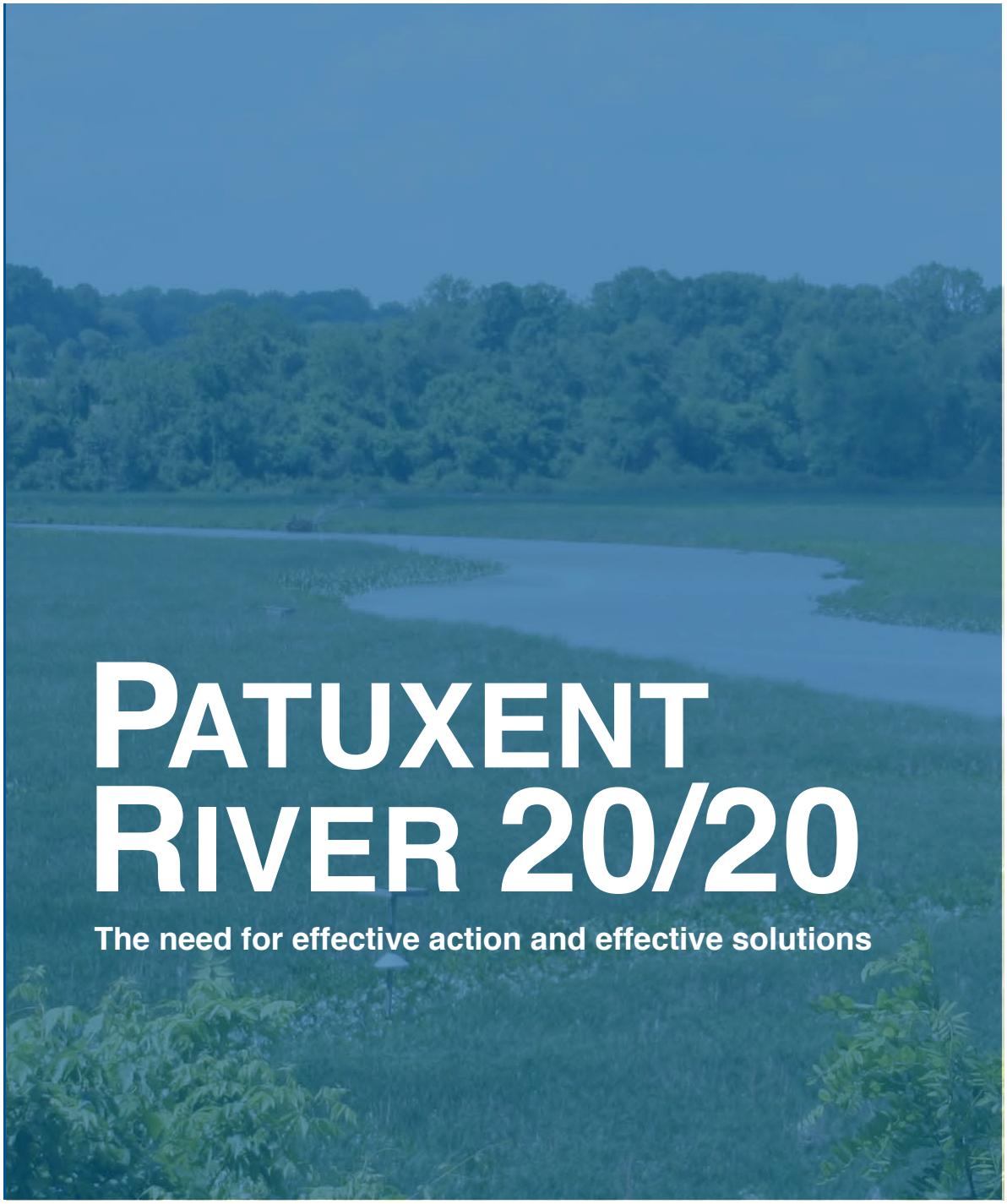

Patuxent River 20/20

The need for effective action and effective solutions

Patuxent RIVERKEEPER®

December 2007

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Acknowledgments

This report was authored by Jennifer Bevan-Dangel and Fred Tutman.

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The authors alone bear responsibility for any factual errors. The views expressed in this report are those of the Patuxent Riverkeeper and do not necessarily reflect the views of our funders.

The Patuxent Riverkeeper is a 501(c)(3) organization. The Patuxent Riverkeeper works to conserve, protect, and replenish the State's longest and deepest intrastate waterway. Our tools include strategic advocacy, restoration, and education to achieve long-term sustainability for the ecosystem of the entire Patuxent River Basin and the people who rely on its future.

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Foreword

We, the Patuxent River Commission, envision a Patuxent River ecosystem as vital and productive in 2050 as it was in 1950. We are committed to being stewards and advocates for the River and to lead and inspire actions to protect, enhance, and restore living resources and the natural, cultural, economic, and recreational values of the river and its watershed.

The Commission applauds the efforts of those who have worked to produce this comprehensive report on the issues that most affect the river today. Each of the factors covered here must be addressed, and soon, if we are to restore the river to its rightful place in Maryland's ecosystem.

The Commission's membership includes watermen, farmers, academics, developers, businessmen, environmentalists, and interested citizens as well as representatives of state, regional, and local governments, utilities, and a federal facility. Because our interests are so diverse, unanimous agreement on any one recommendation in the 20/20 Plan would be a lofty goal indeed, but this varied group of stakeholders is united by their desire to see the river restored.

During 2008, the Commission intends to review and update the Patuxent River Policy Plan, the document mandated to be used as a policy guide by local jurisdictions and units of state government in carrying out their actions and regulatory programs in the watershed.

We recommend that the 20/20 Plan be read by everyone concerned with the health of the River and we commit to using it as a basis of discussion in our stakeholder meetings on the Policy Plan.

The Patuxent River Commission is a 34-member inter-jurisdictional body created by the State Legislature in 1980 to provide guidance on land use and governmental policies in the Patuxent watershed with the aim of promoting the protection and restoration of the river.

Summary

In October 2006, advocates and local leaders held the first annual State of the River Summit at the Calvert Marine Museum in Solomon's Island. Over 200 people gathered to take stock of the current state of the Patuxent and the effectiveness of previous attempts to restore it. At that Summit the problems facing the watershed were identified and a dialogue was started over the need for action. This paper is a result of that call to action.

This paper is the first step in developing a specific action plan to start restoring the Patuxent River. It identifies the primary sources of pollution in the Patuxent and the short- and long-term steps required to address them. *Patuxent 20/20* was developed by integrating existing studies and reports on the river into a single document. It provides a brief overview of the Patuxent River, including a characterization of the watershed, the water quality challenges it faces, a history of restoration efforts, and an examination of the barriers to its restoration. *Patuxent 20/20* then delves into the actions needed to restore the river, analyzing the steps needed to address growth and development, land preservation, point sources, agriculture, air deposition, and management of the resource.

Through the spring and summer of 2007 the Patuxent Riverkeeper compiled the available data on the river and held extensive interviews with local and state advocates, citizen groups, and decision makers. The Riverkeeper staff then produced a first draft of this report based on that information. The preliminary draft of the report was sent to the Patuxent River Commission as well as local and state advocates for peer review and feedback. After feedback and editing a working draft was prepared for the State of the River Summit in October. Comments received during the Summit and further feedback were incorporated into the final document, which was released in December 2007.

Pollution in the Patuxent comes from four main sources: development, agriculture, air deposition, and individual polluting facilities. Development, some of which relies on wastewater treatment plants, has the most significant impact on water quality in the Patuxent watershed, followed by agriculture and air pollution. The individual facilities are the smallest source of pollution in the watershed.[1]

There is no single solution that will restore and protect water quality; the solutions are multiple and sometimes overwhelming. But this report finds that there are specific actions that can be taken immediately to protect the river. These actions are a combination of enforcing and funding existing laws and planning for the changes that are to come. These actions include both short-term (within the next two years) and long-term (within the next five to ten years) steps that must be taken to protect the Patuxent.

PRIORITY SHORT-TERM ACTIONS INCLUDE:

- The State should finish creating numeric pollution limits for nutrients in the Patuxent and its tributaries (TMDLs) to enable local governments to implement the Water Resources Element into their growth plans, as required by recent legislation.[2]
- The local governments should update their growth plans with clear standards for where and how growth should occur and where open space must be preserved. Zoning should be amended to accurately reflect those plans. Zoning in preservation areas should reflect that goal and allow minimal development, such as one dwelling unit per 25 acres for resource protection areas.
- The State and local governments should appropriate sufficient funding to aggressively enforce critical areas, wetlands, stormwater, and erosion laws to protect stream buffers from human impact.
- The State and local governments should make significant changes to their stormwater management regulations to require green development practices to mitigate the impact of polluted runoff, as required by recent legislation.[3]
- The State and counties should establish new revenue sources to fund stormwater retrofits.
- Local governments should establish a revenue source and leverage available federal and state funds to upgrade their minor wastewater treatment plants. Local governments should force private wastewater facilities to comply with pollution limits and upgrade their facilities. Federal facilities should also be upgraded.
- The State and local governments should provide adequate funding, technical assistance, and enforcement to ensure that farmers can and are implementing nutrient management plans on their farms to minimize polluted runoff.
- The State and local governments should plan for mass transit programs, including both rail and bus, by planning for transit oriented development and providing sufficient funding for transit programs.

Paddlers at the Annual Patuxent River Sojourn.

PRIORITY LONG-TERM ACTIONS INCLUDE:

- The State should establish a plan to bring all pollution sources on the Patuxent within the numeric limits (TMDLs) set above.
- The State should continue its efforts to preserve land along the Patuxent to provide a green infrastructure for habitat and water quality protection. The State should work with local governments and private organizations to ensure land is purchased in a proactive and comprehensive fashion.
- As population grows, local governments should ensure that appropriate pollution removing technology is installed in all treatment plants so that the net pollution from these plants does not increase with increased flows.

Long time advocates for the Patuxent see a growing acceptance of poor river quality among citizens and government officials. The success of policies and regulations must be judged not by what they are but by what they do for the river. Residents, legislative officials, and regulatory agencies must all feel that culture shift. 2008 is the 400th anniversary of the first discovery of the Patuxent by explorer Captain John Smith. Maryland can honor that milestone by envisioning the river the way Smith saw it and taking action now to protect it.

This report shows us how to restore the river. We must now commit to a timeline for making that happen.

Introduction

> ***"We shall need compromises in the days ahead, to be sure. But these will be, or should be, compromises of issues, not principles. We can compromise our political positions, but not ourselves. We can resolve the clash of interests without conceding our ideals."***
>
> ***~ John F. Kennedy[4]***

In 1981 the State of Maryland and the seven counties in the Patuxent River watershed agreed to a critical goal: to restore the water quality in the Patuxent River to what it was in 1950.[5] But over 26 years later, those jurisdictions have failed to meet that goal.[6] Despite some initial progress, water quality in the Patuxent continues to decline, sedimentation continues to increase, and fisheries continue to shrink.

Citizens and advocates for the river are growing frustrated by the lack of progress on restoring the river. As one citizen observed, "We know what needs to be done. We just need to stop fooling around and start doing it!"[7] This paper is the first step in developing a specific action plan to "start doing it."

Patuxent 20/20 lays out the policy and regulatory actions needed to restore and protect the Patuxent River. The report relies heavily on two primary sources of background information on the Patuxent. The Maryland Tributary Strategies plan for the Patuxent River provides the most comprehensive scientific background on the pollution sources in the river.[8] The Patuxent River Commission's policy plan identifies the broad policy recommendations that the State and local governments have already committed to for protecting and restoring the river.[9] A full bibliography is included as an appendix to this report.

This report attempts to avoid scientific or technical minutia while providing a clear, concise summary of the problems and solutions that will restore the watershed. It also attempts to provide a comprehensive list of the problems and actions needed for full restoration of the river. Just as an individual suffering from multiple diseases would urge his medical team to treat each illness, so too must restoration efforts on the Patuxent address each source of pollution.

At its core, *Patuxent 20/20* finds that restoration of the Patuxent River requires a substantial change in how we approach development, agricultural runoff, air pollution, and pollution from point sources such as wastewater treatment plants. New strategies, meaningful enforcement, and broad public support must be developed if the river is to be restored. Failure to take serious action threatens the future of the Patuxent, including the communities that rely on it for drinking water in the north and for commercial fisheries in the south. Failure to clean the Patuxent also offers the chilling implication that, if we can't clean Maryland's river, we can't clean the Chesapeake Bay.

Patuxent 20/20 was first released at the Second Annual State of the River Summit in October 2007. The Summit, hosted by the Calvert Marine Museum, brought together citizens, scientists, and government officials to discuss the actions needed to restore the river. A panel of State and county officials discussed the report and the actions it calls for. The panel was aware of the need for action, and supported several of the specific actions called for in the report. More importantly, all of their presentations touched on the basic needs: planning, enforcement, funding, and increased cooperation.[10]

But in the end, what happens as a result of this document rests in the hands of readers like you who will define the course of the Patuxent's future. Through your engagement, your involvement, and your commitment you will determine our ability to protect one of Maryland's greatest rivers and one of nature's greatest gifts—clean water.

WHY PROTECT THE PATUXENT?

While the extent and breadth of actions needed to restore the river can appear daunting, the cost of inaction is incredibly high. It is worth taking a moment to remember the many reasons why the river is worth the hard work required to restore it.

We are the stewards of healthy land and clean water for our children. The Patuxent River that John Smith visited during his explorations 400 years ago was rich in marine life. This bounty sustained the 1,800 Algonquian-speaking natives living in the region at the time and the economies of local communities for centuries. We have not been prudent stewards of the bounty we inherited from them. Through pollution, over consumption, and excessive economic development, we have not only depleted once valuable fisheries, but also polluted the land, damaging its beauty and impairing its ability to nourish and sustain us. We have been poor stewards of the land that we were given, and are leaving future generations a world where they will be unable to thrive in a healthful environment.

Maryland has the ability and capacity to restore the river. Maryland is now the state with the highest family incomes in the nation, with a stable job market, a high quality of life, and a deep appreciation for the ever diminishing natural and agricultural resources of the region. A society so blessed with success can ensure continued prosperity only by bold new initiatives. The mission for the greater Washington region is to balance economic growth while also restoring the health and vitality of this still productive estuary. If Maryland cannot succeed, then no one can.

The law requires it. The Clean Water Act of 1972 mandated that the Environmental Protection Agency (EPA) employ a variety of regulatory and non-regulatory

tools to sharply reduce direct pollutant discharges into waterways as well as make money available for municipal wastewater treatment facilities.[11] Furthermore, in December 1981, the seven counties along the Patuxent River concluded a binding agreement (called the Patuxent Charette) that committed these jurisdictions to reduce the flow of nitrogen and phosphorous from sewage plants into the river to specified levels.[12] Neither legal obligation has been fulfilled. While there were some initial improvements in water quality as a result of the treatment of municipal sewage, population increases have eroded those reductions.

Significant reductions in nutrient pollution have been followed rapidly by improvements in water quality.[13] Very shortly after sewerage treatment plants began removing large amounts of nitrogen and phosphorous from the Patuxent in 1992, it responded very quickly with signs of recovery. Within two years, underwater vegetation began returning to sections of the upper river. Unfortunately population increases have offset these initial reductions and allowed more nitrogen and phosphorous to flow into the river.[14] But further restoration efforts should result in a similarly rapid recovery.

Maryland's citizens and leaders should take pride in removing from our river the pollution we created. The Patuxent is the longest river totally enclosed within Maryland. Apart from air-borne chemicals produced from out-of-state power plants, virtually all the pollution tainting Patuxent waters is produced in Maryland. This can be cleaned up without cumbersome coordination with other states. The river's pollution is of our making, and its restoration is our responsibility.

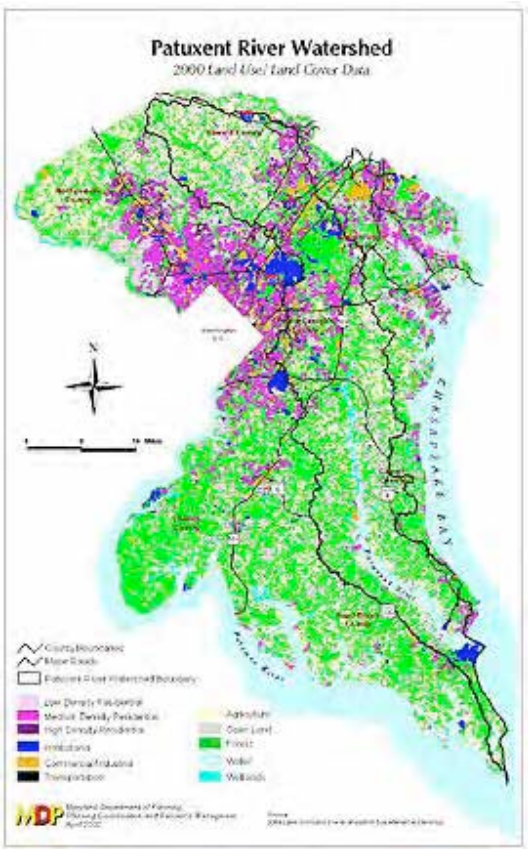
A successful restoration of clean water in the Patuxent River would provide a powerful precedent for restoring the Chesapeake Bay. The Patuxent is a microcosm of the Bay because its economy, population density and sources of pollution are parallel. If Maryland officials cannot clean pollution from a river that is completely within one state, then there is little hope of marshalling the technical knowledge, political will, and financial resources to clean up the Bay. A successful effort to reduce pollution in the Patuxent would not only restore the natural beauty and bounty to a historic Maryland waterway while providing an outdoors recreation opportunity for the region, but would also provide an effective model for restoring the Bay.

Continued growth in pollution threatens both surface and ground sources of drinking water. The quality and quantity of the reservoir and groundwater sources of drinking water are essential for sustaining current and projected future growth in the region. Reservoirs in the north of the Patuxent River provide drinking water for residents of Montgomery and Prince George's counties, and groundwater flowing to the Patuxent provides drinking water for many residents in the south of the watershed. The continuing rise in pollution could contaminate reservoirs, streams, and groundwater and require expensive new systems to

make water potable. The expansion of impervious surfaces could decrease groundwater levels, which already threatens future growth in Charles County.

Maryland needs to protect a valuable economic resource. A large part of the economy of the Patuxent basin is dependent on its historic presence as an active commercial fishery and its emerging presence as a beautiful and wholesome place in which to live, work and recreate. Continued growth in pollution will undermine the economic base of the
region. The depletion of the fisheries threatens the already shrinking commercial fishing industry. Home values will fall as the river dies.[15] Failing water quality will harm the growing tourism and recreation industry, from recreational fishing to kayaking to bird watching, and diminish the supporting infrastructure including motels and restaurants.

BACKGROUND ON THE PATUXENT CHARACTERIZATION OF THE WATERSHED



Source: Maryland Department of Planning

The Patuxent River is the largest river with a watershed located entirely within the state of Maryland and one of the eight major tributaries to the Chesapeake Bay.[16] The basin includes roughly 64,000 acres (930 square miles) across seven counties, encompassing one-tenth of the State's total land area.[17] 110 miles long, by the time it reaches the Chesapeake Bay the Patuxent River is over a mile wide and 175 feet deep, making it the deepest river in Maryland.[18] Roughly half its length is considered tidal.

The headwaters of the river are found near Mt. Airy, where Montgomery, Frederick, and Howard counties meet. Five main tributaries, the Western Branch, Middle Patuxent River, Little Patuxent River, Cabin Branch, and Collington Branch, as well as several smaller tributaries comprise the total drainage of the Patuxent watershed.[19] Over a fourth of the watershed, 28%, is in Prince George's County. Howard County is next at 21%, and Calvert County is third with 18%. Anne Arundel County holds 14%, St Mary's County 9%, and Montgomery County 7%. Charles County contains the smallest part of the watershed with 3%.[20]

The river provides a diverse and varied habitat for fish, birds, and other animals. There are cold water trout streams in the far north of the River in the State preserved Patuxent River Park, whooping crane breeding grounds in the Patuxent Wildlife Refuge, vast marshlands in the Jug Bay Wetlands Sanctuary, and open water fisheries around Solomon's Island at the river's mouth. The river is home to more than 100 species of fish, including bass, catfish, chain pickerel, and bluefish,[21] and provides nesting grounds and habitat for bald eagles, blue herons, osprey, and numerous other bird and animal species.[22]

Ospreys are one of the many birds commonly seen on the Patuxent.

The human footprint on the river is formidable. There were once great iron foundries in the north, active dams and mills in Savage Falls near Columbia, and industrial sites near Laurel. Two dams were built to create drinking water supply reservoirs between Montgomery and Howard Counties. Surface mining sites pocket Prince George's and Anne Arundel, while major federal military installations span the river. Sprawling development continues to convert land throughout the watershed, with an immediate increase in housing coming in the next few years as a result of base realignment and closures (BRAC) nationwide.[23] Over twenty major and minor wastewater treatment plants and countless septic systems are spread along the Patuxent's length to support that growth.[24]

Current estimates for land cover in the watershed are: 30% developed, 23% agriculture, 43% forest, 3% water, and 1% barren.[25] The most urbanized areas include Columbia, Bowie, Laurel, and the southern edges of Ellicott City. The Maryland Department of Planning projects that the population of the Patuxent watershed will increase by 200,000 people to nearly 1,200,000 residents in 2020.[26] If recent trends continue the impact of population growth on the watershed will far exceed the actual rise in population, as the amount of land lost to development far outpaced the actual rate of population growth in the last thirty years.[27]

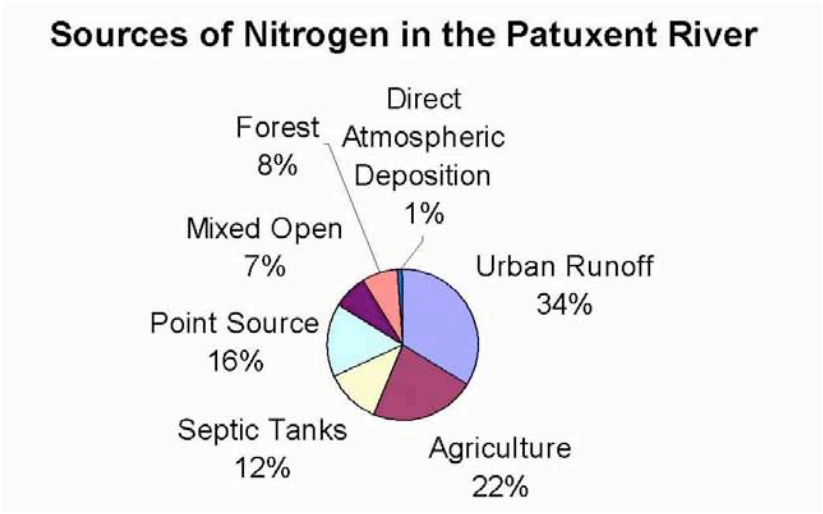
WATER QUALITY AND THE PATUXENT

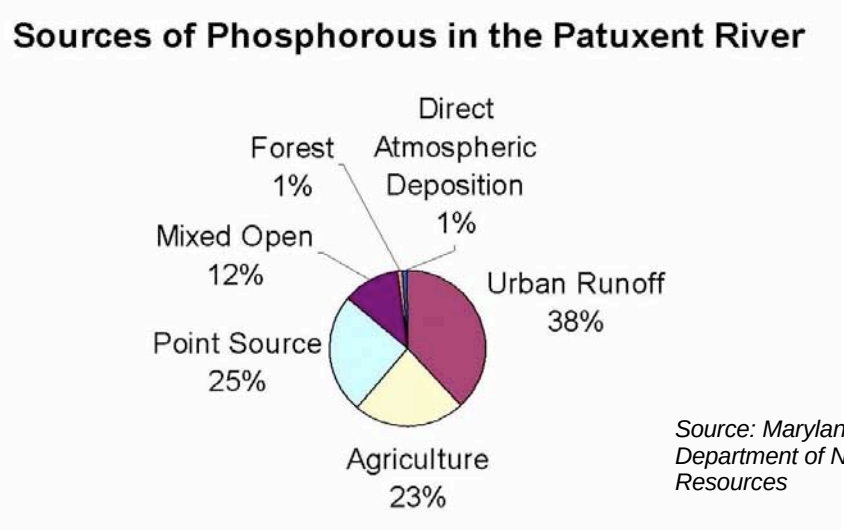
The main pollutants that impair water quality in the Patuxent are nitrogen, phosphorous and sediment. Nitrogen and phosphorous feed algae blooms in the river, which block sunlight from entering the water and impair survival of plants and animals that live on the river floor. When the algae die the decomposition process consumes all the available oxygen in the water, creating dead zones where living things cannot grow. These oxygen-deprived "dead zones" have been growing in size and duration. Sediment also impairs river life by smothering grasses and oyster beds.[28]

The nutrient pollution in the river has been termed 'nutrient obesity'.[29] This term encompasses the basic nature of nutrient pollution; it comes from too many sources in too large a quantity. In 2005, 34% of the nitrogen in the Patuxent

came from urban runoff, 22% came from agriculture, 16% came from point sources such as wastewater treatment plants, 12% came from septic systems, and 1% came from direct atmospheric deposition to the water.[30] The sources of phosphorous were roughly the same, with slightly more coming from point sources such as wastewater treatment plants instead of septic systems.[31] Just over half the sediment in the river comes from agriculture with another fourth from urban runoff.[32]

Generally speaking, pollution loads have gone down over the last thirty years. However, recent water quality monitoring trends show pollution to be slowly increasing and water clarity to be steadily decreasing over the last decade.[33] Habitat is degrading as well, particularly in the middle section of the river.[34] And algae blooms, including toxic algae blooms, have been increasing in the lower regions of the river.[35] Grasses in the lower part of the river are only at 10% of their restoration goal.[36]





Source: Maryland Department of Natural Resources

Other contaminants also impact water quality. Runoff from developments carries toxins including oils, pesticides, and other chemicals from roads, lawns, and parking lots directly into the water.[37] This can change water temperature, harming cold-water fish species such as trout; and increase water velocity, causing stream bank erosion when storms occur.[38] Runoff from farms contains sediment, fertilizers, and pesticides.[39] Various individual facilities, from small permit holders such as gas stations to large federal facilities such as the Patuxent Naval Air Station, contribute additional toxins such as arsenic, chlorine, mercury, and lead into the river.[40] In some areas of the river nutrients or other pollution sources have caused pollution 'hot spots', areas of intense pollution.[41]

The middle section of the Patuxent River shows the impact of sediment pollution and stream scouring, but still provides good habitat and a scenic paddle.

Restoring water quality will require addressing all types and sources of pollution in a comprehensive, meaningful way.

HISTORY OF RESTORATION EFFORTS

Strong citizen advocacy has restored the river before, and can do so again. From the 1940s to the 1960s, the middle Patuxent drainage was the focus of efforts to address major soil erosion stemming from the post-World War II housing boom in the Bowie area and the related expansion of gravel operations to provide building materials for that boom.[42] The Maryland Water Pollution Control Board responded to substantial interest in the problem by developing a sediment control act for the Patuxent River watershed. These were the first soil containment practices for the Bay region backed with state enforcement power. They were so successful that they were extended to the entire state in legislation passed in 1969.

In the 1970s, the Commissioners of the three southern counties in the watershed were concerned about the large amount of pollution that upriver wastewater treatment plants were dumping into the river and the effect that this was having on downriver water quality. They concluded that the State was not compelling wastewater treatment facilities to comply with the Federal Clean Water Act, and in 1979 they filed a lawsuit to force upgrades to the plants. The State of Maryland settled the law suit through a consensus-driven negotiation in December of 1981, commonly referred to as the Patuxent Charette. Their aim was to develop a unified strategy to restore the river.

From the Charette came a renewed State commitment to enforce Federal and State laws and to seek mandatory compliance with water quality goals for the river. Maryland greatly overhauled its State Water Restoration Plan and enacted the Patuxent Watershed Act of 1984 to create the Patuxent River Commission. The Commission's role is to monitor and advise the State and the seven counties on policy matters related to the Patuxent. The Commission promulgates the

Bernie Fowler ,center, is joined by Delegate Kullen, Senate President Miller, Governor O'Malley, Attorney General Gansler, Betty Fowler, and Senator Dyson at the 2007 Patuxent Wade-In. (Congressman Hoyer not shown.)

Patuxent Policy Management Plan, which is a set of visions, guidelines and recommendations for protecting the river.

For several years after the Patuxent Charette there were measurable gains in water quality on the Patuxent. This was an historical achievement for the Patuxent River and a model for other rivers and the Chesapeake Bay. But over the last decade the gains made in the 1980's have been more than offset by the impact of population expansion throughout the watershed. The water quality problems are similar, but the causes have broadened and shifted. While wastewater outflows and runoff from agriculture still play a significant role in overall loads into the river, runoff from construction sites and development has increased significantly.

Several State policies over the last few years have begun to address the problems associated with development and other pollution sources, but these are just the first steps in a long process. The Chesapeake Bay Restoration Fund, created in 2004, will generate significant funding for upgrading wastewater treatment plants including those in the Patuxent. The water resources element required by legislation in 2006 will force counties to analyze their impact on water quality as they continue to grow and develop. Finally, the Stormwater Management Act of 2007 will change the way developers build by requiring more environmentally sensitive design and less runoff from new developments.

These key bills build upon a framework of state legislation that provides funding for open space protection, limits growth in the buffers around tidal rivers and bays, protects wetlands and forests, requires farmers to establish plans that limit their nutrient runoff, and encourages new growth in areas with existing development. These laws provide a basic structure to protect the Patuxent River watershed, but loopholes, lack of enforcement, and changes in development patterns inhibit the realization of their full potential.

In addition, the goals and strategies of the Patuxent Charette have never been fully realized. As the Chesapeake Bay grew as the preeminent concern for state policy makers, the Patuxent River has been relegated to a secondary problem.[43] Proponents seeking fulfillment of the States' original promise to the Patuxent have tried vigorously to draw attention back to the original Charette Goals and the pre-existing commitments made by the State to the river.[44] However, the Commission's authority has been limited by the fact that it is simply an advisory body without true legislative powers; its recommendations are voluntary, not mandatory.

Scientific analysis shows that the river can respond in as little as two years to restoration efforts. Through developing and adopting a cooperative action plan, the seven counties and the State are in a position to be national leaders in planning,

regional coordination, increased enforcement, and leveraging local, state and federal funding. The Patuxent can again serve as the model for government action and watershed restoration. All that is needed is the renewed drive to make it happen.

The Patuxent Riverkeeper engages in river patrols and responds to citizen complaints, providing a voice for the river.

THE BARRIERS TO RESTORATION

With so much history and importance defining the Patuxent River, many citizens and advocates cannot understand why more progress has not been made to restore it. Unfortunately for the river, political and financial decisions do not happen in a vacuum. Legislative and regulatory bodies make tough decisions about which policies to enact and which programs to fund – decisions that often happen with too little input from citizens.

Elected officials must become experts on a wide variety of issues, ranging from health care to education to the environment. Often operating under tight timeframes, such as the ninety day session for the State legislature, officials must deal with multiple issues from a variety of constituents. Those constituents who are vocal, engaged, and informed help shape the decisions that are made and give officials the encouragement needed to prioritize their particular concern above all the others.

Elected officials must make similar choices when allocating funding. With a State deficit of over $1.7 billion, finding the money needed to fully staff environmental agencies and fund conservation practices is a challenging task. Protecting the Patuxent is an investment in the future; a future with a thriving economic base, clean air and water, and healthy citizens throughout the watershed. But investing in benefits tomorrow is hard when vocal interests clamor for funding today. Citizens who care about the environment must make sure their representatives hear their voice, and must urge those representatives to support funding choices that protect the Patuxent.

Funding shortfalls impact regulatory agencies at both the State and local level. Understaffed agencies cannot adequately enforce the laws they are charged to oversee.[45] Violators of the law often recognize staffing shortfalls and abuse the lack of oversight either by intentionally misrepresenting their actions or by neglectfully failing to follow the laws. The lack of enforcement undermines public confidence in and compliance with environmental laws and regulations.[46] Even citizens who wish to follow the law often have no one to help them understand what actions they can and should take to stay within legal limits. Without adequate

Citizens gather to support the environment at Lawyer's Mall in Annapolis. (Photo: Maryland League of conservation Voters)

Citizens turn out to protest a poorly planned development in Anne Arundel County.

enforcement and outreach, Maryland's existing environmental laws end up providing little protection at all.

The solution to these barriers rests in education and appreciation for the importance of the Patuxent River. Residents of the watershed have become accustomed to and even comfortable with the current levels of pollution. They do not understand the cumulative effect of pollution over the years, or have an appreciation for what the Patuxent looked like just half a century ago.[47]

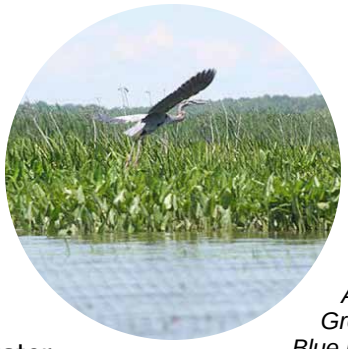
A false sense of invulnerability has numbed many residents to the potential health threats from pollution, despite reports of fecal coliform closing beaches in the river and fish consumption advisories. Other residents, due to increased social and economic mobility, view the river as a resource to be used and plan to simply move on once the economic benefit is gone.[48] Education and outreach programs, while they have only a limited impact on the reduction of nutrients in the river, are vital to raising the political and public awareness of the need to protect the river.

Making substantial reductions in nutrients and sediments also requires the public to begin re-thinking the impacts they have on pollution. Small individual activities such as installing rain gardens and rain barrels, upgrading septic systems, household water conservation, and using public transportation systems have cumulative effects on pollution levels. More importantly, they increase the public's engagement on the issues of clean water and create a base for political will.

There also needs to be more coordination and integration among the seven counties and the various State agencies. Understanding successful restoration policies and approaches in other jurisdictions provides elected and regulatory officials at the local level with ideas for their own jurisdiction. Coordinating actions among the various State agencies ensures that environmental laws are being used to their utmost to fully protect this resource.

Studies have shown that voluntary programs are not enough to restore and protect water quality. [49] This fact is circular. Officials cannot expect the public to protect the river or follow the laws without proper enforcement and outreach. But citizens cannot expect elected officials to pass strong policies and allocate adequate funding for the river without public engagement, because competing interests will always demand those resources. Legislators must remain tough with their demands and fund adequate enforcement, and citizens must be vocal about their support for those actions. Achieving both will take citizen awareness, policy reform, and vigilant enforcement.

Blueprint for Change: Comprehensive Actions and Policies Required to Restore and Protect the Patuxent



A Great Blue Heron takes flight on the Patuxent River.

This section analyzes the major sources of pollution within the watershed and the immediate steps required to prevent or restore the damage that has been done. The areas covered include development, preservation, farming, air pollution, point sources, and comprehensive management of the river.

History shows that taking serious action to protect the river has almost immediate results in improved water quality. When the wastewater treatment plants were upgraded following the 1981 Charrette agreement, water quality responded within just two years.[50] But gains in water quality can be just as quickly turned around without continued advocacy at every level, as seen by the recent downturn in water quality.[51]

Patuxent 20/20 strives to provide a comprehensive list of policy and regulatory actions, and as such it does not cover in detail specific environmental restoration activities. For a comprehensive list of those activities, see the US Army Corps of Engineers report produced in 1996, which highlights individual projects that could be done to restore natural environments to protect water quality.[52]

Decisive action at the State and local levels includes policy change, better enforcement, new funding, and education and outreach. This report breaks those actions into short-term (1-2 years) and long-term (5-10 year) items. It also prioritizes critical or immediate next steps by placing those activities in bold. A successful combination of the proposed solutions will include action at the State and local level addressing every source of pollution.

The Patuxent River runs through thick marshlands at Jug Bay Wetlands Sanctuary.

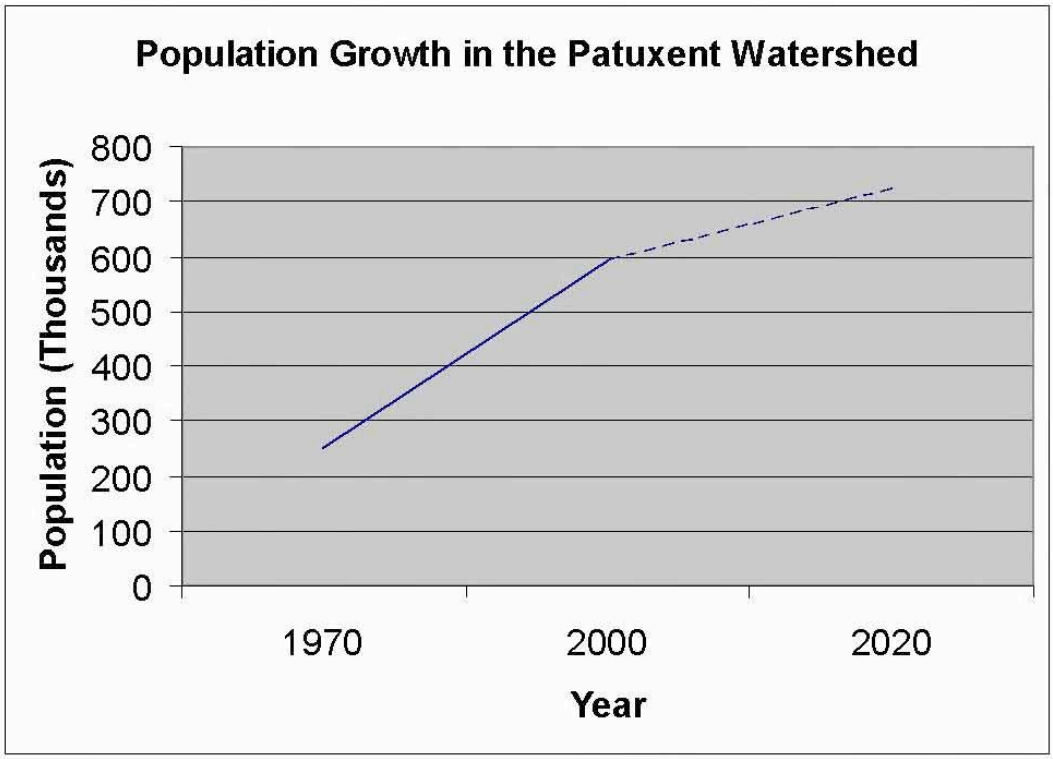
Key Actions For Change

- Establish strong new regulations at both the State and local levels in response to the Stormwater Management Act of 2007, create a dedicated revenue fund for stormwater retrofits, and increase funding to hire enough enforcement staff to fully implement and enforce stormwater and erosion laws.
- Create public education and outreach campaigns on the impact of domestic discharges including fertilizer and pet waste, reduce government use of fertilizers and pesticides, and increase street sweeping.
- Limit the use of septic tank systems in new developments.
- Maintain full funding for Program Open Space and the other programs funded by the real estate transfer tax, and update zoning so that rural or preservation zoning allows at most 1 dwelling unit per 30 acres density.
- Increase wetland permit fees and fund increased staff for State and local enforcement of wetlands laws. Authorize the Critical Area Commission to adopt regulations and fund increased staff for State and local enforcement of Critical Area laws.
- Allocate State and local funding to maintain and increase forest cover, especially in around the Patuxent Reservoirs Watershed.
- Ensure that the major treatment plants meet the goal of upgrading to enhanced nutrient removal by 2010 and plan for continued upgrades of major and minor plants over time.
- Ensure adequate inspection and enforcement of permits for point source polluters.
- Adopt Environmental Management Systems for federal facilities holding them to the highest environmental standards.
- Support a strong federal farm bill with conservation funding dedicated for the Patuxent River watershed. Establish a Chesapeake Bay Trust Fund to increase and sustain funding for conservation practices such as those funded by the Maryland Agricultural Water Quality Cost-Share Program (MACS).
- Increase the agricultural land transfer tax and dedicate that increased funding to farmland preservation. Plan and zone for contiguous, viable farming communities.
- Increase mass transit funding and plan for additional mass transit in the areas throughout the watershed with sufficient population densities, either current or projected, including expanded rail and rapid bus services.
- Increase permit fees and penalties for air pollution permit holders to increase staff and ensure adequate inspections and enforcement.
- Establish limits on climate change emissions based on sound science, encourage restoration and protection of marshlands and SAV beds which provide damper effect on waves and enhances sediment capture, and promote living shorelines.
- Establish total pollution limits for the river and set an implementation strategy and schedule to bring both point and nonpoint sources of pollution into compliance with those limits.

I. GROWTH AND DEVELOPMENT

Development is the fastest growing threat to water quality in the Patuxent River.[53] When land is developed two negative impacts occur. First, developed land never reverts back to its original natural cover, and forests, fields, and wetlands are lost forever. Second, pollution loads into the river are increased. Urban lands are the leading source of nutrients in the watershed, producing 34% of the nitrogen and 38% of the phosphorous.[54] Taking into account both direct runoff from development and the auxiliary impacts of development, such as discharges from waste water treatment plants, development produces roughly two-thirds of the nitrogen and phosphorous pollution in the river.[55]

This impact will only grow as the watershed continues to develop. The Patuxent watershed has seen significant growth in recent decades, and the rate of growth and development continues to accelerate. Population in the watershed grew by 136% between 1970 and 2000, and is expected to grow by another 22% by 2020.[56] This is an additional 586,426 people.[57] This growth will increase the amount of impervious surface in the watershed, causing direct declines in watershed health.[58]



Source: Maryland Department of Natural Resources

Growth in the watershed is inevitable. But the impact that growth will have on water quality is not. Local jurisdictions are currently not meeting their environmental and infrastructure goals and standards; the coming growth will increase the burden on cities and counties already straining to provide services and accommodate

Suburban sprawl in previously forested areas along the Patuxent River contributes to pollution in the watershed.

development while preserving environmental quality. But implementing smart, aggressive policies now can enable counties to minimize the levels of pollution for decades to come.

The greatest difficulty in dealing with a constantly changing source of pollution is that, with every year of delay, the actions required to solve the problem change as well. This leaves the State and local governments with a bifurcated problem; dealing with the existing problem and planning for the coming one. Older developments across the watershed have left a legacy of poor stormwater management, a legacy that floods neighborhoods, erodes stream banks, and carries pollution into the Patuxent.[59] Older septic tanks and waste water treatment plants require a significant financial investment to upgrade them into effective, properly working systems.

While dealing with these existing problems, governments must plan for the future. Fortunately, recent legislation requires the local governments to consider water quality when planning new development.[60] As the State develops numeric criteria for the pollution load allowed in the river and its streams, all sources of pollution will be held accountable for meeting those standards.[61] But dealing with this complicated issue will always require a mix of fixing the old and planning better for the new.

i. Stormwater and Sediment Erosion

Key recommendations: Establish strong new regulations at both the State and local levels in response to the Stormwater Management Act of 2007, create a dedicated revenue fund for stormwater retrofits, and increase funding to hire enough enforcement staff to fully implement and enforce stormwater and erosion laws.

The act of building creates pollution in two phases. First a builder must clear the land, grade it, and build on it; pollution created in this process is governed by sediment and erosion laws. Sediment and erosion from construction sites creates visible plumes of sediment pollution and directly accounts for four percent of the nutrient pollution in the Patuxent River.[62] After the building is complete, the new impervious surface changes where rainfall flows and creates pollution known as stormwater runoff. Stormwater runoff carries nitrogen and phosphorous into the river along with a variety of toxins from pesticides, car fluids, and other household and commercial wastes.[63] Stormwater runoff also scours streambanks, washing sediment into the river downstream.

Poorly managed construction sites allow sediment to run off into nearby waters.

The way we manage stormwater has evolved over time, and is still evolving. Older developments simply directed it away from the buildings and into streams as quickly as possible, causing massive flooding, stream bank erosion, and downstream pollution.[64] Over time engineers and scientists have developed methods to keep the rainfall where it lands, allowing it to filter through the soil to remove pollutants and recharge groundwater, replicating conditions existing before the development occurred. Recent State law now requires that developers build in ways that minimize pollution and other problems caused by stormwater.[65]

Traditionally engineers managed runoff by channeling it away from homes through large stormwater pipes, sending pulluted water flooding into the nearest river.

Regulations from the 2007 Stormwater Management Act must still be implemented and enforced.[66] This law, which will require developers to use green development techniques known as low-impact design, will improve stormwater on most sites. But many of these newer methods require ongoing maintenance and continued oversight as these practices are developed and perfected. There is also a billion dollar cost to repair and upgrade the existing, poorly designed developments and their affected streams.[67]

STATE ACTIONS (STORMWATER AND EROSION CONTROL)

Short-term

- **Establish strong new regulations in response to the Stormwater Management Act of 2007.**
- Utilize the Soil Conservation Districts to provide greater technical assistance to local governments for implementing their stormwater and sediment and erosion control programs, especially as the new stormwater management law comes into effect.
- **Create a dedicated revenue source, such as the Chesapeake Bay Trust Fund, for stormwater retrofits.[68]** Maximize the impact of that funding by focusing it in prioritized areas and requiring matching funds from local governments and establish a system for monitoring the impact of these funds.
- Allocate sufficient funding to increase the number of enforcement staff overseeing stormwater and sediment and erosion permits.
- Increase enforcement of stormwater and sediment and erosion permits on State, federal, and non-delegated local projects. Increase technical training for inspectors and establish accountability standards to ensure appropriate implementation of the regulations.
- Develop and implement stronger MS4 permits for stormwater at the county level.[69]
- **Establish a new training program for developers and contractors to explain environmental site design practices and stress the importance of stormwater and sediment and erosion controls.**

LOCAL ACTIONS (STORMWATER AND EROSION CONTROL)

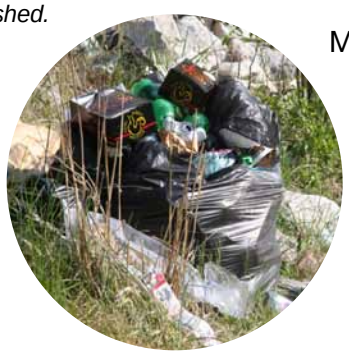
Short-term

- Where local governments have delegated authority, create strong local stormwater and sediment and erosion ordinances in response to the Stormwater Management Act.
- **Update zoning, public works, and other local regulations to allow for the implementation of environmental site design practices as required by the Stormwater Management Act.**
- **Where local governments have delegated authority, allocate sufficient funding to adequately inspect and enforce stormwater and sediment and erosion laws.**
- Create a dedicated revenue source to retrofit existing stormwater problems and restore impacted streams.[70]
- Recommend the use of low cost technologies to reduce nitrogen contamination to groundwater.

ii. Domestic Discharges

Key recommendations: Create public education and outreach campaigns on the impact of domestic discharges including fertilizer and pet waste, reduce government use of fertilizers and pesticides, and increase street sweeping.

Household wastes are an element of the stormwater runoff that pollutes the river. Whether from the avid gardener who over-applies fertilizers and pesticides, the backyard mechanic who dumps his oil down the storm drain, or the dog owner who fails to clean up after Fido, the cumulative impact of these actions is significant but the individual responsibility is hard to trace.[71] Public education campaigns are a critical tool in combating these practices.



Litter is the most obvious impact individuals have on the watershed.

Minimizing lawns and the fertilizers applied to them is a key piece of solving this problem.[72] Eliminating this 1950s status symbol can be done through public education and changing the way homes and offices are designed. Lawn care companies, which are employed by individuals, governments, institutions, and businesses throughout the watershed, can impact runoff by limiting their use of fertilizers and pesticides.[73]

STATE ACTIONS (DOMESTIC DISCHARGES)

Short-term

- **Re-open the Maryland soil testing facility to allow homeowners to test their soils at a reasonable rate.**
- **Create public education and outreach campaigns on the impact of domestic discharges including fertilizers and pet waste.**
- Encourage or prohibit the use of phosphorous free fertilizer[74]
- Work with fertilizer companies and local merchants to eliminate spring application of fertilizers and to limit the amount of fertilizer applied.

Long-term

- Enact the bottle bill in Maryland, creating a deposit and return system on bottles to reduce urban and suburban trash.[75]
- Establish a fee for the non-agricultural use of pesticides to fund public education and outreach campaigns.
- **Analyze and reduce government use of non-agricultural fertilizers and pesticides and convert landscaped areas into wildflower and native plant gardens where appropriate.**

LOCAL ACTIONS (DOMESTIC DISCHARGES

Short-term

- **Increase street sweeping.**
- Create public education and outreach campaigns on the impact of domestic discharges including fertilizers and pet waste.

Long-term

- **Analyze and reduce government use of non-agricultural fertilizers and pesticides and convert landscaped areas into wildflower and native plant gardens where appropriate.**

iii. Septics

Key recommendation: Limit the use of septic systems in new developments.

The impact of development reaches beyond the immediate runoff. The people living and working in new homes and office centers need facilities to deal with their waste, either individual septic tanks or cumulative wastewater treatment plants. About 23% of existing housing in the watershed is dependent on septic systems.[76] Septic tanks contribute 12% of the nitrogen in the watershed.[77]

Sprawl and septic systems are intertwined. Septics are commonly used in rural areas where homes cannot connect to wastewater treatment plants. Conversely, the use of septic systems allows for sprawl because it enables homes to be developed in rural areas away from existing infrastructure. As the watershed continues to grow, it is imperative to limit the use of septic tanks in new developments. Although they only treat a quarter of the waste, septic tanks contribute almost half as much nitrogen to the watershed as wastewater treatment plants.[78] Because they are scattered throughout the watershed on private homes, septic systems are also far harder to track and upgrade.

Restricting development of homes in areas reliant on septic tanks and requiring advanced nitrogen removing systems for all new septic tanks will limit the future impact of these diffuse sources of pollution.[79] Funding is also needed to retrofit the existing septic tanks in the watershed.

STATE ACTIONS (SEPTIC SYSTEMS)

Long-term

- Continue the Bay Restoration Funding to upgrade existing septic tanks to advanced nitrogen removal standards with a focus on the Patuxent Watershed.
- Explore other tax incentive programs for homeowners to upgrade their existing septic tanks to nitrogen removing technologies.

LOCAL ACTIONS (SEPTIC SYSTEMS)

Short-term

- Prohibit septic tanks in major subdivisions (developments of 5 or more units).[80]
- **Require advanced nitrogen removing technology for all new septic tank systems where septic systems are allowed.**
- Restrict zoning to limit growth in rural areas that require septic systems.

Long-term

- Explore local tax incentive programs for homeowners for upgrading existing septic tanks to nitrogen removing technologies.

II. GROWTH AND PRESERVATION

The Patuxent Wildlife Refuge provides habitat and protects water quality through its forested buffer.

Open spaces—forests, farms, wetlands, and parks—play multiple roles in protecting the Patuxent River. Forests, fields, and wetlands are irreplaceable filters, as they trap rainwater before it reaches the river, slow down the speed of the runoff, and absorb out most of the nutrients and pollutants before they can enter the water.[81] The closer these natural filters are to the water the more vital their role—wetlands and stream buffers are particularly valuable for water quality.[82] But forests, farms, and parks also serve a role in engaging the public, maintaining our history, and preserving our quality of life.[83]

Preserving farmland preserves a way of live, a local economy, and an opportunity for environmental stewardship.

These critical open spaces are continuously imperiled. Over the last few decades, the amount of land converted for development has far outpaced actual population growth in the region, and a significant percent of new growth is occurring outside the designated growth areas.[84] Current zoning would allow 100% more development throughout the watershed if the area were fully built out, though current growth projections estimate a 50% increase in development in the region.[85]

Studies of watershed health show that losing just 10% of the land to impervious surfaces significantly impacts the health of the rivers and streams.[86] Recent work by the Maryland Department of Natural Resources on areas of the river of special concern to threatened fish species, called stronghold watersheds, shows that the impervious surface threshold is even lower for protecting rare, threatened, and endangered species.[87]

Parks are a critical resource for educating the next generation on the importance of the environment. (Source: Maryland Recreation and Parks Association)

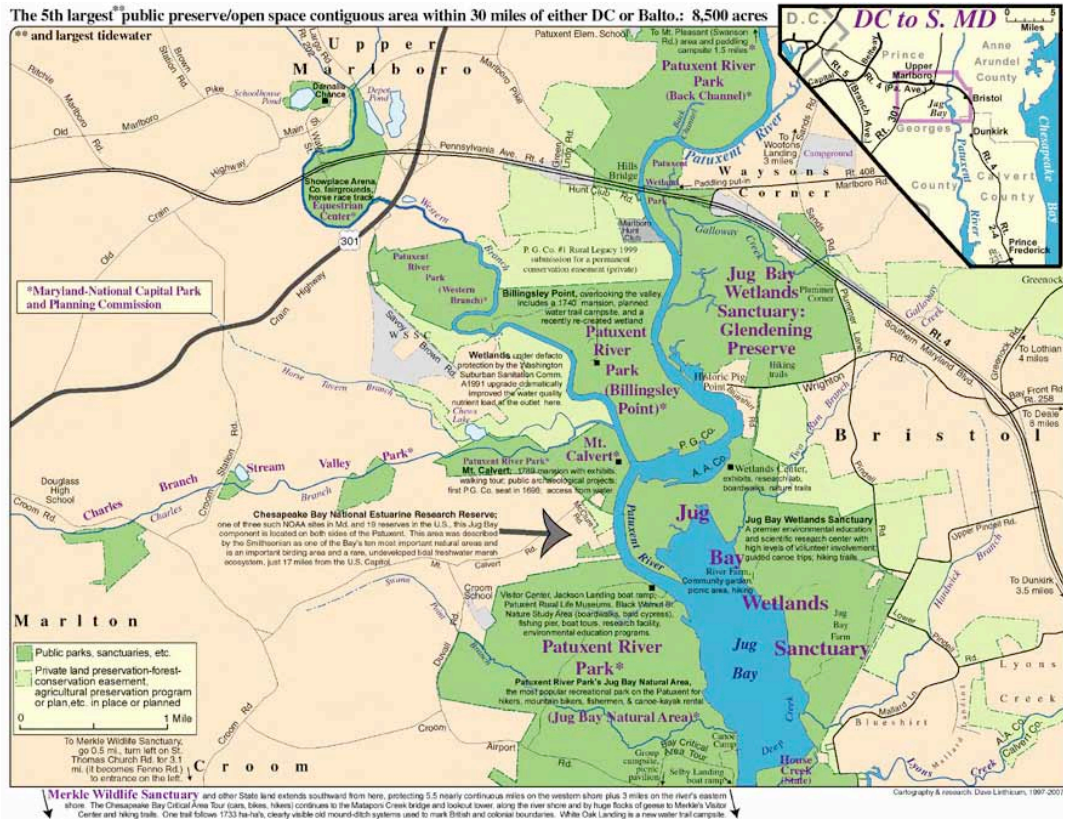
Thirty percent of the land in the Patuxent watershed is currently in urban use, with an impervious cover of only 4.41%.[88] This low imperviousness is one of the reasons the river is able to rebound in response to pollution reductions.[89] As the watershed continues to grow, preservation will become one of the most critical policies for protecting the river.[90]

i. Open Space and Habitat

Key recommendations: Maintain full funding for Program Open Space and the other programs funded by the real estate transfer tax, and update zoning so that rural or preservation zoning allows at most one dwelling unit per 25 acres density.

The State and local governments have long recognized the importance of preserving open space. In 1969 Maryland became one of the first states to create a dedicated funding source for land conservation, with a lofty goal of preserving an acre of land for every acre that is developed.[91] Revenue generated by a small tax on every real estate sale goes towards park, farm, and forest conservation via easements or direct purchase.[92] A portion of the funding also goes to local governments to create parks and preserve farms.[93] Over time the State has raised its conservation goals and expanded its preservation programs, though conservation efforts have been hampered by repeated diversions of this dedicated fund.[94]

Local governments also play a critical role in open space preservation. Beyond funding, counties in particular can control development with their authority over land use and development. Proper zoning and other incentives encourage development where the infrastructure exists to accommodate it and restricts development in rural or undeveloped areas.[95] Transition zones around urban areas provide for a clear demarcation of where growth should occur and inhibit sprawling growth. Solid comprehensive plans must be backed by strong zoning coupled with an active program to purchase easements on rural lands. Other tools to preserve open space and steer development include forest conservation requirements and State-level Smart Growth incentives.[96]



The Patuxent River Park is just one example of critical parkland preserved along the river. (Source: Maryland National Capital Parks and Planning)

Several counties in the watershed have developed strong preservation and smart growth tools. For example, Calvert County has established priority preservation along the Patuxent River, is aggressively preserving land at three times the rate of development, and has capped buildout in the county to 37,000 households.[97] Montgomery County, at the other end of the watershed, has created an agricultural reserve where development is very limited and has implemented a strong transfer of development rights program to shift growth to its urban areas. Working together to set innovative policies, the counties in the Patuxent Watershed can become a model for growth in the region.

Preserving open space and wetlands along the river provides habitat and protects water quality.

The Maryland Department of Natural Resources has bought land in a systematic fashion, creating a network of State parks matched with rural legacy areas along the edge of the Patuxent River. A combination of comprehensive planning, adequate preservation funding, and restrictive land use policies can enable the State to reach its conservation goals of one acre preserved for every acre developed and significantly protect the health of the Patuxent River.[98]

STATE ACTIONS (OPEN SPACE AND HABITAT)

Short-term

- **Maintain full funding for Program Open Space and other programs funded by the real estate transfer tax.**
- Increase funding for operation and maintenance of parks and State forests.[99]
- Establish a 'no net loss' rule for forest conservation.
- Revitalize the State Greenprint Program, factoring in the water quality and habitat functions of all remaining unprotected and undeveloped land in the watershed. Create a comprehensive plan for prioritizing preservation based on that program.
- **Ensure that federal facility growth resulting from BRAC occurs within a smart growth framework** and does not impact open space critical for water quality or the integrity of existing parks, including the Patuxent Wildlife Refuge.
- Complete a single state growth plan as required by the 1970s smart growth law.
- **Update and refine the smart growth laws to truly direct growth into already developed areas and to resolve conflicts in the law such as adequate public facilities ordinances and water capacity issues.**

Long-term

- Continue the successful policy of DNR to protect habitat and public access to the river in the piedmont areas. Expand that protection in the tidal areas and expand the existing parks that protect the headwaters.
- Leverage State open space funding to require counties to improve their zoning practices or reward progressive counties with increased funding allocations.

LOCAL ACTIONS (OPEN SPACE AND HABITAT)

Short-term:

- **Zone for protection. Establish a minimum of 1 in 25 acre density for preservation or rural areas including farmland, forestland, and habitat.**
- **Tighten up the process for granting variances and waivers under current zoning law** to ensure that rural or preservation areas are not developed.
- Update existing priority funding areas to better reflect smart growth principles.
- Establish strong Transfer of Development Rights and Purchase of Development Rights programs and work for the adoption of strong programs in all seven counties.[100]

Long-term:

- **As comprehensive plans are updated, ensure that there is a green infrastructure type plan for where preservation should occur**, considering factors such as habitat protection, agricultural areas, and water quality. Ensure that county land preservation, parks, and recreation plans are incorporated into comprehensive plans.
- Preserve public access to open space. Create parks that include public boat launch sites and nature trails, and dedicate sufficient operation and maintenance funding to ensure public education needs are met.
- Expand existing parks to maximize open space funding and expand greenways.
- Increase collaboration with private organizations such as the American Chestnut Land Trust and the Trust for Public Land to maximize land conservation abilities.

ii. Wetlands and Buffers

Key recommendations: Increase wetland permit fees and fund increased staff for State and local enforcement of wetlands laws. Authorize the Critical Area Commission to adopt regulations and fund increased staff for State and local enforcement of Critical Area laws.

Wetlands are the kidneys of the river.

Wetlands and open space areas along the river provide the most positive direct impact on water quality. Wetlands are the kidneys of the river, filtering sediment, nutrients, and chemicals out of the water.[101] Therefore development within 1000 feet of the waterline has a direct and immediate impact on the health of the river.[102] Over time the State and federal government have developed numerous laws to protect these priceless buffers.

Wetlands are protected by a host of federal, state, and local laws, primarily the Clean Water Act at the federal level and the Tidal and Nontidal Wetland Protection Acts and Programs at the state level.[103] The goal of these various laws is to protect wetlands from development, with a goal of no net loss of wetlands within the state.[104]

The Critical Area Law limits development within 1,000 feet of the Chesapeake and Atlantic Coastal Bays and their tidal tributaries and creates a 100' buffer in which no development should occur.[105] However, the law is administered by 64 jurisdictions with limited oversight from the Critical Area Commission, leading to inconsistent interpretation, implementation, and enforcement.[106]

Individual homes along the riverfront have a cumulative impact on water quality.

Maryland also implements the Federal Coastal Zone Management Act, which includes the tidal areas along the Patuxent River.[107] Maryland's Coastal Program seeks to balance development with preservation within that coastal area.[108] Two additional considerations are important in permitting growth in environmentally sensitive areas—the location of steep slopes and highly erodable soils.[109]

But weaknesses within both the policies and their enforcement continue to hinder preservation efforts.[110] In 1997 only 40% of the river's forested buffers remained.[111] The majority of the wetlands in the watershed are fragmented and scattered, with 48% under three acres and another 32% under ten acres.[112] The laws often contain loopholes that allow for continued development, even when not appropriate, and rarely look at the cumulative impact of development on the remaining wetlands and buffers.[113]

Housing developments like this one along the edge of the Chesapeake Bay dump pollution straight into the waterway.

Furthermore, enforcement at the local level is often inadequate, both in the number of inspectors and the severity of the fines.[114] Finally, public education and responsibility are widely lacking. Individuals either ignorantly or willfully violate these laws, citing either the small impact their project makes or the small chance of getting caught and fined.[115] Unfortunately, the cumulative impact of those many violations results in a significant deterioration of water quality and undermines the function of the laws.

STATE ACTIONS (WETLANDS AND BUFFERS)

Short-term

- **Increase fees paid in lieu of mitigation and ensure the Wetland Compensation Fund is restoring wetlands in a timely manner.**
- Use increased permit fees to fund more staff for enforcement of the wetlands laws. Increase technical training for inspectors and establish accountability standards to ensure the regulations are implemented adequately.
- **Place higher priority on the avoidance of and minimization of impacts on wetlands, and require increased mitigation with meaningful restoration projects.**
- Increase public outreach and education on the importance of wetlands laws, especially to landowners in the buffer areas.
- Improve implementation of the Coastal Zone Management program.
- **Grant the Critical Area Commission authority to adopt its own regulations.**
- Fund increased staff for the Critical Area Commission to bolster enforcement and regulatory capacity.
- Increase public outreach and education on the importance of the Critical Area Law, especially to landowners in the critical area.
- Hold contractors liable for their violations of the Critical Area Law.

Long-term

- **Prioritize reforestation in stream buffers as part of state restoration efforts and for mitigation targets, to maintain green infrastructure along the river.**
- Analyze the State laws to ensure that Critical Area, Smart Growth, and other environmental laws are working together as effectively as possible. Update the laws where needed to increase their integration.

LOCAL ACTIONS (WETLANDS AND BUFFERS)

Short-term

- Increase scrutiny of and restrictions on development in wetland or buffer areas through more restrictive zoning, a more rigorous permitting process, and higher standards for other permits related to development, such as stormwater permits.
- **Analyze the cumulative impact of all development applications on wetlands and buffers before allowing individual projects to proceed.**
- **Increase local stream and wetland buffer requirements.**[116]
- **Improve administration of the Critical Area Law through tighter limitations on variances and increased enforcement.**
- Increase scrutiny of and restrictions on development in the critical area through more restrictive zoning, a more rigorous permitting process, and higher standards for other permits related to development, such as stormwater permits.
- Analyze the cumulative impact of all development applications on the remaining critical area land before allowing individual projects to proceed.

Long-term

- Establish a maximum permissible cumulative impact in the critical area, after which any further development will be extremely limited.

Paddlers enjoy kayaking in the Triadelphia Reservoir.

iv. Water Qualtity

Key recommendations: Allocate State and local funding to maintain and increase forest cover, especially in around the Patuxent Reservoirs Watershed.

Preserving open space also protects drinking water. Reservoirs in the north of the river relieve demands on groundwater and support high density development in Montgomery and Prince George's Counties. They require forest buffers to reduce sediment flows and protect water quality. In the southern part of the watershed, the growth of impervious surfaces threatens recharge locations for aquifers that provide drinking water to local communities.

The Triadelphia Reservoir provides recreation opportunities and natural habitat as well as drinking water.

In 1996, Montgomery, Prince George's, and Howard Counties joined the Washington Suburban Sanitary Commission, the Maryland National Park and Planning Commission, and the Montgomery and Howard Soil Conservation Districts in signing the Patuxent Reservoirs Watershed Protection Agreement. Annually since 1997, these signatories have completed an Annual Report to summarize accomplishments and identify funding needs to address reservoir watershed priority resource issues.

The priority resources are reservoirs and drinking water supply, terrestrial habitat, stream systems, aquatic biota, rural character and landscape, and public awareness and stewardship. The member agencies identified maintaining and increasing forest cover in the watershed as the most cost-effective means of protecting the priority resources. Unfortunately, only a small amount of grant funding has been available to date to begin making progress on this highest priority action item.[117]

The Governor has created a committee on water resources, which can provide a framework for inter-county water supply analyses. The largest challenge to maintaining water quality in the reservoirs and aquifers is that of keeping development in the watershed at low intensity levels with forested buffers, particularly around the reservoirs themselves.

STATE ACTIONS[118] (WATER QUALITY)

Short-term

- Work with the local stakeholders to implement the Patuxent Reservoirs Watershed report findings, particularly funding for tree reforestation in the reservoirs area.
- Fund an aquifer study covering all of Southern Maryland.

Long-term

- Perform a full analysis of existing and projected water supplies for the Patuxent watershed region, with a capacity analysis of the amount of growth those water supplies can sustain.
- Develop and implement efficiency measures for water consumption and use.

LOCAL ACTIONS (WATER QUALITY)

Short-term

- Encourage private property owners to participate in tree planting programs.
- Fund reforestation efforts with a goal of increased forest connectivity and forest interior habitat.
- Establish and maintain minimum 35' riparian buffer on all public land.
- Create a dedicated revenue source to retrofit existing stormwater problems and restore impacted streams.
- Establish a minimum of 1 in 25 acre density for areas within the reservoirs watershed.

Long-term

- Establish and maintain minimum 35' riparian buffer on all private land.

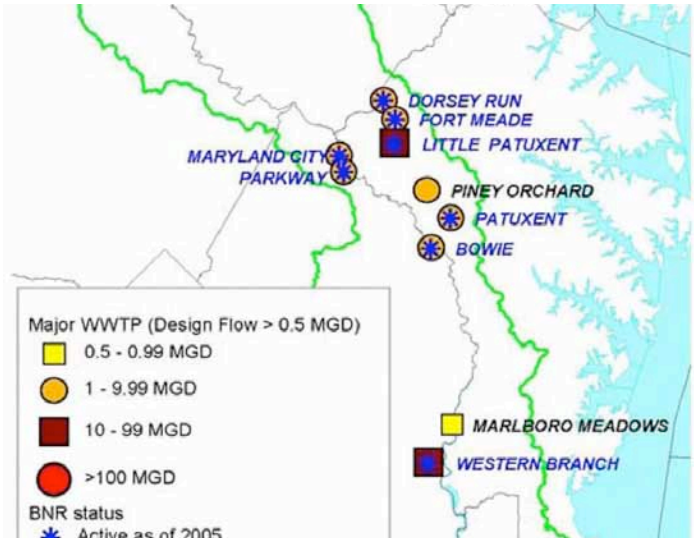
III. POINT SOURCES

Point source pollution accounts for roughly a third of the total nutrients in the watershed.[119] The biggest point source polluters are wastewater treatment plants, but there are a total of 97 permitted facilities along the river, including wastewater treatment plants, industrial polluters, and federal facilities.[120] Some of these facilities emit nitrogen and phosphorous, but others foul the river with additional pollutants including toxic chemicals and thermal pollution.

i. Wastewater Treatment Plants (WWTPs)

Key recommendations: Ensure that the major treatment plants meet the goal of upgrading to enhanced nutrient removal by 2010 and plan for continued upgrades of both major and minor plants over time.

Wastewater treatment plants are the primary source of point source pollution, causing 16% of the nitrogen and 25% of the phosphorous pollution in the river.[121] It is worth noting that the loads from wastewater treatment plants has decreased significantly over the last two decades; nitrogen and phosphorous levels are almost half what they were in 1985.[122] Indeed, the battle against this



Source: Department of Natural Resources

source of pollution has made some of the most significant improvements in water quality in the Patuxent in the last few decades.[123]

Several state initiatives have caused this impressive improvement. As a result of the Patuxent Charette and other State actions, caps were set on the loads of pollution from wastewater treatment plants.[124] In addition, in 2004 the Maryland legislature passed the Chesapeake Bay Restoration Fund, which created a small surcharge on water bills to fund upgrades of the major wastewater treatment plants around the state.[125] This funding will enable seven of the ten major treatment plants on the Patuxent to upgrade their nutrient removal systems by 2010.[126]

Unfortunately, even with enhanced nutrient removal upgrades at the major plants, the total daily loads of pollution will not reach the Charette goals of 1981.[127] Even after upgrading the plants, the current caps will allow a daily output of 2,807 pounds of nitrogen and 210 pounds of phosphorous from the major plants alone. These loads go beyond the original phosphorous goals, but are more than twice the daily goal for nitrogen.[128]

In addition, as population increases, the total daily loads of pollution from wastewater treatment plants threaten to increase as well. Some plants may grow beyond their prescribed load limits even if the rate of nutrient removal is kept constant. The Maryland Department of the Environment is developing a cap and trade program to enable plants to meet their load limits by purchasing nutrient reductions from other sources.[129] Care must be taken to ensure that trading between sources of pollution does not benefit another watershed at the cost of the Patuxent.

Minor wastewater treatment plants are held to less strict pollution caps and have no dedicated source of funding to enable their upgrades.[130] While these plants are a far less significant pollution source than the major plants, reducing their pollution loads is still a critical step to meet the Charette goals and to restore water quality.[131]

More funding is needed to target the treatment systems within the Patuxent watershed and more forward planning is also needed to ensure that those systems, once upgraded, do not expand their output to pollute more than before. Establishing long-term upgrade schedules for the plants based on watershed pollution limits would ensure that this problem does not continue to resurface over time.[132]

STATE ACTIONS (WWTPs)

Short-term

- Ensure continued distribution of the Chesapeake Bay Restoration Funds in an efficient and speedy manner, prioritizing major treatment plants along the Patuxent. **Meet 2010 goals for ENR upgrades on the seven Patuxent plants.**
- Create a funding source for upgrading the minor wastewater treatment plants.
- Increase enforcement and litigation against non-compliant wastewater treatment plants, particularly private plants, for overflows and exceedances.

Long-term

- Set upgrade schedules for the major and minor wastewater treatment plants to account for increased loading due to increased growth over time.

LOCAL ACTIONS (WWTPs)

Long-term

- Create a dedicated funding source for upgrading minor wastewater treatment plants and **plan for continued upgrades of all plants over time**.
- Require privately owned plants to fund their own upgrades in a timely manner.
- Encourage private plants to go beyond the established caps for minor plants and implement enhanced nutrient removal technology.

ii. Permitted Facilities

Key actions: Ensure adequate inspection and enforcement of permits for point source polluters.

Pipes are the most typical source of pollution requiring a permit under the Clean Water Act.

Point sources of water pollution are governed by federal law under the Clean Water Act.[133] There are 97 permitted facilities along the Patuxent, predominantly industrial facilities but also including the twenty wastewater treatment plants.[134] These facilities operate under special permits which regulate how much they may impact water quality through the discharge of pollutants, including nutrients and chemicals, and other impacts, such as

Wastewater treatment plants are the largest point source polluters in the watershed.

dissolved oxygen and temperature.[135] Most of the reporting for these facilities is self-reporting, and enforcement rests with the Maryland Department of the Environment.[136]

While Maryland ranks fairly high nationwide for compliance with permit restrictions, 42% of the permitted facilities violated their limits at least once from 2003-2004.[137] Overall, pollution from industrial sources accounts for six percent of the nutrient pollution in the Patuxent.[138] Other types of impacts include chemicals, such as copper and arsenic, and temperature changes.[139] More aggressive enforcement and inspections would help protect the river from these toxins.

Another regulated source is mining activities. Although active mining is slowly ending throughout the watershed, this leaves numerous former mining sites which are either abandoned or are being converted into new uses such as golf courses or shopping malls. Conversion of these sites needs to happen with strict environmental controls and oversight.[140]

STATE ACTIONS (PERMITTED FACILITIES)

Short-term

- **Ensure adequate inspection and enforcement of permits for point source polluters.**
- Guarantee best environmental practices are employed when converting abandoned mines to new uses.

Long-term

- Tighten pollution limits as permits are renewed as needed to meet pollution loading limitations.
- Targeted litigation should be initiated where necessary to assure compliance.

LOCAL ACTIONS (PERMITTED FACILITIES)

Short-term

- Ensure best environmental practices are employed when converting abandoned mines to new uses.

iii. Federal Facilities

Key actions: Adopt Environmental Management Systems for federal facilities to hold them to the highest environmental standards.

The river is almost bookended by large federal installations; from Ft. Meade and the National Security Administration in northern Anne Arundel County to the Patuxent River Naval Air Station at the mouth of the river in St. Mary's County. These facilities produce toxins, including byproducts from explosives testing such as perchlorate, and some manage their own wastewater treatment plants, such as the federal facility at Fort Meade.[141]

Several federal facilities have been listed as highly contaminated sites in the last two decades. The Beltsville Agricultural Research Center was placed on the national priorities list in 1994 due to concerns over several old landfills and other waste disposal sites.[142] Portions of the Patuxent River Naval Air Station were designated a superfund, or highly toxic, site by the Environmental Protection Agency in 2000.[143]

A recent Environmental Protection Agency report found that all but one federal facility in the region was in compliance with environmental laws.[144] However, federal facilities are able to avoid public reporting of their pollution loads, limiting their accountability and limiting the ability of the State or concerned citizens to take action on suspected pollution.[145] The Environmental Protection Agency manages a database that records the status of pollution permit holders, but researching federal facilities on that database returns limited information.[146]

With the population growth and development anticipated with BRAC expansion, particularly in the Fort Meade area, it is essential that the federal facilities plan for and accommodate that growth in a manner that protects environmental resources and water quality in the Patuxent.[147]

FEDERAL ACTIONS (FEDERAL FACILITIES)

Short-term

- Work with the Congressional Delegation and with the BRAC Sub-Cabinet to ensure that National Security Agency, Fort Meade, Patuxent Naval Air Station, and other federal installations expand and implement best management practices so that even with increased population and waste the end results are measurable improvements on the water treatment at and discharge from those wastewater treatment plants.

- **Adopt Environmental Management Systems for federal facilities as a way to go beyond regulatory compliance and implement higher environmental standards.[148]**

Long-term

- Work with the Congressional Delegation to allocate funding to upgrade air, water, and sewage plants on federal facilities in the watershed.
- Increase reporting by federal facilities, initiate actions to bring these facilities into compliance as needed.

Soybeans are a prime row crop in the region.

IV. AGRICULTURE

Preserving farmland and working farms preserves water quality, our history, and our quality of life.[149] Because farms are the most cost-effective source of nutrient reductions, they are often the focus of watershed restoration efforts.[150] Yet the pollution loads from well-managed farms are far less than the cumulative loads from development, especially when waste treatment and air deposition are factored into the equation.[151]

The greatest threat to farming in the Patuxent region is the combination of low profits and high land prices.[152] These two factors discourage young farmers from entering the business, and entice older farmers to sell the farm for development.[153] The State and local governments must look for policies and revenue sources to keep farming sustainable and profitable in the region.

Agriculture does contribute significant nutrient and sediment loads into the river. In the Patuxent, 22% of the nitrogen and 23% of the phosphorous pollution comes from farms.[154] Proper farm management practices can limit this impact, but most farmers are unable to add the cost of pollution controls to an already expensive business venture.[155]

The State and local governments must require sound management practices on farms but need to financially support farmers as they implement those changes. This investment pays off for the government over time, as the cost of providing this assistance to farmers is far less than the economic cost of infrastructure and other services for developed areas.[156] Also, farmland provides an excellent opportunity for reforestation. The Department of Natural Resources is working on a reforestation initiative that includes retaining 65-70% of all watersheds in rural land uses with active forest buffers.[157]

The Maryland delegation is working on securing funding in the Federal Farm Bill which would provide incentives for farmers to both implement conservation practices on their farms and to preserve their land. Federal opportunities like this are critical to supplement State and local funding for these programs.

i. Pollution Reduction Practices

Key recommendations: Support a strong federal farm bill with conservation funding dedicated for the Patuxent River watershed and establish a Chesapeake Bay Trust Fund to increase and sustain funding for conservation practices such as those funded by the Maryland Agricultural Water Quality Cost-Share Program (MACS).

The largest impact of runoff from farms is sediment runoff. Over half the sediment flowing into the Patuxent each year comes from agriculture.[158] Soil and water runoff from farms carries with it nitrogen, phosphorous, and chemicals from fertilizers and pesticides.[159] Farms raising livestock create runoff from manure and, if the animals are not properly fenced off, can cause intense damage to streams located on the property.[160]

There are several programs that exist to help farmers appropriately plan for and manage sediment and nutrient runoff. The State requires all farmers to create a nutrient management plan for their farm to ensure that best management practices are used to limit nutrient runoff.[161] As of 2007, 97% of farms were under farm management and 95% had met their legal requirement to create nutrient management plans, though enforcement remains low with six inspectors managing 600 inspections.[162]

The Maryland Department of Agriculture and the Soil Conservation Districts are also actively working to implement more advanced plans, known as Soil Conservation and Water Quality Plans, on farms. As MDA explains, these plans encourage natural resource management on farms and the use of best management practices to control erosion and sediment loss and to limit nutrient runoff, while preserving habitat. These plans explore sediment control options including farming practices such as crop rotation and planting cover crops as well as structural practices such as creating sediment basins and stabilization structures.[163]

The State also runs a cost-share program to help farmers implement practices such as cover crops, storage sheds, and stream fencing.[164] There are also several federal and State programs that pay farmers to keep land along rivers and other critical areas out of production, protecting stream buffers and habitat.[165] These programs need sufficient funding for both the practices themselves and also the staff to implement them and engage in continuing research into the most effective management practices.[166]

Row crop farms such as this corn field can reduce their pollution by maintaining forested buffers and planting cover crops in the winter.

STATE ACTIONS (POLLUTION REDUCTION PRACTICES)

Short-term

- **Support a strong federal farm bill with conservation funding dedicated for the Chesapeake Bay Region and the Patuxent River watershed in particular.**
- **Establish a Chesapeake Bay Trust Fund to increase and sustain funding for conservation practices such as those funded by the Maryland Agricultural Water Quality Cost-Share Program (MACS).**
- Increase inspection and enforcement of nutrient management plans to ensure compliance.
- Fully fund the cover crops program.[167]

Long-term

- Require mandatory stream buffers and set backs on farms with a significant potential for pollution, equivalent to the setbacks required for development.[168]
- Increase technical assistance to farmers by fully staffing the Soil Conservation Districts and the Cooperative Extension Service, and increase targeting to find farmers who need assistance.
- Increase funding for technical research and assistance on integrated pest management and other innovative farming techniques.

LOCAL ACTIONS (POLLUTION REDUCTION PRACTICES)

Short-term

- **Provide technical assistance and incentives to promote the implementation of conservation practices to control and minimize loading of farm-derived nutrients into the Patuxent through runoff and groundwater.**

Long-term

- Support local farming communities through outreach and information sharing services, such as websites, newsletters, and staffing for local agriculture assistance programs.

ii. Preserving Farms

Key recommendations: Increase the agricultural land transfer tax and dedicate that increased funding for farmland preservation, and plan and zone for contiguous, viable farming communities.

Since the earliest settlements in the 1600s, tobacco has been the predominant crop raised throughout the lower portion of the watershed. As a result of federal anti-tobacco legislation, that crop has largely phased out and farmers have shifted to traditional row crop plants such as corn, soybeans, and hay.[169] Livestock in the watershed includes some dairy and cattle farms, particularly in the north, with a growing presence of horse farms throughout the watershed.[170]

This Prince George's farm lost its water supply when a poorly planned housing development diverted it.

These shifts in crop production reflect the difficulty in keeping farming profitable in the region. High land prices combined with low profits make farming an unappealing venture in the region, and other factors including dry summers, equipment repairs, and health insurance costs can drive farmers out of business.[171]

Part of the solution lies in the market. The recent demand for alternative fuels has already improved profits for certain farmers and niche markets such as horses, organic produce, and even vineyards offer solutions for farmers on smaller acreage.[172] The other part lies in smart preservation. Keeping farming communities intact through well-planned preservation efforts keeps farming viable, as those communities support the services, supplies, and culture that support farming.[173]

Contiguous farming districts make farming sustainable.

STATE ACTIONS (PRESERVING FARMS)

Short-term

- **Increase the agricultural land transfer tax and dedicate that increased funding for farmland preservation.**
- Increase and sustain funding for the farmland conservation programs and agriculture support programs, including Rural Legacy, Maryland Agricultural Land Preservation Fund (MALPF), local purchase of development rights programs, and the young farmers program, as outlined in the Agricultural Stewardship Act of 2006.[174]

- Implement the policies developed by the current agricultural task force to improve the tax structure to assist farmers.
- Study the impact of corn ethanol on water quality and determine if the environmental impact is acceptable.

Long-term

- If environmentally sound, promote alternative fuels such as barley-based ethanol, cellulosic ethanol, bio-diesel, switchgrass, and animal wastes. Support new processing plants for environmentally sustainable alternative fuels.

LOCAL ACTIONS (PRESERVING FARMS)

Short-term

- **Plan and zone for agriculture communities; use preservation funding to ensure contiguous, viable farming districts.**
- Create task forces like the Prince George's task force to find ways to support farming, such as easing restrictions on road-side produce stands, promoting farmers markets, and 'buy local' campaigns.
- Ensure farming viability by including agriculture as part of the economic development plan. Assign dedicated staff within the economic development agency specifically devoted to agriculture, as Howard County does, or hold "planning for agriculture" sessions with the aid of an outside organization, such as American Farmland Trust.
- Create an Ombudsman position for the five counties of Southern Maryland to assist in developing new enterprises and support the transition from tobacco to other sustainable sources of farm income.

Long-term

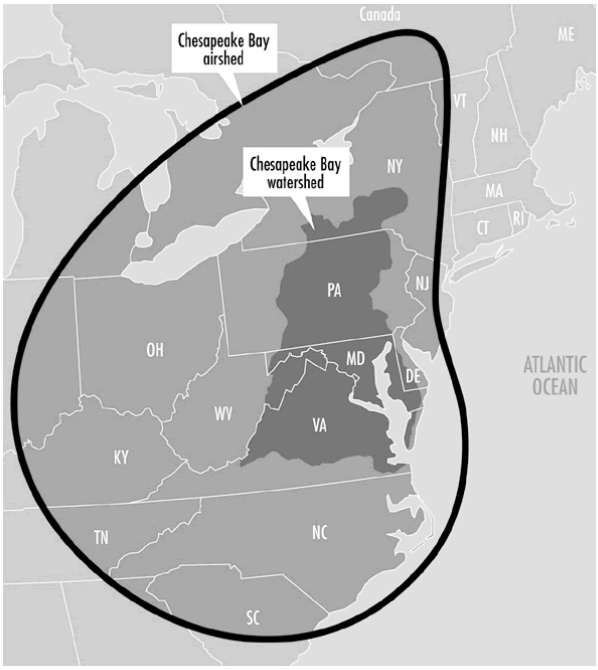
- Implement task force findings and provide support for farming communities.

V. AIR DEPOSITION

Air deposition occurs when pollutants carried in the air get washed back onto the land and into the river during rainstorms. Air pollution in the form of nitrogen oxides accounts for 7% of the nitrogen flowing directly into the Patuxent each year, but is responsible for closer to a third of the nitrogen overall.[175] Other pollutants from air deposition include sulfur, which contributes to acid rain, and mercury, which is a potent neurotoxin that harms fish and the people and animals that eat them. The two main sources of air deposition include emissions from cars and trucks and pollution from industrial sources such as power plants.

Continued growth will also increase this type of pollution. New roads and highways facilitate longer commutes and more driving, increasing the amount of local pollution into the watershed.[176] Increased energy demand creates an incentive for power plant expansion, further perpetuating the problem.

Another difficulty with air deposition lies in the fact that a significant percent gets carried into the watershed from other parts of Maryland and from beyond the state. The 'airshed' stretches as far west as Ohio.[177] Maryland is working with the federal government and its neighboring states to seek additional pollution reduction measures beyond its borders.[178] Alternatively, Maryland can seek judicial sanctions on major polluters, such as the recent successful case against an Ohio-based power company.[179] In addition to interstate efforts, it is vitally important that Maryland takes action over the sources the state can control.[180]



Source: Chesapeake Bay Foundation

i. Traffic

Key recommendations: Increase mass transit funding and plan for more mass transit in the areas throughout the watershed with sufficient population densities, either current or projected, including expanded rail and rapid bus services.

Pollution from cars and trucks is a critical source of pollution to address within the watershed because these emissions occur low to the ground and tend to stay closer to the area where it was produced.[181] There are several types of vehicle fleets on the road where tighter emission standards could be required. The largest fleet is the standard cars and trucks driven by the average resident. The Maryland Clean Cars Act of 2007 sets very high emission standards for these

Our reliance on highways for transportation leaves lasting impacts on the environment..

vehicles, modeled after the stringent California standards.[182] Two other fleets of vehicles could be held to higher standards; government vehicles and diesel trucks.[183]

The most efficient way to decrease pollution from vehicles, however, is to decrease vehicle miles driven. That requires sound planning for growth and a serious investment in mass transit.[184] As new roads are built, the government should ensure they are efficient in the way they move people. And the government should plan for and invest in walkable, mixed use communities with adequate public transportation; an investment in both the quality of the river and the quality of life.

FEDERAL ACTIONS (TRAFFIC)

Short-term

- Encourage the Congressional Delegation to support 40 miles per gallon vehicle fuel economy standards.
- Establish a program to upgrade existing diesel trucks already on the road.

STATE ACTIONS (TRAFFIC)

Short-term

- Rigorously implement the Clean Cars Act.
- Create other incentives for hybrids and low emission vehicles, such as allowing those vehicles to utilize HOV lanes and providing tax breaks for their purchase.
- Explore behavior changing incentives, such as a tax on vehicle miles traveled or incentives for using transit and ride share programs.
- Tighten the specification standards for government fleet vehicles and invest in advanced technology vehicles such as hybrid or natural gas.

Long-term

- Limit state matching funds for highway and other road projects unless the local government can show a clear display of need and a clear connection to smart growth principles.
- **Increase mass transit funding and plan for more mass transit in the areas throughout the watershed with sufficient population densities, either current or projected. Transit should include expanded rail and rapid bus services.**

- Increase funding and technical assistance for transit oriented development.
- Adopt statewide a green highway approach to transportation planning and approval process with greater avoidance of wetlands and important habitat, in conformance with the intent of the 2006 Federal Transportation legislation.

LOCAL ACTIONS (TRAFFIC)

Short-term

- Tighten the specification standards for government fleet vehicles to require advanced technology vehicles such as hybrid or natural gas.
- Incorporate transit oriented development into local growth plans, concentrating high density development near metro and bus hubs.
- Encourage walkable, mixed-use communities, and alter zoning to allow for mixed use communities.

Long-term

- **Plan for more mass transit in the areas throughout the watershed with sufficient population densities, either current or projected. Transit should include expanded rail and rapid bus services.**
- Establish sound comprehensive plans in line with smart growth principles and ensure that transportation projects are planned and implemented that are consistent with those plans.

ii. Smokestacks

Key recommendations: Increase permit fees and penalties for air pollution permit holders to increase staff and ensure adequate inspections and enforcement.

There are 119 air pollution permit holders in the Patuxent Watershed counties, with just under three dozen of those facilities located in the Patuxent Watershed.[185] The permit holders include power plants, gasoline stations, various industries, and government facilities. In the last three years 15% of the facilities in the watershed counties reported being out of compliance with their air pollution permits at least once; 84% of those were out of compliance on more than one occasion.[186]

The Chalk Point power plant is one of the seven oldest coal-powered plants in Maryland.

These facilities are scantily inspected—no location had more than one inspection a year and 45% have never been inspected or were inspected only once in the last three years.[187] A fifth of the total permit holders have been the subject of formal enforcement actions in the last three years, and another fifth have been the subject of informal enforcement actions in that same time period.[188]

Power plants are a significant polluter in the region. Mirant's Chalk Point power plant, located in Prince George's County, emits over seven million pounds of pollutants every year, including both sulfur and nitrogen oxides as well as toxins such as arsenic, dioxins, hydrochloric acids, and mercury.[189] This plant reported being out of compliance with its air pollution permit restrictions on opacity every quarter for the last three years.[190]

The passage of the Healthy Air Act will dramatically reduce power plant emissions from Maryland's oldest and dirtiest polluters, including the Chalk Point plant. But implementation of the act will still require rigorous inspection and enforcement.

FEDERAL ACTIONS (SMOKESTACKS)

Short-term

- Rescind the recent federal law that restricts the ability of local communities and individual States to deny power plant and transmission expansions in their jurisdiction.
- Require the Midwest States to reduce their air pollution emissions on older plants. Deny State Implementation Plans under the Clean Air Act that do not include best available technology for emissions control from power plants.

Long-term

- Encourage small and local generation while de-prioritizing large, centralized power plants.

STATE ACTIONS (SMOKESTACKS)

Short-term

- **Increase permit fees for air pollution permit holders to increase staff and ensure adequate inspections and enforcement. Increase penalties to provide a stronger deterrent to noncompliance.**
- Implement the Healthy Air Act with adequate enforcement to ensure compliance.

- Require Continuous Emissions Monitors for particulate mater on all power plants.

Long-term

- File enforcement actions for violations rather than relying almost entirely on consent decrees to bring violators into compliance with their pollution permits.

LOCAL ACTIONS (SMOKESTACKS)

Long-term

- Oppose the permitting of any new coal-fired power plants.
- When working with other proposed power plants encourage advanced technology plants.[191]

VI. SEA LEVEL RISE AND SHORELINE LOSS

Key recommendations: Establish limits on climate change emissions based on sound science, encourage restoration and protection of marshlands and SAV beds which provide damper effect on waves and enhances sediment capture, and promote living shorelines.

In the last century the rate of sea level rise, which had been a half a foot per century, increased to a foot per century. This increased rate is expected to accelerate in the future as a result of global warming, with a current projected rise of another two to three feet in the next century.[192] Coastal and wetlands areas, as well as low elevation lands, will be submerged; salinity levels will shift; and water temperatures may change. Increased hurricane risks such as Isabel and Ardesta, with a seven foot tidal surge, threaten property and water quality.

Rising water levels will exacerbate the existing problems with shoreline erosion and the associated sediment loading into the river. Shoreline practices can accelerate shoreline loss, or can anticipate and accommodate continued rise in water levels. Hardened shorelines exacerbate water level rise, destroying habitat and causing severe flooding problems during major storm events. Living shorelines protect buffers, habitat, and property, and do not cause significant sedimentation.

Riprap and other shore-hardening practices increase the force of tides downriver and exaggerate the impacts of storms

Living shorelines diminish storm effects and reduce flooding.

Although the potential impact of sea level rise and climate change need to be further studied in the Patuxent watershed, the federal, state, local governments, and individuals can take action now to limit its impact.

FEDERAL ACTIONS (SEA LEVEL RISE AND SHORELINE LOSS)

Short-term

- Commit to reduce energy consumption and to meet science-based climate change emissions reductions, and implement laws and regulations that will enable the country to meet those reductions.

STATE ACTIONS (SEA LEVEL RISE AND SHORELINE LOSS)

Short-term

- Implement the recommendations of the Commission on Sea Level Rise for low lying areas of the estuary.
- Increase public education and outreach to encourage the installation of living shorelines.
- Increase public education and outreach to encourage the adoption of low cost practices to reduce carbon dioxide emissions and energy consumption.
- **Encourage restoration and protection of marshlands and SAV beds which provide damper effect on waves and enhances sediment capture.**
- Strengthen and enforce the Critical Area Act.[193]
- **Establish limits on climate change emissions based on sound science.**[194]

Long-term

- Implement policies and regulations that will enable the State to meet science-based climate change emissions reductions.[195]

LOCAL ACTIONS (SEA LEVEL RISE AND SHORELINE LOSS)

Short-term

- **Implement environmentally sensitive approaches to shoreline erosion measures which protect beaches and promote living shorelines.**

Long-term

- Consider tidal surge, shoreline buffers, and other factors in land use planning in the tidal portions of the watershed, with consideration given to the potential impacts of continued climate change.

VII. OVERARCHING SOLUTIONS

Key recommendations: Establish total pollution limits for the river and set an implementation strategy and schedule to bring both point and nonpoint sources of pollution into compliance with those limits.

Very few unplanned ventures succeed. Restoring a watershed is no different. Attempts to protect the Patuxent are splintered among various State agencies, various counties, and various advocacy groups. All these entities seek the same goals but do not have a clear plan to get there.

The comprehensive plans of the seven counties are critical tools for the counties to determine the nature and direction of growth in their future. But the details of those plans vary, and a regional analysis of the strengths and weaknesses of each plan as pertaining to the environmental future of the Patuxent River has yet to be completed.

There is a critical need for increased cooperation, communication, and consensus on the actions that all seven counties should take to ensure success in restoring the river and a commitment from all levels of the government to support the steps needed to get there.[196] The State has the opportunity to fund a master plan for the watershed which builds on the comprehensive plans of the counties, region, and state to craft actions to restore and protect the river in advance of

Rogard Ross speaks at the 1st Annual State of the River Summit in 2006 at the Calvert Marine Museum in Solomon's Island.

the hundreds of thousands of new residents coming to the watershed in the near future and beyond.

Current trends for some counties call for the same rate of growth over the next thirty years as they have sustained in the last thirty. In many areas of the region the infrastructure needs of the current populations are not being met, and this is a poor indicator of the region's ability to address the coming growth.

There has been a growing attention on the role of watershed planning to combat a lack of green infrastructure at the local level. Watershed planning enables local governments to improve and protect water quality while maximizing staff time and their ability to leverage State and Federal funding. Coupling watershed planning with comprehensive plans, especially as the water quality elements are drafted to those plans, can provide a solid framework for local governments to balance growth and the environment.[197]

There have been several attempts to achieve a unified plan for the Patuxent. The Patuxent River Commission is required by state law to create a policy plan for the river.[198] This plan was approved by the State legislature and the seven counties in 1984, and updated in 1997.[199] However, the recommendations in the plan are statements of broad goals and visions, without the specificity required to ensure action. Most recently, there has been a growing movement to designate the Patuxent as the demonstration river for the State.[200] Despite the suitability of the Patuxent as a model for bay restoration and the historic significance of the river, this effort has not yet proven successful.[201]

There are some discreet actions that the State can take to improve watershed planning. The Clean Water Act requires the State to create total maximum daily loads (TMDLs), or numeric pollution limits, for the waters of the State.[202] While the Maryland Department of the Environment has begun work on these numeric limits, the process is time-consuming and at the current rate completing TMDLs for the Patuxent and its tributaries will take a significant time investment. The State should prioritize establishing TMDLs in the Patuxent watershed so that local governments can incorporate these limits in their comprehensive plans as they work to restore the river.

The State should also expand citizen's and organization's rights to take polluters to court, a right known as standing. Granting citizen and organizational standing ensures that, when local or State officials are unable to inspect and enforce a pollution limit, citizens will have the ability to step in and hold the polluter accountable. Recent attempts to expand standing under Maryland's environmental laws have been unsuccessful.[203]

The failure to act on historic promises and restore Maryland's 'greatest river' has led some to question our ability to protect the Chesapeake Bay. Long time advocates for the Patuxent see a growing acceptance of poor river quality among

citizens and government officials.[204] 'Good enough' is rarely actually good enough; the success of policies and regulations must be judged not by what they are but by what they do for the river. Everyone must commit to doing more and planning smarter to restore the Patuxent.

STATE ACTIONS (OVERARCHING SOLUTIONS)

Short-term

- **Establish total pollution limits (TMDLs) for the river, taking into account existing and future sources of pollutants.**
- Look at the statute that created the Patuxent River Commission and make suggestions to improve its composition. Reevaluate how it can be more effective in coordinating action among the seven counties and the State.
- Increase the involvement of the Patuxent River Commission in the individual counties. Hold meetings where county executives are invited to attend and create an outreach committee that can engage each county in substantive policy debates.
- Prioritize the Patuxent River through funding, policies, and regulatory decisions.
- Expand standing to allow citizen suits to increase enforcement of frequently violated laws.
- Create a curriculum for students and an outreach program for adults that explains the environmental and historic importance of the Patuxent River and the role individuals can play in its restoration.

Long-term

- **Set an implementation strategy and schedule to bring both point and nonpoint sources of pollution into compliance with TMDL limits.**
- Integrate planning across the various State agencies, including the departments of the Environment, Natural Resources, Planning, Agriculture, and Transportation, as well as the Critical Area Commission.

LOCAL ACTIONS (OVERARCHING SOLUTIONS)

Short-term

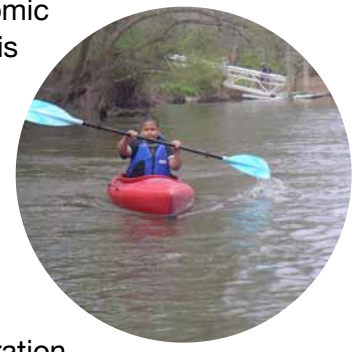
- **Coordinate efforts to update comprehensive growth plans and to incorporate a water resources element into those plans.**

Long-term

- Work together in both the northern and southern regions and through the entire watershed to improve and expand planning and restoration efforts.
- Increase education of students and outreach to adults on the Patuxent River.

Conclusion

The Patuxent River provides an economic engine for the region, a quality of life for the residents of its watershed, and an irreplaceable habitat for the birds, fish, and other animals that depend on it. Throughout the last half century the Patuxent has been a driving force for watershed restoration efforts in the State, proving that concerned citizens can make a difference and that concerted action can improve water quality.



There are many challenges facing the watershed, especially as the region absorbs a swelling population. But elected officials, regulators, and citizens have the tools and solutions that can enable economic growth and development while protecting water quality. What is needed now is the determination to make tough choices and take action.

The seven counties of the watershed have an unprecedented opportunity to chart their futures. The Patuxent counties can set a regional or even national model for cooperation, coordination, and environmental protection.

The State also has an opportunity to reinvigorate its water restoration programs, using the Patuxent as a model and a guide. Poll after poll shows that Maryland citizens care about the environment and want to see action taken to protect it.[205] The State can lead the way by finding the funding, reforming the policies, and increasing enforcement staff in the various agencies.

The steps to restoring the Patuxent are numerous, and action is needed on a variety of issues. Some immediate steps that can be taken include:

While resolving the budget crisis, the State should ensure that fines and fees on polluters are increased to fund more staff within the State agencies and pass a dedicated fund for watershed restoration, such as the Chesapeake Bay Trust Fund (or Green Fund).

As the counties update their comprehensive plans to incorporate water quantity and quality elements, they should ensure that their plans adequately identify and protect preservation areas, with zoning that truly limits growth in rural and protected areas.

Both the State and the counties should increase their staff for inspectors, and enforcement for all environmental laws, focusing in particular on sediment and erosion, critical area, and wetlands violations.

State and local governments should increase their public education and outreach on how citizens impact the Patuxent and what they can do to protect it.

This report is one step towards creating an action plan to restore the Patuxent. The report will be updated to include the discussion at this year's State of the River Summit and will be released in December.

The seven counties and the State must now turn this report into action. Let us once more pledge to restore the Patuxent River to the water quality it enjoyed in 1950. Let us commit ourselves to that endeavor, and take the actions necessary to accomplish it. Future generations will determine how well we succeed.

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"Western Branch Watershed Restoration Action Strategy, Final Report 2004", Prince George's County, Department of Environmental Resources and the City of Bowie, Maryland Coastal Zone Management Program, Department of Natural Resources, 2004.

Appendix

APPENDIX 1: PATUXENT PRESERVATION CHRONOLOGY

1977 The Boards of Commissioners of Calvert, Charles, and St. Mary's Counties file suit against EPA to halt expansion of the Savage Sewage Treatment Plant on the Patuxent in Howard County.

1978 The Boards of Commissioners also file suit against EPA and the Maryland, challenging the adequacy of the Patuxent River Water Quality Management Plan approved by EPA.

1979 Governor Hughes tours the lower Patuxent River with state and local officials and commits Maryland to better management of the watershed.

1980 The Patuxent River Watershed Act creates the Patuxent River Commission. The U.S. District Court rules in favor of the Southern Maryland counties in both cases and orders EPA to prepare an Environmental Impact Statement on the Savage Sewage Treatment Plant and also orders Maryland and EPA to prepare a new water quality plan for the Patuxent.

1981 The Patuxent "Charrette" is held. This historic conference results in a consensus to restore water quality in the river to 1950 levels.

1983 The EPA approves the revised Water Quality Management Plan for the Patuxent River.

1984 President Reagan pledges $10 million a year for four years for the Chesapeake Bay. The Patuxent River Watershed Policy Plan is approved by the counties and the Maryland Assembly.

1985 EPA publishes its report "Summary of Findings: Advanced Wastewater Treatment Facilities Proposed for Patuxent River Basin, Maryland."

1986 Maryland Office of Environmental Programs issues its "Patuxent River Basin Update", a progress report on Water Quality Management Planning.

1987 Chesapeake Bay Agreement is signed, establishing a 40% nutrient reduction goal.

1991 The Patuxent Watershed Demonstration Project is begun.

1992 The Bay Agreement is amended to create the tributary strategies.

1995 The Patuxent River Commission is tasked to serve as the Tributary Team for the Patuxent.

2000 The Chesapeake Bay 2000 Agreement is signed, setting restoration standards for 2010.

2004 The Chesapeake Bay Restoration Fund is passed, establishing a dedicated funding source for wastewater treatment plant upgrades.

2006 HB1141, requiring counties to add a water quality and quantity element to their growth plans, is passed. The Healthy Air Act and the Agricultural Stewardship Act also pass.

2007 The Stormwater Management Act of 2007 is passed, as well as the Clean Cars Act.

APPENDIX 2: STAKEHOLDERS IN THE WATERSHED

A stakeholder is an individual or group with a discernable interest in a given issue or concern whose interest would be affected by a material change in that issue. There are a number of interest groups active in shaping the policies affecting the river and who make a difference in building public awareness and willpower needed to bring about change water quality and social culture relating to the river.

Sector	Nature of interest in the river	Issues
Advisory Groups	Various chartered groups with different aims seeking to address public and private interests on the river.	Sometimes can find consensus but helpless where consensus is harder to find.
Commercial Watermen	Rely on clean water and healthy fisheries for economic survival	Sustainable livelihood severely at risk
Elected Officials	Often serve as the arbitrator between public and private interests on the river	Generally caught in a complex balancing act between representing the public good and maintaining political survival.
Environmentalists	Seek conservation for biodiversity and various public interest agendas. Some are funded by restoration efforts.	Often fractured in focus and rarely operating as an organized presence. Often dominated by membership governed concerns.
Farmers	Property values, economic issues, a regulated community.	At a crossroads to protect their investment. Often blamed for pollution problems.
Government	Parklands, municipal expansion, tax base and other dividends associated with watershed resources and growth	Balancing a variety of interests. Water quality is only a the priority for select agencies.
Homeowners	Rely on property values, recreational values and public health and safety	Future, health, investment and recreational interests in jeopardy.
Industry and/or nonprofit lobbyists	A plethora of paid interests represent any number of stakes in the future of the river with an eye toward advancing the policy aims of their employers.	Influential in creating pressure and building support for the priorities of their clients.
Real Estate/ Builders	A wide range of business interest are tied to the builder, contractor, & construction industries.	Profit and market incentives are not always aligned with water quality concerns.
Regulators	Often influence policy with institutional self interest fused with the public interest mission.	Sometimes caught in the middle, not always in sync with citizens or with the regulated sector.
Scientists and Researchers	Education, scientific inquiry, and knowledge.	Generally working on areas of interest for which public support can be found

Endnotes

[1] See “Water Quality and the Patuxent”, p. 9 of this report.

[2] “Land Use – Local Government Planning” (HB 1141), 2006. Available online at: mlis.state.md.us/2006rs/billfile/HB1141.htm.

[3] “The Stormwater Management Act of 2007”, (HB 786/SB784), 2007. Available online at: mlis.state.md.us/2007RS/billfile/sb0784.htm.

[4] “Profiles in Courage”

[5] Patuxent River Charette, 1981. Referenced in “Environment - Bay Restoration Fund - Patuxent River Watershed” (SB 379), 2006. Available online at: mlis.state.md.us/2006rs/bills/sb/sb0379f.pdf.

[6] The current state of the river is discussed extensively in the Patuxent Tributary Strategy report from 2006. (Maryland Department of Natural Resources, “Maryland Tributary Strategy Patuxent River Basin Summary Report for 1985-2004 Data” (February, 2006).)

[7] First Annual State of the River Summit, October 2006, official transcript. For copies of the transcript contact the Patuxent Riverkeeper office.

[8] Pax Trib Strategy 2006 Report, supra note 6.

[9] Patuxent River Commission, “Patuxent River Policy Plan: An Update for 1984 to 1997,” (November, 1997). Available online at: www.mdp.state.md.us/info/patuxplan.htm. Those recommendations focus on preservation of parks, forests, buffers, and farmland; concentrating new development in existing growth areas and minimizing the water quality impacts of that development; funding retrofits of existing developments; and managing water quality protection in a planned, comprehensive way.

[10] Secretary Shari Wilson, the Department of the Environment, spoke of the challenge in balancing the state authority over water quality with the local authority over land use. She also mentioned the need for greater enforcement, particularly with sediment and erosion control. Assistant Secretary Frank Dawson, the Department of Natural Resources, spoke of the need to integrate the efforts of the various agencies as they implement existing environmental laws, and stressed that citizens must also take action to restore and protect the watershed. Assistant Secretary Don Halligan, the Department of Planning, stressed that the administration was re-emphasizing Smart Growth though he echoed that the state has no authority over local land use decisions, making the role of the Department one of coordination and assistance only. Margaret McHale, Chair of the Critical Area Commission, analogized the situation to a "three-legged race" where the State was trying to win the marathon of environmental protection while joined to its partner, the local governments. Secretary Roger Richardson, the Department of Agriculture, cited the loss of farmland and the pressure on farmers to reduce more pollution from less land. He pledged to work to 100% compliance with nutrient management plans and to increase inspection of cover crops. There is a need for funding for technical assistance and research to perfect conservation practices on farms. Meg Andrews, representing the Department of Transportation, seconded the need for funding, to build the road and transit systems the region needs. She supported the call for assessing transit needs, and also pledged that the Department was increasing its internal enforcement for construction activities. Sue Veith from St. Mary's County and Greg Bowen from Calvert County both spoke of the difficulty implementing smart growth policies in the real world. They mentioned the laws the county used to ensure it grew in a sustainable way. Finally, a panel of legislators including Delegates Sue Kullen, John Bohanan, and Elizabeth Bobo talked about their commitment to pass legislation to help restore this river. (Second Annual State of the River Summit, October 5th, 2007.)

[11] The Clean Water Act, 33 U.S.C. 1251 et seq. Available online at www.epa.gov/r5water/cwa.htm.

[12] Charette, supra note 5.

[13] First Annual State of the River Summit, October 2006, presentation by Dr. Walter Boynton. See supra note 6 for transcript information.

[14] Pax Trib Strategy 2006, supra note 6, p. 10.

[15] Poor, P. Joan, et al., "Exploring the hedonic value of ambient water quality: A local watershed-based study," Ecological Economics, Vol. 60, No.4, February 1, 2007, ISSN0921-8009. This economic study of the St. Mary's River watershed showed that home values decrease significantly when pollution increases, including homes not directly on the water.

[16] Chesapeake Bay Program, "Watershed Profiles: Patuxent". Available online at: www.chesapeakebay.net/wspv31/(2w0ma0223y54ww55jhj22045)/WspAbout.aspx?basno=4&topic=5

[17] Pax Trib Strategy 2006 Report, supra note 6, p. 2.

[18] The deepest point of the river is at Point Patience near the Thomas Johnson bridge crossing. Depth readers on the Patuxent Riverkeeper boat have read as deep as 185 feet at times.

[19] CBP Watershed Profiles, supra note 16.

[20] Dennis King et al, "Managing Patuxent River Water Quality: Looking Beyond Science and Politics to the Economics of Decision-Making," Report to NOAA National Ocean Service, Contract NAO3NOS4780007, p. 20 (April 15, 2007).

[21] Maryland Department of Natural Resources, "Patuxent River Basin Overview," p. 2 (November, 2003). Available online at www.dnr.state.md.us/Bay/tribstrat/patuxent/patuxent.pdf.

[22] According to the Patuxent River Wildlife Refuge, over 200 species of birds nest in the refuge alone (US Fish and Wildlife Service, "Patuxent Research Refuge Homepage," available online at: www.fws.gov/northeast/patuxent/prrdefault.html).

[23] Maryland Department of Planning, "Base Relocation and Closure (BRAC) Report," (December, 2006). Available online at: www.mdp.state.md.us/msdc/military/Report/BRAC_Report.htm

[24] Pax Trib Strategy 2006 Report, supra note 6, p. 3.

[25] Personal conversation with Dan Baldwin, Maryland Department of Planning, September 21, 2007.

[26] Basin Overview, supra note 21, p. 1.

[27] Presentation by Secretary Richard Hall, Maryland Department of Planning, to the Patuxent River Commission, August 8, 2007.

[28] For more information see the Chesapeake Bay Program, "Urban Stormwater," available online at: www.chesapeakebay.net/wquality.htm.

[29] Boynton, supra note 13.

[30] Maryland Department of Natural Resources, "DRAFT Maryland Tributary Strategy Patuxent River Basin Summary Report for 1985-2005 Data", p. 5 (August, 2007). Atmospheric depositon is closer to a third of the total nitrogen, but because it falls on urban or agricultural lands it is usually accounted for in those totals.

[31] Id.

[32] Id. 54% is from agriculture and 28% is from urban sources.

[33] Id., p iv.

[34] Id, p iv.

[35] Id, p v.

[36] Id, p v.

[37] CBP Urban Stormwater, supra note 28.

[38] Id.

[39] MaryPIRG Foundation, "Healthy Farms for a Healthy Bay: The Benefits of Agricultural Conservation Programs" (Winter 2005-2006), available online at: www.marylandpirgstudents.org/reports/air-and-water/clean-air-and-water-reports/healthy-farms-for-a-healthy-bay-the-benefits-of-agricultural-conservation-programs.

[40] US Environmental Protection Agency, "Enforcement and Compliance History Online," available at www.epa-echo.gov/cgi-bin/get1cReport.cgi?tool=echo&IDNumber=110011748118.

[41] USGS report from the Chesapeake Bay Program website, www.chesapeakebay.net.

[42] John Capper, Garrett Power, and Frank Shivers, Jr., "Chesapeake Waters: Pollution, Public Health, and Public Opinion, 1607-1972" p. 158 (Tidewater Publishers, Centreville, 1983).

[43] During the 2005 legislative session, opponents of proposed legislation to prioritize the Patuxent for wastewater upgrades argues vehemently that original Charette goals were now impossible to meet, others that the costs of meeting those goals would bankrupt some of the stakeholders. Still others argued that the Patuxent had made considerable gains on record and that it was unfair to seek further reduction in the pollutants facing the river when there were so many other polluted waterways in the state. There was a genuine "buzz" that the problems of the Patuxent were no more important that those facing the Bay.

[44] Notably, Senator Fowler has argued that there is a paradox in launching a broad based initiative to save the entire Bay without having demonstrated either the political will or practical ability to clean up the one major tributary that is contained entirely within the state.

[45] For example, the Maryland Department of the Environment has only 5 staff within their entire stormwater program.

[46] King, supra note 20, p. 8

[47] Senator Bernie Fowler, personal communication September 24, 2007.

[48] One of the most egregious examples of this is the Chesapeake Ranch Estates, a development in the southern part of Calvert County. Developers squeezed as many lots as possible in their subdivision with total disregard for whether septic systems would work on the lots or the effects of stormwater runoff from poorly designed roads and houses on steep slopes. The developers are long gone, but property owners (who can't build because their lots won't perk), residents and Calvert County are left with the expensive problem of addressing costly sewage and runoff problems.

[49] King, supra note 20.

[50] Boynton, supra note 13.

[51] Pax Trib Strategy 2007 Report, supra note 30, p. 10.

[52] US Army Corps of Engineers, "Patuxent River Water Resources Reconnaissance Study," July 1996, www.mdp.state.md.us/INFO/patux/WATER.pdf (last accessed September 13, 2007).

[53] Boynton, supra note 13. Indeed, the recent EPA report on the Chesapeake Bay restoration efforts found that the Bay watershed will not meet restoration deadlines due to increased population growth in the region. (Environmental Protection Agency, "Development Growth Outpacing Progress in Watershed Efforsts to Restore the Chesapeake Bay", Report No. 2007-P-00031, p8 (September 10, 2007).

[54] Pax Trib Strategy 2007 Report, supra note 30, p5.

[55] Basin Overview, supra note 21, p. 1.

[56] Id.

[57] King, supra note 20, p. 20.

[58] Center for Watershed Protection, "Death for streams lies in the pavement," (Baltimore Sun, October 2000). Available at www.cwp.org/sun_article.htm.

[59] CBP Urban Stormwater, supra note 28.

[60] HB 1141, supra note 2; HB 786, supra note 3.

[61] See "Water Quality and the Patuxent", p. 9 of this report for a full discussion of pollution load limits.

[62] King, supra note 20, p. 23. Construction activities comprise an unknown portion of the sediment runoff from urban areas, which is 28% of the total sediment in the river (Pax Trib Strategy 2007 Report, supra note 30, p. 5).

[63] CBP Urban Stormwater, supra note 28.

[64] For more information on stormwater runoff, see also the Maryland Department of the Environment, "Maryland's Stormwater Management Program," available online at:
www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/home/index.asp.

[65] HB 786, supra note 3.

[66] Part of HB786 requires MDE to establish a joint process for approving stormwater and sediment and erosion permits, looking at the cumulative impacts of both. This, as well as the requirement for environmental site design, will help drive improvements to the construction site planning.

[67] Numbers for stormwater retrofits baywide are available in the Maryland Department of Natural Resources, "Maryland's Tributary Strategy: Executive Summary," p. 9-10 (September 2004). Available online at
www.dnr.state.md.us/Bay/tribstrat/exec_summary_5_6_2.pdf.

[68] This would include maintenance for best management practices, such as sediment ponds.

[69] A coalition of groups has worked for two years to help draft the MS4 storm-water permit for Montgomery County. While this effort has not yet been successful, it has produced an excellent template for MS4 permits state-wide.

[70] This would include maintenance for best management practices, such as sediment ponds.

[71] Chesapeake Bay Program, "How You Can Help the Bay," available online at www.chesapeakebay.net/helpbaysept2006.htm.

[72] Id. at "Skip Spring Fertilizer… and Wait Until Fall."

[73] The University of Maryland has extensive recommendations on fertilizer use.

[74] Scotts has entered into a voluntary agreement to provide phosphorous free fertilizers in the Bay region.

[75] While several states have already implemented deposit and return systems for recyclable containers, this recommendation is listed as a long-term action due to several calls for more study on the most efficient, cost-effective infrastructure to establish this system in Maryland.

[76] Pax Trib Strategy 2006 Report, supra note 6, p3.

[77] Pax Trib Strategy 2007 Report, supra note 30, p5. This number continues to grow, from 6% in 1985 to 11% in 2003 to 12% in 2005 (Pax Trib Strategy 2006 Report, supra note 6, p. 7).

[78] Pax Trib Strategy 2006 Report, supra note 6, p. 3, 7.

[79] There has been some interest in clustering development for conservation on shared systems, though these have not proven sufficient to date. Even shared septic systems cannot filter pollution as efficiently as WWTPs.

[80] Permitting the use of septic systems in major subdivisions enables sprawling development with large homes on large lots, frequently within rural areas and away from existing infrastructure. Prohibiting development on septic systems would require development to be placed where either sewage treatment facilities exist to process the waste or at extremely low densities in rural areas.

[81] Chesapeake Bay Program, "Land Conservation," available online at: www.chesapeakebay.net/land.htm.

[82] Chesapeake Bay Program, "Wetlands," www.chesapeakebay.net/habitats.htm, and "Forests," available online at: www.chesapeakebay.net/habitats.htm.

[83] Maryland Recreation and Parks Association, "What are the benefits of parks and recreation?," available online at: www.mrpanet.org.

[84] Hall, supra note 27.

[85] Id.

[86] CBP Watershed Profiles, supra note 16.

[87] Scott Stranko, Department of Natural Resources, presentation to the Patuxent River Commission, October 11, 2006.

[88] Id; see also "Characterization of the Watershed," p. 8 of this report.

[89] See "History of Restoration Efforts," p. 11 of this report.

[90] Preservation and planning for development is also a critical piece of the Patuxent River Policy Plan. Supra note 9.

[91] Department of Natural Resources, "Program Open Space," available online at: www.dnr.state.md.us/pos.asp.

[92] Partners for Open Space, "Save Maryland's Lands," available online at: www.partnersforopenspace.org.

[93] Id.

[94] Id.

[95] Local Government Commission, "Overcoming Obstacles to Smart Growth through Code Reform," available online at: ww.lgc.org/freepub/PDF/Land_Use/sg_code_exec_summary.pdf.

[96] For more background on Smart Growth visit the Maryland Department of Planning, "Smart Growth Background," available online at www.mdp.state.md.us/smartintro.htm.

[97] Greg Bowen, presentation at the Second Annual State of the River Summit, October 2007.

[98] Montgomery County's agricultural reserve is an example of an excellent program that included clear delineations of rural growth areas, restrictive zoning, and a functioning TDR program. See National Resources Defense Council, "Montgomery County Agricultural Reserve: The Country's Largest Farmland Protection Program," available online at: www.nrdc.org/cities/smartGrowth/solve/mont.asp.

[99] In 2006, park funding was at 46% of 2002 levels.

[100] Poorly designed TDR and PDR programs are at best unhelpful and can actually hinder smart growth efforts. Montgomery County and Calvert Counties provide models for good TDR and PDR programs.

[101] For more information visit the Maryland Department of the Environment, "Wetlands Functions," at: www.mde.state.md.us/Programs/WaterPrograms/Wetlands_Waterways/about_wetlands/wetfunc.asp.

[102] The Critical Area Commission, "Critical Primer," at www.dnr.state.md.us/criticalarea/section2.html.

[103] For a full list of laws visit MDE, "Maryland's Wetland Regulation Database", at: www.mde.state.md.us/Programs/WaterPrograms/Wetlands_Waterways/regulations/database.asp

[104] Id.

[105] For more information visit the Critical Area Commission homepage at: www.dnr.state.md.us/criticalarea.

[106] Personal communication with Margaret McHale, Chair of the Critical Area Commission, November 28, 2007.

[107] Coastal Zone Program, "Maryland Coastal Program," at: www.dnr.state.md.us/bay/czm/about_czm.html

[108] Id.

[109] Maryland Department of Planning, "Resource Protection," available at: www.mdp.state.md.us/rp.html.

[110] The Critical Areas Law is the best example, for a full analysis of the problems with the current law and administration see the University of Maryland School of Law, "Enforcement in Maryland's Critical Area: Perception and Practice" (May 2006), available online at: www.law.umaryland.edu/specialty/environment/documents/Final_Critical_Area_Report.pdf.

[111] CBP Watershed Profiles, supra note 16.

[112] Id.

[113] See the UM Law report, supra note 113; see also the Abell Foundation, "An Evaluation of the Maryland Critical Area Program" (December 2003), available online at: www.abell.org/pubsitems/env_critical.area_1203.pdf.

[114] The King report, supra note 20, uses critical areas as an example of how weak enforcement leads to intentional violations. See also the UM Law report, supra note 113, for more information on weakness within the critical area law.

[115] King, supra note 20, p. 47-48.

[116] Prince George's County's recent efforts to increase stream buffers from 50 to 100 feet from any stream's wetland in the county is an excellent model for this.

[117] Patuxent Reservoirs Watershed Technical Advisory Committee, "Patuxent Reservoirs Watershed Annual Report 2006," (2006).

[118] Many of these actions are from the Patuxent Reservoirs Watershed Annual Report, supra note 117.

[119] Pax Trib Strategy 2007 Report, supra note 30, p. 5.

[120] ECHO, supra note 40.

[121] Pax Trib Strategy 2007 Report, supra note 30, p. 5.

[122] Pax Trib Strategy 2006 Report, supra note 6, p. 7. Loads have also decreased in the last two years, dropping 8% for nitrogen and 4% for phosphorous from 2003-2005.

[123] For more information see "History of Restoration Efforts", p. 11 in this report.

[124] Maryland Department of Natural Resources, "Maryland's Chesapeake Bay Tributary Strategy Statewide Implementation Plan," p. 7 (August 2007); caps are set at 4 mg/l nitrogen and .3mg/l phosphorous for major plants and at 18 mg/l nitrogen and 3 mg/l phosphorous. This goes beyond the Charette limit of 1 mg/l for phosphorous. The Charette also calls for total daily load limitations of 420 pounds for phosphorous and 1250 pounds for nitrogen.

[125] For more information see the Maryland Department of the Environment, "Bay Restoration Fund (Senate Bill 320)" available online at www.mde.state.md.us/Water/CBWRF/index.asp.

[126] Pax Trib Strategy 2007 Report, supra note30, p. 6. The upgrade schedule on the remaining plants is not clear.

[127] Due to exponential population growth, some commentators believe the Charette loading goals cannot be met without either population caps in the region or significantly ratcheted down nutrient discharge limits on the wastewater treatment plants.

[128] Charette, supra note 5; and Implementation Plan, supra note 124, p. 10.

[129] Implementation Plan, supra note 124, p. 8.

[130] "Minor" plants are those with a design capacity of less than 500,000 gallons a day. (Id.)

[131] Implementation Plan, supra note 124, p. 7; bay-wide, majors account for 95% of the WWTP loads but Patuxent specific numbers are not given.

[132] The Charette (supra note 5) gives one of the first examples of setting loading limits based on water quality limits. Total maximum daily loads are the latest mechanism to set pollution limits for the river, upon which pollution from all sources would be restricted. Those are discussed in the final section of this paper on page 32.

[133] Clean Water Act, supra note 11.

[134] King, supra note 20, p. 43.

[135] Clean Water Act, supra note 11.

[136] For more information see Maryland Department of the Environment, "Water Management Permits," available online at: www.mde.state.md.us/Permits/WaterManagementPermits/index.asp.

[137] King, supra note 20, p. 43.

[138] King, supra note 20, p. 23.

[139] Christy Leavitt, "Troubled Waters: An analysis of Clean Water Act compliance, July 2003-
December 2004" (March 2006), available online at: www.uspirg.org/uploads/iN/ZM/iNZM2tGz4x7smwVULhTpow/troubledwaters06.pdf.

[140] The 1984 Patuxent River Policy Plan listed sand and gravel mine extraction in its ten priorities for the river. A subsequent report in 2000 on progress under that plan analyzes steps counties have taken in managing and converting their abandoned mine sites. Patuxent River Commission, "County Management Measures Augmenting the Patuxent River Policy Plan" available online at: www.dnr.state.md.us/BAY/TRIBSTRAT/patuxent/2000_matrix.pdf.

[141] ECHO, supra note 40.

[142] Sixty areas of concern were identified with at least four ending up as listed as CERCLA toxic sites. These various dumping sites were in active operation until the 1970s to 1990s. (Maryland Department of the Environment, "Beltsville Agricultural Research Center MD-053," available online at: www.mde.state.md.us/assets/document/brownfields/Ag_Resrch_Fac.pdf)

[143] Environmental Protection Agency, "Record of Decision: Naval Air Station Patuxent River" (January 2000), available online at: www.epa.gov/reg3hwmd/super/sites/MD7170024536/rod/2000-02.pdf

[144] For more information on the EPA program visit their website at: www.epa.gov/compliance/federalfacilities/index.html

[145] The Patuxent River Naval Air Station refuses to make public its clean water act permits, and a history of violations is not available to the public. ECHO, supra note 40.

[146] ECHO, supra note 40.

[147] Expansion at Fort Meade will bring 10,679 people, 42.2% of the total BRAC growth. Another 474 households, 1.9% of BRAC growth, will come to the Andrews Air Force Base area. For more information on BRAC, see the BRAC Report, supra note 23.

[148] For more information, go to www.epa.gov/region03/federal_facilities/ems.htm. The US EPA laboratory at Ft. Meade has adopted an EMS.

[149] Healthy Farms, supra note 39.

[150] Chesapeake Bay Commission, "Cost-Effective Strategies for the Bay" (December 2004), available online at: www.chesbay.state.va.us/Publications/cost%20effective.pdf.

[151] For a full discussion of the impacts of development see "Growth and Development," p. 17 in this report.

[152] Healthy Farms, supra note 39.

[153] Several task forces have been formed to fully research this issue, including ones at the State level and in Prince George's County.

[154] Pax Trib Strategy 2007 Report, supra note 30, p. 5.

[155] Healthy Farms, supra note 39.

[156] Environment North Carolina, "The Value of Open Space," p. 5-6 (June 2004), available online at: www.environmentnorthcarolina.org/reports/preservation/preservation-reports/the-value-of-open-space-how-preserving-north-carolinas-natural-heritage-benefits-our-economy-and-quality-of-life

[157] Department of Natural Resources presentation, "Forest Conservation for the Chesapeake Bay: The Goal-Setting Process in Maryland" (June 2007), available online at: www.dnr.state.md.us/forests/download/MDForestConGoal07short.pdf.

[158] Pax Trib Strategy 2007 Report, supra note 30, p. 5. This is down one percent from 2003 (Pax Trib Strategy 2006 Report, supra note 6, p. 8).

[159] Healthy Farms, supra note 39.

[160] Id.

[161] Maryland Department of Agriculture, "Maryland Nutrient Management Law," available online at: www.mda.state.md.us/pdf/NM_Law.pdf.

[162] Personal statement by Secretary Roger Richardson, Second Annual State of the River Summit, October 2007.

[163] Maryland Department of Agriculture, "Soil Conservation and Water Quality Plan Implementation," available online at: www.mda.state.md.us/resource_conservation/trib_strategies/scwqpi.php.

[164] Maryland Department of Agriculture, "Maryland Agricultural Water Quality Cost-Share Program: Providing Grants to Help Farmers Protect Natural Resources," available online at: www.mda.state.md.us/pdf/MDA_MACS_bro_proof4.pdf.

[165] Healthy Farms, supra note 39.

[166] Id.

[167] Funding for this program comes from numerous sources, including the Bay Restoration Fund, the MACs program, and general funds allocated according to the Agricultural Stewardship Act.

[168] This could be administered by MDA or MDE.

[169] USDA, "National Agricultural Statistics Service," available online at: www.nass.usda.gov/Statistics_by_State/Maryland/index.asp#.html.

[170] Id.

[171] Healthy Farms, supra note 39.

[172] More info on alt. fuels, farm tour for niche markets. Environmental impacts of corn based ethanol outweigh the benefits.

[173] Healthy Farms, supra note 39; see also the "Agricultural Stewardship Act of 2007," (HB2/SB5), available online at: mlis.state.md.us/2006rs/billfile/hb0002.htm.

[174] Id.

[175] Air deposition onto developed or agriculture lands is included in those estimates, causing air deposition itself to be generally underreported. The Power Plant Research Program within DNR, in conjunction with the Chesapeake Bay Program and the Tributary Teams is engaging in research to further refine these numbers. Power Plant Research Program, "Maryland Power Plants and the Environment: A review of the impacts of power plants and transmission lines on Maryland's natural resources (CEIR-13)," p. 3-13 (January 2006).

[176] MaryPIRG Foundation, "Paving the Way: How Highway Construction Has Contributed to Sprawl in Maryland" (January, 2001), available at: http://static.marylandpirg.org/mdp.asp?id2=4770&id3=MD&.

[177] For a map of the airshed, visit Chesapeake Bay Program, "Modeling the Chesapeake Bay," available online at: www.chesapeakebay.net/info/wqcriteriapv/modeling.cfm.

[178] The Federal Clean Air Interstate Rule impacts nineteen states and the District of Columbia, and requires significant pollution reductions through both direct reductions and the implementation of a cap and trade system. (Personal communication with Herb Sachs, Maryland Department of the Environment, November 19, 2007.)

[179]Maryland was a party in the nation's largest environmental settlement, reached in early October, against American Electric Power Co. The Ohio-based company will now be required to invest $4.6 billion to reduce pollution at 46 coal-fired plants in Ohio, Indiana, Kentucky, Virginia, and West Virginia. This investment is anticipated to reduce pollution by 1.6 billion pounds each year through 2018. (Lara Jordan, "Acid rain case settled for $4.6 billion," Yahoo! News (October 2007), available at: http://news.yahoo.com/s/ap/20071009/ap_on_bi_ge/clean_air_lawsuit.

[180] The passage of the Healthy Air Act in 2006 shows the state's resolve to act locally despite size of airshed. ("Maryland Healthy Air Act," (SB 154), 2006.)

[181] Chesapeake Bay Program, "What Goes Up Must Come Down: How Nutrients in the Air Affect the Bay," available online at: www.chesapeakebay.net/newsair080805.htm.

[182] The federal Clean Air Act allows two sets of standards for vehicle emissions: states may either follow the federal standard or the stricter California standard. Maryland joined eleven other states in opting to follow the higher standards. MDE has proposed implementing regulations that will begin this program with the 2011 model year. "Maryland Clean Cars Act of 2007," (HB131/SB103), 2007, available online at: mlis.state.md.us/2007RS/billfile/sb0103.htm.

[183] For more information on the diesel trucks, see Environment New Jersey, "Diesel and Health in America: The Lingering Threat" (February, 2005), available online at: www.environmentnewjersey.org/reports/clean-air/clean-air-program-reports/diesel-and-health-in-america-the-lingering-threat.

[184] *Paving the Way* found that road creation and expansion projects can actually create sprawl, increasing the volume of traffic on the newly built road by 20% immediately upon completion. Supra note 176.

[185] ECHO, supra note 40.

[186] Id. Not all of these violations were for pollutants of particular concern to the river, such as nitrogen and mercury.

[187] Id.

[188] Id. Some of the formal and informal actions were taken against the same facilities. Several facilities underwent several enforcement actions.

[189] Environmental Protection Agency, "Toxic Release Inventory," accessible online at: www.epa.gov/triexplorer/facility.htm.

[190] ECHO, supra note 40.

[191] Examples include plants that use wastewater treatment water for coolant water and which have advanced closed systems to capture all air emissions, or other technologies that would limit the plant's impact on the environment.

[192] Department of Natural Resources, "DNR Answers Questions about Sea Level Rise In Response to IPCC Report," available online at www.dnr.state.md.us/dnrnews/infocus/sealevel_rise.asp.

[193] For more information see "Wetlands and Buffers," p. 27 in this report.

[194] For an example of science based standards see "The Global Warming Solutions Act" (HB 890/SB 409), 2007, available online at: mlis.state.md.us/2007rs/billfile/sb0409.htm.

[195] For a comprehensive list of policies see Environment Maryland, "A Blueprint for Action: Policy Options to Reduce Maryland's Contribution to Global Warming" (June 2007), available online at: www.environmentmaryland.org/reports/global-warming/global-warming-program-reports/a-blueprint-for-action-policy-options-to-reduce-marylands-contribution-to-global-warming.

[196] For more information on watershed planning, see the Chesapeake Bay Program, "Watersheds," available online at: www.chesapeakebay.net/wshed.htm.

[197] For an excellent overview of what watershed planning entails and how to do this, see "A User's Guide to Watershed Planning" (December 2005), prepared by the Center for Watershed Protection for DNR. Available online at www.dnr.state.md.us/watersheds/pubs/userguide.html

[198] Patuxent River Commission, "Patuxent River Commission," available online at: www.mdp.state.md.us/info/patux.htm.

[199] Policy Plan, supra note 9.

[200] This motion was officially adopted at the Patuxent River Commission meeting in July 2007.

[201] For more explanation of this see "Why Protect the Patuxent," page XX in this report.

[202] EPA Growth Report, supra note 53, p. 9. The EPA states that implementation of TMDLs is critical for restoring the Bay and its tributaries.

[203] A strong environmental standing bill died in the last 30 minutes of session in 2006, one vote away from passage. ("Environment – Judicial Review of Permits – Standing" (HB 1429/SB 589), 2006, available online at: mlis.state.md.us/2006rs/billfile/sb0589.htm.)

[204] Fowler, supra note 47.

[205] Recent polling has been done by Partners for Open Space, Chesapeake Bay Foundation, 1000 Friends of Maryland, and others. An online survey done by Patuxent Riverkeeper was released with the report and is available online at www.paxriverkeeper.org. The 2006 election also showed clear support for pro-environmental candidates. See Maryland League of Conservation Voters, "2006 Election Report" (November 2006), available online at: www.mdlcv.org//files/06_elections_report.pdf.