Op-Ed: Restoring the Health of the Chesapeake Bay: an overview of pollutants, sources, and steps to revive the Bay
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1. Introduction
H. L. Menken once wrote that Maryland is a mysterious and beautiful State, and at the heart of that mystery and beauty is the Chesapeake Bay.

The Chesapeake Bay is a living, and relatively shallow-water estuary, and is the largest and longest of such in the United States. She is actually a living web of living plant, animal and water systems that are mutually dependent on one another for life.

The Bay is also the source of jobs, income, food and prosperity for countless thousands of Marylanders in this generation and the next.

What value would a waterfront home anywhere in Maryland have if the waters in front of it were dead, devoid of life, incapable of maintaining their health, and unable to sustain animal, plant or human life?

During my time in office as Governor of Maryland, my administration set the Strategic Goal of Restoring the Health of the Chesapeake Bay. Our benchmark was to take the actions necessary to reach the “Healthier Bay Tipping Point” by the year 2025. Although we were not the first administration to pursue this goal, no prior administration has made greater strides.

Over the last eight years, we have put in place: 1) the necessary actions and funding mechanisms to reduce all four major sources of pollution from land — agricultural, wastewater treatment, septic, and storm-water, 2) the performance measurement and management system, now known as the Maryland BayStat, to drive the restorative actions taken on land in ways that all citizens and stakeholders can see, monitor and guarantee, 3) an agreement by all six States and the Federal Environmental Protection Agency to take necessary, verifiable and measurable actions on land, accounted for against two-year milestones, to restore the waters of their own State that flow, ultimately, into the Chesapeake Bay.

In the following, I will lay out the measures we have taken to reduce pollution from all four sources, and thereby improve the health of the waters of the Chesapeake Bay.

2. An Overview of the Causes of Chesapeake Bay Pollution
2.1 Main pollutants
The main pollutants of the Chesapeake Bay are nitrogen and phosphorous. While these nutrients promote the growth of organisms in the Bay, excessive amounts lead to the degradation of water quality. Excess nitrogen and phosphorous cause unnaturally high algae blooms that block sunlight to underwater flora, deplete the natural oxygen in the water, increase the natural pH of the Bay, and create fertile environments for the growth of harmful parasites. Cyanobacteria (“blue-green algae”) are also known to proliferate under high nutrient conditions. These harmful bacteria produce powerful toxins that can affect the liver and nervous system of domestic pets. In short, high algae blooms block the process of photosynthesis, thereby leading to the disruption of the aquatic food chain, and endanger the lives of dependent organisms including humans.

2.2 Major sources of nitrogen and phosphorous
The four major sources of pollutants of the Chesapeake Bay are agricultural waste, wastewater treatment, septic, and storm water run-offs (Figure 1). Agricultural farms account for 37% and 53% of nitrogen and phosphorous pollution to the Bay, respectively. Storm water yields 20% of the total amount of nitrogen pollution, and 22% of the gross amount of phosphorous to the Bay.

To address this problem, the O’Malley-Brown Administration implemented (and in some cases strengthened) several actions.
3. Steps implemented to reduce pollution in the Bay

The purpose of each of the actions outlined below is to reduce phosphorus and nitrogen pollution runoff into the Chesapeake Bay from each of these four sources of pollution on land.

For two of these sources – agricultural pollution and wastewater treatment pollution — actions taken on land have been steadily reducing the flow of pollution into the waters of the Bay.

3.1 Implementing Agricultural Best Management Practices

Maryland, together with the other five states of the Chesapeake Bay watershed, has agreed to reduce the amount of harmful pollution entering the Chesapeake Bay and its tributaries from agricultural sources. Maryland farmers have long been leaders in this effort, showing farmers in other states that it is possible to be profitable and more responsible at the same time.

The Environmental Protection Agency (EPA) requires that Maryland and other Bay states make verifiable reductions of farm nutrient pollution by 2025 (Figures 5 and 6). Nutrients—primarily nitrogen and phosphorus—are key ingredients in fertilizer and animal waste.

Since the beginning of the O’Malley-Brown Administration, progress on the following key agricultural actions to reduce the levels of phosphorous and nitrogen entering the bay includes:

1) Cultivation of Cover Crops: Considered one of the most cost effective practices to reduce nutrients, cover crops are cereal grains planted annually after summer and fall harvest to take up excess nutrients. In recent years, the Cover Crop Program has expanded in both popularity and scope thanks to new, dedicated funding provided by the Chesapeake Bay Restoration Fund and the Chesapeake Bay 2010 Trust Fund. Between 2007 and 2014, the Administration has provided farmers with $113.4 million to plant cover crops that have prevented 14.7 million pounds of nitrogen and 501,686 pounds of phosphorus from entering the Chesapeake Bay.

2) Nutrient Management Program: The Nutrient Management Program protects water quality in the Chesapeake Bay and its tributaries by ensuring that farmers and urban land managers apply fertilizers, animal manure and other nutrient sources in an effective and environmentally sound manner. Agricultural activities must occur annually and different nutrient efficiencies are applied according to the level of management, which includes precision agriculture, enhanced nutrient management, and nutrient management on pasture. Maryland met its 2013 Watershed Implementation Plan (WIP) goal of managing a total of 1,050,458 acres, and achieving nitrogen reduction of approximately 4 million pounds.

3) Manure Transport: The Manure Transport program provides financial assistance to farmers who have excess manure or high soil phosphorus, which restricts manure use. As a result of manure transport, farmers transported 668,000 tons of manure to sites and alternative uses where it could be safely used during the last eight years. Using EPA’s interim nutrient reduction values, farmers reduced nitrogen by 1,336,000 pounds and phosphorus by 1,336,000 pounds.

4) Cost-Share Program: The Maryland Agricultural
Water Quality Cost-Share (MACS) Program provides farmers with grants to cover up to 87.5 percent of the cost to install Best Management Practices (BMP) on their farms to prevent soil erosion, manage nutrients and safeguard water quality in streams, rivers and the Chesapeake Bay. BMP and per farm caps were raised during the O’Malley-Brown Administration, and additional funds were directed to cost share BMPs using the Chesapeake Bay 2010 Trust Fund. During the last eight years nearly 4,500 BMPs were installed, reducing nitrogen by 920,000 pounds and phosphorus by 500,000 pounds.

Soil Conservation and Water Quality Plans: A Soil Conservation and Water Quality Plan (SCWQP) is a comprehensive plan that addresses natural resource management on agricultural lands and utilizes BMPs that control erosion and sediment loss, nutrients and manages runoff. In 2014 Maryland was actively managing nearly 934,000 acres under SCWQ plans and reducing nitrogen by 868,620 pounds.

Figure 3 Total Phosphorous load (millions of lbs) from agriculture from 1985-2013

5) Conservation Reserve Enhancement Program: A federal/state partnership, CREP pays landowners to take marginal crop and pastureland out of production for 10-15 years and install stream buffers, wetlands and protect highly erodible land. In 2009, CREP was reauthorized with a streamlined process providing more attractive incentives for BMPs. The O’Malley-Brown Administration allocated nearly $2.4 million in special funds to support $100/acre signing bonuses, and more than $2 million in cost-share funds. From 2010-2014, Maryland farmers participating in the program have installed 1,675 acres of riparian grass buffers; 733 acres of riparian forest buffers; 1,398 acres of highly erodible land protection; and 547 acres of wetlands achieving nearly 77,000 pounds in nitrogen reductions.

Figure 4 Total Nitrogen load from wastewater (Millions of lb) from 1985-2013

Governor O’Malley speaking with local farmer

3.2 Wastewater Treatment Plants
Discharge from wastewater treatment plants is the second-largest source of nutrient pollution in Maryland, accounting for approximately 25% of the nitrogen pollution that flows from homes in Maryland into the rivers and waters of the Chesapeake Bay.

To address this pollution, Maryland has undertaken several actions, highlighted below, to improve wastewater treatment plants (WWTP) in the state. These actions began when Governor Ehrlich signed into law the much-maligned “Flush Tax” which now assesses a $5 a monthly fee for the upgrading of wastewater treatment plants and septic systems across Maryland.

The following actions were implemented to help reduce the amount of wastewater from treatment plants deposited into the Bay:

1) Wastewater Treatment Plant Fund: As of July 30, 2014, the Comptroller of Maryland has deposited approximately $620 million in the Maryland Department of the Environment (MDE) Wastewater Treatment Plant Fund.

Figure 4 Total Nitrogen load from wastewater (Millions of lb) from 1985-2013

2) Bay Restoration Fund: The Bay Restoration Fund
is a dedicated fund, financed by wastewater treatment plant users. With the capital improvements program, the Fund is used to upgrade Maryland’s 67 WWTPs with enhanced nutrient removal (ENR) technology so they are capable of achieving wastewater effluent quality of 3 mg/l total nitrogen and 0.3 mg/l total phosphorus. In addition to significant nutrient reductions, other pollutants will be further reduced (beyond the conventional 90 percent) due to the installation of the world’s most advanced treatment technologies. A similar fee paid by septic system users is utilized to upgrade onsite systems and implement cover crops to reduce nitrogen loading to the Bay.

Figure 5 Total phosphorous load from wastewater (Millions of lbs) from 1985-2013

3) Wastewater Treatment Upgrades: As of December 10, 2014, 35 WWTPs have been upgraded, 12 short of the 2015 goal of 47. The remaining 12 plants will be completed by December 2015.

4) Minor Sewage Plant Upgrades: The 2012 Bay Restoration Fee increase allowed MDE to target minor sewage treatment plants (less than 0.5 million gallons per day). The goal is to complete the upgrade of at least five minor plants before 2017 consistent with the Maryland Phase II WIP for the Chesapeake Total Maximum Daily Load (TMDL). As of December 10, 2014, two minor facilities completed the Enhanced Nutrient Reduction (ENR) upgrade, three are under construction, four are in design, and two are in planning. After upgrading major WWTPs in 2017, the used of BRF-Wastewater fund will be expanded to more minor facilities, septic upgrades and storm water control.

5) Phosphorous – Dishwashing Detergent (HB 1131/SB 766 of 2007): Prohibits a person from using, selling, manufacturing, or distributing for sale household dishwashing machine detergent that contains more than 0.5 percent of phosphorus by weight after January 1, 2010.


3.3 Storm water pollution
Twenty percent of the harmful pollution that flows from land into the Chesapeake Bay comes from storm water runoff. Therefore reducing the pollution carried by storm-water run-off is essential to restoring the health of the Chesapeake Bay.

Storm water management fees, enabled by state law and crafted by city and county councils, are now in place to improve storm water management systems and encourage newer, and more environmentally friendly design. These fees only apply to development in Maryland’s ten most heavily populated and heavily developed counties – those counties with the vast majority of Maryland’s paved surface.

Opponents of this long overdue and much needed law made great hay over this measure to remediate storm-water pollution. Ironically, most of the citizens and avid bloggers who most intensely decried this measure and labeled it “the rain tax,” do not live in counties where it applies - God bless them.

Below are the most impactful actions we have taken as a people just over the last several years during to reduce damage to the Bay caused by storm-water pollution.

1) Storm water Management Act: On April 24, 2007, Governor O’Malley signed the “Storm water Manage-
2) **National Pollutant Discharge Elimination System (NPDES) Storm water Permits**: Issued NPDES storm water permits with increased impervious area treatment goals to four Phase I jurisdictions (Baltimore City, Anne Arundel, Baltimore, and Prince George's Counties.) New permits require Phase I Municipal Separate Storm Sewer System (MS4) jurisdictions to commence and complete restoration efforts for 20 percent of the impervious area that is not already restored to the maximum extent practicable.

3) **Stormwater Runoff Management Retrofits**: About 35,000 additional pounds of nitrogen will be reduced by the end of the 2015 milestone period as Maryland’s large jurisdictions work to meet the recently tightened requirements of municipal stormwater permits. To date, 254,873 pounds of nitrogen have been reduced, an increase of over 240% from 2006.

4) **HB 446, 2012 Bay Restoration Fund (BRF)**: During the 2012 legislative session, House Bill 446 doubled the BRF fee for most users served by wastewater treatment plants and those on On-site sewage dispos- al (septic) systems to $5.00 per month per household/EDU. In addition to funding WWTPs and Best Available Technology (BAT) upgrades of the septic systems, HB 446 allows BRF funding to be provided to local government for stormwater BMPs after 2017.

5) **Lawn Fertilizer Law**: The 2011 Lawn Fertilizer Law ensures that urban stakeholders do their part to reduce nutrient runoff. Lawn fertilizer accounts for 44 percent of all fertilizers sold in Maryland, and the State has almost equal amounts of lawn acreage as cropland. With this law, Maryland became the first state in the Chesapeake Bay region to restrict phosphorus use and set limits for nitrogen use on lawns. The law instituted new labeling requirements for turf fertilizer, requires training and certification for professional fertilizer applicators, and establishes a public education program. Maryland began receiving phosphorous reduction credit for the 2011 Fertilizer Act in 2013 and reductions will be applied annually. Based on the watershed model analysis the result in 2013 was a phosphorus reduction of approximately 54,000 lbs.

6) **Watershed Protection and Restoration Program**: The Watershed Protection and Restoration Program (HB987) was signed into law in April 2012. The program establishes a system of storm-water remediation fees and a local watershed protection and restoration fund (WPRF) that must be implemented by the 10 largest jurisdictions that are subject to a National Pollutant Discharge Elimination System (NPDES) Phase I MS4 permit in Maryland.

7) **Chesapeake and Atlantic Coastal Bays 2010 Trust Fund and Nonpoint Source Fund (HB5 of 2007 Special Session, HB369/SB213 of 2008)**: In 2007, Governor O'Malley created the Chesapeake and Atlantic Coastal Bays Trust Fund (Trust Fund). The Trust Fund capitalized with a portion of existing revenues from the motor fuel tax and existing revenues from the sales and use tax on short-term vehicle rentals. Funding is approximately $50 million annually (although it has varied from year to year) to be used for nonpoint source pollution control projects. The bill also codifies the BayStat Program and requires it to administer the trust fund. The bill establishes a BayStat subcabinet and a related scientific advisory panel.

### 3.4 Septic systems

What happens when population grows but counties aren’t willing to pay to extend sewer infrastructure? Developers are left with little option but to meet the housing demand by building more and more homes on septic systems.
In Maryland there are now approximately 420,000 septic systems, with 52,000 systems located in the Critical Area – the land within 1,000 feet of rivers, streams, and tidal waters. Over the decades, as population and sprawl increased while investments in public waste water infrastructure decreased, more and more homes were built on septic systems. This growing source of Bay pollution now accounts for 6% of Bay pollution — in many river-sheds, like the Severn, it is a much higher percentage.

![Figure 7 Total nitrogen load from septic sources (Millions of lbs) from 1985-2013](image)

The typical septic system — as designed — does not remove nitrogen; instead it delivers about 24 pounds of nitrogen per year to the groundwater. (Multiply that by 420,000...). An upgraded, nitrogen-removing septic system cuts nitrogen pollution discharge in half.

To reduce this source of Bay pollution, we have taken the following actions as a people since 2006:

1) **Septic System Upgrade Fund:** As of July 30, 2014, the Comptroller of Maryland has deposited approximately $83 million in the MDE Septic System Upgrade fund. **Sustainable Growth and Agricultural Preservation Act:** In 2012, the Maryland General Assembly passed the Sustainable Growth and Agricultural Preservation Act introduced by Governor O’Malley. The law requires local governments to halt septic sprawl and restricts the development of septic housing in our more ecologically sensitive areas.

2) **Septic Retrofits:** Maryland’s septic retrofit program began in 2008. This technology reduces discharge of nitrogen from septic systems to the environment thereby improving the quality of both ground and surface water. As of November 2014, 6,405 systems have been upgraded with BAT.

3) **Bay Restoration Act of 2009 (HB176/SB554):** This act requires that all new or replacement septic systems in the Critical Areas use nitrogen removal technology, which can prevent 50 percent of a system’s nitrogen from polluting groundwater and local waterways.

4) **HB 446, 2012 Bay Restoration Fund (BRF):** During the 2012 legislative session, House Bill 446 doubled the BRF fee for most users served by wastewater treatment plants and those on On-site sewage disposal (septic) systems to $5.00 per month per household/EDU. This bill will double implementation of BAT upgrades to about 1,200 systems per year. In addition, HB446 will provide for increased funding for BAT upgrades starting in 2018.

5) **Best Available Technology Regulations (COMAR 26.04.02.07):** Beginning in January 2013, all new septic system installations and repair or replacement of a system at a property in either the Chesapeake Bay critical area or the Atlantic Coastal Bays critical area were required to install BAT. A grandfathering provision enabled some planned system installations to be installed during 2013 with conventional systems.

6) **Bay Restoration Fund - Authorized Uses (HB11 of 2014):** This bill expands the uses of the Septics Account of the Bay Restoration Fund (BRF) to include: (1) providing grants or loans for connecting a property served by a septic system to an existing biological nutrient removal (BNR) facility (2) covering the cost of the principal on debt issued by a local government for specified sewer connection projects and (3) providing assistance for specified sewer connection projects located outside of a priority funding area (PFA).

7) **Bay Restoration Fund - Authorized Uses - Local Entities (HB12 of 2014):** This bill requires up to 10 percent of the funds in the Septics Account of the Bay Restoration Fund (BRF) to be distributed to a local public entity delegated by MDE to cover reasonable costs associated with the implementation of MDE regulations pertaining to onsite sewage disposal (septic) systems that utilize the BAT for the removal of nitrogen.
4. Conclusion: If we can save the Bay, we can save the world

The Chesapeake Bay may be viewed as a microcosm of the world’s ecosystems. Restoring the health of the waters of the Chesapeake Bay is not a pipe dream, and neither is it some nostalgic memory nor wistful dream.

As the damage to the Bay was man-made, so too must be the restoration of the Bay. If we continue to reduce pollution with better actions, choices, and designs on land that work, we will continue to reduce the man-made pollution that damages the health of the Bay. We will continue to move forward to that tipping point where our actions join forces with the natural restorative and cleansing powers of the Bay – the Oysters, the sub-aquatic grasses, the Menhaden.

We have brought forward the political will as a people to put actions, strategies and funding mechanisms in place to reduce all four main sources of Bay pollution. We have forged the consensus necessary among all States in the Bay watershed to do the same. We have created common platforms for progress that allow for a level of measurable, timely, and accountable actions to be seen and verified by all through BayStat and the EPA's ChesapeakeStat.

Small things done well, make bigger things possible. If we can save the Bay, we can save our world.

About the Author: Martin O'Malley, JD (University of Maryland School of Law) joined the Johns Hopkins Carey Business School in 2015 as Professor (by Courtesy). Martin O'Malley served as Governor of Maryland from January 17, 2007 to January 21, 2015. Prior to serving as governor, O'Malley served two terms as the mayor of Baltimore, where TIME named him “one of America's top five big city mayors.” He also served two terms as Chair of the Democratic Governors Association.