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A BETTER WAY TO RESTORE THE CHESAPEAKE BAY

Government must address the nutrient and sediment discharges from the Conowingo Dam.

BY JAMES SIMPSON

EXECUTIVE SUMMARY

MARYLAND OFFICIALS EXPECT THAT IT WILL COST OVER $14 BILLION in the next decade to meet U.S. Environmental Protection Agency pollution mitigation targets for the Chesapeake Bay by 2025. The EPA intends to require other states in the Bay watershed to undertake similar efforts. The efforts will focus on pollution sources thought to be “controllable”: agricultural runoff, septic effluent, storm water runoff, and waste water treatment plant discharge, and will target nitrogen, phosphorus, and sediments.

Puzzlingly, these efforts ignore one of the most significant sources of these pollutants. The Conowingo Dam on the Susquehanna River near Rising Sun, Md., holds an enormous deposit of sediment rich in nitrogen and phosphorus. Periodic storms cause massive discharges of that sediment, dwarfing the pollution reduction amounts targeted by the EPA. Dredging the dam to reduce that sediment would be costly, but it would go much further toward addressing Bay pollution than any of policy actions currently being implemented in Maryland and expected in other states.

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INTRODUCTION

The Chesapeake is the largest estuary in North America and the largest coastal water body in the world. It contains 3,600 species of fish, wildlife, and plants. The watershed encompasses six states, Maryland, Virginia, West Virginia, Pennsylvania, New York, and Delaware, as well as Washington, D.C. It includes about 1,800 local governments, and is home to almost 17 million people and 77,000 farms. Its economic value is approximately $1 trillion. It is a paradise of seafood, recreation, and tourism. Preserving it should be a major public goal.

But the health of the Bay has been in decline for decades. This decline can be seen in the change in the Chesapeake's oyster population over time. Oysters are the Bay's natural filter, consuming algae that cloud water and remove life-giving oxygen. Oysters also consume nitrogen and phosphorus, the two notorious pollutants from agricultural runoff and human waste. Each adult oyster can filter up to 50 gallons of water per day. Oysters are thus both an indicator of Bay health and a contributor to it.

In the last 30 years, the seafood industry in Maryland and Virginia has lost $4 billion.

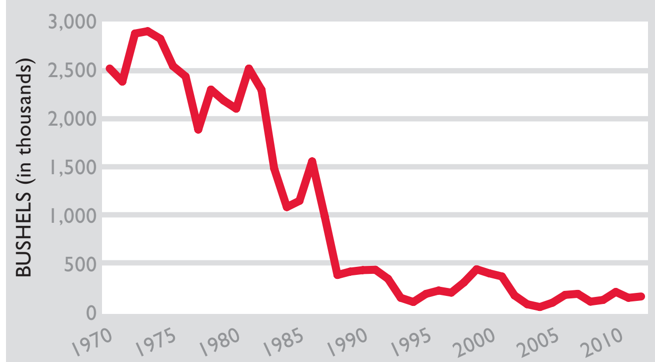
Between 1920 and 1969, Maryland's annual oyster harvest averaged between 2 and 3 million bushels per year, with no discernible trend up or down. The harvest reached 2.9 million bushels in 1972–73 but then began a precipitous decline.[1] This is depicted in Chart 1.

The harvest fell below 500,000 bushels in 1988 and has never exceeded that level since. Between 2002 and 2012, the annual harvest has averaged a mere 125,000 bushels. The Chesapeake's oyster harvest has remained at 5 percent of historic levels since 1994.

In terms of economic impact, there were over 2,000 licensed oyster fishermen in Maryland in the 1970s and 1980s. Today there are about 550. The total dockside value of oysters for 2010, the latest data available, was $4.4 million.[2] Average payoff for those 550 permit holders was about $8,000. By comparison, the 1975 take was approximately $50 million in 2013 dollars.[3] Split between 2,000 fishermen, average earnings would have been about $25,000. While most watermen also harvest crabs and other seafood, the declining oyster harvest has had a major impact on their livelihood.

Reduced harvests affect every other aspect of the Bay's commercial fishery, from packaging houses and retail stores to restaurants. In the 1970s, total value of the fishery in Maryland was approximately $130 million. Today it is about $10 million.[4] There were 136 oyster shucking businesses throughout Maryland and Virginia in 1974. Today there are less than a dozen.[5] In the last 30 years, the seafood industry in Maryland and Virginia has lost $4 billion.[6]

CHART 1. MARYLAND ANNUAL OYSTER HARVEST



Source: Maryland Department of Natural Resources

The Upper Bay, that portion of the Chesapeake north of the Bay Bridge, used to produce harvests of 25,000 bushels or more per year, but the 2012–13 harvest was a mere 183 bushels.[7] The Maryland Department of Natural Resources (DNR) surveys the number of juvenile oysters (called spat) in key locations. This "spatfall" or "spatset" measures the oyster population's potential resilience. In Upper Bay survey locations, the spatfall count has been zero or close to zero per bushel for decades.

The rapid oyster decline during the 1980s can be traced to diseases—predominantly MSX, believed to be a pathogen of Asian origin, and Dermo, a disease of unknown origin—that decimated the oyster population. Sedimentation, nitrogen, and phosphorus contributed.

Nitrogen and phosphorus can cause algal blooms that deplete dissolved oxygen. Excessive sedimentation blankets the bottom, smothering oysters and essential plant life and denying necessary substrate for young oysters to survive. All three pollutants increase turbidity, shutting out life-giving sunshine in the underwater environment. These factors also weaken oyster populations, making them more susceptible to disease.

Large floods also bring fresh water into the bay, lowering salinity to dangerous levels for oysters and other marine creatures and further weakening their resistance to disease. Ironically, MSX and Dermo cannot live in low-salt environments, so the Upper Bay, which receives fresh water from the Susquehanna River, has a much lower oyster mortality rate from those diseases.[8]

COMBATING NUTRIENT DISCHARGES—OR NOT?

The U.S. Environmental Protection Agency, the State of Maryland, and most private organizations identify nitrogen, phosphorus, and sediments as the chief forms of Bay pollution. The EPA and the State of Maryland have focused most of their recent Bay restoration efforts on controlling current man-made sources of nitrogen, but even if eliminated entirely, those sources would reduce nitrogen levels by only a small fraction.

TABLE 1. MARYLAND'S POLLUTION REDUCTION GOALS IN BAY TMDL (Tons Per Year)

POLLUTANT	2010 LOAD	2025 BAY TMDL TARGET LOAD	AMOUNT REDUCTION	PERCENT REDUCTION
NITROGEN	26,380	20,585	-5,795	-22.05%
PHOSPHORUS	1,650	1,405	-245	-14.9%
SEDIMENTS	688,000	675,000	-13,000	-1.9%

Source: Watershed Implementation Plan Phase II; Table 2

In its efforts to maintain water quality under the federal Clean Water Act, the EPA determines the total maximum daily load (TMDL) of pollutants a given body of water can handle while still maintaining water quality standards. In 2010 the EPA assigned Chesapeake Bay TMDL targets for nitrogen, phosphorus, and sediments with a full implementation date of 2025. Those targets are listed in Table 1.[9] The official estimates are all expressed in pounds (as opposed to tons, as shown in Table 1), making the targeted reductions look much larger. As will be shown later in this paper, however, the reduction targets are really very small when compared with total pollution levels, and especially the major Bay pollution source that has been overlooked.

The State of Maryland developed a Watershed Implementation Plan (WIP)[10] in response to the EPA's TMDL targets and is planning to spend an estimated $14.4 billion between 2010 and 2025 to meet those targets. The actual cost could be much higher. As the Maryland Department of Legislative Services notes:

> *While this cost estimate provides helpful information, it is incomplete and may change significantly. For example, among other things, the estimate does not account for financing costs, inflation, private and federal government costs (i.e., industrial source upgrades and federal waste water treatment plants), and certain ongoing programmatic costs.*[11]

The WIP focuses only on those pollution sources thought to be "controllable." Cost breakdown for reducing pollution from each of those sources is provided in Table 2.

In 2010 the EPA assigned Chesapeake Bay TMDL targets for nitrogen, phosphorus, and sediments with a full implementation date of 2025.

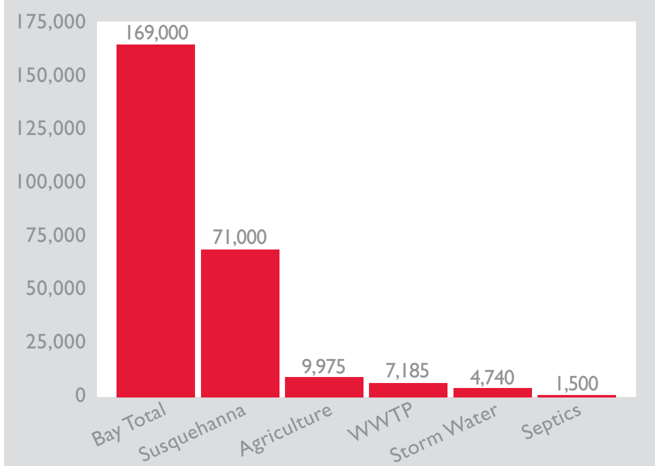
Most funding to address agricultural runoff is being provided by the private sector and the farmers themselves, so 94 percent ($13.5 billion of the $14.4 billion) of the anticipated cost addresses pollution from waste water treatment plants (WWTPs), storm water, and septic tanks. The estimated funding targets nitrogen, phosphorus, and sediments.

TABLE 2. WIP FUNDING REQUIREMENTS 2010-2025 ($ Billions)

AGRICULTURAL RUNOFF	$0.9
WWTPS	$2.4
STORM WATER	$7.4
SEPTIC TANKS	$3.7
TOTAL	**$14.4**

Source: Maryland Department of Legislative Services

CHART 2. NITROGEN LOADS TO CHESAPEAKE BAY BY MARYLAND SOURCE (in Tons)



Sources: Chesapeake Bay Program: USGS & WIP Phase II

Chart 2 shows the annual nitrogen load delivered to the Bay from various Maryland sources compared to the Bay total from all sources.[12] Maryland's WWTPs, septics, and storm water deliver a total of 13,425 tons of nitrogen—a mere 7.9 percent of the total load. Yet, as Table 3 reveals, Maryland will spend $13.5 billion to reduce Bay nitrogen by only 2 percent[13] at an average cost of $1,882.85 per pound from these three sources. Septics' nitrogen targets will be achieved at a cost of over $3,200 per pound—an estimated total cost of $3.7 billion—and will reduce Bay nitrogen by 0.3 percent. Storm water nitrogen reduction will cost $3,400 per pound—an estimated total cost of $6.9 billion—to reduce Bay nitrogen by 0.6 percent.

TABLE 3. WIP ANNUAL NITROGEN AND PHOSPHORUS REDUCTION TARGETS AND ASSOCIATED COSTS

	REDUCTION TARGETS[1]		COST IN	COST	COST	PERCENTAGE OF ANNUAL LOAD ABATED	
	NITROGEN	PHOSPHORUS	BILLIONS[2]	PER TON	PER LB.	NITROGEN[3]	PHOSPHORUS[4]
WWTP	1,895	40	$2.40	$1,240,310	$620	1.1%	0.4%
STORM WATER	965	110	$7.40	$6,883,721	$3,442	0.6%	1.0%
SEPTIC	575	0	$3.70	$6,434,783	$3,217	0.3%	0.0%
SUM OF ROWS 1-3		150	$13.50	$3,765,690	$1,883	2.0%	1.4%
AGRICULTURAL RUNOFF	2,365	95	$0.90	$365,854	$183	1.4%	0.9%
SUM OF ROWS 4-5		245	$14.40	$2,482,759	$1,241	3.4%	2.3%

1 Source: Phase II Maryland WIP; Table 2. Amounts converted to tons
2 Source: Maryland Department of Legislative Services
3 Note: Percentage of Chesapeake Bay Program estimated average nitrogen loads to the Bay; 1990–2013
4 Note: Percentage of Chesapeake Bay Program estimated average phosphorus loads to the Bay; 1990–2013

TABLE 4. VIRGINIA'S POLLUTION REDUCTION GOALS IN BAY TMDL[1]

	TONS PER YEAR				COMPARED TO MARYLAND TARGETS[2]	
	2009 LOAD	BAY TMDL TARGET LOAD	AMOUNT REDUCED	PERCENT REDUCED	AMOUNT REDUCED	PERCENT REDUCED
NITROGEN	34,064	26,294	-7,770	-22.8%	-5,795	-22.0%
PHOSPHORUS	4,336	3,201	-1,135	-26.2%	-245	-14.9%
SEDIMENTS	1,871,461	1,625,691	-245,770	-13.1%	-13,000	-1.9%

1 Chesapeake Bay Program.
2 See Table 1.

Phosphorus targets are even smaller, reducing phosphorus by only 2.3 percent of the Chesapeake's average annual load. These targeted phosphorus reductions are to be met approximately as follows: 51.6 percent agriculture, 17.8 percent storm water and 23.7 percent WWTP. There are no targets for septics.[14] The WIP does not attempt to quantify sediment reductions from individual sources, but the targeted reduction from all sources is negligible.

Waste water treatment plants Conspicuously absent from the various Bay analyses are the many "illegal" spills of municipal sewer systems, called "Sanitary Sewer Overflows," or SSOs. These occur when sewer pipes clog or pumping stations malfunction. Sewage then backs up and spills into storm water pipes that ultimately empty directly into the Bay. The state tracks SSOs,[15] but because they are considered "illegal," they are not counted in official estimates; neither are they included in WWTP or storm water reduction targets.

The EPA states in its Chesapeake Bay TMDL document:

> *SSOs represent a source of nitrogen and phosphorus to the Chesapeake Bay; however, information available to characterize their contribution to the overall nitrogen and phosphorus loads delivered to the Bay is limited largely because of their illegality and infrequency. Although the Bay Watershed Model does not specifically account for SSOs, the nitrogen and phosphorus load contributions from SSOs are part of the background conditions incorporated into the Phase 5.3 watershed model and, therefore, such loads are accounted for in the data used for calibration of the Bay Watershed Model. Because SSOs are illegal, however, the Chesapeake Bay TMDL assumes full removal of SSOs and makes no allocation to them.*[16]

It is difficult to understand how nitrogen and phosphorus loads from SSOs "are accounted for in the data" when their "illegality and infrequency" prevents those loads from being measured. Furthermore, the spills are not infrequent and are substantial. Some 3.8 billion gallons of raw sewage flowed into the Bay between 2005 and 2013. That equates to approximately 16 million tons, or two million tons per year for the time in question, if one assumes the weight of water—more if the sewage is heavier. The nutrients and sediment in that discharge dwarf pollution load targets calculated for the TMDL from any of the three main targeted sources. It also raises the question, why are policymakers so focused on septic tanks and not more focused on WWTP spills?

TABLE 5. VIRGINIA ESTIMATED TMDL COSTS 2011-2025 (in $ Billions)

POLLUTION SOURCE	TOTAL COSTS	STATE COSTS	WHO PAYS
AGRICULTURE	$1.2	$0.8	STATE/FARMERS
WWTP	$1.4	$0.3–0.4	STATE/LOCAL GOV'T/RATE-PAYERS
STORM WATER	$9.4–$11.5	$2.1 (VDOT)	LOCAL GOV'T/PROPERTY OWNERS/VDOT
SEPTIC TANKS	$1.6	$0	HOMEOWNERS
TOTAL	**$13.6–$15.7**	**$3.2–$3.3**	

Source: Virginia Senate Finance Committee

Septic Systems Maryland officials estimate that it will cost state and local taxpayers $14.4 billion to implement the WIP—an amount that will overburden many county budgets. In exchange for that money, and the decreased funding for schools, transportation, and public safety it entails as well as the loss of household income, the state will achieve a paltry 3.4 percent reduction in nitrogen and a 2.3 percent reduction in phosphorus—amounts so small as to be almost immeasurable. Incorporated in that spending is $3.7 billion for septic systems, along with onerous, expensive septic regulations, that will achieve a mere 0.3 percent nitrogen reduction.

The EPA says there is no direct impact from properly functioning septic systems.[17] The WIP implies the same thing, focusing exclusively on those septic systems near Bay tidal waters during the interim period (2010–17). The WIP states:

> *The primary Interim Target strategy for reducing loads from septic systems is to target about 60% of the systems within 1,000 feet of tidal waters (Critical Area) for either upgrading to nitrogen removal technology or connection to an advanced waste water treatment plant. Local plans were adopted as-is, with the State assigning a 60 percent rate of upgrades in the critical area for jurisdictions that did not submit a plan. This resulted in an Interim Strategy that increases septic system connections by 7,895 and septic system upgrades by 43,181 between 2010 and 2017. In addition, the Interim Strategy calls for septic pumping of about 25,325 systems. The estimated reduction is about 320,000 pounds/year [Ed note: that's 160 tons/year] when fully implemented.*[18]

For the final implementation years, the WIP continues to focus on septic upgrades in critical areas, placing others last:

> *Upgrades are first applied in the order of systems in the critical area (within 1,000 feet of tidal waters) for applicable counties, then to systems within 1,000 feet of a perennial stream and then to remaining systems.*[19]

Imposing costly regulations on septic systems to achieve such small reductions seems questionable at best. So why is Maryland so focused on septics? Instead of supporting meaningful environmental goals, it is intended to buttress Maryland's long-embraced "smart growth" agenda—a collection of policies with questionable fiscal, environmental, and quality-of-life outcomes. Discussion of this connection is beyond the scope of this paper, however, but will be the focus of future work.

Maryland officials estimate that it will cost state and local taxpayers $14.4 billion to implement the WIP.

The Clean Chesapeake Coalition, a relative newcomer in the Bay advocacy community, has expressed skepticism over Maryland's focus on septics and the motivations behind that focus. Concerning 2012 septic legislation, the group stated:

> *The Bay TMDL "pollution diet" upon which the State of Maryland publicly justified SB236 does not consider individual septic systems to be a significant source of pollution to the Bay. According to the EPA, septic systems only have "the potential to deliver nitrogen and phosphorus to surface waters directly because of system failure and malfunction and indirectly through groundwater…. [F]unctioning systems do not contribute nitrogen and phosphorus loads to the surface waters directly." [see Bay TMDL § 4.6.4]*
>
> *In actuality, it is now apparent that the "septics bill" was a growth management initiative directed at certain portions of the State and a centralization of land use planning at the State level, being disguised as a scientifically based, TMDL driven measure to save the Bay. The Coalition queries why the Maryland Department of Planning (not MDE) spearheaded the Administration's centerpiece environmental legislation during the 2012 Maryland General Assembly Session. For the most transparent and cost effective public policy, environmental arguments for limiting septics must be decoupled from the State's growth management agenda.*[20]

VIRGINIA'S TMDL TARGETS

Maryland shares Bay shoreline with its southern neighbor, the Commonwealth of Virginia. Virginia estimates a total cost of $13.6 to $15.7 billion to meet its TMDL targets by 2025.[21] This is similar to Maryland's projected cost, but,

TABLE 6. TOTAL VIRGINIA TMDL POLLUTION REDUCTION TARGETS BY SOURCE	NITROGEN		PHOSPHORUS		SEDIMENTS	
	TONS	PERCENT	TONS	PERCENT	TONS	PERCENT
AGRICULTURE	3,641	-2.8%	-842	-8.8%	-400,715	-9.2%
STORM WATER	-663	-0.5%	-135	-1.4%	-103,717	-2.4%
WWTP	3,577	-2.7%	-292	-3.0%	49,617	1.1%
SEPTIC TANKS	-189	-0.1%	0	0.0%	0	0.0%

Source: Chesapeake Bay Program

with the exception of nitrogen, TMDL targets are magnitudes larger as shown in Table 4.

The distribution of Virginia's cost estimates between the various pollution sources is provided in Table 5. Including the Virginia Department of Transportation (VDOT), the state anticipates spending approximately $3.2 billion of the total cost. While ultimately taxpayers foot the bill for the entire amount, much of the cost will be felt directly by farmers, water utility rate payers, and property owners.

With the exception of agricultural targets for phosphorus and sediments, this huge cost will reduce total pollution loads to the Bay by relatively small amounts. (See Table 6.) Water utility bills, for example, will have to increase substantially to cover $1–$1.1 billion of the $1.4 billion allocated to upgrade WWTPs—all for very modest pollutant reductions.

Virginia's property owners on septic systems can expect big bills in addition to whatever cost increases they bear as the result of cleanup efforts in other areas. The state plans to retrofit 168,000 septic tanks—more than 30 percent of Virginia's estimated 536,000 systems—over 14 years, at a cost of $114 million per year. This comes out to between $6,000 and $12,400 per homeowner for necessary upgrades. Additionally, the newer systems will require annual maintenance at a cost of $300–$500.[22] *These major expenses will ultimately reduce Bay nitrogen by a mere 0.1 percent, according to the EPA's own data.* Interestingly, the Virginia Senate Finance report provided estimates of the cost per pound to reduce nutrients from storm water (upgrades, $500 or more per pound; new development, $92.40 per pound), WWTPs ($15.80–$47.40 per pound), and agriculture, (up to $21.90 per pound), but it failed to note the estimated cost for septics of $4,242 per pound.[23]

THE ELEPHANT IN THE ROOM

The State of Maryland has pointedly ignored a single, enormous source of the pollutants that it is targeting in its WIP. The magnitude of this source was shown in stark relief in September 2011 when Tropical Storm Lee swept through the Mid-Atlantic, dropping up to 15 inches of rain over a five-day period and causing extensive flooding. According to the U.S. Geological Survey (USGS), this massive amount of water scoured sediment—as well as the nitrogen and phosphorus trapped in it—that had been collecting behind the Susquehanna River's Conowingo Dam for years. Over five days, 19 million tons of sediment were released from the dam's flood gates.[24]

Image 1: Conowingo Dam, after Tropical Storm Lee (September 12, 2011)
Source: Wendy McPherson/U.S. Geological Survey

TABLE 7. 2013 BAY SEDIMENT LOADS All Sources (In Tons)	
NEW YORK	160,649
PENNSYLVANIA	1,282,458
MARYLAND	626,366
VIRGINIA	1,789,014
WEST VIRGINIA	172,490
DELAWARE	49,361
DISTRICT OF COLUMBIA	8,551
TOTAL	**4,088,888**
TROPICAL STORM LEE	**19,000,000**

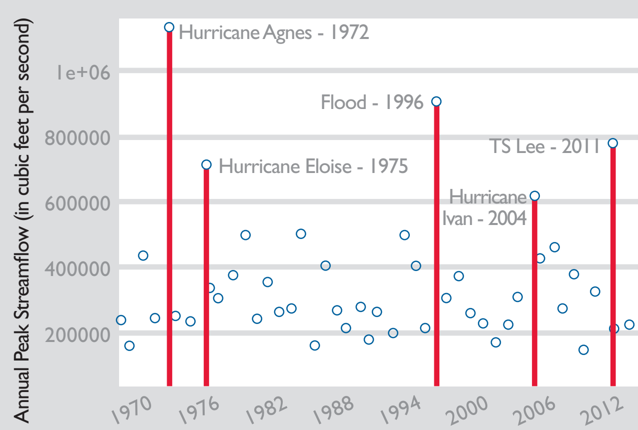
Source: Chesapeake Bay Program

Image 2: Sediment Plume after Tropical Storm Lee
Source: U.S. Weather Service

According to Robert Hirsch of the USGS, this discharge equaled fully *39 percent of all sediment released into the Bay from the Susquehanna between 2002 and 2011.*[25] It also contained 42,000 tons of nitrogen and 10,600 tons of phosphorus. The satellite photo in Image 2 shows the sediment plume. The quantities of pollutants from this single event dwarfed all nitrogen, phosphorus, and sediment reduction targets for all Bay states, including Maryland, New York, Pennsylvania, Virginia, West Virginia, Delaware, and Washington, D.C. The nitrogen release alone was more than 12 years' worth of Maryland's targeted 3,436 ton reductions from WWTPs, storm water, and septics, and greater than targeted nitrogen reductions from all sources for all Bay states. The phosphorus release was more than 43 times larger than Maryland's targeted reductions (245 tons) and over four times the targeted reductions for all states. The sediment release exceeded 28 years' worth of total targeted reductions for all states and 1,460 years of Maryland's annual sediment deposit targets. In fact, Maryland's total estimated annual sediment deposit into the Bay from all sources is 687,908 tons, a mere 3.6 percent of sediments released during this one storm. In 2013, the total sediment deposit from all states was an estimated 4.1 million tons, less than one quarter of the sediments released from the Conowingo by Tropical Storm Lee. See Table 7.

Similar storm events have occurred in the recent past. The first was Hurricane Agnes in 1972, followed by Hurricane Eloise in 1975, then a major flood in 1996. These three events dumped an estimated 33 million tons of sediment.[26] Next were Hurricane Ivan in 2004 and finally Tropical Storm Lee in 2011. Each event delivered large amounts of sediment, and because nitrogen and phosphorus attach to the sediment, huge amounts of those nutrients were also discharged into the Bay. Chart 3 shows water flows from the Conowingo during these five storm events. While the 1996 flood released more water, Lee produced more sediment than any but Agnes.

CHART 3. DISCHARGES FROM THE CONOWINGO DAM



Source: U.S. Geological Survey

The Conowingo Dam was built in 1928. At that time, the water behind the dam was 120 feet deep. Today it is 20 feet deep or less; the rest having been filled in by sediment. The Maryland Department of Natural Resources (DNR) held a forum on restoring the Bay recently. In their presentation, DNR officials claimed, "Over the past 25 years, the amount of suitable oyster bar habitat has declined 80 percent, from 200,000 to 36,000 acres. Sedimentation has played a large role in the loss of habitat."[27]

TABLE 8. UPPER BAY OYSTER HARVEST FOLLOWING FLOOD/STORM EVENTS (in Bushels)					
1996 FLOOD		2004 HURRICANE IVAN		2011 TROPICAL STORM LEE	
OYSTER SEASON	HARVEST	OYSTER SEASON	HARVEST	OYSTER SEASON	HARVEST
1995-96	26,600	2002-03	18,930	2010-11	6,310
1996-97	2,600	2003-04	2,210	2011-12	297
1997-98	18,800	2004-05	1,632	2012-13	183

The state has been conducting studies of this problem for decades. In 2000, the Chesapeake Bay Program's Scientific Technical Advisory Committee (STAC) prepared one such study, describing in detail the predicted effects of Conowingo's sediment overflows:[28]

- Increased loading of phosphorus in the Middle Bay
- Increased need for dredging the navigation channels in the Upper Bay
- Higher turbidity and faster sedimentation everywhere, but especially in navigation channels
- Poor recovery of Submerged Aquatic Vegetation (SAV) because of decreased light penetration
- Benthic organisms (e.g., oysters) adversely affected by increased sediment loads
- Episodic deposition rapidly increases mortality
- Effects of increased sedimentation on fish, including:
  - Direct effects of feeding, clogged gill tissues, and smothering of eggs
  - Indirect effects on the abundance of planktonic prey of larval and juvenile fish
  - Habitat alterations through increased silting and sedimentation
- Increased channel dredging that will affect fish spawning and nursery habitats

The study predicted that when the dam reaches its sediment storage capacity, sediment flow to the Bay will increase 150 percent, but claims that will not occur for "20 or 30 years." In fact, the Bay is already showing the effects described in the report.

Following Tropical Storm Lee, Maryland Gov. Martin O'Malley stated that the storm "provided a vivid demonstration of the need to take steps to *head off what could be a catastrophic event causing immediate and enormous damage* to our restoration processes. The time to address this threat is now."[29] (Emphasis added.) The governor's press release noted that Conowingo's "capacity to store sediments will be reached in 15 to 20 years," which would be correct if the 2000 study's predicted 20–30 year timeframe was accurate. But Lee *was* catastrophic and did enormous damage—environmental damage from the Conowingo Dam is happening *now*. Unfortunately, Governor O'Malley's immediate action plan was only to commission another report.

The Clean Chesapeake Coalition criticized the state for burdening Maryland taxpayers with the new rain tax and planning to devote $7.4 billion for storm water cleanup, while ignoring the massive pollution loads to the Bay resulting from the Conowingo's sediment crisis.

Carroll County, Md., Commissioner Richard Rothschild, Kent County, Md., Commissioner Ron Fithian, Bay watermen, and others believe the dam has already reached its sediment capacity. Rothschild says, "Conowingo is in effect the state's oldest and largest storm water management pond, but in 80 years it's never been cleaned. Instead we spend billions of dollars removing nutrients with an eyedropper while tens of thousands of tons of pollutants from the dam kill our oyster beds and aquatic vegetation as the result of these storms."[30]

Conowingo is in effect the state's oldest and largest storm water management pond, but in 80 years it's never been cleaned.

USGS's Hirsch explains:

> *When you think about Conowingo and Tropical Storm Lee, look at it this way. Conowingo Dam is a large sediment trap that has been in place for over 80 years. For most of its life it did a great job of trapping most of the sediment that flowed into it when large floods transported large amounts of sediment down the Susquehanna River. But that trap is rapidly filling up, and as it fills it becomes less-and-less able to trap sediment coming in and more-and-more prone to scour (disturbing the sediment deposited over those 80 years and moving it out of the reservoir and into the Bay).*
>
> *This presents a big challenge to those trying to help the Bay ecosystem. Even to keep the status quo of the last few years, in terms of the average annual inputs of phosphorus and sediment to the Bay, the citizens of the Susquehanna River Basin will have to reduce their inputs substantially to compensate for the loss of the trapping capability of Conowingo Dam.*[31]

Fithian, a former waterman, believes that excess sediments are a main reason the Upper Bay no longer produces oysters. He says that each big storm leaves a layer of silt covering the bottom that buries oyster beds and prevents essential sea grasses and SAV from growing. "There aren't enough grasses to make a salad," he quipped. Oysters on the bottom are smothered by the silt and young oysters cannot find old oyster shell—the necessary substrate—to attach to.[32]

Upper Bay catch statistics bear out Fithian's story, showing that after each storm, the oyster population declines dramatically (Table 8). And following each event, the oyster population has been less able to bounce back. At present, the Upper Bay oyster population is essentially dead.

Maryland has been buying oyster shells from Florida in an attempt to rebuild oyster beds. Fithian says that is unnecessary; there are plenty of shells on the bottom, but buried in muck. There are a number of methods for harvesting oyster. Rakes are used in shallow water and long-handled rakes or oyster tongs in deeper water. A preferred method watermen use is called "power dredging," where a toothed, wire basket is dragged across the bottom, somewhat like a large clam rake. It removes the muck and exposes old shell. According to Fithian, this method could reestablish those beds, but there is much resistance to using it. After Hurricane Agnes, Fithian says, he knew the industry was dying. He quit in the 1990s.[33]

Captain Larry Powley, a waterman, and founder and board member of the Harvesters Land & Sea Coalition, does not understand why the State of Maryland has shown such little interest in sediment releases from the Conowingo Dam. The watermen agree that Conowingo sediment plumes are the major problem and, like Fithian, Powley believes the watermen's preferred method of oyster fishing could restore the fishery.[34]

While it is the most efficient method for harvesting oysters, other experts debate the value of power dredging as a method of restoring oyster beds and claim it damages the bottom. Maryland's Department of Natural Resources conducted a four-year study spanning 2000 to 2004 that evaluated the effectiveness of power dredging in increasing spatfall compared with a sanctuary area where no harvesting occurred. The study found no significant difference between the two sites.[35] Wherever the truth lies, it may be irrelevant as the state appears to be completely ignoring the largest single source of Bay pollution.

The Maryland Port Administration is currently considering a proposal to build a factory that would convert sediment into a popular building material called "lightweight aggregate."

Opportunity squandered In 2011, the State of Maryland was given a unique opportunity to begin addressing the existential threat to the Bay posed by Conowingo sediment. Conowingo's owner, the Chicago-based Exelon Corp., was planning a merger with Maryland's Constellation Energy. To gain the state's approval, the companies agreed to spend $1 billion on various initiatives as directed by Governor O'Malley.[36] None of those initiatives targeted sediment. Instead they funded a laundry list of the governor's pet projects and political priorities.[37]

DREDGING THE CONOWINGO

The annual cost to remove two million tons of sediment trapped by the Conowingo Dam is at least $48 million.[38] The dam is believed to contain 174 million tons of sediment. If all sediment were removed at the same dredging cost, the total expense would be $4.2 billion, and would not include the cost of disposal (which would be significant). But there are some ways to defray that cost. The Maryland Port Administration is currently considering a proposal to build a factory that would convert sediment into a popular building material called "lightweight aggregate." Locating such a factory at Conowingo could recover significant dredging costs.[39] Sediment can also be used as topsoil.

Even at twice the cost, dredging the Conowingo would be a bargain in nutrient and sediment removal, given the $14.4 billion the state intends to spend to remove only 3.4 percent of the Bay's nitrogen. Also, the Maryland Port Administration spends about $43 million per year dredging the Bay—partially as a result of Conowingo silt—to keep commercial shipping lanes open.[40] Dredging the Conowingo could significantly reduce that need.

CONCLUSION

"Save the Bay" has become an iconic slogan in the state of Maryland. One can see it on license plates, bumper stickers, t-shirts and elsewhere. There has been no lack of enthusiasm for improving the Chesapeake's water quality. But despite at least $15 billion in federal, state, local, and private spending on Bay preservation and restoration efforts since 1983,[41] the Bay's bellwether resource, the oyster, has declined to a tiny fraction of its historic population. It seems like saving the Bay is a losing battle.

The state is preparing to spend a minimum of $14.4 billion more on Bay restoration efforts in what appears to be another pointless exercise, while ignoring an existential pollution threat. Similarly, Virginia has estimated a cost of up to $15.7 billion to meet its modest EPA TMDL targets. Virginia has a more ambitious target for sediments, but this is still dwarfed by the Conowingo spill. The sedimentation flows from the Chesapeake watershed states are an ongoing problem that policymakers may need to address in time, but those flows are small compared to the massive periodic spills from the Conowingo Dam. Addressing the Conowingo would both reduce its threat and ease political tensions over minor but costly reductions from other sources.

Maryland leaders need to reassess their priorities and focus on reducing the sediment threat from the Conowingo Dam.

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31. Robert M. Hirsch, Email message to James Simpson. March 18, 2014.
32. Ron Fithian, Kent County commissioner. Interviewed by James Simpson. March 20, 2014.
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34. Larry Powley. Interviewed by James Simpson. March 22, 2014.
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37. Among the projects suggested by Governor O'Malley and adopted by Exelon and Constellation:
    - Subsidies to low/middle income for electric bills ($10 million)
    - Low-to-moderate-income customer weatherization program ($50 million)
    - The governor's offshore wind farm project ($32 million)
    - New natural gas generation in Maryland ($96–$142 million)
    - New Tier 1 generation in Maryland ($294–$295 million)
    - New solar generation in Maryland ($146–$155 million)
    - New animal waste-fueled generation ($89–$157 million)
    - Charitable contributions ($70 million)
    - Baltimore headquarters ($95–$120 million)
    - Maryland goal of reducing energy use 15 percent by 2015 ($10 million)
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