving nitrogen concentration below 8 mg/l total nitrogen. The BNR Cost-Share Program, first funded by the Maryland General Assembly during the 1984 legislative session, is a 50/50 State/local cost-share grant program that provides financial assistance to local governments to implement BNR technology at the largest publicly-owned sewage treatment plants in Maryland.

ENR Program

Recognizing that more needs to be done, the Chesapeake Bay 2000 Agreement requires further reductions in nitrogen and phosphorus entering the Bay by about 20 million pounds and 1 million pounds per year, respectively. MDE will use the Bay Restoration Fund to upgrade the significant wastewater treatment plants that discharge to the Chesapeake Bay with ENR technologies. Significant federal facilities are also required to upgrade to ENR. Once upgraded, these plants are expected to reduce nitrogen and phosphorus in the wastewater down to 3 mg/l total nitrogen and 0.3 mg/l total phosphorus. All facilities are required to maintain their loading caps. By meeting and maintaining these requirements, approximately one-third of the needed reductions under the Chesapeake Bay 2000 Agreement will be achieved. Grant funding assistance up to 100% of eligible ENR costs for planning,

Tributary Team members go on field tours, such as this one at a wastewater treatment plant, so that they can make informed decisions and proposals with their watershed initiatives.

design, and construction for significant facilities is available subject to the requirements of the BRF. Other facilities may be upgraded after the ENR upgrade of the targeted significant facilities is complete.

Maryland Water Quality State Revolving Loan Fund (WQSRF) Program

The WQSRF makes below market rate of interest loans to local governments for water quality improvement projects. More than half of the wastewater treatment projects identified for funding through MDE's BNR Cost-Share Program have borrowed the 50% cost-share portion (local match to the State BNR Grant), as well as the expansion portion of the project costs, from the WQSRF. Projects identified for funding through MDE's ENR Program are also expected to utilize the WQSRF program to cover non-ENR costs of the upgrade.

Supplemental Assistance Program

The Supplemental Assistance Program provides grant assistance to local governments for planning, design, and construction of needed wastewater facilities. This program is used to help fund projects that MDE deems necessary to address high priority public health or water quality problems, and where the grantee's ability to pay for the needed improvements is usually limited. The majority of grant recipients are the more rural, less affluent counties and municipalities. This program helps pay for compliance-related wastewater treatment plant rehabilitation; the connection of older, established communities with failing septic systems to public sewers; and the correction of system deficiencies, such as combined sewer overflows, excessive inflow and infiltration, or antiquated pump stations. This program also supplements the local share of BNR upgrades for small, low-income jurisdictions. Grants are typically used in conjunction with other State and Federal funding sources with participation by the grantee at a level determined to be affordable. Although the program represents a small fraction of the State's overall wastewater needs, it is used annually to address the most critical water quality and public health needs in those Maryland jurisdictions least able to proceed alone with project implementation.

Implementation Barriers and Possible Solutions

Barriers to Implementation	Solutions to Overcome Barriers
• Continued growth will lead to increased loads on wastewater treatment plants. • The District of Columbia Tributary Strategy does not include upgrading the Blue Plains Wastewater Treatment Plant.	• Local governments and wastewater treatment plant owners could explore water reuse and zero discharge to maintain nutrient loading caps. Loading caps can also be maintained through trading or offsets. • Federal, State, and local governments should continue discussions with the District of Columbia Water and Sewer Authority to secure Federal support and funding for the Blue Plains Wastewater Treatment Plant upgrade with nutrient reductions.

State Initiatives to Address the Implementation Gaps

2-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDE will implement the following actions:

- Complete ENR upgrades at six (6) significant wastewater treatment plants. This is an ongoing action that is being implemented through the Bay Restoration Fund.

Implement the December 2004 EPA/States Chesapeake Bay Permitting Approach. As the discharge permits for the significant facilities come up for renewal, the annual loading caps for total nitrogen and phosphorus will be included as permit limits. Maryland will also include in these permits a requirement consistent with the Point Source Strategy to upgrade the facility to achieve ENR and operate the ENR facility, once the upgrade is completed, in a manner that optimizes its nutrient removal capability. The load allocations for non-significant facilities will be implemented through a goal-based approach.

- Develop a trading/offset strategy to address growth and provide for cap maintenance.

The Maryland Department of Natural Resources (DNR) will implement the following actions:

- Upgrade the facility at Elk Neck State Park to ENR treatment.

5-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDE will implement the following actions:

- Complete ENR upgrades at 48 significant wastewater treatment plants. This is an ongoing action that will be implemented through the Bay Restoration Fund. MDE is the responsible agency.

- Implement the December 2004 EPA/ States Chesapeake Bay Permitting Approach.

Long-Term Action Plan

These are long-term initiatives for education, policy, and restoration needs to meet Bay water quality standards. They are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDE will implement the following actions:

- Complete ENR upgrade at 12 significant wastewater treatment plants, including upgrade of the three largest facilities - Back River, Patapsco, and Blue Plains. Continue ongoing inter-jurisdictional coordination of the Blue Plains wastewater treatment plant upgrade.

Stakeholder Roles in Implementing the Strategy

Private Landowners

- Support the Bay Restoration Fund, which is a dedicated fund financed by citizens and businesses to upgrade Maryland wastewater treatment plants with ENR facilities.

- Support local officials in project development and implementation.

- Establish and support water conservation as a critical part of reducing the amount of wastewater that needs to be treated.

State Government

- Process and administer the Bay Restoration Fund. MDE will issue bonds pledged in full or in part from funds generated by this program.

- Manage the planning, design, and construction of ENR at the major publicly owned wastewater treatment facilities discharging to the Chesapeake Bay.

- Provide financial assistance to local governments for smaller, private, and industrial wastewater treatment facilities on a case-by-case basis considering cost effectiveness, water quality benefits, readiness to proceed, and nitrogen/ phosphorus contributions to the Bay.

- Incorporate load caps into NPDES permits. Work with local governments to develop a strategy to offset load increases and maintain load caps achieved as a result of ENR Strategy implementation.

Federal Government

- Upgrade federal facilities to meet ENR concentrations of 3.0 mg/l or less total nitrogen and 0.3 mg/l or less total phosphorus and adhere to loading caps established for all wastewater treatment facilities.

- Provide additional funding to allow projects and the ENR Program to be more affordable.

- Administer the NPDES Permits Program, which is delegated to the State of Maryland. The EPA is responsible for issuing the NPDES permit for the Blue Plains Wastewater Treatment Plant, which serves portions of Montgomery and Prince George's Counties.

Local Governments

- Initiate the planning, design, and construction of ENR projects.

- Develop implementation schedules to meet the 2010 Tributary Strategy goals.

- Work with congressional delegations and request additional Federal funding to make projects more affordable.

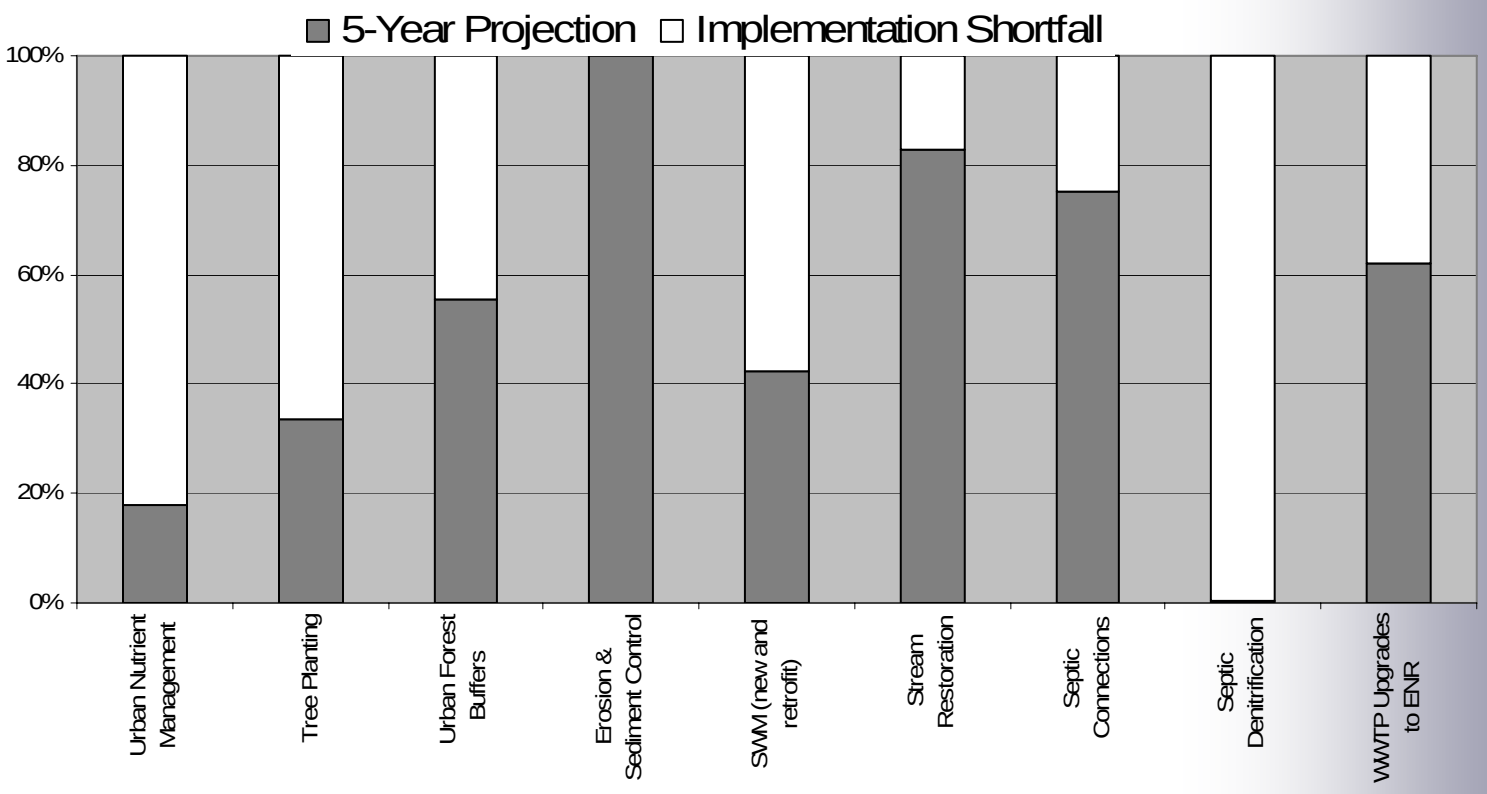
Bay Restoration Fund Advisory Committee

- Evaluate the cost, funding, and effectiveness of the wastewater treatment plant upgrades. Consult and advise the counties and MDE regarding the on-site system upgrade program. Recommend future changes to the restoration fee if necessary.

Urban Sources

The Urban Strategy acknowledges that urban development, impervious surface, and sprawl development have a profound influence on the quality of Maryland's waters. The following strategy includes a plan to address these impacts through stormwater treatment of developed land. Strategies addressing septic systems and growth management are described in detail later in this plan.

Urban Implementation Schedule



Note: Implementation schedules were developed using current and projected budget allocations and tracked implementation rates as a result of state regulations and voluntary participation. Projected statewide implementation schedules emphasize cost effective practices and the need to continue to pursue additional state and federal funding to increase implementation rates.

Stormwater Strategy

- One hundred percent of newly developed and redeveloped lands (2003-2010) will address stormwater management in accordance with Maryland's existing stormwater management regulatory requirements [i.e., using the Unified Sizing Criteria from the *Maryland Stormwater Design Manual* or promoting Environmental Sensitive (Site) Design (ESD) measures with the ultimate goal of sustainable development].

- All stormwater management practices for recently developed lands (1985 to 2002) shall be inspected and maintained in accordance with Maryland's existing stormwater management regulatory requirements or upgraded/retrofitted to more effectively reduce nutrients and/or provide channel protection where deemed appropriate and as funding is available.

- Up to 40% of untreated developed land (e.g., developed pre-1985) will be retrofitted (e.g., construct new and/or modify existing stormwater management practices including nonstructural and structural designs, reducing impervious cover, reducing runoff, pollution prevention measures, etc.) as funding is available. Retrofit goals will vary depending on localized impairments and required reduction goals. Street sweeping, storm drain system cleaning, canopy coverage to reduce impervious surface, and other practices will be included in this strategy when improved monitoring and documentation to quantify the practice efficiencies are provided.

- Educate and achieve the participation of 100% of all Maryland residents to reduce home fertilizer use.

- Continue to implement Maryland's sediment and erosion control regulations for 100% of disturbed land (2003-2010).

Implementation Schedule

Practice	Units	Strategy Goal	Progress Through 2004	5-Year Implementation Schedule	
				1-2 Year Goal	3-5 Year Goal
Nutrient Management					
Urban Land*	ac/yr	737,342	0	52,667	79,001
Mixed Open Land*	ac/yr	727,823	0	51,987	77,981
Tree Planting					
Mixed Open Land	ac	5,195	3,578	560	840
Urban Land	ac	10,000	0	24	72
Forest Buffers	ac	1,375	343	167	251
Sprawl Reduction**	ac	21,527	0	0	0
Erosion & Sediment Control	ac/yr	60,935	38,163	9,107	13,661
Stormwater Management (new and retrofit)	ac	604,745	144,909	44,781	67,408
Wetland Restoration	ac			237	621
Stream Restoration	lf	368,679	106,835	78,603	119,629

Notes:
Estimates for the 5-year implementation schedule are based on existing programs and funds as well as regulatory requirements.

* This practice may be implemented at the local level; however, a statewide tracking system has not been established yet.

** Methods to measure the decrease in the rate of harmful sprawl are still under development. See the Growth Management Strategy.

Current Programs

Implementing the Strategy

MDE's Stormwater Management Program will support the implementation of new stormwater management practices, the upgrade of older stormwater management facilities, and the retrofit of older urban development with stormwater management practices. Specifically, the agency's *Maryland Stormwater Design Manual*, the Municipal Separate Storm Sewer System (MS4) Permit Program, and the erosion and sediment control programs will help implement *Maryland's Tributary Strategy*.

Maryland Statewide Stormwater Management Program

In 1982, the Maryland General Assembly passed the *Stormwater Management Act* with the intent of reducing, as much as possible, the adverse affects of stormwater runoff and safeguarding life, limb, property, and public welfare. State regulations were adopted in 1983 that required local ordinances to be adopted and implemented by 1984. Each local jurisdiction, both counties and municipalities, has a State approved and locally enforced stormwater management ordinance. The ordinances address the goals and guidelines set forth in

Tributary Team members get a first-hand look at a Green Roof, which helps reduce stormwater runoff by 50-75% during an average rain event while offering aesthetic and air quality benefits and reducing the roof's surface temperature.

the adopted regulations and include administrative processes specific to each local jurisdiction. The regulations were revised in 2000 with the adoption of the *Maryland Stormwater Design Manual*, and the local jurisdictions began implementing the changes in 2001.

The new design guidance has three main goals:

1. Protect waters of the State from adverse impacts of urban stormwater runoff.

2. Provide design guidance on the most effective nonstructural and structural BMPs for development.

3. Improve the quality of BMPs constructed, specifically regarding performance, longevity, safety, maintenance, community acceptance, and environmental benefits.

The manual also includes a number of incentives to encourage the use of nonstructural practices, such as natural area conservation, grassed channels, and reduction in impervious cover. This approach to stormwater management is consistent with and supportive of the Tributary Strategy.

Municipal Separate Storm Sewers (MS4 Permits)

MDE is responsible for issuing discharge permits to local jurisdictions and the State Highway Administration for their MS4s. These permits are consistent with and support the *Maryland Tributary Strategy*, specifically the goal to retrofit up to 40% of existing developed lands with stormwater management measures. Through the MS4 permit, watershed restoration requirements have been set using an incremental approach to identify and begin to retrofit 10% of the existing impervious area within a 5-year permit term. MS4 permits are currently in the third generation, and the effected local jurisdictions are required to identify another 10% for the new permit cycle. The exception is Baltimore City, which is required to retrofit a total of 30% of its existing impervious areas. Local jurisdictions will systematically address the need to restore and treat the stormwater runoff from the most populated impervious areas. The State Highway Administration, in addition to developing a system for tracking the amount

of treated and untreated impervious surface in the highway system, will be required to perform 25 significant water quality retrofits in this cycle.

Erosion and Sediment Control in Maryland

Erosion and sediment control practices specified in the Tributary Strategy will be implemented through existing Maryland laws and regulations. Legislation has existed since the early 1930s to protect Maryland waters from various pollutants. A statewide sediment control program was mandated in 1970 when the General Assembly passed the Sediment Control Law. From a historical perspective, Maryland's incentive for having an erosion and sediment control program is the Chesapeake Bay.

The program developed in 1970 is essentially the same that exists today with an approved plan being required for any earth disturbance of 5,000 square feet or more and 100 cubic yards or more, plan approval exemptions for agricultural uses, plan review and approval by local Soil Conservation Districts, grading ordinance adoption and project inspection by local jurisdictions, utility construction inspection by the Washington Suburban Sanitary Commission, and criminal penalties for sediment pollution. Various programmatic improvements have included requiring sediment control plan approval prior to issuing grading and building permits (1973), requiring training and certification of "responsible personnel" (1980), shifting enforcement authority from local to State control and establishing delegation criteria (1984), limiting the exemption for single-family residential construction on 2-acre lots (1988), requiring NPDES stormwater discharge permits for construction activity (1991), and subjecting agricultural land management practices to enforcement action for sediment pollution (1992).

Maryland's Erosion Control Law and regulations specify the general provisions for program implementation; provisions for delegation of enforcement authority; requirements for erosion and sediment control ordinances; exemptions from plan approval requirements; requirements for training and certification programs; criteria for plan submittal, review, and approval; procedures for inspection and enforcement; and applicant responsibilities. MDE has established minimum criteria for effective erosion and sediment control practices. The *1994 Standards and Specifications for Soil Erosion and Sediment Control* are incorporated by reference into State regulations and serve as the official guide for erosion and sediment control principles, methods, and practices.

Small Creeks and Estuaries Restoration Program

The Small Creeks and Estuaries Restoration

Program offers financial assistance to local governments for voluntary stream and creek restoration projects that improve water quality and restore habitat. Funds are targeted for seriously degraded water bodies in Maryland. Types of projects funded include stream channel reconstruction, stream bank stabilization, vegetative buffers, wetlands creation, treatment of acid mine drainage, and dredging.

The projects funded through this program are designed to correct the consequences of many years of accumulated sediment and pollution that have resulted in water quality problems. Long-term pollution control measures, such as stormwater controls, revegetation, reforestation, marsh creation, and sediment controls, may be necessary to eliminate the sources of the problem.

The program provides grant funds to counties and incorporated municipalities under a cost-share agreement. Funds are provided on a reimbursable basis after a payment request is made for eligible project costs. The program provides up to 50% in grant funds for the study, approved design, and construction costs or up to 75% with demonstrated need. Local match may be provided as cash and/or in-kind services or other local funding. Other State and/or non-State sources of funds, including Federal funds, may be used as a local match. Local match financing is available through the WQSRF Program.

State Initiatives to Address the Implementation Gaps

2-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders. **MDE** will implement the following actions:

Implementation Barriers and Possible Solutions

Barriers to Implementation	Solutions to Overcome Barriers
• Upgrading and retrofitting privately owned stormwater facilities could be problematic due to a lack of financial assistance and property access issues. • Inspecting and maintaining stormwater facilities can strain the limited local resources (in non-urbanized areas). • Local public works' codes (e.g., setbacks, roadway width, curb and sidewalk, etc.) limit the ability of using certain Environmentally Sensitive (Site) Design ESD measures and/or Low Impact Development (LID) techniques. • Additional research is needed to quantitatively assess other useful stormwater BMPs and pollution prevention measures (e.g., street sweeping, storm drain cleaning, stream restoration, etc.) in order to provide other options to address urban pollutant loads.	• Local, State, and Federal governments could provide additional financial assistance or other incentives (e.g., tax reduction incentives, etc.) to encourage stormwater facility upgrades and/or retrofits. • Local governments need to have greater flexibility within their local codes to allow for greater use of ESD measures and/or LID techniques. • *Maryland's Stormwater Design Manual* provides flexible design practices to local governments and promotes ESD techniques. • Educate local governments and developers about the flexibility and innovation allowed under Maryland's stormwater manual.

- The Governor's FY 2007 budget for MDE includes $326,000 in funding to improve stormwater management on State lands as part of the statewide Tributary Strategies. This funding will be utilized for the assessment of impervious area of State lands and to identify and implement selected wetland creation/ stormwater management projects on State lands (i.e., Government Leads By Example). In FY 2007, an appropriate consultant will be retained to work under MDE supervision to assess state lands (e.g. DNR, SHA, DGS and/or Universities) to identify and implement appropriate demonstration project(s) to the extent the budget allows. Subsequent budget requests will be required to implement all of the projects.
- Through both the Tributary Strategy and TMDL programs, the State is asking local governments to manage their land more effectively with respect to restoring water quality, but the State has not been as active as it should on its own lands. Government by example is a critical approach if we are to have any success in restoring the Chesapeake Bay.

DNR will implement the following actions:

- Provide technical assistance and funding to implement urban tree canopies in five Maryland communities. State funds will leverage funds from private partners, such as the Chesapeake Bay Trust, to increase the implementation of tree canopies, to reduce urban runoff, and to improve local air quality. Agreements have been signed in five Maryland communities to increase tree canopies.
- Work with local governments during the Program Open Space park review process to encourage stormwater management enhancements and the use of ESD/LID techniques on local park lands.
- Implement 20 demonstration sites that showcase design techniques that increase infiltration and minimize ecological impacts from runoff, including living roofs, permeable pavers, and bioretention facilities.
- Create a Landowner Incentive Program that provides cost-shares for the conservation and restoration of private lands where sensitive species are at risk. This program will target private landowners other than production agriculture. Restoration BMPs include forest buffers, stream protection with and without fencing, and tree plantings.

5-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

DNR will implement the following actions:

- Retrofit stormwater management improvements on 40% of DNR-owned and -managed properties as funding becomes available through capital improvement budgets and outside grant sources.

Long-Term Action Plan

These are long-term initiatives for education, policy, and restoration needs to meet Bay water quality standards. These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDE will implement the following actions:

- Revise general MS4 permits on a 5-year cycle to ensure consistency with water quality standards.

Stormwater ponds can enhance a neighborhood and provide habitat for local wildlife.

Stakeholder Roles in Implementing the Strategy

Private Landowners

- Finance, design, and implement erosion and sediment control and stormwater management plans that include structural and nonstructural BMPs to address site-specific pollution and runoff issues on their property.

- Comply with Maryland's erosion and sediment control and stormwater management programs as well as the EPA's NPDES municipal and industrial stormwater permits.

State Government

- Review and approve sediment control and stormwater management plans for State and Federal construction projects, regulations, and standards.

- Delegate authority to local jurisdictions for administering erosion and sediment control programs.

- Certify "responsible personnel" for erosion and sediment control.

- Conduct inspections on non-delegated enforcement areas for erosion and sediment control as well as State and Federal facilities.

- Provide guidance to local jurisdictions for designing effective stormwater management programs for controlling runoff from developed areas.

- Review local stormwater management programs.

- Issue NPDES discharge permits to certain municipalities to prevent pollution from entering storm drain systems and subsequently flowing into local waterways.

- Provide financial assistance to local governments (e.g., Stormwater Pollution Control Cost-Share Program, Small Creeks and Estuary Program, State Revolving Fund Loan Program, Link Deposit Program, etc.).

Federal Government

- Provide certain financial assistance (e.g., Section 319 Grant, Section 306 & 309 Grants, Chesapeake Bay Implementation Grant, Section 104 (b)(3) Grant, etc.) and regulatory authority (e.g., oversight of the NPDES Stormwater Permits Program that is delegated to the State of Maryland) to ensure implementation of Maryland's erosion and sediment control and stormwater management programs.

Local Governments

- Implement Maryland's stormwater management program for private and local projects (e.g., adopt an ordinance, plan review, plan approval, inspection, enforcement, monitoring, maintenance, planning, etc.).

- Inspect and enforce erosion and sediment control activities within a delegated jurisdiction.

- Establish stormwater utilities. (Local governments have the authority and are encouraged to consider this; however, few have implemented such a utility to date.)

- Administer local development processes to support the implementation of the Tributary Strategy and minimize water quality impacts on local waterways (e.g., planning and zoning, public works, environmental programs, etc.).

Soil Conservation Districts

- Review and approve erosion and sediment control plans and small pond design plans for local and private construction projects to ensure compliance with Maryland's erosion and sediment control laws, regulations, and standards.

- Provide technical assistance and guidance on programs available to landowners for the implementation of BMPs that are required by Maryland's erosion and sediment control and stormwater management programs.

Septic Strategy

A two compartment tank is prepared to be set into the ground.

Recognizing the potential impact of all septic systems on both local and downstream water quality, *Maryland's Tributary Strategy* includes the following septic upgrade goals:

- One hundred percent of new septic systems installed beginning in 2006 will include enhanced denitrification technology as funding is available and/or required by regulatory action.

- One hundred percent of all existing septic systems will need treatment, upgrades, or documentation of improved nitrogen removal or be hooked up to an existing sanitary sewer system as funding is available.

Goals will vary depending on localized impairments, individual Tributary Strategies, and required reduction goals. Documentation of existing systems and/or enhanced regulatory requirements of treatment systems will be included as meeting this strategy when improved monitoring and documentation to quantify the practice efficiencies are provided.

Implementation Schedule

				5-Year Implementation Schedule	
Practice	**Units**	**Strategy Goal**	**Progress Through 2004**	**1-2 Year Goal**	**3-5 Year Goal**
Septic Connections*	systems	14,047	10,546	0	0
Septic Denitrification	systems	347,897	412	588	882

Notes:
Estimates for the 5-year implementation schedule are based on Chesapeake Bay Restoration Fund projections and feasible implementation rates statewide. Numbers represent equivalent dwelling units (EDUs).

* Implementation goals for septic connections are established locally and will be developed with local governments through the water and sewer planning process.

Current Programs

Implementing the Strategy

Bay Restoration Fund

Effective October 1, 2005, a $30 annual fee is collected from each home served by an on-site system. The total estimated program income is $12.6 million per year. Sixty percent of these funds will be used for septic system upgrades and the remaining 40% will be used for cover crops. There are approximately 420,000 on-site systems in Maryland. With priority given to failing septic systems in Critical Areas, funds can be provided for upgrades of existing systems to best available technology for nitrogen removal or for the marginal cost of using best available technology instead of conventional technology.

As part of the Bay Restoration Fund, the Bay Restoration Fund Advisory Committee was formed. The responsibilities of the committee include identifying additional funding sources for the Bay Restoration Fund, making recommendations to improve the effectiveness of the Bay Restoration Fund in reducing nutrient loadings to the waters of the State, and advising MDE on the components of on-site sewage disposal system education, outreach, and upgrade programs. The committee first met in October 2004 and continues to meet on a regular basis.

Implementation Barriers and Possible Solutions

Barriers to Implementation	Solutions to Overcome Barriers
• There is no uniform standard for performance or maintenance of new septic systems, which could result in neglected systems that fail to properly denitrify effluent. • Without incentives, the public may be unwilling to accept the increased costs of installing and maintaining the new denitrifying systems. • In addition to failing to justify the need for this program in many locations, the State lacks the regulatory authority to enforce septic upgrades.	• State or local governments could require long-term maintenance contracts prior to approval of septic systems. • The State can promulgate standards for system performance and maintenance. • The State could develop incentives to encourage installation of denitrifying systems. • Counties should take a proactive role in identifying situations where sewer connections to convenient or failing septic systems are possible, and the State should increase the nutrient cap of the local wastewater treatment plant to accommodate such connections. • Conduct outreach and education programs to the public.

Workers install a bioclere aerobic unit.

State Initiatives to Address the Implementation Gaps

Use of an advanced on-site sewage disposal system that reduces the discharge of nitrogen is, for the most part, voluntary. The Bay Restoration Fund provides a significant funding source for upgrading such systems; however, even fully utilizing this funding, Maryland will still fall far short of the goal of 100% on-site sewage disposal system upgrade. To meet the 100% goal will require a combination of funding and mandatory upgrade requirements.

2-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

The University of Maryland will implement the following actions:

- Seek final EPA approval of performance monitoring grant for advanced nitrogen removal technology for on-site sewage disposal systems. Perform in-place nitrogen removal monitoring of systems in at least two counties.

- Develop education and Maryland Cooperative Extension programs for county administrators, real estate developers, and homeowner associations regarding the on-site sewage disposal system's advanced nitrogen removal and eligibility for the Maryland Bay Restoration Fund. The University of Maryland and MDE will lead this initiative with MDE providing public outreach, communication, and technical assistance.

5-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

The Bay Restoration Fund Advisory Committee will implement the following actions:

- Promote the use of denitrifying systems, particularly in the Critical Area.

Long-Term Action Plan

These are long-term initiatives for education, policy, and restoration needs to meet Bay water quality standards. These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDE will implement the following actions:

- There are approximately 420,000 septic systems in Maryland. Few of these systems remove much nitrogen. Installation of best available technologies is largely voluntary. The Bay Restoration Fund can provide grants and loans for about 600 systems per year. To fully implement the use of best available technology septic systems, there will need to be some combination of additional funding and regulations or code that require their use.

Stakeholder Roles in Implementing the Strategy

Private Landowners

- Voluntarily upgrade their on-site sewage disposal systems and properly operate and maintain them. Current funding is available for 600 to 700 upgrades per year.

State Government

- Provide the funding necessary to upgrade on-site sewage disposal systems, to implement the management programs necessary to ensure that these systems operate efficiently in perpetuity, and to provide guidance to local governments and private landowners.

Federal Government

- Provide funding to support the State's effort to upgrade on-site sewage disposal systems.

Local Governments

- Implement local policy and code to encourage or require the upgrade of on-site sewage disposal systems and to consider applying for funding on behalf of landowners in a block-grant approach.

A worker prepares a trench and distribution box.

Growth Management Strategy

Although Maryland will continue to experience growth, how this growth is managed will be critical to achieving and maintaining the nutrient cap. Implementation of this strategy requires full cooperation with local government planning agencies and will help Maryland with the challenging task of maintaining the nutrient and sediment reduction goals.

Maryland's Tributary Strategy re-affirms the State's commitment to achieve a 30% annual reduction in the rate of harmful sprawl by 2010. For this plan, harmful sprawl baseline estimates were developed using data from MDP's report *Maryland's Changing Land: Past, Present and Future* (Baltimore, MD). Projected land consumed for urban growth and forest conservation benefits from 2001-2010 provide the original baseline and estimated amount of reduction in the rate of acres by 2010. MDP is in the process, however, of re-examining its rate of sprawl reduction estimates.

Implementation Schedule

The implementation schedule for the 30% reduction in the rate of harmful sprawl depends on the indicators that the State and individual counties agree to use. Whether the indicator is acres consumed outside of Maryland's designated growth areas, average lot size, newly generated impervious cover both inside and outside of the State's designated growth areas, or some other measure, identifying an indicator that accurately measures harmful sprawl is necessary for the goal to be meaningful. The State and counties need to work together to resolve this issue.

Current Programs

Implementing the Strategy

Maryland's Economic Growth, Resource Protection, and Planning Act of 1992 provides the foundation to implement the 30% reduction in the rate of harmful sprawl as well as the remaining sound land use commitments of the *Chesapeake 2000 Agreement*. The act embodies recommendations made by The Year 2020 Panel to the Chesapeake Executive Council (in 1988). The act contains statutory requirements for local jurisdictions to include eight visions with a sensitive areas element in their comprehensive plans. The visions include the following:

1. Development is concentrated in suitable areas.
2. Sensitive areas are protected.
3. In rural areas, growth is directed to existing population centers, and resource areas are protected.
4. Stewardship of the Chesapeake Bay and the land is a universal ethic.

5. Conservation of resources, including a reduction in resource consumption, is practiced.
6. To assure the achievement of (1) through (5) above, economic growth is encouraged and regulatory mechanisms are streamlined.
7. Adequate public facilities and infrastructure are available or planned in areas where growth is to occur.
8. Funding mechanisms are addressed to achieve these visions.

In 1997, Smart Growth initiatives were passed to provide implementation and funding mechanisms for the *Planning Act of 1992*. These implementation mechanisms include the *Priority Funding Area Act of 1997* (directing growth to designated areas), the Rural Legacy Program (preserving and conserving lands outside designated growth areas), and three economic and revitalization incentive programs (Brownfields Voluntary Clean-up and Revitalization Incentive, Job Creation Tax Credit, and Live Near Your Work Demonstration).

In 2003, Governor Robert Ehrlich issued the *Priority Places Strategy Executive Order*, which reconfirms the intent of Priority Funding Areas by targeting redevelopment efforts and streamlining regulatory and permitting processes inside Priority Funding Areas. Go to www.mdp.state.md.us for more information regarding Maryland's growth management policies.

Recent Smart Growth initiatives led by MDP include the following:

- The Interagency Coordinating Committee reviewed a few rounds of Priority Places applications. This process has provided an opportunity for heightened coordination among State agencies regarding the role of Smart Growth policies, water quality issues, and Tributary Strategy goals on a given project and its surrounding area. For example, to support Smart Growth inside the designated growth area of Leonardtown and, in turn, assist the Leonardtown Wharf Priority Place project, State agencies expedited technical and financial assistance to upgrade the Leonardtown Wastewater Treatment Plant to ENR.

- Completion of a development capacity methodology that can be used to assist local governments in watershed and natural resource planning for the purpose of improving the Bay's water quality. MDP has worked with Charles and Worchester Counties to integrate the development capacity methodology into their comprehensive plans. This effort serves many purposes for growth management, including exploring growth scenarios and growth-related nonpoint source impacts on water quality.

- Commencement of a pilot project to incorporate a land use assessment into the Watershed Restoration Action Strategies of Frederick and Worchester Counties. This effort highlights current land use policies and growth trends that have implications on water quality and accomplishing the Bay goals and, where applicable, TMDLs.

- Continued development of a Growth Simulation Model to run under Oracle and establishment of policy options to generate growth forecasts on a watershed basis.

- Continued partnerships with Federal and State agencies and local jurisdictions to increase Transit-Oriented Development by identifying land use characteristics that change development trends and policies to encourage development of mixed-use walkable communities near transit. These initiatives include the following:

  ⇨ MDP, the Maryland Department of Transportation, the Maryland Transit Administration, Baltimore City, and Baltimore County are planning for the future Red Line.

  ⇨ MDP, the Maryland Department of Transportation, and the Maryland Transit Administration are working with local governments to change development trends and policies so that Maryland's communities will be more likely to receive the Federal Transit Administration's New Starts Program funds, which considers existing and potential future land use as a key criterion.

  ⇨ MDP, the Maryland Department of Transportation, the Maryland Transit Administration , and Baltimore City are working to create an economically vibrant place at State Center in Baltimore that takes advantage of the existing subway and light rail stations. They are also working to increase transit ridership by working with developers and held a week-long planning event and design charrette from January 10-14, 2005.

Implementation Barriers and Possible Solutions

Barriers to Implementation	Solutions to Overcome Barriers
• Local regulations and caps on wastewater treatment plants may cause conflicts with the desire to develop inside the Priority Funding Areas. • There is no sufficient legal tool available to the counties or the State to track the rate of sprawl and enforce growth management techniques.	• County comprehensive plans should be updated to reflect the Tributary Strategies. • The State could develop a system that combines wastewater treatment plant capacity and local needs with development capacity. • Better local planning for water quality.

State Initiatives to Address the Implementation Gaps

2-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDP will develop a framework for local jurisdictions to voluntarily incorporate the 30% reduction in the rate of sprawl goal, the ENR nutrient limit goals, and TMDLs into local comprehensive planning.

- Incorporate the ENR Strategy goals, the 30% reduction in the rate of sprawl goal, and the development capacity methodology into the *Comprehensive Plan Review Guidance Guidelines*.

- Provide technical assistance to local governments to incorporate the ENR Strategy, the 30% reduction in the rate of sprawl goal, and the development capacity methodology into comprehensive plans.

MDP and MDE will work together to integrate ENR nutrient limit goals and TMDLs into county water and sewer plans.

MDP will develop an impervious surface indicator assessing impacts on water quality in its Growth Simulation Model.

MDP will implement the following actions:

- Provide a framework for local jurisdictions to voluntarily integrate the reduction in the rate of sprawl goal into comprehensive plans.

- Refine and improve the methodology by which the State measures the rate of sprawl.

- Work with MDE to address potential conflicts between directing growth inside Priority Funding Areas and complying with local water quality requirements and Tributary Strategy ENR nutrient limits.
- Work with MDE to establish a

framework to integrate the ENR Strategy nutrient limits into water and sewer plans.

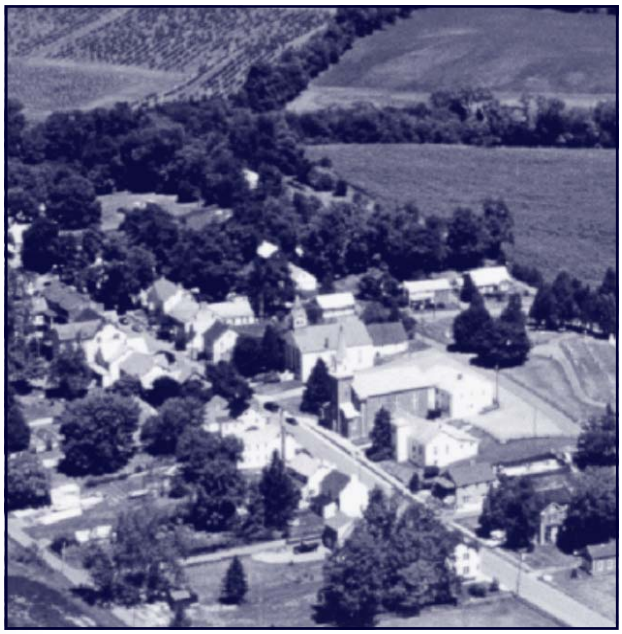
The University of Maryland will implement the following actions:

- Apply for the Chesapeake Bay Program's Scientific and Technical Advisory Committee grant funding to hold a scientific and technical forum on LID technologies for new development and retrofits. Identify the state of research, near-term implementation technologies, and promising developments.

5-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDP will implement the following actions:



Burketsville shows how growth can be focused around a town center while maintaining agricultural and green space areas.

- Introduce legislation to incorporate the Tributary Strategy into local comprehensive plans.

- Increase MDP's capacity to provide technical assistance to local jurisdictions that integrates Smart Growth and Priority Places growth management policies with local water quality requirements and baywide water quality goals.

- Increase MDP's capacity to provide analytical services to local jurisdictions on alternative growth scenario analyses and their associated impacts on water quality.

Long-Term Action Plan

These are long-term initiatives for education, policy, and restoration needs to meet Bay water quality standards. These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDP will implement the following actions:

- Continue to increase MDP's capacity to provide technical assistance to local jurisdictions that integrates Smart Growth and Priority Places growth management policies with local and baywide water quality goals and requirements into local planning efforts.

- Continue to increase MDP's capacity to provide analytical services to local

jurisdictions on alternative growth scenario analyses and their associated impacts on water quality.

Stakeholder Roles in Implementing the Strategy

Private Landowners

- Choose to live in designated growth areas and Priority Funding Areas.
- Change fertilizer application behaviors to only apply in the fall and only the amount of fertilizer necessary based on soil testing.
- Shift landscaping preferences to include native plant species, more trees, and woodland cover.

State Government

- Provide funding assistance for infrastructure- and/or development-related projects inside Priority Funding Areas.
- Review amendments to Priority Funding Area boundaries.
- Review projects seeking State funds for infrastructure projects to ensure that they meet the *Smart Growth Areas Act* provisions for development-related projects serving Priority Funding Areas.
- Encourage school infrastructure planning and construction inside Priority Funding Areas.
- Provide leadership to local governments to enact and enforce regulations, provisions, policies, and programs that direct growth to Priority Funding Areas.

Federal Government

- The Federal government must work with State and local governments to provide guidance for land use, growth, and the myriad of Federal environmental requirements. Federal agencies that should coordinate efforts and work with State and local governments include the EPA, the National Oceanic and Atmospheric Administration, the Department of the Interior, the National Park Service, the U.S Fish and Wildlife Service, the U.S. Army Corps of Engineers, and Federal Highways (where applicable).

Local Governments

- Enact and enforce regulations, provisions, policies, and programs that direct growth to Priority Funding Areas, which will resolve conflicting and competing requirements.
- Plan for appropriate development in areas with impaired waters.
- Consider TMDLs and impaired waters in zoning decisions and comprehensive plans.

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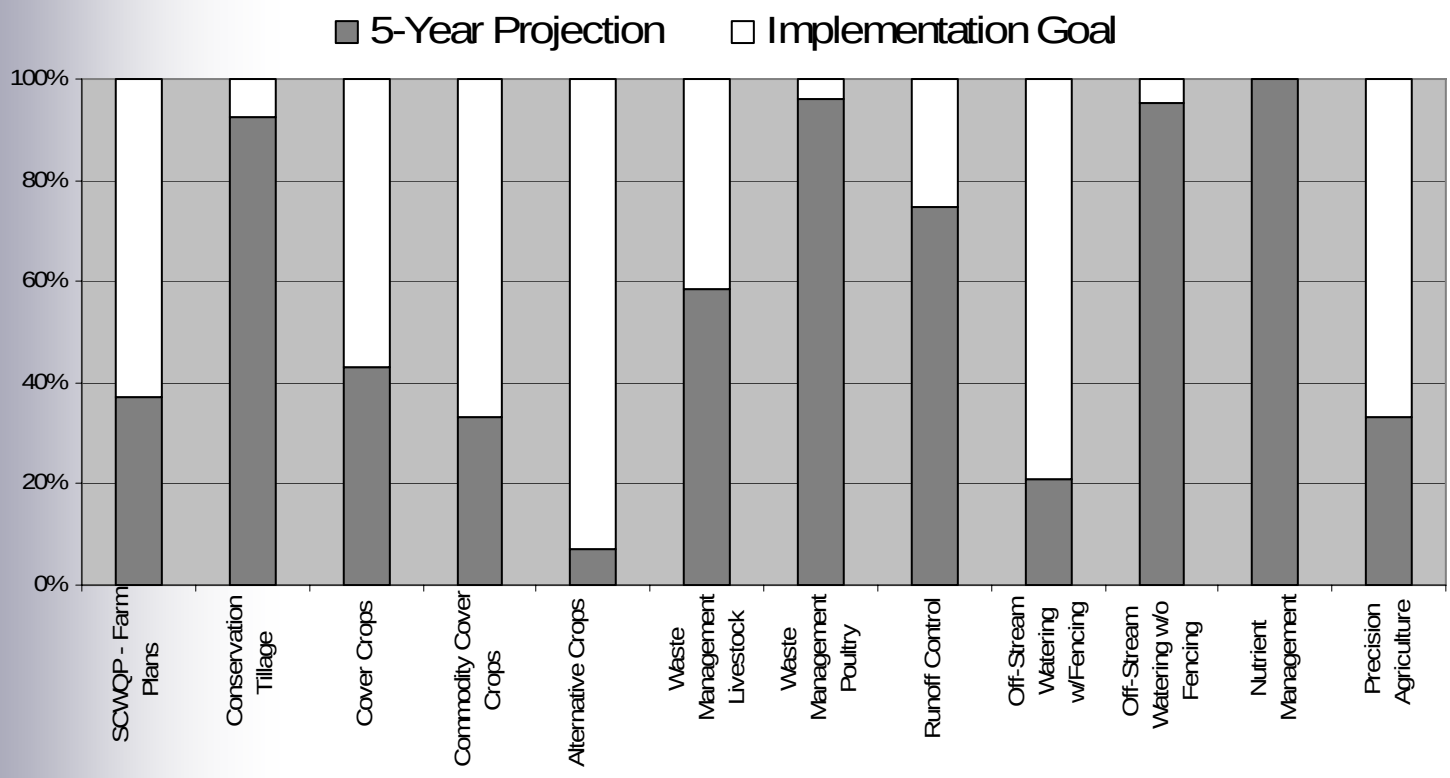
Agriculture Strategy

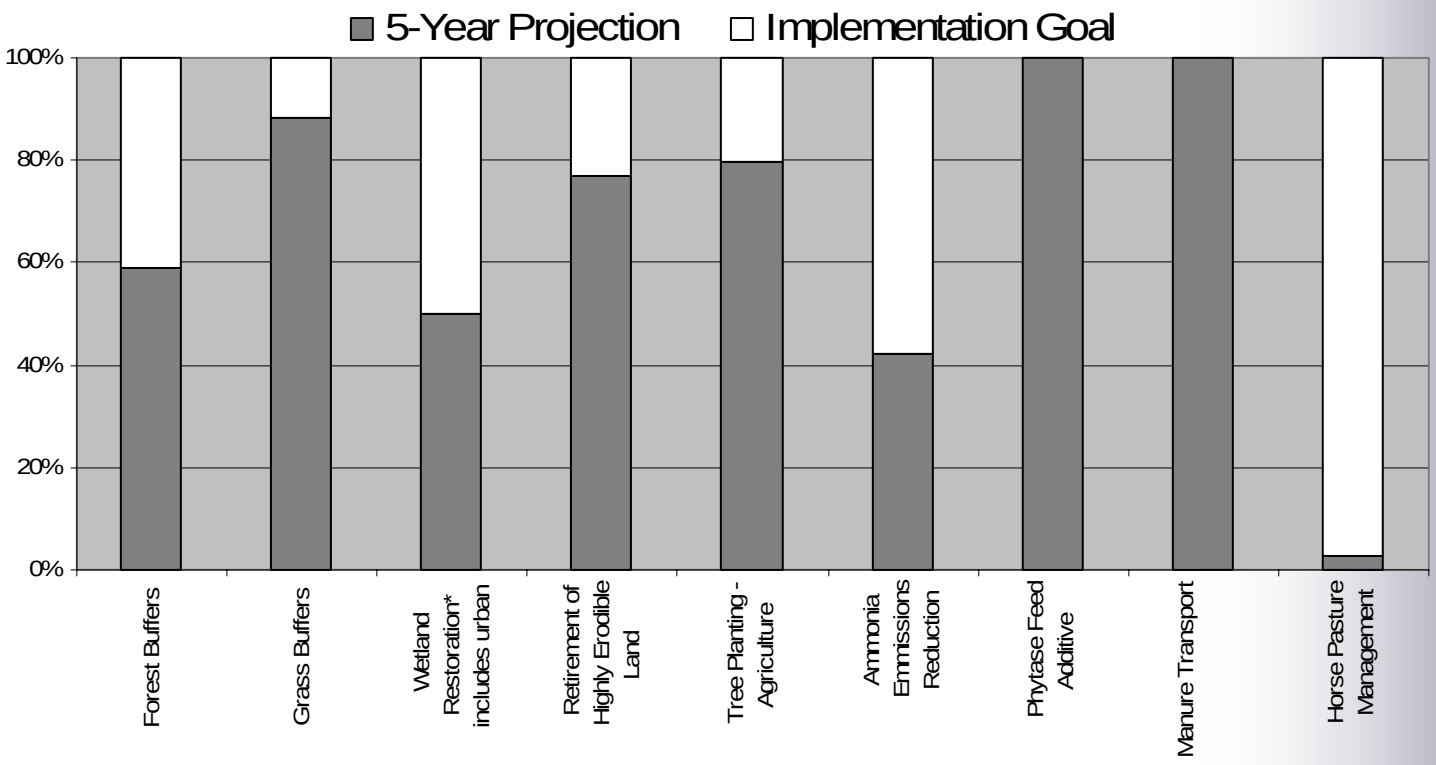
The Agriculture Strategy includes a plan to work with Maryland's farm community to implement a range of BMPs on farmland across the watershed to reduce nutrient and sediment loads. These BMPs are conservation practices that accomplish water quality goals while balancing the needs of crop and livestock production. This strategy has significantly expanded BMP options, including more than 23 different practices that work to protect the soil and natural resources.

Agriculture Implementation Schedule



Note: Implementation schedules were developed using current and projected budget allocations and tracked implementation rates as a result of state regulations and voluntary participation. Projected statewide implementation n schedules emphasize cost effective practices and the need to continue to pursue additional state and federal funding to increase implementation rates.

Agriculture Implementation Schedule (continued)



Note: Implementation schedules were developed using current and projected budget allocations and tracked implementation rates as a result of state regulations and voluntary participation. Projected statewide implementation schedules emphasize cost effective practices and the need to continue to pursue additional state and federal funding to increase implementation rates.

Implementation Schedule

				5-Year Implementation Schedule	
Practice	**Units**	**Strategy Goal**	**Progress Through 2004**	**1-2 Year Goal**	**3-5 Year Goal**
Soil Conservation and Water Quality Plans*	ac	1,364,718	757,248	-100,000	-150,000
Conservation Tillage	ac/yr	718,037	747,655	665,037	665,037
Cover Crops, Small Grains, and Alternative Crops					
Cover Crops	ac/yr	600,000	52,328	230,000	230,000
Commodity Cover Crops	ac/yr	150,000	0	50,000	50,000
Alternative Crops	ac/yr	50,000	0	0	3,500
Animal Waste Management Systems					
Livestock	systems	2,023	1,056	50	75
Poultry	systems	1,247	1,075	50	75
Runoff Control	systems	1,092	715	40	60
Pasture BMPs					
Off-Stream Watering w/Fencing	ac	11,505	1,642	300	450
Off-Stream Watering w/o Fencing	ac	29,748	26,895	600	900
Nutrient Management, % Treated	%	100%	80%	100%	100%
Precision Agriculture	ac	300,000	0	0	100,000
Retirement Programs					
Forest Buffers	ac	32,506	17,836	500	780
Grass Buffers	ac	60,764	33,708	8,000	12,000
Wetland Restoration	ac	16,678	6,448	300	450
Retirement of Highly Erodible Land	ac	28,922	12,251	4,000	6,000
Tree Planting - Agriculture	ac	10,712	8,051	200	300
Ammonia Emissions Reduction	houses	740	0	12	300
Phytase Feed Additive (% reduction)	%	32%	16%	30%	32%
Manure Transport (tons)**	tons/yr	70,000	36,730	75,000	75,000
Horse Pasture Management	operations	7,040	0	50	150

Notes for the Implementation Schedule (on previous page):

* Soil Conservation and Water Quality Plans are developed every 10-years. The negative value reflects the expectation that current levels of plan development cannot be maintained with projected funding and/or staffing.

** Estimates for the 5-year implementation schedule are based on projected funding from known sources, tracked implementation rates as a result of regulation and voluntary participation, and feedback from the local level on the feasibility of implementation in the near-term.

Conservation Tillage: A potentially significant percentage of Maryland's conservation tillage acres may qualify as "No Till," yielding greater (but currently uncredited) benefits.

Nutrient Management: In Maryland, nutrient management plans are applied to pasture land, but these acres are not incorporated in the Chesapeake Bay Program's model framework to date.

Precision Agriculture: The Chesapeake Bay Program models this BMP as an alternative to nutrient management and subtracts reported precision agriculture acres from total Nutrient Management Plan Implementation (NMPI).

Mixed Open Nutrient Management: The Chesapeake Bay Program applies nutrient management to all mixed open acres without horse pasture management.

Horse Pasture Management: Maryland's strategy is to establish 7,040 systems based on an averaged number of acres per place or per system.

Current Programs

Implementing the Strategy

Maryland Agricultural Water Quality Cost-Share (MACS) Program

MACS was established by State law in 1984 to help farmers control nutrient runoff and protect water quality and natural resources on their farms and comply with Federal and State environmental regulations. MACS provides farmers with grants to cover up to 87.5% of the cost to install BMPs on their farms to control soil erosion, manage nutrients, and safeguard water quality. A maximum funding level of up to $20,000 per project and $50,000 per farm applies. Farmers receiving MACS funds for animal waste treatment and containment projects may receive up to $75,000 per project with a maximum of $100,000 per farm when combined with other BMPs. In many instances, MACS and U.S. Department of Agriculture (USDA) funds may be combined.

Cover Crop Program

The Cover Crop Program provides cost-share assistance to farmers to implement this BMP. Cover crops absorb unused crop nutrients remaining in the soil following the fall harvest and act as a ground cover to keep the soil from eroding during the winter months. Maryland continues to refine the program, providing tiered incentives in 2004 to encourage early planting, which maximizes nutrient uptake. Cost-share support is administered through MACS.

Soil Conservation and Water Quality Program

This program helps farmers and landowners develop plans featuring a menu of BMPs uniquely suited to each site. Soil Conservation District staff provide technical assistance to develop these plans and design and implement BMPs, which helps farmers and landowners protect natural resources while maintaining production goals. Farmers are also advised about funding assistance and apprised of new research and technologies in land and water management.

Maryland Nutrient Management Program

This program provides financial and technical assistance to farmers to help them meet requirements of the Water Quality Improvement Act. Farmers who have a gross income of $2,500 or more or who have 8,000 pounds or more of animals must have a nutrient management plan. It also requires University of Maryland fertilizer management guidelines to be followed for nutrient application on certain non-agricultural lands. Nutrient management plans address the timing, application, and management of all nutrient sources used in the farming operation. The Maryland Department of Agriculture (MDA) certifies and licenses private and public sector nutrient management consultants who provide technical assistance in the development and implementation of nutrient management plans. Maryland Cooperative Extension develops nutrient management plans for farmers and trains consultants and farmers to become certified planners, enabling farmers to prepare their own plans. Cost-share for private sector development of plans is available from MACS or the Environmental Quality Incentives Program (EQIP).

Maryland Manure Transport Program

This program provides cost-share assistance of up to $20 per ton to transport manure from animal operations with excess waste or documentation of phosphorus over-enrichment to farms where it is land applied in accordance with a nutrient management plan or for alternative uses. Poultry companies provide a 50% match for litter transported from their growers farms. Cost-share support is administered through MACS.

Environmental Quality Incentives Program (EQIP)

EQIP provides financial assistance of up to 75% for the installation of BMPs, with a maximum of $450,000 for any individual or eligible entity through 2007. Approximately 60% of the funds are directed to livestock related conservation practices. Funds are also available to address locally identified conservation concerns. Contracts are from 1- to 10-years in length. The program is administered by the Natural Resource Conservation Service (NRCS) through local Soil Conservation Districts. Projects may be co-cost-shared with MACS Program support.

Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP)

The USDA administers these programs. They are designed to set aside and implement conservation measures to protect highly erodible land and other sensitive farmland

for a period of 10- to 15-years. CREP also targets the creation of riparian buffers and wetland restoration. The State also offers cost-share through the MACS Program for installation of BMPs and may purchase easements under CREP.

Conservation Security Program (CSP)

This program supports ongoing conservation stewardship of agricultural lands by providing assistance to producers to maintain and enhance natural resources. Administered through NRCS, it provides tiered payments to qualified farmers who are managing natural resources on their farms to achieve certain levels of soil and water quality as well as other identified natural resource objectives. Cost-share is also available to enhance current conservation efforts. Farmers in the Chester-Sassafras and Monocacy watersheds are eligible for this program in 2005.

Wetland Reserve Program (WRP)

NRCS administers this program to provide financial incentives to landowners seeking to restore nontidal wetlands. Payment includes compensation for a wetland easement as well as cost-share funding to restore wetlands. There are three options for participants — permanent easements, a 30-year easement, and a restoration cost-share agreement.

- Permanent easements are conservation easements in perpetuity. USDA pays for the easement as well as 100% of the cost of restoring the wetland.

- A 30-year easement is a conservation easement lasting for 30-years. USDA pays 75% of what would be paid for a permanent easement as well as 75% of restoration costs.

- A restoration cost-share agreement is an agreement to reestablish a degraded or lost wetland habitat. USDA pays 75% of the restoration costs. This does not place an easement on the property. The landowner provides the restoration site without reimbursement and agrees to maintain it for a minimum of 10-years.

Low Interest Loans for Agricultural Conservation (LILAC) Program

This program is available to help farmers install BMPs or purchase equipment to protect natural resources and safeguard water quality. Loans offered through the LILAC program can help farmers bridge the cost-share gap that exists in many

Conservation tillage involves leaving stalks and leaves from the previous crop on the ground's surface before and during planting to protect the soil from erosion.

government conservation incentive programs. These loans are guaranteed by the State Revolving Loan Fund and are available at lending institutions throughout the State.

Operation and Maintenance Plans for Public Drainage and Public Watershed Associations

These plans outline upkeep activities that the Public Drainage Association intends to perform for a 2- to 3-year period. These activities are designed to minimize the environmental impacts of agricultural drainage ditches while maintaining functioning drainage systems. Public drainage systems were created to reduce flooding, to address landowners' drainage needs, to protect public health, and to improve the transportation infrastructure while supporting local economies. Cost-share assistance for the installation of several eligible BMPs for drainage ditches may be available from MDA.

Rural Abandoned Mine Program (RAMP)

NRCS administers this program. The district conservationist is in charge of this land reclamation program on a county-wide basis, and Soil Conservation Districts are involved in the design, approval, and inspection of implemented BMPs to assure their performance as specified by law.

Implementation Barriers and Possible Solutions

Cover and Alternative Crops:	
Barriers to Implementation	**Solutions to Overcome Barriers**
• It is not practical to have more than 70% of cropland in conservation tillage. Farmers with a corn/wheat rotation must till once every 4- to 5-years to avoid a fungus problem. • Farmers need more flexibility with cover crops and a larger window in which to plant them. • The cap on the number of cover crop acres per operator that are eligible for cost-share may limit participation by some farmers. • There is a lack of funding or program support for the commodity cover crops BMP. • Alternative crops are not attractive to landowners because there is no market for them.	• The State should explore if removing the cap on the number of acres planted with cover crops will increase acres enrolled. • The State could create more flexible rules for cover crops and forgo the higher uptake. • State or local funding for the Commodity Cover Crop Program may increase acres planted. Additionally, an ethanol plant in Maryland would create a market for the crops. • The State could assist in creating the necessary infrastructure and funding source for a successful alternative crops program.

Animal Waste Management:	
Barriers to Implementation	**Solutions to Overcome Barriers**
• Often landowners with horses do not perceive themselves as part of the agricultural community, complicating the implementation of Horse Pasture Management Programs.	• Federal, State, and local governments and Soil Conservation Districts should reach out to these landowners to help educate them about the impact of their operations. Additionally, a funding mechanism for assuring adequate staff and program implementation would aid this process.

Land Retirement:	
Barriers to Implementation	**Solutions to Overcome Barriers**
• Most of the available land has already been used for a retirement BMP, and landowners are concerned about taking additional land out of production. • Unlike other retirement BMPs, conversion of lands to wetlands involves a permanent change in land use.	• Consider allowing the harvest of grassed buffers to encourage landowners to plant more.

Agriculture Conservation Plans:	
Barriers to Implementation	**Solutions to Overcome Barriers**
• There are insufficient funds and personnel to implement the Nutrient Management and Soil Conservation and Water Quality Plan Programs.	• In addition to Soil Conservation District staff requirements in the Code of Maryland Regulations, increased staffing and resources for the State and Soil Conservation District agricultural programs are necessary to meet ambitious implementation goals.

Innovative Practices:	
Barriers to Implementation	**Solutions to Overcome Barriers**
• Precision agriculture is not fully evolved or adapted for Maryland conditions, implementation is expensive, fertilizer application tools are not available, and its current usefulness is limited to large operations.	• The Federal and State governments should fund more research in the field. • Precision agriculture needs to be compatible with farmer and fertilizer applicator equipment.

State Initiatives to Address the Implementation Gaps

2-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDA will implement the following actions:

- Increase MDA funds to cost-share the expense of transporting excess manure from farms and regions to areas where manure nutrients can be used under the guidance of a nutrient management plan.

- Expand the Cover Crop Program. Cover crops are a cost effective BMP with an established and proven track record for implementation results. This initiative proposes an increase to MDA's cover crop funding that, when added to the existing program, will achieve nearly 50% of the Tributary Strategy implementation goal for this practice. Funding from this initiative would also provide resources to implement cover crops on lands owned by or under easement with DNR as part of the State's effort to lead by example.

- Establish a Commodity Cover Crop Program that will allow the winter crop to be harvested and sold as a commodity. This program will provide an incentive to eliminate fall fertilization of commodity grains. This will increase the farm community's participation, resulting in more acres being planted.

- MDA will continue to look for opportunities, such as grant funds for staff dedicated to address small horse operations of less than eight horses at a demonstration level. MDA has extended the eligibility of the MACS Program to

Cover crops, such as rye, wheat, and barley, are planted during the fall to reduce soil erosion and take up crop nutrients left over from the previous crop.

include horse operations with eight or more animals. MDA will work with local Soil Conservation Districts to implement this action.

- MDA will work with the University of Maryland, Maryland Cooperative Extension, local Soil Conservation Districts, and NRCS to conduct management demonstrations and research in ammonia emission reduction.

- Work with the dairy industry to develop alternative manure management systems. This will assist in compliance with phosphorus-based nutrient management plans. MDA will be the lead agency, working with the Soil Conservation Districts, NRCS, and the University of Maryland.

- Work with the Chesapeake Bay Program to account for water quality benefits achieved by implementing BMPs on public drainage systems. These BMPs have water quality and other environmental benefits that have not been credited in the Chesapeake Bay Program's watershed model.

- Continue to work with the nursery industry on water management and issues related to nutrient management as a means of assuring proper control of nutrients from this sector.

- Continue to maintain and manage public drainage associations in a cost effective and environmentally sensitive manner.

- Conduct a demonstration of Management Intensive Grazing Systems for dairy production designed to improve pastures and forage resources to support the majority of a herd's nutritional needs. Management Intensive Grazing reduces dependence of off-farm feed inputs and helps achieve a nutrient balance or closed system. The purpose of the project is to demonstrate and promote the adoption of this approach to protect or improve water quality, soil quality, and grazing land health while sustaining productivity and the economic viability of dairies.

DNR will implement the following actions:

- Coordinate a DNR Stream Restoration Program that focuses stream corridor restoration in agricultural areas using low cost, highly effective practices that improve water quality. This program would be coordinated with MDA, MDE, and local Soil Conservation Districts utilizing existing and new sources of funds.

- Assess opportunities to expand the use of manure products on State-owned lands and replace the use of commercial fertilizers. DNR-owned agricultural lands will be assessed first with a Phase II assessment of all State lands following. If needed, requirements will be revised to allow for the use of manure-based products on DNR-owned agricultural lands.

- Require all operators leasing State row crop land to apply to the State Cover Crop Program in addition to

Maryland farmers use nutrient management plans to help prevent over-fertilization of crop fields. The plans, which are required by law, balance crop nutrient needs with fertilizer applications.

implementing their approved nutrient management plan. This would only apply to operators and lands eligible for the State Cover Crop Program, as funding may not be available for all State-owned lands, and will be targeted to lands where poultry litter is applied.

- Encourage the planting of cover crops on all easements funded by DNR land preservation programs. This rule change should be consistent with Maryland Agricultural Land Preservation Fund requirements. This would only apply to operators and lands eligible for the State Cover Crop Program as funding may not be available for all State-owned lands. Cover crops will be targeted on all State lands where poultry litter is applied.

- Continue to pursue increasing DNR Program Open Space funds for CREP easements. Not to exceed 25,000 acres for each easement type and a total of 100,000 acres.

The University of Maryland will implement the following actions:

- Sign Memorandum of Understanding with the USDA Agricultural Research Service; the EPA Chesapeake Bay Program; MDA; and USDA Cooperative State Research, Education, and Extension Service (CSREES) Mid-Atlantic Water Quality Program for coordination on research, education, and establishment of priorities for agricultural management related to the Chesapeake Bay goals.

- Provide technical support to NRCS for approval of animal diet modification standards for EQIP funding in Maryland and develop an extension and outreach program on diet modification and overfeeding.

- Identify gaps and develop research recommendations on the impacts of ammonia emissions from animal farms. Identify and implement demonstration projects of promising management tools in cooperation with NRCS.

- Evaluate and demonstrate opportunities to manage excess manures in cooperation with USDA, industry, MDA, and Mid-Atlantic land grant universities.

- Conduct research and demonstrations of enhanced nitrogen use efficiency for

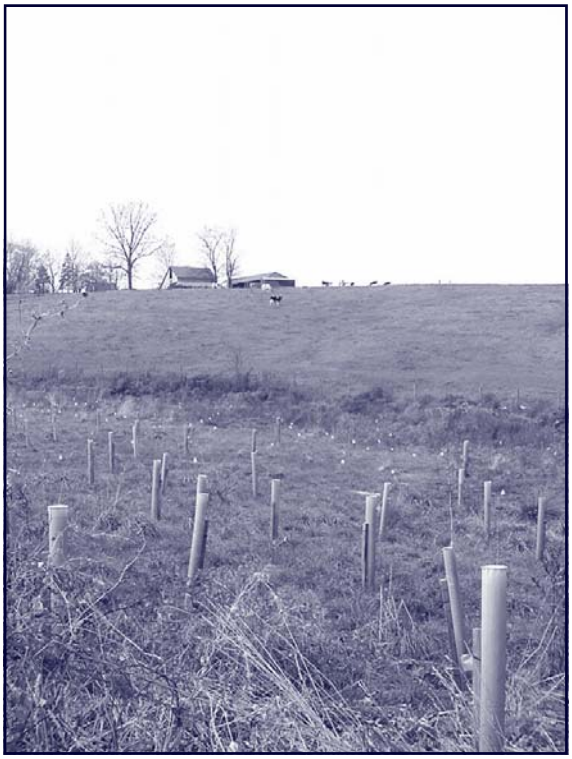
crop production, including cover crops, while assuring their economic sustainability.

- Develop precision agriculture and nutrient use efficiency demonstration and monitoring projects for Maryland and the Mid-Atlantic region in coordination with industry and State agencies. The University of Maryland will coordinate this initiative with MDA, the Soil Conservation Districts, and other interested stakeholders.

- Assist with identification and analysis of opportunities in the Farm Bill for additional or targeted funding for conservation. The University of Maryland will coordinate this initiative with MDA and the Soil Conservation Districts.

- Implement a program to improve dairy herd nutrition using milk urea nitrogen. Milk urea nitrogen has been shown to be an excellent predictor of nitrogen excreted directly into dairy cow manure. Milk urea nitrogen can be used to identify herds that are overfed protein, and routine milk urea nitrogen analysis can help producers fine tune feed management and reduce the nitrogen excreted to manure. Currently, despite the promise of milk urea nitrogen analysis, there remain obstacles to its widespread adoption in the field. These barriers include milk laboratories' skepticism of the value of milk urea nitrogen analysis and a lack of understanding of the process and its value on the part of producers. The ultimate goal of this project is to reduce nitrogen losses to air and water from dairy farms in the Chesapeake Bay region by improving dairy herd nutrition. Milk urea nitrogen analysis will be institutionalized in milk laboratories and dairy operations, and an innovative incentive program will be established to encourage producers to reduce nitrogen lost to the environment by decreasing nitrogen feeding.

- Utilize conservation tillage to minimize nutrient losses from poultry litter applied in grain production systems. A recent economic analysis confirmed that application of broiler litter as a fertilizer to crop land is the highest value use of the litter generated on the Delmarva Peninsula. The amount of phosphorus applied with manure usually has not been considered when determining



Stream protection with fencing re-establishes stream banks that have been eroded by animal traffic with vegetation.

recommended application rates. In these situations, soil phosphorus concentrations can increase rapidly. Recent research that examined phosphorus in manure-amended Atlantic Coastal Plain soils suggest that the Chesapeake Bay and its tributaries are more vulnerable to receiving excess phosphorus from surface runoff than from leaching. This same research concluded that the primary focus of phosphorus management efforts should be minimizing loss through surface runoff pathways coupled with monitoring the degree of phosphorus saturation of surface soils. The purpose of this project is to demonstrate that existing conservation tillage technology can be successfully used to partially incorporate poultry litter in reduced tillage grain production systems, preserving surface residue and soil conservation conditions while reducing nitrogen and phosphorus losses compared to no-till production systems. This nutrient management approach will be demonstrated and evaluated on 10 to 12 farms across the Delmarva Peninsula.

5-Year action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDA will implement the following actions:

- Implement soil conservation and water quality planning by reinstating staff positions and the necessary budget.
- Implement runoff control. This is based on retrofitting poultry operations to meet new concentrated animal feeding operation (CAFO) requirements.
- Increase the retirement of highly erodible land. This is contingent on the reauthorization of the CREP Program.
- Implement grass buffers. This is contingent on the reauthorization of the CREP Program.
- Install riparian forest buffers. This is contingent on the reauthorization of the CREP Program.
- Increase wetland restoration. This is contingent on the reauthorization of the CREP Program.
- Improve horse pasture management. MDA will continue to look for opportunities, such as grant funds for staff dedicated to address this issue at a demonstration level.
- Implement ammonia emission reductions. This is based on funding and the EPA's new air emission initiative for agricultural operations. MDA will work with the University of Maryland to implement this initiative.
- Pilot precision agriculture. MDA will explore opportunities for tax incentives/ write-offs (i.e., equipment purchase as

well as incentive costs for sampling, yield monitoring, and consultation services).

- Encourage alternative crops. MDA will explore market development and infrastructure needs to promote these crops.

- Support oyster aquaculture. MDA will continue to look for opportunities, such as grant funds for staff dedicated to address this issue at a demonstration level. Water quality benefits for this practice need to be assessed and monitored by DNR and the Chesapeake Bay Program.

DNR will implement the following actions:

- Encourage landowners whose conservation easements were purchased with State funds to implement BMPs and restoration programs. Direct existing funds when possible and seek to obtain specific funds to initiate BMPs and restoration programs on these lands. This initiative would educate and offer a menu of land use conservation programs to these landowners.

The University of Maryland will implement the following actions:

- Partner with USDA/Agricultural Research Service (ARS) – Mid-Atlantic land grant institutions on precision feeding diet demonstrations for dairy and beef cattle.

- Develop education and outreach activities in coordination with USDA/ARS bioenergy research and demonstration in the Chesapeake Bay, focusing on dairy anaerobic digestion and energy from manure.
- Evaluate economically viable alternative

Livestock Animal Waste Management Systems include manure storage structures that protect animal waste from rainwater runoff and allow manure to be recycled as a fertilizer when field conditions are right.

crops or crop/animal production systems with lower nutrient impacts than current systems.

Long-Term Action Plan

These are long-term initiatives for education, policy, and restoration needs to meet Bay water quality standards. These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDA will implement the following actions:

- Continue to pursue, demonstrate, and promote alternative technologies and management measures to deal with manure management issues and nutrient reduction strategies.
- Assure long-term agricultural viability while implementing management measures that minimize and reduce nutrient impacts.
- Continue to implement and adapt a broad range of technical and financial assistance programs that support a variety of agricultural BMPs in order to address different types of farm operations and site-specific conditions.
- Continue to work with the University of Maryland and the research community to improve BMP effectiveness and to develop new or innovative tools that reduce nutrient impacts from agriculture and restore the Chesapeake Bay.
- Utilize a strong network of outreach and education activities to promote the adoption of agricultural BMPs.

Stakeholder Roles in Implementing the Strategy

Private Landowners

- Finance and implement BMPs to address site-specific nutrient and sediment issues on their property.

Business and Industry

- The dairy industry needs to be a partner in feed formulation and dietary modifications as well as alternative manure management.
- The poultry industry needs to provide incentives and encouragement for diet modification, ammonia emission reductions, and manure management.
- The grain industry needs to participate in precision agriculture and enhanced nitrogen use efficiency.

State Government

- Provide staff and funding to Soil Conservation Districts for technical assistance to farmers and landowners for the implementation of BMPs.

Federal Government

- Provide staff and funding to Soil Conservation Districts for technical

assistance to farmers and landowners for the implementation of BMPs.

Local Governments

- Provide staff and funding to Soil Conservation Districts for technical assistance to farmers and landowners for the implementation of BMPs.

Soil Conservation Districts

- Provide technical assistance and guidance on programs available to farmers and landowners for the implementation of BMPs and coordinate activities and funding between district, State, and Federal programs.

Soil Conservation and Water Quality Plans provide farmers with site specific solutions to prevent soil erosion and protect water quality.

Air Deposition Strategy

Air deposition reductions are closely tied to the requirements placed on Maryland under the EPA's *Clean Air Act*. While the act is focused on reducing emissions related to the national ambient air quality standards, there are nitrogen deposition co-benefits associated with the implementation of the *Clean Air Act* — nitrogen oxide emission reductions have an immediate impact on reducing the nitrogen loads into the Bay.

Maryland has implemented numerous regulatory programs to reduce airborne nitrogen oxide emissions. These programs (some State and some Federal) cover all applicable nitrogen oxide emission sources (point, areas, mobile, and non-road). Specifically, utility emission control regulations, Federal motor vehicle emission reduction programs, and regional nitrogen oxide reduction measures have and will provide Maryland with major nitrogen oxide reduction benefits. These programs are directly tied to the implementation of the *Clean Air Act*.

Additionally, Maryland has taken an aggressive non-regulatory stance in an effort to further reduce in-state nitrogen oxide emissions. Voluntary programs, like the Ozone Action Day Program, have been widely viewed as successful emission reduction programs that help both the Chesapeake Bay and air quality overall.

This Air Deposition Strategy assumes full implementation of existing *Clean Air Act* policies that could equal a 15% nitrogen reduction to the Bay from the air.

Implementation Schedule

2005: Maryland will continue to push EPA to focus on reductions in transported emissions. Begin development of air quality plans for the new 8-hour ozone and fine particle air quality standards.

2006: Continue development of air quality plans for 8-hour ozone and fine particle air quality standards. This will include the development of any new emission control regulations or emission reduction strategies.

2007: Maryland will submit an air quality plan for the 8-hour ozone standard to the EPA.

2008: Maryland will submit an air quality plan for the fine particle standard to the EPA.

2009/2010: Continue to implement the Emission Control Strategies under the *Clean Air Act* (the 8-Hour Ozone and Fine Particle Air Quality Plans) and the new *Federal Clean Air Interstate Rule*.

Current Programs Implementing the Strategy

- *Clean Air Act* requirements under the 1-hour ozone standard, including our State Implementation Plans for the 1-hour ozone standard.

- Federal Emission Control Programs, such as the Federal Motor Vehicle Emission Control Program and the Nitrogen Oxide State Implementation Plan (which targets power plants).

- Maryland has developed more than 50 specific emission reduction regulations in the past 15-years.

Implementation Barriers and Possible Solutions

MDE's focus with respect to emission reduction strategies hinges on ensuring that air pollution transport is being handled on regional and Federal levels. While Maryland has been a national leader in implementing programs to reduce its emissions, the State needs focused regional and national efforts to attain the national standards. Maryland has been aggressive in pushing EPA to seek enhanced transport reductions. In addition, MDE has been actively working with regional organizations to seek additional emission reductions from upwind states. The State is pursuing transport reductions while ensuring that local control programs remain strong and innovative. Without the continued support of the EPA and neighboring states, it will be

Car emissions are a major source of air deposition in the Chesapeake Bay watershed.

difficult to achieve the air and water quality standards.

State Initiatives to Address the Implementation Gaps

2-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDE will implement the following actions:

- Continue implementation of 1-hour ozone control programs.
- Continue to push for regional nitrogen oxide control programs to reduce air pollution transport. Success in this arena will lead to substantial nitrogen deposition benefits for the Bay.
- Continue to work independently and also with the Ozone Transport Commission on the development and implementation of an aggressive power plant control programs that will require nitrogen oxide reductions faster and deeper than Federal requirements.

5-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDE will implement the following actions:

- Develop and implement emission controls to meet the 8-hour ozone and fine particle national ambient air quality standards.
- Implement the nitrogen oxide control program via the *Clean Air Act* (for 8-hour ozone and fine particle national

Factory emissions are another major source of air deposition in the Bay watershed.

ambient air quality standards) and the new *Federal Clean Air Interstate Rule*.

- Fully implement several Federal Motor Vehicle Emission Control Programs (e.g., Tier II and heavy duty diesel standards).

Long-Term Policy Plan

These are long-term initiatives for education, policy, and restoration needs to meet Bay water quality standards. These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

MDE will implement the following actions:

- Continue implementing any formal control program and maintenance measures, such as the 8-hour ozone and fine particle *Clean Air Act* requirements.

Stakeholder Roles in Implementing the Strategy

Private Landowners

- Support the Ozone Action Days Program.

Business and Industry

- Comply with necessary Federal and State regulations in a timely manner.

- Support MDE's push for regional controls to ensure reductions in pollution transport.

State Government

- MDE will develop State Implementation Plans for fine particle and ozone, which will reduce nitrogen deposition through the direct reduction of nitrogen oxide. These plans are due in 2007/2008 and will be fully implemented by 2009/2010.

- MDE will continue to push for regional reductions to control transported pollution.

- MDE will also implement any Federal rules, such as the *Federal Clean Air Interstate Rule* and *Clean Air Mercury Rule*, to reduce emissions from the power plant sector.

Federal Government

- Continue to work with MDE and regional organizations to enhance the control of transported pollution.

- Work with MDE on the implementation of the *Federal Clean Air Interstate Rule* and *Clean Air Mercury Rule*.

Local Governments

- Work with MDE to develop local emission control programs needed to meet the air quality goals.

- Support MDE's push for regional controls to ensure the reduction in pollution transport.

Other State Initiatives to Address the Implementation Gaps

Following are policy actions that do not fall under any one particular strategy yet will help address the implementation gaps and achieve the Tributary Strategy goals.

2-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

DNR will implement the following actions:

- Foster wetland restoration. This initiative will help provide the necessary technical expertise, project funds, partnerships, and incentives that will encourage landowners and land managers to maximize the benefit of existing funding programs and to undertake wetland restoration projects. In order to achieve a balanced approach to wetland restoration efforts throughout Maryland, restoration targets will be set for both public and private lands.

- With support from all state agencies: target the Corsica watershed as a model for restoration. The Corsica watershed provides an opportunity to employ all State resources to reduce nutrients, including BMP implementation and targeted land preservation. This effort will provide invaluable experience and knowledge on how to overcome implementation barriers as well as result in measurable improvements in water quality.

The University of Maryland will implement the following actions:

- Complete the *Chesapeake Bay Program Innovation Strategy* for incorporating and approving innovative techniques into the Tributary Strategy and model calculations.

MDE will implement the following actions:

- TMDL implementation guidance will assist local governments in finding offsets to maintain the nutrient caps and improve water quality.

The Tributary Teams host meetings, forums, and workshops where local citizens, other organizations, and government officials can exchange information and ideas and move watershed initiatives forward.

- Create documents and maps that target areas for wetland restoration, creation, and enhancement thereby providing water quality and habitat benefits. Identify existing wetlands for preservation that will aid in offsets of additional nutrient loads from development. This action is funded by an EPA grant.

- Develop new guidelines for marsh creation as a practice for shore erosion control and wildlife habitat. This action is funded by an EPA grant.

- Develop new methods for evaluating the success of mitigated wetlands to process nutrients and to perform other water quality functions. The guidelines will include new monitoring, assessment, and construction practices. An EPA grant is funding this action.

5-Year Action Plan

These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

DNR will implement the following actions:

- Double submerged aquatic vegetation restoration acreage using new planting technologies. In 2002, the EPA Chesapeake Bay Program and its partners committed to planting or seeding 1,000 acres of submerged aquatic vegetation baywide by 2008. This represents a several orders of magnitude increase over all previous efforts and will require the development of new technologies and approaches to meet this goal.

- Work with the U.S. Fish and Wildlife Service, MDE, MDA, and Ducks Unlimited to restore wetland functions while addressing issues, such as mosquito control, to improve the function and longevity of tidal wetlands.

- Partner with the Alliance for the Chesapeake Bay and the University of

Maryland College of Agriculture and Natural Sciences to work with Maryland utility companies and create a fund to decrease nutrient inputs to the State's waterways and provide for terrestrial carbon sequestration.

- Implement nonstructural (living) shoreline techniques on DNR-owned lands where practical to restore critical habitats and reduce shoreline erosion rates.

Long-Term Action Plan

These are long-term initiatives for education, policy, and restoration needs to meet Bay water quality standards. These initiatives are organized by the agency that will be responsible for implementing them. Many of these initiatives, however, will require the cooperation and coordination of several State agencies, local governments, and other stakeholders.

All State agencies will implement the following actions:

- Conduct education and outreach on the Chesapeake Bay, its bounty, and the threats it faces. This is done through graduate education, undergraduate internships, K-12 environmental education programs, K-12 teacher education programs, docent programs, Tributary Team activities, and other educational programs. In addition, the use of various media targeted to specific audiences are regularly developed.

DNR will implement the following actions:

- Implement ecosystem-based fisheries management plans in accordance with the Executive Council directive that incorporates water quality standards and watershed restoration and protection into fisheries management plans. The immediate policy action is to secure staff resources to identify monitoring, analysis, and modeling activities to support ecosystem-based fishery management plans and to locate sources of funding to implement these efforts to the extent practical.

- Develop a long-term, holistic approach for targeting habitat enhancement practices. Through assessments, determine areas of highest priority for water quality and biological diversity and increase implementation in these areas.

The University of Maryland Center for Environmental Science will implement the following actions:

- Study all aspects of nutrient dynamics in all media (air, land, and water) — from loading to biogeochemical transformations to the effects on the ecosystem, particularly phytoplankton uptake, shading of submerged aquatic vegetation, and sediment burial and re-suspension.

- Develop multi-species fishery management plans.

- Establish ecosystem-based restoration science on the oyster, particularly as it relates to population enhancement, natural spat settlement, disease resistance, and the effects of oyster reefs on denitrification.

- Conduct targeted research on the non-native Asian oyster to determine if viable wild populations could exist in Maryland's portion of the Bay and, if so, their effect on native oysters and the Bay ecosystem in general.

- Research the ecology and ecosystem dynamics of harmful algal blooms.

- Identify the effects of landscape changes on water quantity and quality, flooding, and the stream and river ecosystems.

- Study the effects of sea level rise and subsidence on erosion, marsh size and function, and sediment re-suspension in relation to how this will offset Bay restoration.

Part II: Strategies to Achieve, Maintain, and Monitor Water Quality Goals

Coordination Between Regulatory- and Incentive-Based Programs

Tributary Strategies, TMDLs, NPDES Permits, Land Use Planning, and Agricultural Conservation Programs

Tributary Strategies and TMDLs are parallel and complementary programs. Both set quantitative loading goals on a watershed basis. In general, TMDLs are developed for smaller basins to correct local water quality impairments. Tributary Strategies are for larger basins and are usually more stringent than TMDLs. The Tributary Strategies typically require additional load reductions to meet the water quality needs of the Chesapeake Bay and its tidal tributaries.

TMDLs, having a basis in regulation, may result in regulatory action, such as more restrictive permits. Tributary Strategies, being a cooperative implementation program, do not necessarily have the connection to permits. Through Governor Robert Ehrlich's ENR Policy and Bay Restoration Fund, however, Maryland is incorporating Tributary Strategies into NPDES permits. The *Tributary Basin Level Implementation Plans*, to be developed by the Tributary Teams and local governments, will also provide the foundation for implementation of nutrient and sediment TMDLs. TMDLs are consistent with the Tributary Strategies because both recognize that action in the watershed is essential to protect downstream water quality, including the Chesapeake Bay and tidal waters.

Actions to reduce nutrient loadings, commonly called BMPs, are the critical tools of both TMDLs and the Tributary Strategies. Any reductions in nutrient and/or sediment loads accomplished through these practices make progress for both programs and are being tracked. Other practices, such as land use planning or agricultural conservation programs, also aid in achieving the TMDL and Tributary Strategy goals, although their primary purposes may be different. Land use planning structures communities so that the need for public utilities is met and conflicting uses do not impair community functions. Appropriate planning can contribute to water quality improvements and/or reduce future degradation of water quality by minimizing sprawl and impervious surface and by taking water quality into account when planning communities. Likewise, agricultural conservation programs can help maintain an economically viable rural economy while protecting water quality

by limiting development and additional impervious surface and by taking minimally productive land out of farming and letting it return to forest, pasture, or wetland.

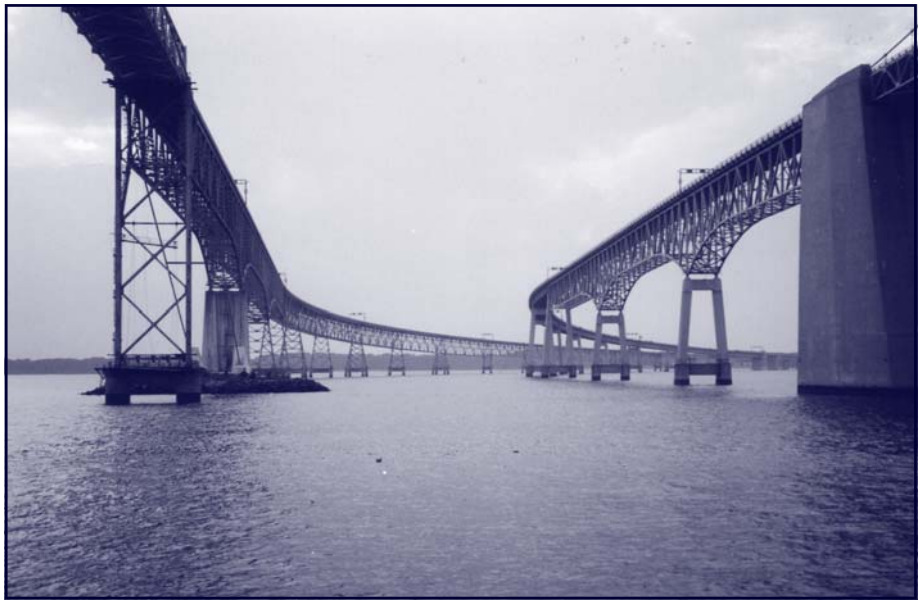
Local governments are encouraged to continue investing in and tracking remediation activities for which quantified load reductions have yet to be estimated. The entire Bay Community is working on quantifying these practices. Demonstrating continuing progress through ongoing and expanded programs is essential. State and local staff should continually seek opportunities to plan innovatively with the recognition of water quality goals and to implement regulatory and voluntary programs in ways that maximize the protection and restoration of water quality.

It is critical to recognize that meeting and maintaining water quality standards is the final goal, not load allocations. Load allocations are the best estimate of what is necessary to achieve the water quality standards.

Priority Places

There is a perception that TMDLs oppose or are contradictory to Priority Places or Smart Growth policies and that TMDLs will prevent high density growth that will negatively impact water quality in places where there is supporting infrastructure. The first and most obvious response is "Who would want to live in a place with poor water quality if they could avoid it?" The less obvious response is that there really is not a contradiction. There just needs to be a recognition that the patterns, types, methods, and costs of development need to be revised to meet all of a community's needs.

TMDLs do not prevent development. They simply provide a quantitative assessment of the allowable loads of a pollutant into a water body. Some argue that TMDLs will eventually prevent growth. Growth can be accommodated and water quality can be restored and maintained through offsets,



mitigation, improved control structures, minimization of impervious surface, pre-treatment, and maintenance of ecosystems that provide for pollution minimization (e.g., wetlands).

This statement is a broad generalization because some areas may be particularly sensitive to pollution, other areas may not provide for offsets, and there is likely some limit to the density that can be accommodated. In the New York City metropolitan area, for example, TMDLs are being implemented that will meet the water quality standards of Long Island Sound. If it can be done there — considering the population density on the North Shore of Long Island and the South Shore of Connecticut and the discharges from Manhattan — then it should be possible in many places. Communities need to plan more extensively for the environmental aspects of their community, particularly what "build out" should look like.

Comprehensive Plans

All communities have to provide comprehensive plans. These plans address many environmental issues. In the past, it was impossible to address water quality in a quantitative way as part of the planning process. TMDLs now provide that planning opportunity.

Although all the Bay watershed's TMDLs have not been completed, more than 100 are finalized. The Tributary Strategies also provide a quantitative basis for the limits that should be explored through the planning process. To take the next step into quantitative water quality planning, municipalities and local governments will also use pollution factors for each land use — a list of factors that enable communities to at least do "back of the envelope" calculations of net pollution loadings resulting from land use changes — and technical assistance that the State agencies are willing to provide (e.g., "Scenario Builder").

Cap Management Strategy

Maryland's Tributary Strategy is a plan to reduce current pollutant loads (nitrogen, phosphorus, and sediment) to levels that will enable the Bay to achieve water quality standards. These allowable pollutant loads are called allocations, which are divided among the various States and the watersheds within those States. The Bay currently receives loads much larger than the allocations; thus the loads need to be significantly reduced to achieve the water quality standards.

The standards are based on the best scientific knowledge of the conditions necessary for the Bay's living resources (e.g., fish, crabs, clams, submerged aquatic vegetation, etc.) to thrive. Once these standards are met, the Bay will be considered restored and no longer an impaired water body. The load allocations are an estimate of the maximum amount of pollution permissible. Once the allocations, or water quality standards, are reached, they must be maintained and the pollution loads must not be allowed to rise above the cap. If the cap is not maintained, the water quality will degrade again to the detriment of the Bay.

Current efforts seek to reduce loads in the face of increased development and population in Maryland. A strategy must be developed that will enable continued growth and increasing population and still not exceed the pollutant cap. There are several key components to the Cap Management Strategy, each raising questions about how to best approach cap management. These include the following:

- **Technical Components:** What techniques and practices are available to reduce the amount of pollution from any specific activity? How are they tracked and quantified? How will pollutant reductions be credited?

- **Policy Components:** How will processes and permits be structured to incorporate incentives and find acceptable solutions to difficult questions that meet the needs for economic growth and Bay restoration?

- **Political Components:** How will the public be engaged? How will agreements be reached that will enable the technical and policy components mentioned above?

Within these three broad areas, there are several categories of tools and approaches that can be used to help maintain the cap and offset any new loads that may occur as the overall pollutant loads necessary to achieve the cap are reduced.

The Roles of Planning and Growth Management

Understanding the limits imposed by Bay nutrient allocations (and local TMDLs) is critical to meeting and maintaining the cap. This understanding should be factored into comprehensive planning discussions with communities and set in a context of quality of life, economic growth, waste treatment capacity and the costs to increase that capacity, and the desire for a restored Chesapeake Bay. There will be trade-offs, and part of the discussion should center on the issues of Smart Growth/Priority Places, the costs to enable high density growth, the need to avoid sprawl, and the planning and development tools that minimize the impacts of growth on the Bay (e.g., cluster development, local treatment versus septic systems, and ESD and LID practices).

A related issue includes the need, in many instances, for better interdepartmental communication. For example, planning must know what public works is thinking and vice versa. The section in this document titled "Coordination between Regulatory- and Incentive-Based Programs" addresses some of these program coordination issues. To assure good communications, the State agencies meet almost every month through the Bay Workgroup and the Bay Cabinet. In addition, MDE and MDP have conducted a series of workshops for local governments to further address questions about linking environmental protection with comprehensive planning.

Building a Growth Management Strategy to maintain nutrient and sediment reduction goals is a challenging task and will be a dynamic process. Elements of this strategy are under development as part of the TMDL implementation guidance, the coordination between different State agencies, and revisions to State regulations and discharge permits. As a comprehensive approach to

growth management develops, the following components must be incorporated:

A Watershed Planning Approach

The water quality impacts of redevelopment and infill projects are best understood in terms of their impact on an entire watershed rather than on adjacent streams. The water quality of streams is determined by the broad land use decisions made in a community. Watershed plans can provide a blueprint for land use that establishes a basis for evaluating development proposals within the broad context of development patterns. Watershed planning can provide a basis for coordination between county and municipal governments on steps needed to protect water quality or to provide flexibility for infill and redevelopment proposals. Infill and redevelopment proposals can be encouraged at the same time that water quality standards are maintained.

A successful watershed plan identifies resource land and water quality issues and develops viable solutions. Such a plan delineates the most appropriate infill and redevelopment sites. It also includes wetland, riparian buffer, and stream restoration areas requiring infrastructure retrofit, enabling developers to readily identify sites and actions for off-site mitigation.

Flexibility

Existing regulations require a reduction of impervious surfaces for most infill and redevelopment projects. They also allow a range of on-site and off-site alternatives to achieve that reduction. For example, regulations require a 20% reduction in impervious surfaces but allow developers to achieve an equivalent reduction on-site, off-site, or by making a fee-in-lieu payment. Projects can include new measures, retrofitting existing facilities, stream restoration, or other BMPs.

In Priority Funding Areas, where it is not always economical to provide stormwater management on-site, the local government should develop a menu of off-site measures in advance as part of a watershed management plan. Local government managers should be trained to encourage such approaches in targeted areas. They should encourage innovative landscaping techniques as a way to achieve reductions in runoff. In some cases, stormwater design flexibility must be coupled with variances from local zoning, building, and construction codes to allow smaller setbacks, narrower street widths, and similar accommodations.

Funding

Redevelopment sites often have a lot of impervious cover and require significant stormwater management to control runoff. Infill and redevelopment sites are generally small, and there is often insufficient area to accommodate on-site management and still retain the economic use of the land. It is often desirable or necessary to look for off-site alternatives to meet mandated stormwater management responsibilities. To ensure the availability of off-site alternatives, local governments should clearly identify where off-site efforts can best benefit the watershed. A coherent policy should govern the use of fee-in-lieu collections to assure that the necessary environmental benefit is realized.

Funding programs for stormwater management should address the maintenance of existing facilities. Local governments should re-evaluate existing maintenance and bonding requirements for private stormwater projects to ensure that sufficient funds are available to keep such projects viable over time. Programs for financing stormwater management should also consider a full range of cost reduction mechanisms and funding opportunities.

The Role of Regulation

The *Clean Water Act* and EPA's associated implementing regulations make water quality restoration mandatory. Key components are permits for wastewater and for "wet weather" controls like stormwater, construction sites, and other sediment and erosion control permits.

Wastewater Permits

The EPA and the State enforce wastewater treatment permit limits that will meet Tributary Strategy goals and achieve and maintain water quality standards. In addition, the Chesapeake Bay Restoration Fund will provide grants to local governments for treatment upgrades necessary to achieve state-of-the-art nutrient removal levels that are necessary to maintain permitted nutrient loading caps for the State's largest wastewater treatment

plants as required by the Bay Permitting Approach established by the EPA and all of the Bay watershed's jurisdictions.

Stormwater Permits

Inspection and compliance for wet weather controls are critical responsibilities at both the State and local levels. In addition, the need to maintain the efficient operation of stormwater control facilities is critical and falls largely to local jurisdictions. Development of stormwater utilities to fund maintenance may be a critical tool to achieve and maintain water quality goals.

The Roles of Offsets and Nutrient Trading

As Maryland's population continues to grow, there will be an increasing need for public infrastructure to accommodate the growth. This may result in some areas requesting additional capacity at their wastewater treatment plants or for an increase in impervious surface for high density living areas. As these situations arise, there will be a need for specific offsets to the increased nutrient and sediment loads that may result.

Potential offsets could include the following:

- **Land Use Changes:** Different land uses release different amounts of pollution. Many factors go into the loads from each land use, including soils, slopes, and existing management. One aspect that is relatively constant is that forested land results in the least amount of pollution. Increasing forest acres could be an excellent means to offset increased pollution from other land use changes resulting from development.

- **"Cross-Source" Partnerships:** Typically four broad sources of Bay pollutants are noted: point sources, urban, agriculture, and air, and that format is followed in this document. There may be opportunities to develop partnerships, agreements, or payments to facilitate additional pollutant controls across these sources (e.g., a local jurisdiction that

wants additional development could pay an agricultural source to install additional practices that might not otherwise be used).

- **Point to Nonpoint Trading:** A wastewater treatment plant seeking additional capacity could purchase or trade for additional nonpoint source controls. An example is installation of BMPs by a waste treatment facility or developer seeking additional capacity.

- **Reductions in Releases to Groundwater:** One example is hooking septic systems to the wastewater treatment plant where treatment to 3-4 mg/l of nitrogen is possible as opposed to leaving the septic systems in place to discharge approximately 15 mg/l. Other technologies are also being examined for their potential to reduce nutrient releases from septic systems.

Future Challenges

Developing and implementing a comprehensive strategy to manage Chesapeake Bay nutrient and sediment load caps will be equally, perhaps even more challenging than achieving those caps. Work to develop many of the core components outlined in this section is already underway; however, assistance and action will be needed at all levels in order for Maryland to implement a Cap Management Strategy. Efforts to coordinate between State agencies and work collaboratively with local governments and other stakeholders must continue indefinitely until regulations, processes, and programs are in place to maintain nutrient and sediment caps. MDE is currently drafting guidelines for administering nutrient offsets and trading, drawing upon similar efforts underway in Pennsylvania and Virginia. The draft guidelines were circulated for interagency and intergovernmental review from October through December 2005.

Focus Areas to Target Additional Research, Demonstrations, and Outreach

The development of the Tributary Strategy to meet the newly established nutrient and sediment loading caps has shown that aggressive implementation of the current suite of approved BMPs is critical, requiring, in some cases, nearly a 100% participation in some sectors. Even with this degree of implementation, these current practices alone will not reach the nutrient and sediment reduction goals. *Maryland's Tributary Strategy Statewide Implementation Plan* needs to assume vigorous demonstration, outreach, and funding components to reach the level of adoption envisioned in the Tributary Strategy. The plan also needs to enact a serious research effort to verify the effectiveness of some key new technologies and management strategies and implement them in the near-term.

Recommended Future Actions

Urban/Suburban Nonpoint Sources

The State and local governments need to continue working with partners, such as the American Homebuilders Association, Builders for the Bay, LID Center, and urban planners, to identify and pilot cost effective retrofits in high impact subwatersheds. An immediate need is to target critical areas where septics play a significant role in nutrient impairment. The State should leverage the Chesapeake Bay Restoration Fund with private and public grants and establish partnerships with university researchers and septic system vendors to set up commercial and residential demonstration sites accompanied with widespread outreach and education to local and county officials, real estate developers, and homeowner associations.

Agricultural Nonpoint Sources

Research, demonstration, and outreach in this area need to focus on technologies and strategies that begin addressing the long-range goal of nutrient balancing at the regional and subwatershed level. Critical innovations that need investment and are ripe for public and private partnerships must target animal and crop production in the following key areas:

- **Manure Management:** Recent workshops of scientific experts are reaching consensus that feed management is the single most promising and cost effective approach for reducing excess manure nutrients. Maryland has already instituted phytase management in chicken feed with a demonstrated 16% reduction of phosphorus in the manure. The State and university must begin a large scale educational assistance effort with NRCS' technical expertise to adopt and implement the NRCS Feed Management Conservation Standard that provides EQIP monies to participating producers.

The educational effort partnering with dairy and beef growers must also emphasize the priority the State gives to these practices, particularly in those critical subwatershed areas that are impacted the most by manure runoff. A companion research effort should coordinate the university's and the USDA ARS's ongoing animal diet research for poultry, dairy, and beef to provide the most comprehensive and up-to-date information for use by field extension personnel. Other priorities for manure-related research and demonstrations that promise long-range results include market development for manure-based products initially supported by State use and purchasing goals and educational campaigns and the use of manure as feedstock for bio-energy demonstration pilots.

- **CROP PRODUCTION:** The *Maryland Tributary Strategy* calls for an extensive adoption of new BMP technology, especially in the area of precision agriculture and cover crops. A significant investment is necessary in outreach and demonstration, especially to ensure implementation by farmers at a critical mass level in the necessary key subwatersheds. Demonstration pilots and broad-scale educational efforts must include types and availability of techniques and equipment for balancing fertilizer application, yield- and cost-benefits (these include sensors, injections systems, rates, etc.). Research into optimum cover crop varieties, timing, and opportunities for their use as an additional income stream, such as hulless barley for ethanol use, could vastly

improve both the effectiveness and adoption. Additional funding, demonstration, and outreach programs must be established throughout the State to reach the near 100% level of implementation.

POINT SOURCES

ENR technology is largely available and understood for wastewater treatment plants and could be used by smaller facilities to maintain loads established in the ENR Strategy. For those facilities where such costs are prohibitive, the State, Federal and local governments need to invest in research that increases cost effectiveness on a smaller scale and that looks to pollution prevention strategies for waste streams entering the facilities, especially in new or expanding communities. Education and outreach should address those pollution prevention opportunities at the local community level and should be coordinated with urban and suburban stormwater and wastewater planning. Immediate educational efforts could focus on critical subwatersheds, such as areas on the lower Eastern Shore, where high water tables, increasing flooding, and new development are converging.

Tracking and Monitoring Progress

Effectively communicating progress on the restoration of the Chesapeake Bay to all stakeholders and the general public is an essential component of this implementation plan. Timely and accurate reports on BMP implementation and subsequent changes in water quality keep all responsible parties accountable for making progress and educate the public about the connections between watersheds, water quality, and the ecosystem's resiliency.

Past restoration progress reports have focused on a myriad of disparate indicators of ecosystem health or depended heavily on complex computer models with many assumptions that integrated watershed health with water quality. While these efforts are helpful and were often ahead of their time, a new, more integrated and comprehensive approach to reporting restoration progress is necessary to avoid confusing and sometimes conflicting Bay health messages.

Starting in August 2004, a group of scientists and communicators sponsored by the EPA Chesapeake Bay Program, representing all six Bay watershed States and the District of Columbia, met to map out a new approach to reporting Bay restoration progress. The outcome is a series of four annual reports providing regular communications to stakeholders and the public on the restoration and health of the Chesapeake Bay and its watershed. The reports will provide an assessment of what restoration actions are taking place in the Bay watershed and in Maryland; how these actions influence the stressors on the Bay; and, in turn, how all this affects the Bay's health.

Specifically, the information will include the following:

- **Chesapeake Bay and Watershed Restoration:** A report on indicators used to measure and communicate specific actions being implemented to improve the Chesapeake Bay's health. Examples include agricultural BMPs, wastewater treatment upgrades, land use changes, changes in impervious cover, fisheries management actions, etc.

- **Chesapeake Bay and Watershed Stressors:** A report on indicators used to measure conditions and factors that are affecting the Bay's health. For example, monitored loading of nutrients and sediments entering the Bay each year, harvest of fish and shellfish, etc.

- **Chesapeake Bay Ecosystem Health:** A report of indicators used to assess the ecosystem health of the Chesapeake Bay and its tidal tributaries. When the necessary information is available, a similar, but separate group of indicators

for the nontidal rivers, stream corridors, and surrounding watersheds will also be developed. Examples include the extent of the Dead Zone, or anoxic area, in the Bay; measures of water clarity and algal growth; and populations of keystone fisheries.

Communication Strategy

The EPA Chesapeake Bay Program and DNR will communicate these indicators of progress, providing an overall baywide prospective as well as tributary basin and watershed level details. Baywide information will be communicated through a series of four reports with Maryland-specific information reported as part of the larger reports on a periodic basis and as requested throughout the year.

The four annual reports include the following:

1. A late spring forecast of water quality in the mainstem of the Chesapeake Bay for the coming summer months. This includes a prediction of the extent of the anoxic zone in the Bay, possible outbreaks of harmful algal blooms in the Potomac River and other tributaries (future), and expected changes in submerged aquatic vegetation coverage in Maryland and baywide.

2. A fall report of actual water quality from the previous summer, including an explanation of how conditions compared to forecasts and highlights of the impacts of weather, management practices, and other factors on observed water quality.

3. A winter report to comprehensively assess the implementation of restoration actions to reduce the flow of nutrients and sediments to the Bay. This will include BMP implementation, upgrades to wastewater treatment plants, the extent of impervious surface cover in developed areas, land preservation, air quality controls, etc.

4. In early spring of each year, an annual assessment of the key indicators of the Chesapeake Bay's health will be reported. This report will provide an integrated assessment of Chesapeake Bay ecosystem conditions, including water quality, fisheries, resource populations, and forage and habitat for important Bay fisheries.

The first of these reports was released in the late spring of 2005. Data and analysis for the remaining reports are being compiled in hopes of providing timely updates to stakeholders and the public on the state of the Chesapeake Bay and the health of its watershed. As information and tracking processes improve, these reports will be more timely and will provide more, readily understood assessments on how the Bay is doing and whether Maryland is fulfilling its commitment to implement BMPs and restore water quality in the Chesapeake Bay and its tributaries.

Acronyms

best management practice – BMP

biological nutrient removal — BNR

concentrated animal feeding operation — CAFO

Conservation Reserve Enhancement Program — CREP

Conservation Reserve Program — CRP

Conservation Security Program — CSP

enhanced nutrient removal — ENR

Environmental Quality Incentives Program — EQIP

Environmentally Sensitive (Site) Design — ESD

equivalent dwelling unit — EDU

Low Impact Development — LID

Low Interest Loans for Agricultural Conservation Program — LILAC

Maryland Agricultural Water Quality Cost-Share Program — MACS

Maryland Department of Agriculture – MDA

Maryland Department of Natural Resources — DNR

Maryland Department of Planning – MDP

Maryland Department of the Environment — MDE

Maryland Water Quality State Revolving Loan Fund — WQSRF

milligrams per liter — mg/l

municipal separate storm sewer — MS4

National Pollutant Discharge Elimination System — NPDES

Natural Resource Conservation Service — NRCS

Nutrient Management Plan Implementation — NMPI

Rural Abandoned Mine Program — RAMP

Total Maximum Daily Load — TMDL

U.S. Department of Agriculture – USDA

U.S. Department of Agriculture Agricultural Research Service — USDA ARS

U.S. Department of Agriculture Cooperative State Research, Education, & Extension Service — USDA CSREES

U.S. Environmental Protection Agency – EPA

wastewater treatment plant – WWTP

Wetland Reserve Program – WRP

Technical Appendix

Technical information about the Tributary Strategy, including BMP descriptions and photos, implementation goals, estimated nutrient removal benefits, cost projections, funding sources, and progress reports, will be posted on the Maryland Department of Natural Resources Tributary Strategies webpage in the Documents and Reports section located at http://dnrweb.dnr.state.md.us/watersheds/surf/bmp/.

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