Testimony of Kim Coble
Vice President, Environmental Protection and Restoration, Chesapeake Bay Foundation

Before the
Subcommittee on Water and Wildlife,
Environment and Public Works Committee,
Unites States Senate
May 13, 2014

Solving the Problem of Polluted Transportation Infrastructure Stormwater Runoff

Good afternoon Chairman Cardin, Ranking Member Boozman, and members of the Subcommittee. My name is Kim Coble, Vice President of Environmental Protection and Restoration at the Chesapeake Bay Foundation ("CBF"). On behalf of CBF's Board of Trustees, staff and more than 200,000 members, thank you for inviting me to participate in today's hearing.

For more than 40 years, CBF has been working to restore the Chesapeake Bay and the rivers and streams that feed it. The Chesapeake Bay is the largest estuary in the United States. In fact, our 64,000 square mile watershed is similar in size to England and is home to over 17 million people in six states and the District of Columbia. From Cooperstown, New York to Cape Henry, Virginia, from the Allegheny Mountains to the Atlantic Ocean, millions more travel our roads to work in our region and to visit our beautiful streams, rivers and Bay.

At the outset, I would like to acknowledge the Committee's longstanding work to protect and restore the Chesapeake Bay. Because of your leadership, we are seeing incredible progress in our fight to Save the Bay. However, there is much work to be done – namely we must address the one growing source of pollution to the Bay: polluted stormwater runoff.

As you know, the Chesapeake Bay is a national treasure but has been suffering for decades from excess nitrogen, phosphorus and sediment pollution. Today, the states of Maryland, Virginia, Pennsylvania, Delaware, West Virginia, and New York, the District of Columbia, and the federal government are working together to reduce these pollutants to a healthy level. These reductions are making a difference in improved water quality and better habitat conditions. In turn, these improved conditions will lead to more fish and crabs and to an economic boost to our communities. There is evidence that the Bay's dead zone is shrinking, that the large underwater grass bed known as the Susquehanna Flats is growing, and many tributaries are returning to health.

According to scientists, we unfortunately are seeing one area where pollution is increasing: urban and suburban stormwater.[1] This is largely due to population growth and related development activities such as road-building.[2]

---

[1] National Academy of Sciences, National Research Council, *Urban Stormwater Management in the United States* (2008), vii, available at http://www.epa.gov/npdes/pubs/nrc_stormwaterreport.pdf [hereinafter "Urban Stormwater"]. Indeed, according to that report, "Stormwater runoff from the built environment remains one of the great challenges of modern water pollution control, as this source of contamination is a principal contributor to water quality impairment of waterbodies nationwide." Urban Stormwater at vii.
[2] Chesapeake Bay Program, *Bay Barometer 2012-2013: Health and Restoration in the Chesapeake Bay Watershed* (2013), 3, 4.

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 one quarter of this developed land -- or 1.3 million acres -- is covered in pavement, roofs, and other surfaces that rain cannot penetrate. Increasingly, spread-out development, known as urban sprawl, is the pattern of development found across our region, far exceeding the rate of growth of the human population in the Chesapeake watershed. In Maryland alone, for example, between 1973 and 2010, the population grew by 39 percent while the amount of developed land multiplied by 154%.[3]

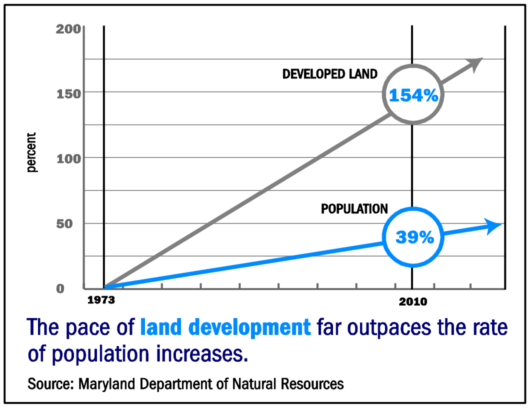


Figure 1: Population Growth vs. Developed Land in Maryland

Runoff from developed land seriously impacts our rivers, streams and the Bay. Currently, stormwater runoff accounts for 17 percent of the nitrogen pollution, 16 percent of the phosphorus pollution, and 25 percent of the sediment pollution in the overall Bay system, and in some states and rivers, those numbers are much higher.[4] In Maryland, nearly one third of the nitrogen, phosphorus and sediment pollution it sends to the Bay comes from stormwater.[5] Across the watershed, runoff harms thousands of miles of rivers and streams. For example, by 2012, there were nearly 2,500 miles of rivers and streams in Pennsylvania, and more than 2,500 miles in Maryland that were legally designated as "impaired" by stormwater under the federal Clean Water Act.[6] In the last nationwide assessment, stormwater runoff was responsible for more than 38,000 miles of impaired rivers and streams, almost a million acres of impaired lakes, and nearly 3,000 miles of impaired bays.[7]

In our watershed, how much of this runoff comes from roads and highways? Based on statewide estimates, federal aid roads and highways in the Chesapeake Bay states create *nearly 21 million pounds/year of nitrogen pollution, more than 2 million pounds annually of phosphorus pollution, and almost 633,000 tons of sediment pollution*.[8] This calculation is based on the latest available figures from the Federal Highway Administration on the number of miles of federal aid highways in each state. We calculated their pollutant loads using average "edge of stream" pollutant loading rates for highways and urban sources derived both from the Maryland State Highway Administration and average values from the Virginia Assessment Scenario Tool, a Virginia-based model. The results can be found in Table 1 (attached).

---

[3] Maryland Department of Natural Resources, "Fisheries Habitat and Ecosystem Program, Land Conservation is Fish Conservation," http://www.dnr.state.md.us/fisheries/fhep .
[4] Chesapeake Bay Program, *Chesapeake Bay Watershed Model Version 5.3.2 2012-2013 Progress Runs* (March, 2014) [hereinafter "Progress Runs"].
[5] U.S. Environmental Protection Agency, *Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment* (December 29, 2010), §4.3, at 4-5, 4-6 [hereinafter "Bay TMDL"].
[6] Chesapeake Bay Foundation, *Polluted Runoff: How Investing in Runoff Pollution Control Systems Improves the Chesapeake Bay Region's Ecology, Economy, and Health* (January 2014), 7 [hereinafter "Polluted Runoff"].
[7] Urban Stormwater, 25.
[8] Note that the magnitude of "edge of stream" pollutant runoff is not the same as the magnitude of in-stream and Bay pollution. Attenuation occurs as pollutants enter waterways, and due to nutrient and other pollutant processing in-stream. These numbers do, however, provide a sense of the magnitude of the problem.

This runoff becomes dangerously polluted. In cities, rainwater or snowmelt flows through gardens and lawns and over hardened or "impervious" surfaces like rooftops, driveways, parking lots, and roads and highways. Along the way, it picks up nutrients such as phosphorus and nitrogen from nearby planted areas, as well as toxic metals such as copper and zinc, and pesticides and herbicides. From pavement, it picks up oil and toxic petroleum products (from motor vehicles and the pavement itself), as well as animal feces, and dirt or sediment.[9] These hard surfaces prevent the water and pollutants from filtering slowly into the ground or being taken up by plants. Instead, it flows into rivers and streams. Just one inch of rain on one acre of hardened surface such as a highway produces 27,000 gallons of polluted runoff – as much as a swimming pool.[10]

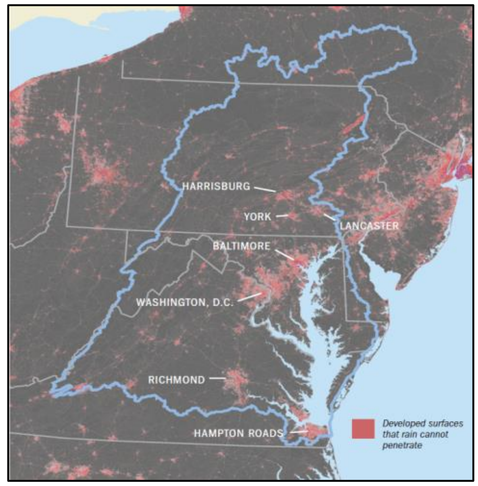
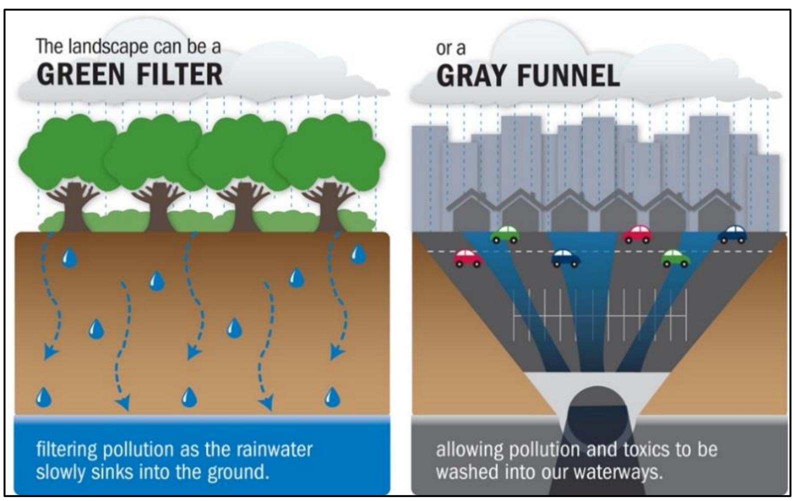


Figure 2: Pavement and other hardened surfaces in the bay watershed

For the Bay and its rivers and streams, the results are devastating. Like us, living creatures in rivers and streams must breathe. But the force and speed of water running off rooftops, parking lots and roads carves deeply into stream-banks and beds, creating incised streams with eroding banks. The sediment then clouds the water, clogs fish gills, and covers stream bottoms, making it difficult or impossible for many species of macro-invertebrates, fish, and amphibians to survive. Phosphorus and nitrogen over-enrich water-bodies, leading to excessive algae blooms. When those algae die off, the aerobic bacteria that decay then draw out huge quantities of oxygen that will not be replaced until fall turnover of the water column. The results are low-oxygen/no-oxygen zones ("hypoxia/anoxia") where fish and other aquatic animals quite literally cannot "breathe." In the Bay during the summer of 2013, 22% of the volume went "dead", seriously reducing habitat for both fish and crabs. In addition, the oxygen depletion killed benthic (bottom) communities of worms and small shellfish that form critical elements in the food webs.



There are direct impacts for humans as well, for example, our drinking water. Stormwater running off highways and other urban surfaces pollutes public drinking water supplies, since many of our rivers and streams are either directly used for this purpose (after treatment) or feed reservoirs. This pollution

[9] U.S. Environmental Protection Agency, *Protecting Water Quality from Urban Runoff* , EPA 841-F-03-003 (2003), http://www.epa.gov/npdes/pubs/nps_urban-facts_final.pdf , last viewed March 28, 2014; Maryland Department of the Environment, Water Management Administration, "Maryland's National Pollutant Discharge Elimination System Municipal Stormwater Monitoring (1997), 10.
[10] Water Education Foundation, "Aquapedia," http://www.aquapedia.com/?s=one+inch+of+rain&x=25&y=23 , last viewed on March 28, 2014.

increases the cost of treatment and filtration. For example, in our area, "[t]he Washington Suburban Sanitary Commission is spending about $28 million to extend drinking water intake pipes farther into the Potomac River to avoid sediment and other runoff pollution near shore."[11] Another example is in our swimming areas. In many areas in our watershed, beaches are closed for at least 48 hours after it rains because bacteria in polluted runoff can cause illness in those who might come into contact with the water.[12] Fishing (especially for shellfish) is often restricted at such times.

Stormwater also causes local flooding and hurts the economy. This is a nationwide problem; in 2008, flooding was estimated to cause $3 billion in property damages. One quarter of this loss – $750 Million – was due to uncontrolled urban and suburban runoff according to the Federal Emergency Management Agency (FEMA).[13]

Today, our highways are a large source of polluted runoff. But they do not have to be. There are modern ways to design stormwater management practices, associated with highways, which significantly reduce polluted runoff. These practices can be used whenever new federal aid highways are constructed, and whenever older facilities are rehabilitated. To be cost-effective, such practices should be included in the design concepts of all roads from the beginning. Using state of the art engineering practices, designs should largely treat polluted runoff where it is captured. Designs must allow it to infiltrate into the ground while plants take up the pollutants. This is very simple. First, a road design must preserve and use the natural landscape as much as possible, or second, it must mimic the way nature itself handles runoff.

There are a wide variety of practices or techniques that can be used for such purposes, from using wetlands to help filter runoff, to creating engineered roadside swales and "bioretention" areas; in more urban settings, the use of special pavement, or planters and "bump-outs" that can capture, reduce the volume of, and treat polluted runoff, has been very successful.[14] In some situations, trees and "rain-gardens" will work well, in others, older practices such as "dry ponds" can be retrofitted to hold water longer, promote infiltration through layers of sand and soil media, and allow plants to take up some of the pollutants. Even structural solutions from the 1980's such as "wet ponds" can be modified to more effectively replicate natural hydrologic conditions. In any case, the main objective should be to transform the landscape as little as possible and maintain or restore the hydrology to that which was present prior to

Figure 3: Examples of road-associated "green" stormwater management

[11] Polluted Runoff, 9.

[12] Urban Stormwater, 26.

[13] James M. Wright, P.E., Federal Emergency Management Agency Training: *Floodplain Management-Principles and Current Practices* (2007-2008), Available online at: http://training.fema.gov/EMIWeb/edu/docs/fmpcp/Chapter%202%20-%20Types%20of%20Floods%20adn%20Floodplains.pdf , 1-4, 2-14.

[14] Federal Emergency Management Agency, SEA Street Publication, FEMA "Lessons Learned Information Sharing" (LLIS.gov) www.llis.dhs.gov/content/2ndavenue-sea-street-seattle-washington; Horner, R., Lim, H.K., Burges, S., *Hydrologic monitoring of the Seattle ultra-urban stormwater management projects* (2002).

highway construction or modification. Doing so could help municipalities through which many of these roads run achieve their pollution reduction obligations.

Investing in these kinds of solutions also has the potential to boost the local economy because it means hiring local construction workers and engineers. A study by the Environmental Finance Center at the University of Maryland concluded that runoff pollution control projects bring a return to local economies of up to 1.7 times the investment.[15] Each $100 million invested in Lynchburg, Virginia, for example, could produce $174 million for the local economy and pay the salaries of 1,440 local workers. In Anne Arundel County, Maryland, the same investment could mean $115 million for the local economy and support 780 local jobs.[16]

Here in the Chesapeake Bay watershed, states are committed to reducing the pollution that is harming the Bay and its rivers and streams. However, polluted runoff is a significant and growing source of water pollution that impacts fish, humans, and property in the Chesapeake Bay watershed. Today, highways produce sizeable pollutant loads to our rivers and streams and can cause local flooding. But we can change this. We can design our highways to use the existing landscape as much as possible to slow and infiltrate polluted runoff. We can put practices in place that mimic nature. We can invest in local workers to install these practices so investments will stay in local economies. The better we engineer our highway system to manage our stormwater, the healthier our rivers, streams, Bay and communities will be.

Once again, thank you for the opportunity to be here today.

[15] University of Maryland Environmental Finance Center, "Stormwater Financing Report to Baltimore, Maryland," December 2013, 29.
[16] Ibid. Note: The difference in the economic benefits in the different local economies is largely due to how many workers would actually live in the jurisdiction where they were hired. For example, more laborers hired to build projects in Lynchburg would be expected to live within Lynchburg city limits whereas fewer laborers hired to build projects in Baltimore would be expected to live within Baltimore city limits.

Appendix

*Table 1: Estimated Polluted Runoff from Federal Aid Highways, Chesapeake Bay Watershed States, 2011 (March 2013)**

Chesapeake Bay Foundation, April 2014

States	Miles**	Acres***	Nitrogen lb/yr****	Phosphorus lb/yr*****	Sediment t/yr******
Delaware	1536	23040	324864	34560	9860
District of Columbia	454	6810	96021	10215	2914
Maryland	7901	118515	1671062	177773	50718
New York	27480	412200	5812020	618300	176401
Pennsylvania	28224	423360	5969376	635040	181177
Virginia	21831	327465	4617257	491198	144639
West Virginia	10452	156780	2210598	235170	67094
TOTAL	**97878**	**1468170**	**20701198**	**2202256**	**632803**

*Source: Derived from Federal Aid Highway Length - 2011, Miles by System March 2013, Table HM15, Office of Highway Policy Information, Highway Statistics Series, FHWA. Polluted runoff estimates based on modeled "Edge of Stream" ("EOS") parameters below. EOS loading rates are higher than "delivered" loads.

**Note that entire state federal aid miles included; Chesapeake Bay watershed miles are less.

***6-lane highway approx. 18.5 ac/mi; 15 ac/mi used here.

****Nitrogen loading rate: 14.1 lb/ac/yr, derived by averaging EOS impervious surface loading rates from MD State Highway Admin rate with VAST (average I.S. rate).

*****Phosphorus loading rate: 1.5 lb/ac/yr, derived by averaging EOS impervious surface loading rates from MD State Highway Admin rate with VAST (average I.S. rate).

******Sediment loading rate: 855.9 lb/ac/yr, derived by averaging EOS impervious surface loading rates from MD State Highway Admin rate with VAST (average I.S. rate).

One mile of federal aid highway, average runoff pollution rates (ChesBay watershed N: 212 lb/yr P: 23 lb/yr TSS: 6.42 tons/yr