



**CHESAPEAKE BAY FOUNDATION**  
*Saving a National Treasure*

**REPORTS**



## **Polluted Runoff:**

**How Investing in Runoff Pollution Control Systems Improves the  
Chesapeake Bay Region's Ecology, Economy, and Health**

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**January 2014**

**“Just 1 Inch of Rain Falling on 1 Acre of Paved Surface  
Equals 27,000 Gallons of Polluted Runoff.”**

<b>CONTENTS</b>	
<b>EXECUTIVE SUMMARY</b> .....	1
<b>Figure 1: Return On Investment From Runoff Control Fees</b> .....	3
<b>RUNOFF: A GROWING THREAT</b> .....	5
<b>Figure 2: Polluted Runoff is Increasing in the Chesapeake Bay Watershed</b> .....	4
<b>Figure 3: Population Growth vs. Developed Land</b> .....	5
<b>THE POLLUTANTS IN RUNOFF: A NOXIOUS BREW</b> .....	5
<b>DAMAGE CAUSED BY POLLUTED URBAN AND SUBURBAN RUNOFF</b> .....	7
<b>Figure 4: Pavement And Other Hardened Surfaces in the Bay Watershed</b> .....	8
<b>Feature: Wading into Runoff Pollution and Human Health</b> .....	10
<b>Feature: Family Feels Taxed by Flooding</b> .....	11
<b>CONTROLLING RUNOFF: THE WIN-WIN OF HOW AND WHY</b> .....	12
<b>Figure 5: Examples of Stormwater Control Projects</b> .....	13
<b>Figure 6: Water Guzzling Trees</b> .....	14
<b>WHAT STATE AND LOCAL GOVERNMENTS ARE DOING TO REDUCE RUNOFF POLLUTION</b> .....	16
<b>Feature: Building Green into an Urban Landscape</b> .....	15
<b>Feature: Washington, D.C.: Schooling the Region on Innovative Ways to Control Runoff</b> .....	19
<b>CONCLUSIONS</b> .....	22

COVER PHOTO: Urban and suburban runoff becomes a noxious brew as it collects pollutants from hardened surfaces and carries them to our local waterways and the Chesapeake Bay. In this December 2010 photo, Diana Muller, the South Riverkeeper with the South River Federation, collects a water sample beneath a stormwater outfall into Crab Creek, a tributary to the South River, in Annapolis, Maryland. “It was just after a rain storm, and the sample showed the water was super high in (sediment), high in nitrate pollution, and high in phosphate pollution,” Muller recalled. “People just throw garbage in the street, and it goes directly into the outfall and into the stream. Unfortunately, this is what stormwater looks like throughout the whole Chesapeake Bay region. And it shows why polluted runoff is our number one fight.”  
Credit: Jennifer Carr/South River Federation.

# Polluted Runoff:

## How Investing in Runoff Pollution Control Systems Improves the Chesapeake Bay Region's Ecology, Economy, and Health

### EXECUTIVE SUMMARY

A national treasure, the Chesapeake Bay and its rivers and streams are central to the culture of the more than 17 million people who live in the six-state, 64,000-square-mile region. Clean water is vital not only to our quality of life, but also to our health, family traditions, and economic well-being.

Over the last quarter century, cooperation between governments, businesses, and individuals has reduced many forms of pollution in the Bay and its tributaries. And right now—a critical moment in time for the Chesapeake Bay and its rivers and streams—a federal and state Clean Water Blueprint is in place to finish the job. One major type of water pollution, however, continues to grow: untreated suburban and urban stormwater runoff<sup>1</sup> from blacktop, roofs, and other hardened surfaces.

Every year, development spreads across an additional 38,000 acres of land in the Chesapeake Bay region.<sup>2</sup> About 10,000 of these acres are hard surfaces that water cannot penetrate.<sup>3</sup> Thus, every four years, an area of land about the size of Washington, D.C. (nearly 40,000 acres), is converted from fields and forests to buildings, roads, and parking lots—the hardened landscape of suburban sprawl. This armoring of the land is worsened by the removal of trees that would normally absorb rain water.

When runoff from storms sweeps across blacktop, it heats up and accelerates down funnels of cement, blasting into streams, eroding stream banks, killing fish and insects, flooding homes, and posing risks to human health.<sup>4</sup>

Runoff collects an often toxic mix of pollutants<sup>5</sup> including trash, oil, dirt, nitrogen, phosphorus, sediment, herbicides, fecal bacteria from pet waste, and even toxic metals like copper dust from the brake pads of cars, as well as lead, zinc, chromium, and cadmium.<sup>6</sup> Researchers have found pesticides in 97 percent of suburban and urban runoff samples, and at levels high enough to harm aquatic life 83 percent of the time.<sup>7</sup>

This report details the problems created by suburban and urban runoff pollution. And it offers steps that local, state, and federal governments can take to reduce pollution and achieve clean water for local streams, rivers, and the Chesapeake Bay.

In the Mid-Atlantic region, suburban and urban runoff is responsible for thousands of miles of waterways that are so polluted they are legally “impaired” under the federal Clean Water Act.<sup>8</sup> This includes 2,451 miles of rivers and streams in Pennsylvania and 2,590

The **Chesapeake Clean Water Blueprint** is the mandatory federal/state effort to restore water quality in the Bay and its rivers and streams. It comprises EPA's science-based pollution limits for nitrogen, phosphorus, and sediment in the Chesapeake Bay watershed and the Bay states and the District of Columbia's plans to achieve them.

**Stormwater** becomes **polluted runoff** when rain collects oil, fertilizers, pet waste, pesticides, toxic metals, and other pollutants from pavement and other hardened surfaces as it runs into local waterways.



*Water from rain sweeps up oil, fertilizers, pesticides, toxic metals, and other pollutants from streets and parking lots and flushes these pollutants into streams and the Chesapeake Bay.*

miles in Maryland (with Virginia's numbers not available).<sup>9</sup> Nationally, runoff pollution is responsible for 38,114 miles of impaired rivers and streams; 948,420 acres of impaired lakes; 2,742 miles of impaired bays; and 79,582 acres of impaired wetlands.<sup>10</sup>

Polluted runoff is the leading known cause of high bacteria levels that trigger beach closings and no-swimming advisories, as well as bans and restrictions on harvesting oysters and other shellfish.<sup>11</sup>

Across the U.S., about \$750 million in annual flooding damage results from uncontrolled rainwater runoff, including flooded basements, sink holes, and eroded roads and buildings.<sup>12</sup> More locally, flooding causes an estimated \$150 million a year in damage in the Susquehanna River drainage area alone.<sup>13</sup>

How can runoff be controlled? The federal Clean Water Act's main enforcement tools for limiting runoff pollution are permits for large counties and cities. But at this writing, most of these permits in the Chesapeake Bay region are outdated (meaning more than five years old) and have been administratively continued pending new ones. As a result, the permits still have old and weak requirements.<sup>14</sup> Outdated permits are a problem for 10 out of 11 of Virginia's largest municipalities,<sup>15</sup> and nine of 10 of Maryland's largest local governments.<sup>16</sup> Pennsylvania's communities in the Bay region, like many smaller towns and counties in Virginia and Maryland, are covered by a different kind of permit that has less specific water pollution control requirements.

**Urban and suburban polluted runoff is a local problem begging local solutions and promising local benefits, as well as larger benefits to the Chesapeake Bay.**

Maryland and Virginia's environmental agencies have pledged<sup>17</sup> to update and strengthen the permits for large counties and cities in 2014 to help meet pollution limits for the Chesapeake Bay. Stronger runoff permits will help the states implement the Chesapeake Clean Water Blueprint, to reduce pollution from all sources, and clean up local streams. Urban and suburban polluted runoff is a local problem begging local solutions and promising local benefits, as well as larger benefits to the Chesapeake Bay.

To reduce runoff pollution, local governments can build cost-effective, common-sense projects.<sup>18</sup> These include building modified ponds and ditches with wetland plants to catch and filter runoff, planting trees, and leaving more land open to absorb rainwater.<sup>19</sup> While many communities are moving ahead with these projects, a few critics want to abolish the pollution-control fees that are needed to pay for them. But here is the good

news: Cost estimates for reducing runoff pollution often drop substantially when more efficient and updated methods are considered. A new estimate for Calvert County, Maryland, came in 96 percent lower than the initial projection,<sup>20</sup> and Frederick County, Maryland's estimate fell by 65 percent.<sup>21</sup>

Runoff pollution control fees and projects can bring a return to local economies of up to 1.7 times the investment, according to a report by the University of Maryland Environmental Finance Center.<sup>22</sup> For example, each \$100 million invested in Lynchburg, Virginia, produces \$174 million for the local economy and supports the jobs of 1,440 local workers, including laborers and engineers.<sup>23</sup> And, in Anne Arundel County, Maryland, the same investment produces \$115 million and supports the jobs of 780 workers.<sup>24</sup>

Because these pollution control projects return benefits to local economies, wildlife, and human health—in addition to improving local water quality—it is critical that communities invest in them.

The following actions are necessary to reduce urban and suburban runoff pollution in the Bay region:

#### Virginia

1. In Virginia, state legislators should appropriate an additional \$50 million to assist local runoff control projects through the Stormwater Local Assistance Fund for the fiscal year starting on July 1, 2014.
2. Lawmakers must support, and not delay, the scheduled July 1, 2014, implementation date for Virginia's new runoff-management rules.
3. By the same date, the Commonwealth must issue final, fully accountable runoff pollution control permits for the state's 10 largest municipalities that have outdated permits.

#### Maryland

1. In Maryland, lawmakers must defeat legislative proposals to delay, weaken, or overturn the state's landmark 2012 runoff pollution control law. That law required the state's 10 largest jurisdictions to establish their own runoff control "stormwater" utility fees by July 2013.
2. State officials need to issue strong and enforceable runoff-control permits for the eight counties and Baltimore City that have outdated permits.
3. During the 2014 Legislative Session in Maryland, the Chesapeake Bay Foundation will be asking that the General Assembly pass a budget that includes full funding of the 2010 Trust Fund (for FY14 it was \$31.5 Million), at least \$36 million additional investment in the Capital Budget, and the \$45 million approved for State Highway Administration for Blueprint Implementation as planned.

**FIGURE 1  
RETURN ON INVESTMENT FROM RUNOFF  
CONTROL FEES**



Runoff pollution control fees and projects can bring a return to local economies of up to **1.7 times** the investment.<sup>22</sup>

Source: University of Maryland Environmental Finance Center

Each \$100 million invested in Lynchburg, Virginia, produces **\$174 million for the local economy** and supports the jobs of **1,440 local workers**, including laborers and engineers.<sup>23</sup> And, in Anne Arundel County, Maryland, the same investment produces **\$115 million** and supports the jobs of **780 workers**.<sup>24</sup>

## Pennsylvania

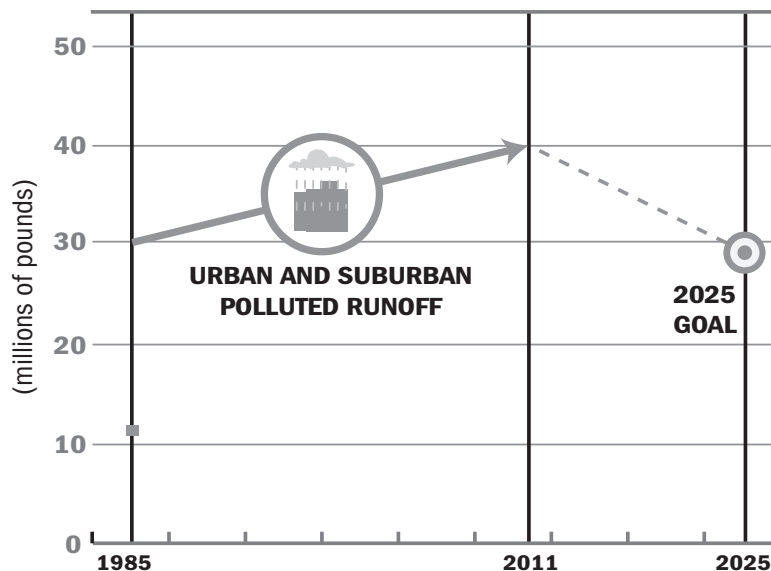
1. In Pennsylvania, the Commonwealth must restore funding and update standards for the state's 1978 Storm Water Management Act, which was funded through 2008 but then zeroed out.
2. The General Assembly should also pass legislation to regulate lawn fertilizer, including the requisite safe timing for its application.
3. Additionally, legislators should defeat House Bill 1565, which would remove requirements for new developments to preserve or restore forests beside the state's most pristine streams.

## Federal

At the federal level, the U.S. Environmental Protection Agency should put into effect new national urban stormwater regulations. And, EPA should ensure timely creation of strong state runoff pollution control permits for local governments.

None of these federal and state actions should be delayed or weakened. Runoff pollution has been inadequately treated for too long. Our streams and rivers are paying for our negligence and we are past due in addressing this growing problem. We all contribute to runoff. We share responsibility for cleaning it up.

**FIGURE 2**  
**POLLUTED RUNOFF IS INCREASING IN THE CHESAPEAKE BAY WATERSHED**



**Polluted runoff** from stormwater is the only major source of pollution still on the rise in the region.

Source: Chesapeake Bay Program 2011 Model

## RUNOFF: A GROWING THREAT

Urban and suburban stormwater runoff is untreated. It erodes streams, kills fish, pollutes swimming beaches, floods homes, and causes many other problems. And runoff pollution is increasing because the amount of land covered by parking lots, roads, roofs, and driveways, continues to grow. Meanwhile, forests, meadows, and other natural filters are disappearing, and manmade filtration systems to control runoff have not compensated for the loss. Only 10 to 20 percent<sup>25</sup> of rain that hits land in its natural state runs off, with the rest absorbed by soil and plants. By contrast, close to 100 percent of the rain that falls on concrete and other hard surface produces becomes runoff. An inch of rain falling on an acre of hardened surface produces 27,000 gallons of runoff.<sup>26</sup>

In the Chesapeake Bay watershed, almost 4.9 million acres of land are developed, which is about 12 percent of the land that drains into the estuary. A little more than a quarter of this developed land (or 1.3 million acres) is covered in pavement, roofs, and other surfaces that rain cannot penetrate. That means that about three percent of the Bay watershed is covered in impervious surfaces.<sup>27</sup> The percentage of coverage by hard surfaces is much higher in urbanized communities: 51 percent in Baltimore; 46 percent in Washington, D.C.; and 24 percent in Newport News, Virginia.<sup>28</sup>

Increasingly, spread-out development patterns—also known as suburban sprawl—is the pattern of development, far exceeding the rate of growth of the human population in the Chesapeake region.<sup>29</sup> In Maryland alone, for example, between 1973 and 2010, the population grew by 39 percent while the amount of developed land multiplied by 154 percent.<sup>30</sup>

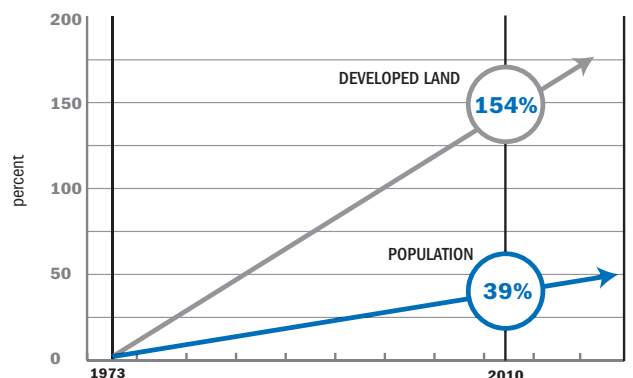
Meanwhile, farms continue to disappear. The amount of land in the region devoted to agriculture dropped 12 percent between 1985 and 2010, to 9 million acres.<sup>31</sup> Forested land is also being consumed, with 25,000 to 36,000 acres of trees cleared each year over the last three decades.<sup>32</sup> That's an expanse of land the size of Baltimore being stripped of its natural filters every two years. (This figure does not include the amount of farmland that is also being developed.)

Trees are cut down for suburban lawns, which are spreading fast. In some instances, due to a high level of compaction, lawns can also be nearly impervious to rain.<sup>33</sup> Blacktop, roofs, and other hard surfaces are also increasing rapidly, with at least 10,000 acres a year on average in the Bay region covered with a water-resistant shell (an equivalent to a new Washington, D.C., every four years).<sup>34</sup>

## THE POLLUTANTS IN RUNOFF: A NOXIOUS BREW

Rain water increases in speed as it flows across developed landscapes. And as the water accelerates, it warms, picks up anything left in its way, erodes stream banks, and pollutes the water into which it flows.

**FIGURE 3**  
**POPULATION GROWTH VS. DEVELOPED LAND**  
**IN MARYLAND**



The pace of **land development** far outpaces the rate of population increases.

Source: Maryland Department of Natural Resources

The list of pollutants in runoff is long.<sup>35</sup> Trash dropped on the street. Nitrogen and phosphorus from fertilizers on lawns and air pollution that settles on the ground. Fecal bacteria, viruses, and other pathogens from animal and human waste. Oil and toxic petroleum products from vehicles and driveway sealants. Pesticides and herbicides from lawns and gardens.<sup>36</sup> Road salt. Dirt from stream banks and construction sites that lack runoff control fencing. Toxic metals, such as copper, lead, and zinc from vehicles, roofing materials, and paints.<sup>37</sup>

The brake linings of cars and trucks are often made with copper, and they shed a fine dust of this toxic metal onto streets.<sup>38</sup> The Maryland Department of the Environment sampled runoff from the state’s major urban areas and found copper in 92 percent of the samples. Fifty-three percent of the time the levels would be acutely toxic to aquatic life.<sup>39</sup> (Copper also appears in waterways because, among other reasons, the metal is an ingredient in herbicides.)<sup>40</sup> Zinc from car tires, road salt, paint, and other products has also been found in runoff, as well as the toxic metals lead, chromium, and cadmium.<sup>41</sup>

**POLLUTANTS IN RUNOFF:**

- |                                     |  |
|-------------------------------------|--|
| 1. Trash                            | 6. Pesticides and herbicides                     |
| 2. Soil and sediment                | 7. Road salt                                     |
| 3. Fecal bacteria                   | 8. Toxic metals including copper, lead, and zinc |
| 4. Nitrogen and phosphorus          |  |
| 5. Oil and other petroleum products |  |

Source: EPA and Maryland Department of the Environment



**Robert G. Traver**  
Professor of Civil Engineering at Villanova University and Director of the Villanova Urban Stormwater Partnership

*“It’s the pollution from the cars, but it’s more than that. It is, for example, the heat of the water that comes off the pavement, and the volume of the runoff from the pavement.”*

Dr. Robert G. Traver, a professor of Civil Engineering at Villanova University and Director of the Villanova Urban Stormwater Partnership, said there is a connection between our dependence on cars and trucks and water pollution.<sup>42</sup> “Cars are very significant, because we build so much infrastructure for the cars—the parking lots, roads, garages, and driveways,” Dr. Traver said. “It’s the pollution from the cars, but it’s more than that. It is, for example, the heat of the water that comes off the pavement and the volume of the runoff from the pavement.”

In terms of the health of the Chesapeake Bay and its local tributaries, some of the biggest problems from runoff are from sediment, nitrogen, and phosphorus. Nitrogen and phosphorus pollution feeds algal blooms that suck oxygen from the water when the algae die, creating low-oxygen “dead zones.”<sup>43</sup> An estimated 25 percent of the sediment polluting the Bay itself is from suburban and urban runoff, as well as 17 percent of the phosphorus, and 16 percent of the nitrogen.<sup>44</sup> In local streams and rivers, the percentage of these pollutants from runoff can be much higher.

Oil and other petroleum products in runoff are well known by scientists to be toxic to aquatic life, even in low concentrations.<sup>45</sup>

Researchers have detected pesticides (including sometimes dieldrin and the now-banned chlordane) in 97 percent of suburban and urban runoff samples nationally, and at levels high enough to harm aquatic life 83 percent of the time.<sup>46</sup> For example, Lake Roland in Baltimore County is so polluted with chlordane<sup>47</sup>—a termite killing pesticide sprayed in nearby homes—that anglers are warned to limit their consumption of fish from the lake.<sup>48</sup>



Runoff often contains bacteria and viruses from leaky or overflowing sewer systems and septic tanks. Rain sometimes flushes these contaminants into streams and onto beaches.<sup>49</sup> Researchers have detected pathogens including fecal coliform bacteria, streptococci, *Salmonella*, *Staphylococcus aureus*, and Polio virus in runoff flowing into urban streams.<sup>50</sup> Some of the potentially disease-causing agents are from animal waste (from dogs, birds, and other wildlife, for example). Others are from human waste (sometimes from improperly installed or neglected sewage pipes that leak waste into stormwater control culverts.)<sup>51</sup> In some older cities and towns—such as Richmond and Washington, D.C.—sewage and stormwater pipes were deliberately combined, so sewage overflows are designed to happen during rain storms. For example, Lancaster, Pennsylvania, releases about 750 million gallons of sewage mixed with stormwater every year into the Conestoga River, which leads to the Susquehanna River and Chesapeake Bay.<sup>52</sup>

“What we do on land goes right into a storm drain and then right into our sources of drinking water and the places where we recreate,” according to Richard Batiuk, Associate Director for Science, Analysis, and Implementation with the U.S. Environmental Protection Agency’s Chesapeake Bay Program.<sup>53</sup> “People always think, ‘once it disappears, it’s okay.’ No, it stays around and it comes back and bites you, either through your faucet or an inability to have a meal of rockfish or crabs.”



**Richard Batiuk**  
Associate Director for Science, Analysis, and Implementation with the U.S. Environmental Protection Agency’s Chesapeake Bay Program

*“What we do on land goes right into a storm drain and then right into our sources of drinking water and the places where we recreate.”*

## DAMAGE CAUSED BY POLLUTED URBAN AND SUBURBAN RUNOFF

The multiple and compounding damage caused by polluted runoff demands our attention: the death of fish and amphibians; human health risks; contaminated drinking water supplies; harbors clogged with sediment; flooded basements and homes; and of course, pollution that fouls streams, rivers, and the Chesapeake Bay.

### Polluted Water

Thousands of miles of waterways in the Chesapeake Bay region have been legally designated as “impaired”<sup>54</sup> (meaning polluted) by suburban and urban runoff under the federal Clean Water Act. In 2012, this included 2,451 miles of rivers and streams in Pennsylvania, and 2,590 miles in Maryland (with Virginia’s numbers not available).<sup>55</sup> Reducing pollution in these waterways is important not only for local water quality, but also for compliance with EPA’s science-based pollution limits and the regional Bay clean-up plan, the



Diedra Floyd/CBF Staff

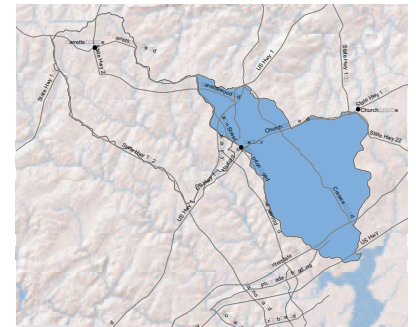
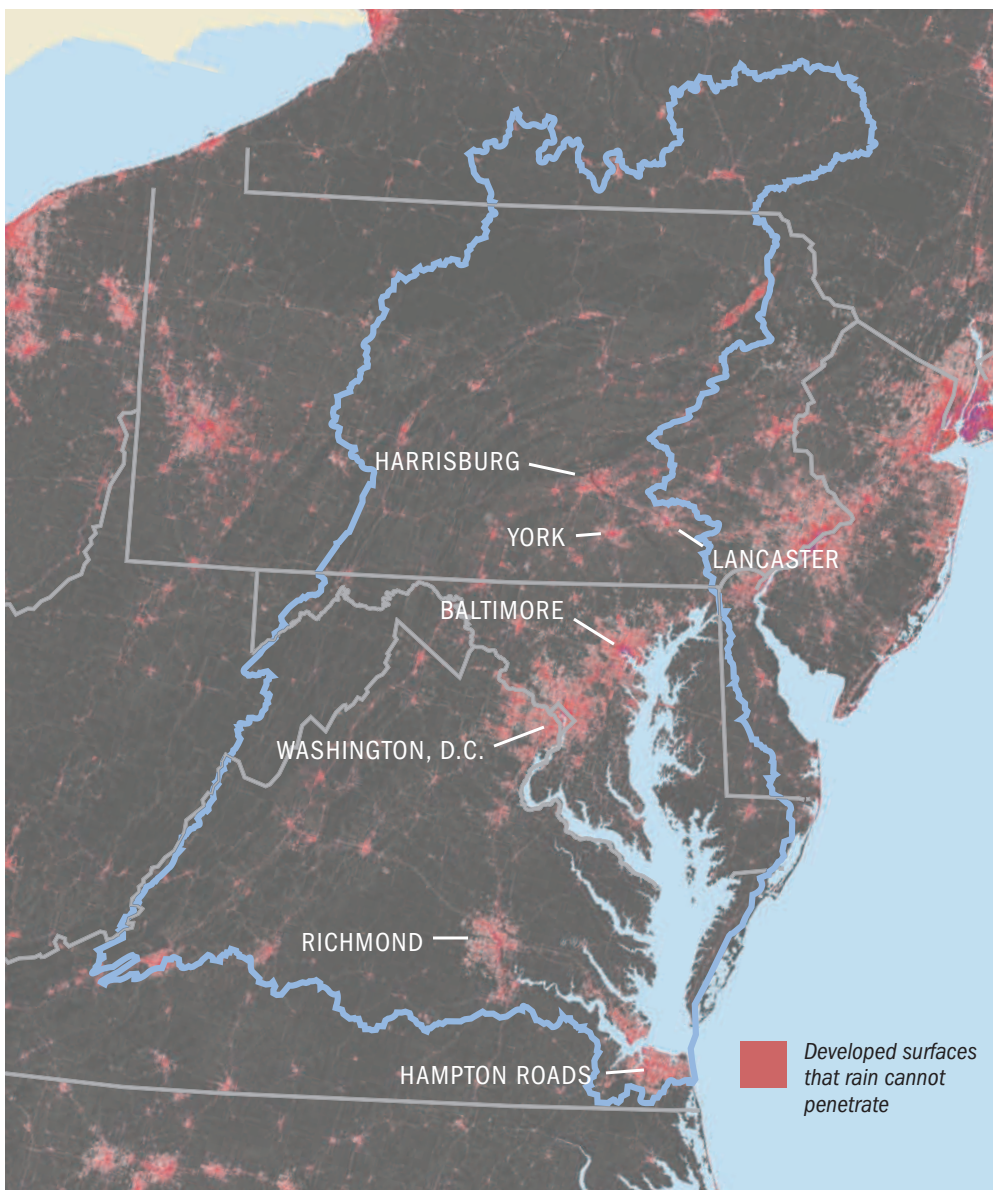
*Urban and suburban runoff is the only major source of pollution that is growing in the Chesapeake Bay and its rivers and streams.*

**FIGURE 4  
PAVEMENT AND OTHER HARDENED SURFACES IN THE BAY WATERSHED**

This aerial image shows the locations of roads, roofs, parking lots, and other developed surfaces that rain cannot penetrate.

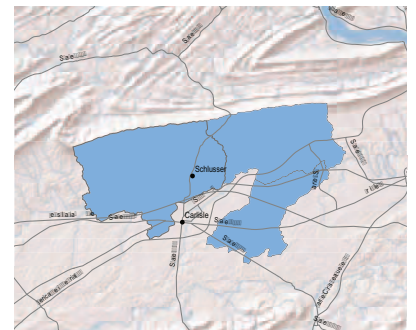
Researchers have concluded that when two to 10 percent of a stream or river's drainage area is covered in hardened surfaces, fish and amphibians begin to disappear.

Here are three examples of local streams in the Bay region whose aquatic life is at risk because their watersheds are at least four to nine percent covered.<sup>80</sup>



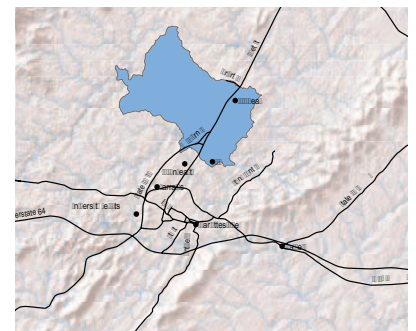
**HARFORD COUNTY, MD:**

*The Bynum Run/Bush Creek Watershed northeast of Belair is at least nine percent covered in pavement, roofs, and other developed surfaces.*



**CUMBERLAND COUNTY, PA:**

*The Hogestown Run and Wertz Run Watersheds west of Harrisburg are at least five percent covered.*



**ALBEMARLE COUNTY, VA:**

*The South Fork Rivanna River Watershed north of Charlottesville is at least five percent covered.*

**At risk areas where four to nine percent of land is covered by developed surfaces that rain cannot penetrate**

Chesapeake Clean Water Blueprint. Nationally, polluted runoff is responsible for 38,114 miles of impaired rivers and streams; 948,420 acres of impaired lakes; and 2,742 miles of impaired bays.<sup>56</sup>

### **Fish and Amphibian Mortality**

Researchers have documented a direct connection between the survival of fish and the percentage of a stream's drainage area covered in hard surfaces.<sup>57</sup> High volumes of runoff kill aquatic insects that fish require for food. Some fish are also less able to survive when the tree canopy over streams is stripped away and water temperatures rise.<sup>58</sup> Brook trout, which are especially sensitive and require cold streams, may disappear from streams whose watersheds are more than two percent hardened surfaces.<sup>59</sup> Several sensitive species of amphibians perish when a waterway's drainage area is more than three percent hard surfaces.<sup>60</sup> Other studies suggest different species of fish, such as yellow perch, stop reproducing when 10 percent of the land is covered.<sup>61</sup>

Some examples of local streams whose aquatic life is at risk due to the percent of the watershed that is hardened are: the Bynum Run-Bush Creek watershed in Harford County, Maryland, which is at least nine percent covered in pavement and roofs; the Hogestown Run and Wertz Run watersheds, just west of Harrisburg, Pennsylvania, which are at least five percent covered; and the South Fork Rivanna River watershed north of Charlottesville, Virginia, which is at least five percent covered.<sup>62</sup>

"There is a reduction in both the numbers of fish you see as well as the types of fish and other aquatic life that you see because of polluted runoff," said Hye Yeong Kwon, Executive Director of the Center for Watershed Protection.<sup>63</sup> "Aquatic life can't tolerate the toxics in runoff, and there are bacterial problems and diseases that emerge as a result of some of these pollutants. And sediment can get in the gills of fish so they can't breathe."

### **Human Health**

The harm is not limited to fish and amphibians, however. Human health is also potentially at risk.<sup>64</sup> Runoff that contains bacteria can cause illnesses in swimmers.<sup>65</sup> Runoff is the leading known cause of high bacteria levels that trigger beach closings and no-swimming advisories.<sup>66</sup> And runoff pollution is also responsible for health-related restrictions on harvesting oysters and other shellfish. One California study found that people who swim downstream from a stormwater outfall pipe have significantly higher risks of becoming sick with fevers, chills, coughing, vomiting, and diarrhea than people who swim more than 400 yards away from the same outfall.<sup>67</sup>

### **Hidden Costs**

Runoff pollution is also expensive to governments and citizens. Sediment clogs harbors, waterways needed for shipping, and drinking water reservoirs.<sup>68</sup> The U.S. Army Corps of Engineers spends many millions of dollars every year dredging runoff sediment.<sup>69</sup> Runoff contamination of drinking water supplies requires local governments (and sometimes individual homeowners on private wells<sup>70</sup>) to pay more to filter nitrates and other pollutants out of their water to make it safe.<sup>71</sup> The Washington Suburban Sanitary Commission is spending about \$28 million<sup>72</sup> to extend a drinking water intake pipe farther into the Potomac River to avoid sediment and other runoff pollution near shore.



**Hye Yeong Kwon**  
Executive Director of the Center  
for Watershed Protection

*"Aquatic life can't tolerate the toxics in runoff, and there are bacterial problems and diseases that emerge as a result of some of these pollutants. Sediment can get in the gills of fish so they can't breathe."*

## WADING INTO RUNOFF POLLUTION AND HUMAN HEALTH

The human health implications of polluted runoff can surface when children swim.

A small crescent of sand beside Hilton Pier in Newport News, Virginia, draws neighborhood kids who love to wade into the James River.

But immediately next to the Hilton Pier Beach, a cement culvert spews polluted runoff from the city's streets across the sand and into the water.

Local health officials found unhealthy levels of bacteria near this beach's waters nine times in the summer of 2013, according to the Virginia Department of Health. The presence of these pathogens forced the city to issue 11 days of "no swimming" advisories—the most of any monitored beach in Virginia's portion of the Chesapeake Bay that year.

On July 23, levels of enterococcus bacteria at the beach (an indicator of fecal waste from people or animals) were 75 times higher than EPA standards for swimming, according to the Virginia Department of Health.

"I am alarmed," said Patricia VonOhlen, a retired teacher who lives near the beach. "If children are swimming there, and it is contaminated, that is a real concern. I think runoff pollution is a big contributor to our problems."

Matt Skiljo, Waterborne Hazards Control Program Coordinator for the Virginia Department of Health, said the bacteria readings at Hilton Pier Beach were high enough to inspire a joint state and local investigation of the city's stormwater system. The investigation is ongoing.

"When you have an incident like that at Hilton Beach, that really grabs your attention," Skiljo said. "We want to find out what's causing it."

Scientists say that the source of bacteria at swimming beaches is often hard to determine. But bacteria levels often rise after storms because rain flushes waste from leaky sewage pipes and overflowing septic systems into waterways, along with fecal matter from pets, rats, and wildlife.

For this reason, officials in Virginia and Maryland recommend that people avoid swimming or wading for a few days after any significant rainfall, according to the Virginia Department of

Source: Virginia Department of Health



High bacteria levels triggered no-swimming advisories for 13 beaches in Virginia in 2013.

Health and Maryland Department of the Environment. Nationally, polluted runoff is responsible for at least 28 percent of the high bacteria levels that trigger no-swimming advisories and beach closures, according to the Natural Resources Defense Council. That makes runoff the leading known cause of beach closures.

"Illnesses generally associated with swimming in water contaminated with urban runoff include earaches, sinus problems, diarrhea, fever, and rashes," an EPA website warns.

In the summer of 2012, 20 beaches in Maryland had no-swimming advisories for a total of 211 days because of high bacteria levels, according to the Maryland Department of the Environment. (The agency did not have data available for 2013.) In Virginia, 17 beaches had no-swimming advisories for 29 days in 2012. Thirteen beaches had advisories for 30 days in 2013 (with half of these in Newport News), the Virginia Department of Health reports.

Jamie Brunkow, Lower James Riverkeeper at the James River Association, said the runoff into the river includes nitrogen and phosphorus pollution that feeds toxic algal blooms.

"We see red tides in this part of the river nearly every year," Brunkow said, as he gazed out on the waterway from Huntington Park Beach in Newport News. "We have dinoflagellate blooms that create a dense red coloration in the water. These algae create long chains that can clog fish gills and cause problems with fish respiration. It's nasty looking and disturbing."

The ugly algal blooms, high bacteria levels, and oyster bed closures in the river are a clear sign that state and local governments need to invest more in runoff pollution control systems, Brunkow said.

"Nobody thinks about runoff," said Beverley Nunnally, a Newport News resident who kayaked down the James River past an outfall pipe. "But I see everything coming out of there after a rain—fast food wrappers, bottles, cans, plastic bags, toys, you name it. We need to do more to keep our waters clean."

## FAMILY FEELS TAXED BY FLOODING

On October 11, 2013, a hard rain fell in Palmyra, Pennsylvania. Before dawn, Elizabeth Stoltzfus woke and trudged downstairs in her pajamas to get her five children ready for school.

That's when she noticed flashing lights through her window. Nudging aside the curtain, she saw people on her sidewalk stretching yellow tape in front of her house. The tape warned: "POLICE LINE—DO NOT CROSS."

"People started yelling at me to get my shoes on and come outside," Elizabeth recalled. "When I stepped out, all I saw was a big hole in front of my house. It went down all the way to the foundation. I yelled 'Oh my God!' and freaked out."

A sinkhole, 16 feet deep and 10 feet wide, had opened in front of her house. It was like a yawning mouth big enough to swallow a car. The sinkhole was one of three that undermined houses on her block during the rain storm, forcing the evacuation of nine families, according to town officials.

Sink holes are an example of the flooding damage that runoff causes to homes, businesses, and roads across the nation.

"You can have runoff that is either under-controlled, or not controlled—and then during large rain events, flooding and related problems not only damage property, but can be a threat to life and health," said Timothy Bruno, a watershed manager for the Pennsylvania Department of Environmental Protection.

Palmyra, Pennsylvania, is particularly vulnerable to sink holes caused by flooding, according to borough officials. The reason is that the town of about 7,000 was built on a formation of limestone that runs through parts of central Pennsylvania and Maryland and into the Shenandoah Valley in Virginia.

Acidity in water slowly dissolves limestone in these so-called "karst" formations, forming underground caverns. These caverns often fill with dirt. Then when rainstorms hit, water flushes out these soft plugs, creating sinkholes.

Palmyra Borough Manager Roger Powl said that although this geological formation contributed to the destruction on October 11, the damage could likely have been avoided or minimized if the town had a stormwater control system under its streets. Such a system would have collected and piped away runoff so it would not have caused as much flooding, Powl said.



Tom Peitony/CBF Staff

*Jonathan and Elizabeth Stoltzfus examine damage to their home caused by flooding.*

In the past, the community was reluctant to invest in runoff control infrastructure. But starting in the spring of 2014, Powl said, Palmyra is changing course and will start building a stormwater runoff system that not only collects runoff but filters it to reduce pollution in streams that feed the Susquehanna River and Chesapeake Bay.

After the evacuation from their damaged home, the Stoltzfus family was sheltered by the American Red Cross. Then Elizabeth's mother took the children into her home outside of town. Three of the kids tripled up in their grandmother's spare bedroom, while the others slept in the basement and another room.

Meanwhile, Elizabeth and her husband, Jonathan, shivered for several weeks as they slept in a poorly heated camper in the driveway.

Jonathan Stoltzfus said the displacement suffered by him and his temporarily homeless neighbors is a vivid illustration of why communities should invest in runoff control systems. Nobody likes to pay fees for stormwater control systems, he said. But being flooded out is far more taxing on people's wallets and psyches.

"It's definitely important to take care of stormwater," said Jonathan Stoltzfus, a truck driver. "I mean, take a look at what we're going through. There are a lot of people out of their homes here. This is something that should have been addressed years ago. Now it's finally time to get serious and really deal with the problem of runoff."

## Flooding

Flooding caused by runoff can hurt the economy.<sup>73</sup> Across the U.S., flooding causes more than \$3 billion a year in property damage according to a 2008 report.<sup>74</sup> About a quarter of this damage (or \$750 million) comes not from hurricanes or rising rivers—but from uncontrolled suburban and urban rainwater runoff.<sup>75</sup> In the Chesapeake Bay region, flooding in the Susquehanna River basin causes an estimated \$150 million in damage each year, according to a 2013 report.<sup>76</sup> The burden is felt by people in the form of flooded basements and garages, ruined rugs and furniture, mold that triggers allergic reactions, and stress.<sup>77</sup> “Repeatedly flooded areas become undesirable places to live or work,” a report from the Federal Emergency Management Agency states. “Property values decline, and the community’s tax base is diminished.”<sup>78</sup>

### **\$750 MILLION**

The amount of property damage every year from flooding caused by runoff.



**Jeff Corbin**

Senior Advisor to the EPA Administrator for the Chesapeake Bay

*“A lot of what’s driving the stormwater discussion is not only the pollution, but also the physical damage it is causing. When we don’t properly manage runoff on a piece of property, it finds a way to go somewhere—and so it goes into basements and garages, and causes real damage. That’s what people are talking about.”*

Jeff Corbin, Senior Advisor to the EPA Administrator for the Chesapeake Bay, said it is this economic dimension of the runoff problem that is receiving a growing amount of attention from state and local government officials.<sup>79</sup> “A lot of what’s driving the stormwater discussion is not only the pollution, but also the physical damage it is causing. When we don’t properly manage runoff on a piece of property, it finds a way to go somewhere—and so it goes into basements and garages, and causes real damage. That’s what people are talking about.”

## CONTROLLING RUNOFF: THE WIN-WIN OF HOW AND WHY

There are several proven strategies to absorb runoff and reduce the risk of routine flooding and damage from polluted runoff.<sup>81</sup> They include planting trees<sup>82</sup> to replace the natural filters removed during development; and installing modified ponds to catch and filter runoff, roadside ditches (called “swales”) with plants to absorb pollutants, and barrels to collect rain from roof downspouts. Developers can construct parking lots of porous pavement. And they can build specially engineered roadside vegetated areas (called “rain gardens”), often in ditches atop perforated drainage pipes and layers of sand and stones. Communities can create more open, green spaces to allow water to soak into the soil. And designers can cover roofs with plants that drink up rain.<sup>83</sup>

### Green Roofs

Apartments with green roofs reduce pollution, lower heating and cooling costs, and are so attractive they command rents 16 percent higher on average than apartments without them.<sup>84</sup> Other runoff control projects that add green to developed landscapes boost residential real estate values by two to five percent, and can lift office rental rates by seven percent.<sup>85</sup>

### Rain Gardens

Rain gardens filter up to 93 percent of the oil in urban and suburban runoff, vastly reducing pollution to local streams.<sup>86</sup> These gardens also filter up to 90 percent of the toxic metals, 70 percent of the sediment, 30 percent of the phosphorous, and at least 25 percent of the nitrogen pollution.<sup>87</sup> (Some gardens are capable of removing more.<sup>88</sup>)

**FIGURE 5  
SOME EXAMPLES OF STORMWATER CONTROL PROJECTS**



Projects like these reduce the cost of treating drinking water by preventing pollution in runoff from getting into groundwater and contaminating wells.<sup>89</sup> In some communities, controlling the flow of water during storms can also help prevent risks to human health by reducing sewage overflows onto beaches and into streams where children play.<sup>90</sup>



**Daniel Nees**

Senior Research Associate at the University of Maryland Environmental Finance Center

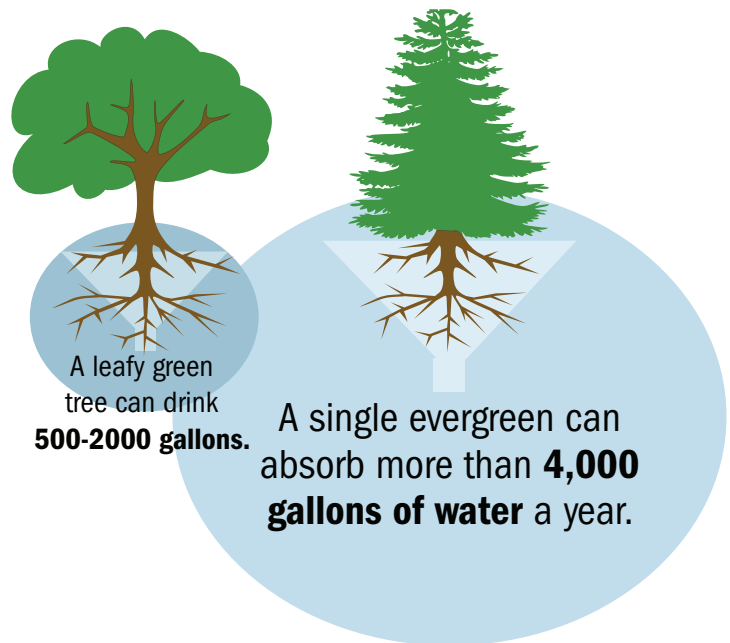
*"The big picture is that controlling runoff makes a community we want to live in."*

### Trees

A single evergreen tree can guzzle more than 4,000 gallons of water a year,<sup>91</sup> and a leafy tree can drink 500 to 2000 gallons.<sup>92</sup> The planting of trees and gardens cools urban areas, improves the appearance of neighborhoods, absorbs carbon dioxide, and provides habitat for wildlife.<sup>93</sup> Creating more open spaces, which absorb runoff, also expands recreational opportunities for local residents who want to walk, jog, and play outside.<sup>94</sup>

"The big picture is that controlling runoff makes a community we want to live in," said Dan Nees, Senior Research Associate at the University of Maryland Environmental Finance Center.<sup>95</sup> "It's greener, healthier, more aesthetically pleasing, and property values go up."

**FIGURE 6  
WATER GUZZLING TREES**



Sources: Natural Resources Defense Council and Vincent Cotrone of Penn State University College of Agricultural Sciences



**Robert Summers**

Maryland's Secretary of the Environment

*"This kind of investment in our stormwater infrastructure creates jobs and creates opportunities for new businesses."*

### Jobs

Investing in local projects to improve local water quality has the potential to boost the local economy because it means hiring local construction workers and engineers. A study by Nees and colleagues at the University of Maryland Environmental Finance Center concluded that runoff pollution control projects bring a return to local economies of up to 1.7 times the investment.<sup>96</sup> Each \$100 million invested in Lynchburg, Virginia, for example, produces \$174 million for the local economy and pays the salaries of 1,440 local workers.<sup>97</sup> In Anne Arundel County, Maryland, the same investment means \$115 million for the local economy and supports 780 local jobs.<sup>98</sup>

"This kind of investment in our stormwater infrastructure creates jobs and creates opportunities for new businesses," said Dr. Robert Summers, Maryland's Secretary of the Environment.<sup>99</sup> "We have some very innovative water-quality control businesses here that are growing and that will build the economy. So this is really is an investment in our future."



## BUILDING GREEN INTO AN URBAN LANDSCAPE

In one of the poorest neighborhoods of Baltimore, city workers demolished 18 abandoned row houses. The rubble was replaced with a park that is improving local residents' quality of life, attracting economic development, and serving as a clean water factory.

The creators of the New Broadway East Community Park used porous pavement for the sidewalks and parking lot.

The popcorn-like material is hard like concrete, but drinks water like a sponge. The absorbent surface—as well as the parks' new trees and grass—prevents rain from flushing oil, antifreeze, and other pollutants from the city streets directly into the Inner Harbor and the Chesapeake Bay.

Next to the park, economic hope is growing. Developers Struever Brothers, Eccles & Rouse Inc., utilizing state historic preservation tax credits, renovated and re-opened a Victorian gothic brewery that had been vacant for decades. They transformed the American Brewery at 1701 North Gay Street into stunningly beautiful offices. A nonprofit organization called Humanim occupies that space, employing and providing job-training services to people from the neighborhood.

Beth Strommen, Director of Baltimore's Office of Sustainability, said Mayor Stephanie Rawlings Blake's administration has budgeted about \$10 million a year to try to create projects all over the city like the New Broadway East Community Park.

The idea is to attract more development by strategically removing blighted buildings and creating green spaces in areas that are now blanketed in blacktop, Strommen said. The city has an estimated 16,000 vacant and boarded-up buildings—blight can scare away investment.

"The mayor is planning to take down another 400 houses a year in the next 10 years," Strommen said, during a visit to the new park. "We see an opportunity here to put back some green space that multi-functions as you see here. It's a park, and it also treats stormwater runoff. So we see an advantage to greening communities, enhancing their economic redevelopment potential, and cleaning up the Bay."

Most of the properties cleared through the city's "Vacants to Values" program will be resold for redevelopment, Strommen said. Others will be left green temporarily until a buyer can be found, and some will likely remain green permanently.



Tom Peltony/CBF Staff

*Guy Hager, a senior director of the Parks & People Foundation, sits in a Baltimore park beside a walkway made of porous pavement.*

The city and partner organizations are also planting thousands of trees and many neighborhood gardens. "This not only improves the environmental conditions, but also improves the quality of life for people," said Jeff Carroll, a program director at Humanim.

Humanim has volunteered to clean and maintain the New Broadway East Community Park. The organization is hiring local people to disassemble abandoned buildings. Instead of demolishing building materials during the process, Humanim's employees carefully save the bricks, marble steps, iron work, fixtures and beams so they can be re-sold and re-used.

The non-profit Parks & People Foundation led the effort to create the New Broadway East Community Park. The organization now intends to help the city with its economic development by making more parks that double as water pollution filters, according to Guy Hager, a senior director at the foundation.

In a city with so much pavement, well-maintained parks not only cool temperatures, they also heat up real-estate values.

"What we have found is that as we begin working with communities to create new green space, investment follows that new green space," Hager said. "Money follows green."

It's an example of clean water and the economy being two sides of the same coin.

## WHAT STATE AND LOCAL GOVERNMENTS ARE DOING TO REDUCE RUNOFF POLLUTION



Jeff Rogge/CBF Staff

### Stronger State Permits

In 1987, Congress amended the federal Clean Water Act with a new section that specifies who is responsible for managing urban and suburban runoff.<sup>100</sup> The amendment requires states to issue water pollution control permits to populous counties and cities, with EPA oversight of the process.<sup>101</sup>

However, this process has been slow. Many of these runoff control permits are both outdated (meaning older than their intended five-year term of coverage)<sup>102</sup> and weak because they currently lack measurable, enforceable pollution limits and other means for assuring accountability.<sup>103</sup> As of December 20, 2013, 10 of 11 of Virginia's largest municipalities have runoff control permits that are outdated and weak. The same is true for nine of 10 of Maryland's largest jurisdictions.<sup>104</sup> Two of these counties, Charles and Frederick, have permits more than a decade old.<sup>105</sup> (Pennsylvania municipalities in the Bay watershed are too small to have the same kind of permit.)

Thomas Schueler, Director of the Chesapeake Stormwater Network, said the fact that runoff-

control permits are outdated is a significant problem. It means they are not reducing as much pollution as they should be. "Those permits are an instrumental element of our ability to protect our local streams and restore the Chesapeake Bay," said Schueler, an expert on runoff pollution.<sup>106</sup> "I have been beyond frustrated the last few years at the glacial pace that they have been proceeding. It is urgent to update these permits."

Fred Cunningham, Director of the Office of Water Permits at the Virginia Department of Environmental Quality, said his agency plans to reissue stormwater runoff pollution control permits with more specific stormwater requirements in 2014.<sup>107</sup> He said the new permits will have measurable goals for reducing pollution that are not included in the current permits.<sup>108</sup> "That's a big step forward for these permittees, having specific requirements to measure progress in addressing stormwater pollution," Cunningham said.<sup>109</sup>

Maryland's environmental agency pledged to issue final, updated runoff-control permits by January 2014 for Baltimore City, Baltimore County, Prince George's County, and Anne Arundel County, with five others to be issued later in the year.<sup>110</sup> However, a November 20, 2013, court ruling<sup>111</sup> could potentially change the schedule. The ruling concerned Montgomery County's 2010 state runoff permit, which was challenged because it lacks specific pollution limits and has other defects. Maryland's proposed permits for other



**Thomas Schueler,**  
Director of the Chesapeake  
Stormwater Network

*"I have been beyond frustrated the last few years at the glacial pace that they [permits] have been proceeding. It is urgent to update these permits."*

large jurisdictions also lack some of these same requirements. Lawsuits have often slowed runoff permits,<sup>112</sup> and the state has repeatedly pushed back its own deadlines.

Many smaller municipalities in Pennsylvania and Virginia, and some in Maryland, are covered by a different kind of runoff permit.<sup>113</sup> These “general permits” are less specific in their requirements for controlling water pollution, but still require some planning and action to manage runoff. Pennsylvania’s and Virginia’s general permits are up to date, but Maryland’s is not.

Beyond state permits, many rural areas and small towns also have their own local laws that deal with runoff in some fashion. Zoning ordinances, subdivision ordinances, and local stormwater laws may address how much land can be paved and how runoff must be treated. But these local ordinances vary in strength and effectiveness.

### **Local Polluted Runoff Utility Fees**

Across the country, many counties and cities lack stormwater runoff control systems, and the ones that do exist are often crumbling and inadequate.<sup>114</sup> To build and improve these systems, local governments—starting almost four decades ago—have been approving local runoff control fees. The first of these fees appeared in Boulder, Colorado, in 1974.<sup>115</sup> Chesapeake, Virginia, created a stormwater utility fee in 1992, followed by nearby Virginia Beach in 1993.<sup>116</sup> Today, more than 1,400 local governments—including at least 17 in Virginia, nine in Maryland, and six in Pennsylvania—collect fees from their residents to build and maintain ponds, ditches, rain gardens, and other projects to catch and filter polluted runoff.<sup>117</sup>

#### *Maryland*

In 2012, the Maryland General Assembly passed a law requiring these runoff pollution control fees in Baltimore and the state’s nine largest counties.<sup>118</sup> The jurisdictions faced a deadline of July 1, 2013, to create fees of whatever amount local officials judged adequate to meet pollution control obligations in their state permits. Most of the local governments met the deadline—but two counties resisted in different ways. Officials in Carroll County refused to impose any fee, arguing the fees are an absurd and unnecessary “rain tax.”<sup>119</sup> The term “rain tax” is a catchy but factually incorrect slogan used by opponents of Maryland’s 2012 stormwater control law. It is intended to confuse discussion of a serious and growing problem and derail solutions. In reality, the pollution control fees are on parking lots, driveways, roofs, and other hardened surfaces, not on rain.

The term “rain tax” is a catchy but factually incorrect slogan used by opponents of Maryland’s 2012 stormwater control law. It is intended to confuse discussion of a serious and growing problem and derail solutions. In reality, the pollution control fees are on parking lots, driveways, roofs, and other hardened surfaces, not on rain.

Carroll County officials said they would use its regular budget to fund the county’s stormwater control program as best they could without the fees. In response, the Maryland Attorney General’s Office informed Carroll County on October 25, 2013, that it is violation of the law and facing penalties of up to \$10,000 per day.<sup>120</sup> In Frederick County, local officials launched a symbolic protest by creating a “penny tax”—a fee of one cent per property per year—which would generate only \$487 in annual revenue.<sup>121</sup> The Maryland Department of the Environment warned the county it is facing fines of up to \$32,500 per day.<sup>122</sup> Governor Martin O’Malley wrote to the leaders of Baltimore and the seven counties



**Dr. Donald Boesch,**  
President of the University of  
Maryland Center for  
Environmental Science

*“Of all the sources of Bay pollution, runoff from developed land is the one that’s going up...so we have to do something to turn that around.”*

that established meaningful stormwater fees and offered new state grants to help reduce the local cost of building some runoff-control systems.<sup>123</sup>

Most of the jurisdictions covered by the 2012 law are moving ahead with building pollution-control projects. In Montgomery County, for example, contractors are hiring an estimated 3,300 construction workers and engineers to restore eroded streams, plant trees, and install roadside rain gardens.<sup>124</sup> However, a number of lawmakers are threatening to try to repeal or delay the full implementation of the law during the 2014 General Assembly session.<sup>125</sup> CBF and other advocates of clean water are pushing to keep the law in place, arguing that investments in pollution-control projects support local jobs, clean streams, and improve the region’s quality of life.

Dr. Donald Boesch, President of the University of Maryland Center for Environmental Science, said that repealing the 2012 law would be a step backward for the Bay restoration effort. “Of all the sources of Bay pollution, runoff from developed land is the one that’s going up,” Dr. Boesch said.<sup>126</sup> “It’s going in the wrong direction. So we have to do something to turn that around. Just like we have to pay for treatment of our other wastes, we have to pay for treatment of the wastes in runoff.”

#### *Virginia*

In 2004, the Virginia General Assembly passed a law authorizing the development of stronger stormwater regulations for use statewide. The new rules would reduce the amount of phosphorus and other pollutants flowing from new development projects into streams and the Chesapeake Bay. Lawmakers repeatedly postponed the commencement of the program—in 2006, in 2009, and again in 2010. In 2011, building on years of work by stakeholders from the development community, local governments, environmental groups, and state agencies, a state board approved new, science-based regulations and authorized them to go into effect on July 1, 2014. As that date approaches, however, many localities and others are protesting the new rules and their responsibilities for controlling runoff pollution. In response, lawmakers in January 2014 filed numerous bills seeking to delay or weaken the rules or to take responsibility away from local governments. The Chesapeake Bay Foundation and other conservation groups are urging the General Assembly to hold firm to the July 1, 2014, deadline and resist any more delays or changes. Timely implementation of the new stormwater rules will accelerate water-quality improvements in the Bay and help Virginia meet the pollution-reduction goals in the Chesapeake Clean Water Blueprint.

#### *Pennsylvania*

Pennsylvania faces some unique challenges in controlling runoff pollution.<sup>127</sup> “Pennsylvania has made some incremental improvements, but it probably has further to go compared to the other states,” said Thomas Schueler, Director of the Chesapeake Stormwater Network.<sup>128</sup>

Among the issues faced by the Commonwealth is a lack of dedicated funding. In 1978, Pennsylvania passed a watershed planning law, called the Storm Water Management Act, with provisions to control runoff pollution.<sup>129</sup> But then the state eliminated all funding for these projects in 2008. Pennsylvania also has other programs that help pay for runoff pollution control projects, but the zeroing out of the budget for the Storm Water Management Act meant a significant cut in the overall amount of money the state invests in the issue.

## WASHINGTON, D.C.: SCHOOLING THE REGION ON INNOVATIVE WAYS TO CONTROL RUNOFF

At one time, the sea of blacktop in front of Brent Elementary School made the schoolyard look like a prison yard.

Today the public school in Washington, D.C., looks much different. Workers ripped out 2,500-square feet of pavement and replaced it with gardens and trees that absorb runoff pollution. In this space is an outdoor classroom, benches, and a “living teepee” in which flowering vines twist around a pyramid-shaped trellis. Children play a xylophone built into the back of an alligator sculpture.

The goal of the change in landscape was to reduce pollution into the Potomac River and Chesapeake Bay, while also inspiring children, according to Jacqueline Emanuel, a parent at the school who helped to coordinate the project.

“When you plant a garden, you send a signal that people care,” Emanuel said. “This project is also about eliminating impervious surfaces, and making sure that the runoff—with trash, pet waste, oil, and all the other pollutants—is captured and filtered right here.”

The District of Columbia boasts perhaps the most progressive program in the Chesapeake Bay region to reduce runoff pollution.

“I don’t think you can give D.C. enough awards for what they’ve done,” said Jeff Corbin, Senior Advisor to the EPA Administrator for the Chesapeake Bay. “You look in every direction and you see green roofs and rain gardens.”

The city is not only greening schoolyards and encouraging dog owners to pick up after their pets. Through a program called “RiverSmart Homes,” the city offers homeowners up to \$1,200 to take steps to control runoff, such as installing rain barrels, planting trees, replacing blacktop driveways with porous materials, and shifting from lawns to landscaping with native plants.

And the District has adopted a pilot program, recently approved by EPA, to test whether vastly multiplying these practices can help it avoid some of the costs of using a more traditional (and expensive) hard construction-based approach to controlling runoff, including pipes. The city is employing one of these old-school strategies by building a massive underground tunnel to prevent overflows of stormwater mixed with sewage into the Anacostia River.

Tom Peltony/CBF Staff



An outdoor classroom and play area replaced what had been blacktop in front of Brent Elementary School.

One of the many school greening projects that have flowered is at Brent Elementary School in the Capitol Hill neighborhood at 301 North Carolina Avenue, SE. Removing much of the blacktop outside the school and planting trees cooled air temperatures by an average of nine degrees Fahrenheit, according to school officials.

“Before we changed the surface of the playground, it got up to 120 degrees on that blacktop,” Emanuel recalled. “So the shade trees have helped immensely.”

The school’s rain garden holds and filters 720 gallons of runoff at a time. The roots of the additional trees that were planted absorb an estimated 1,600 gallons of water per year.

In place of one corner of the formerly paved schoolyard, a crescent of benches, shaded by willow trees, is now used as an outdoor amphitheater.

“It’s not just about having a better school,” Emanuel said. “It’s about having a higher functioning urban environment.”

Tom Peltony/CBF Staff



Parent Jacqueline Emanuel helped coordinate efforts to reduce runoff pollution and green the exterior of her local public school.



**Timothy Bruno**

Watershed Manager for the Pennsylvania Department of Environmental Protection

*“In Pennsylvania, when you are dealing with, in some cases, 100 municipalities in one county, each one of them has its own set of elected representatives and officials, as well as its own tax base...And so this makes large scale stormwater coordination more of a challenge.”*

In July 2013, Pennsylvania Governor Tom Corbett signed a law<sup>130</sup> that allows—but does not require—communities to create runoff pollution control fees. Philadelphia and at least five smaller communities,<sup>131</sup> a majority outside the Chesapeake Bay’s drainage area, already have the fees. More communities in the watershed are now actively considering creating local authorities to collect such fees.

Another problem is that Pennsylvania has multiple local ordinances dealing in some way with managing runoff, responding to several different state laws—and often not promoting the most up-to-date techniques. Finally, Pennsylvania has a more fragmented municipal system than other states. The Commonwealth has not only counties and cities (like Maryland and Virginia) but also 1,547 independent townships and 958 boroughs.

“In Pennsylvania, when you are dealing with, in some cases, 100 municipalities in one county, each one of them has its own set of elected representatives and officials, as well as its own tax base,” said Timothy Bruno, a Regional Watershed Manager at the Pennsylvania Department of Environmental Protection.<sup>132</sup> “And so this makes large scale stormwater coordination more of a challenge.”

On the positive side, Lancaster city has launched an innovative plan to reduce runoff. The city has installed alleys and basketball courts with permeable pavement, and is encouraging property owners to install rain collection barrels and build green roofs.<sup>133</sup> In Harrisburg, CBF and partners are leading an initiative that organizes tree plantings and other efforts to reduce pollution.<sup>134</sup> CBF is also working to provide technical and financial assistance to York County to help it develop a county-wide blueprint for cleaning up local streams by reducing urban and suburban runoff.<sup>135</sup>

To overcome the challenge of fragmented government in Pennsylvania, the University of Maryland Environmental Finance Center recommends more regional teamwork by Pennsylvania communities.<sup>136</sup> “Municipalities across Pennsylvania have begun to realize that collaboration is necessary in order to...manage stormwater,” according to a report by the center.<sup>137</sup> “Working collaboratively will create efficiencies that translate to reduced costs.”

### **Finding More Cost-Effective Ways to Control Runoff**

The cost of building runoff-control projects can be substantial. But it is often less than initially projected. For example, Calvert County, Maryland, estimated that it faced a \$1.2 billion cost over 12 years to meet EPA pollution limits for local waterways, with the vast majority of the expenses for controlling runoff.<sup>138</sup> The University of Maryland Environmental Finance Center, however, conducted an analysis that concluded the county’s costs estimates “appear to be dramatically over-estimated.”<sup>139</sup> The county could use more efficient methods and reduce water pollution the same amount for about \$3.8 million per year. Totalling approximately \$46 million over 12 years, the recalculated cost is 96 percent less than the initial projection.<sup>140</sup> “The county believes that these estimates are a better approximation of the costs,” Dr. David C. Brownlee, Principal Planner for Calvert County, said of the University of Maryland analysis.<sup>141</sup>

The University of Maryland analysis of Calvert County suggests they could save money in part by using a more flexible, performance-based financing system that targets investments in projects that result in the greatest environmental benefit.<sup>142</sup> In particular, the county would get a greater return on its investment if it created incentives for private business owners to take actions like installing rain barrels and planting trees on their

properties, instead of the county building expensive, old-fashioned stormwater culverts and ponds.<sup>143</sup> And, the county could also solve its problems more efficiently if it offset suburban runoff pollution by investing in runoff control projects on local farms,<sup>144</sup> such as planting strips of natural vegetation along streams to filter out fertilizer and sediment.

In another example of declining cost estimates, Frederick County, Maryland, reduced its projected costs for controlling runoff pollution by 65 percent. The lower costs come in part from a plan that relies more on using natural vegetation as filters rather than structural solutions (such as pipes and culverts).<sup>145</sup>

Local officials across the region are also making runoff-control projects more affordable by using the efficiencies of the private sector. Prince George’s County, Maryland, for example, is looking to save as much as 40 percent on their runoff-control costs by developing a public-private partnership (a company with board members appointed by county officials and private investors) and asking this new private entity to be innovative with its financing, construction, and maintenance responsibilities.<sup>146</sup> Some Virginia cities are trying to encourage more private investment in runoff pollution control systems through corporate sponsorship programs that are like “adopt-a-highway” campaigns to reduce litter.<sup>147</sup> These programs, underway in Hampton and Lynchburg, allow companies to raise roadside signs to promote their businesses if they pay for runoff control ditches, ponds, and gardens.<sup>148</sup>



Diana Muller/South River Federation

*The Chesapeake Bay region states need to invest in more effective runoff pollution control systems.*

## CONCLUSIONS

Restoring a national treasure like the Chesapeake Bay and its thousands of miles of rivers and streams is a large and important effort. It requires governments, businesses, and individuals—each of us—to do our part. We need to cooperate and reduce pollution from all sectors—agriculture, wastewater treatment plants, and air. Certainly, controlling urban and suburban polluted runoff should be a top priority.

This final sector—urban and suburban polluted runoff—is the next critical nut to crack in Bay restoration. While reductions in other sectors are being achieved (with more reductions still needed), runoff pollution is still a growing threat to the health of the Bay and our rivers and streams. It also threatens our quality of life, flooding homes and damaging roads and buildings. And runoff pollution can contaminate our drinking water, sicken swimmers, and cloud what should be the clear waters of our streams and the nation’s largest estuary.

Fortunately, local governments can control runoff pollution with cost-effective and straight-forward practices. These projects not only clean up local waterways, but also contribute to the local economy.

The Chesapeake Bay Foundation advocates the following actions to reduce runoff pollution:

### Virginia

#### 1. Approve Funding for Pollution-Control Projects

The Virginia General Assembly should support the work of local governments to control polluted runoff. Specifically, state legislators can help counties and cities pay for pollution-control projects that are required by their state runoff-control permits (known legally as Municipal Separate Storm Sewer System or “MS4” permits). Virginia took an important first step in this direction in 2013 by establishing a Stormwater Local Assistance Fund and appropriating \$35 million for matching grants to localities with shovel-ready projects to reduce runoff pollution.

In the 2014 legislative session, the General Assembly should make appropriations to this fund to ensure an additional \$50 million is available for grants during the year that ends June 30, 2015. Legislators should prioritize grant awards that feature cost-efficient and low-impact practices. The projects should be structured, where possible, to attract supplemental private investment. Aid should also be granted first to localities with effective programs to meet requirements for local matching funds, such as stormwater utility fees, property tax enhancements, or similar measures. Virginia’s successful program assisting localities in the cost of upgrades to its wastewater treatment plants should be a model for funding its runoff-pollution problems.

#### 2. Issue Stronger Municipal Permits

By July 1, 2014, Virginia should issue updated, final, and fully accountable runoff pollution-control permits (Phase 1 MS4 permits) for the state’s largest municipalities that meet the goals of the Chesapeake Clean Water Blueprint.

#### 3. Implement Regulations Quickly to Reduce Runoff Pollution

Lawmakers must support, and not delay, the scheduled July 1, 2014, implementation date for Virginia’s new runoff-management rules. The General Assembly first



authorized updated runoff rules in 2004, and a diverse group of stakeholders helped to craft them under a multi-year consensus-based process ending in 2011. The new rules were slated to go into effect in 2013, but all localities received an extra year—until July 2014—to help them prepare. Legislators must resist any call for further delay.

#### **4. Finalize Blueprint-Compliant Trading Rules**

Virginia should ensure that an expanded nitrogen and phosphorus pollution-trading program provides for meaningful public engagement as well as accountability and transparency with strong oversight. The program must also be Blueprint-compliant by achieving reductions in pollution necessary to restore local water quality and the Chesapeake Bay.

### **Maryland**

#### **1. Defend Pollution-Control Law**

Some critics of Maryland's landmark 2012 runoff pollution-control law are threatening bills that would delay, weaken, or overturn the law's requirement for the 10 most urbanized localities to generate local fees to pay for local pollution-control projects. Legislators should resist any delay or weakening. They should keep the fee structure in place for the state's 10 largest municipalities to help ensure Maryland meets its commitments to the Chesapeake Clean Water Blueprint. Local streams will not get cleaner without financial support for these local efforts.

#### **2. Approve Funding for Pollution-Control Projects**

Legislators should approve a state budget for the year beginning July 1, 2014, that includes funding to support the installation and maintenance of runoff pollution best management practices at the state and local level. During the 2014 Legislative Session in Maryland, the Chesapeake Bay Foundation will be asking that the General Assembly pass a budget that includes full funding of the 2010 Trust Fund (for FY14 it was \$31.5 Million), at least \$36 million additional investment in the Capital Budget, and the \$45 million approved for State Highway Administration for Blueprint Implementation as planned.

#### **3. Issue Stronger Permits**

The Maryland Department of the Environment should issue strong, updated runoff pollution-control permits for the state's nine most populous counties, Baltimore City, and the State Highway Administration. These permits (Phase 1 MS4 permits) must be enforceable; include clear benchmarks and deadlines; and be calibrated to achieve pollution limits for both local waterways and the Chesapeake Bay, in accordance with the Chesapeake Clean Water Blueprint.

#### **4. Encourage More Local Funding**

For smaller communities not covered by Maryland's 2012 law, CBF encourages the voluntary adoption of local fees to pay for the construction of runoff pollution-control projects, which may be required under their general municipal runoff-control permits.

## **Pennsylvania**

### **1. Restore Funding for the State's Runoff-Control Program**

The governor and lawmakers should restore funding and update standards for Pennsylvania's 1978 Storm Water Management Act. This planning program received state funding through 2008, but then it was zeroed out. The law requires counties to prepare watershed-based stormwater management plans to reduce pollution and flooding, and implement the plans through local ordinances. These plans need financial support from the Commonwealth in order for Pennsylvania to meet its commitments under the Chesapeake Clean Water Blueprint.

### **2. Limit Pollution from Lawn Fertilizer**

The General Assembly should pass legislation to limit the type of lawn fertilizer that can be sold and the time of year it can be applied to lawns. This could help reduce the amount of nitrogen and phosphorous pollution in runoff from urban and suburban lawns.

### **3. Protect and Restore Trees along Streams**

Lawmakers should reject a proposed bill (House Bill 1565) that would remove requirements for new developments to protect or restore forests along some of Pennsylvania's most pristine streams. These "forested riparian buffers" are important for controlling flood waters, filtering runoff pollution, and maintaining healthy stream life.

### **4. Encourage Regional Cooperation**

To overcome the fragmented nature of Pennsylvania's local government system, state and local officials should encourage runoff-control efforts based on multi-jurisdictional collaboration. Cooperative runoff-control projects save money and are more effective in reducing pollution. York, Lycoming, and Lancaster Counties already employ programs to share resources, and other municipalities should follow their example.

## **Federal**

### **1. Establish new urban runoff regulations**

Under the federal Clean Water Act, EPA should put into effect a new set of nationwide urban runoff regulations that will serve as a model for how the states and localities must manage and treat such pollution. These long overdue standards were promised as far back as 2010 as part of the settlement of a lawsuit with CBF.

### **2. Create timely runoff permits**

EPA should ensure the timely creation of strong and fully accountable state runoff pollution permits for localities.

These pragmatic recommendations are necessary to meet pollution limits in the Chesapeake Clean Water Blueprint and to restore the health of our waterways.

Over the decades, we have burdened our streams with runoff pollution that flowed from short-sighted management of our land. Now it is time to lift that burden by investing in clean-water projects and our region's environmental and economic long-term future.

When we do, it will not be just we who benefit. Our children, grandchildren, and the iconic wildlife that depend on clean water will as well.

## END NOTES

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## CHESAPEAKE BAY FOUNDATION

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CBF Senior Writer and Investigative Reporter Tom Pelton wrote *Polluted Runoff* after gathering information from state and federal agencies, scientific journal articles and reports, and experts on water pollution. He worked closely with the CBF's Director of Lands Program, Lee Epstein; Pennsylvania Senior Scientist, Ruth Hocker; Maryland Senior Scientist Doug Myers; and others. The report was designed by CBF Graphic Designer, Chelsea Hachey, and Director of Creative Services, Loren Barnett.

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**The Chesapeake Bay's 64,000-square-mile watershed covers parts of six states and is home to more than 17 million people.**