Economic Impact Analysis Update to NSVRC and Localities

Developed by the
University of Maryland Environmental Finance Center

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Objective

With support from the National Fish and Wildlife Foundation (NFWF), the Environmental Finance Center (EFC) examines the potential economic impact associated with stormwater best management practices (BMPs) for communities in the Northern Shenandoah Valley. The goal of the project is to provide data and analysis that enables Northern Shenandoah Valley localities to make evidence-based decisions on where and how to invest limited stormwater resources. This project uses economic modeling to glean insight on how and where stormwater investments may generate greater benefits when implemented under a more coordinated, regional approach.

Background

To date, compliance with the Chesapeake Bay TMDL has followed a county and/or State level approach. The presence and role of the Northern Shenandoah Valley Regional Commission (NSVRC or "the Commission") provides potential opportunities for a regional approach to implementation of stormwater management and other BMPs addressing water quality. The NSVRC on behalf of five counties, Clarke, Frederick, Page, Shenandoah and Warren, prepared a report as input to Virginia's Phase II Watershed Implementation Plan (WIP) for the Chesapeake Bay Total Maximum Daily Load (TMDL) requirements. In preparing the report, the Commission detailed the types of BMPs that counties have set out to achieve nutrient reductions. They are, however, an aggregation of each county's independent effort.

Approach

In order to answer the questions of whether a regional model can afford greater efficiencies and benefits, this study brings together information on:

- types, scale and costs of stormwater BMPs identified by each county in the Northern Shenandoah Valley region as its contribution to reducing nutrient loads that help the State meet the Chesapeake Bay TMDL; and
- the economic impact of stormwater spending specific to each stage of a stormwater BMP's implementation.

Using this information, EFC examines how the scale of resources (i.e., labor) required to support the necessary operation and maintenance of stormwater BMPs may identify where:

- BMPs could be at risk of not being adequately addressed; and

- regionalization of these activities may provide sufficient scale to generate efficiency and effectiveness gains.

Urban Stormwater BMPs

As already indicated, EFC begins with identifying the types and scale of stormwater BMP identified by the counties in the NSVRC WIP of 2012, and couple it with information from the Virginia Assessment Scenario Tool (VAST). We build the economic impact analysis on VAST, since it represent the best available cost data for a majority of the jurisdictions in the region and the data that localities rely on when developing their own WIP cost estimates. Where information was not available in VAST, we relied on studies and feedback.

Based on these sources, we identify a wide range of urban stormwater BMPs. However, our analysis specifically examines four key stormwater BMPs: (i) bioretention / rain gardens, (ii) street sweeping, (iii) urban tree planting and/or urban tree canopy, and (iv) wet ponds and wetlands. Table 1 summarizes the BMPs by county detailing the total expenditures (capital and O&M), life expectancy of the BMP, and total acres treated. The table highlights how varied the counties are with regard their levels of resourcing and the geographic area treated by each BMP. Across the counties, projected total expenditure on these BMPs ranges between $13.8 million and $42.8 million to treat anywhere between 1,060 and 3,315 acres. At the same time, the counties are all fairly consistent in each BMP's relative ranking. Among these four BMPS, in each county wetlands and wet ponds represent around 70% of the treated acres and bioretention and raingardens account for 20% of the treated acres. Street sweeping and urban planting account for around 9% and 1% of treated acres, respectively.

For each urban stormwater BMP type, we divided cost into those pertaining to the capital costs and operations and maintenance (O&M) costs. Understanding the split between these two categories is important because they impact a county's budget differently. Capital costs, which include design costs and construction costs, are generally up-front, one-time costs. In contrast, O&M expenditures represent on-going expenditures typically extending into the medium to long term. The relative share of capital O&M expenses varies among the BMPs. For example, capital expenses represent nearly 70% of bioretention's total expenditures. In contrast, capital expenditures represent only 20% of urban tree planting's total costs. For street sweeping and wet ponds, the relative share of capital costs is less disproportionate to O&M expenditures. Notably, the ratio of capital to O&M expenditures for a BMP does not correlate with a BMP's life expectancy. For example, tree planting has a 75-year life expectancy, with O&M costs representing 80% of the project's total costs. Street sweeping, which as the shortest life expectancy (20 year) also has O&M costs that account for nearly 60% of total project costs.

Regardless of the relative significance of O&M expenditures to a BMP's whole of life costs, we maintain that the O&M activity plays a critical role in the long term efficacy and effectiveness of these capital investments. Given its importance, we focus on O&M activity as an avenue for potential efficiencies and benefits of regionalization.

Table 1: Selected Urban Stormwater Investment by County – 2012 to 2025

BMP	Total Expenditures		Life Expectancy (Yrs)	Total Acres Treated
	Capital ($)	O&M ($)		
Shenandoah County				
Bioretention / Rain gardens	$9,771,600	$3,717,800	25	690
Street Sweeping	$1,686,300	$2,401,300	20	280
Urban Tree Planting &/or Canopy	$24,900	$95,000	75	25
Wet Ponds & Wetlands	$12,970,300	$12,098,300	50	2280
Page County				
Bioretention / Rain gardens	$6,318,500	$2,404,000	25	445
Street Sweeping	$954,700	$1,359,500	20	160
Urban Tree Planting &/or Canopy	$16,600	$63,300	75	15
Wet Ponds & Wetlands	$8,239,500	$7,685,500	50	1450
Clark County				
Bioretention / Rain gardens	$3,155,400	$1,200,500	25	220
Street Sweeping	$533,600	$759,800	20	90
Urban Tree Planting &/or Canopy	$15,000	$57,100	75	15
Wet Ponds & Wetlands	$4,176,500	$3,895,700	50	735
Warren County				
Bioretention / Rain gardens	$5,964,700	$2,269,400	25	420
Street Sweeping	$1,093,600	$1,557,300	20	180
Urban Tree Planting &/or Canopy	$15,000	$57,000	75	15
Wet Ponds & Wetlands	$7,987,000	$7,450,000	50	1405
Frederick County				
Bioretention / Rain gardens	$8,175,400	$3,110,500	25	575
Street Sweeping	$2,067,500	$2,944,200	20	340
Urban Tree Planting &/or Canopy	$21,200	$80,900	75	20
Wet Ponds & Wetlands	$13,504,900	$12,597,000	50	2375

Staffing Requirements to Support BMPs

To better estimate the on-going staffing requirements of stormwater BMPs, we use an economic model called IMPLAN. IMPLAN is an input-output model that tracks how a given expenditure ripples through the economy as measured by productivity, labor demand, and spending (by businesses, government and households). IMPLAN expresses these outcomes in terms of:

- Direct effects – the change in the local economy;
- Indirect effects – the business-to-business transactions required to satisfy the direct effect; and,
- Induced effects – the local spending on goods and services by those working to satisfy the direct and indirect effects.

However, relevant to this analysis is IMPLAN's job estimates. The model allows us to better understand how direct O&M expenditures relate to FTE requirements in organizations providing O&M services.

Table 2 presents resourcing requirements for BMPs on a per acre basis based on information from IMPLAN. It highlights how scale matters and how O&M costs relate to FTE requirements. The O&M component to any one of these BMPs requires implementation of anywhere between 500 and 2000 treated acres in order to support a single full time equivalent (FTE). Looking back to Table 1, each county, many of the BMPs do not BMPs do not reach this threshold even at the end of the implementation period (that is, after implementing BMPs for 13 years). For example in each of the counties, both tree planting and street sweeping account for less than 500 treated acres.

Table 2: FTE and O&M Expenditures Per Acres Treated

BMP	Annualized O&M Expenditures	FTE Requirement
Bioretention/raingardens	$216	0.002
Street Sweeping	$431	0.003
Urban Tree Planting; Urban Tree Canopy	$50	0.0005
Wet Ponds and Wetlands	$106	0.002

Table 3 summarizes the O&M staffing requirements for each county by BMP based on their WIP projections. Staffing requirements reflect total FTEs required after full implementation (that is at the end of 2025). The FTE requirements vary significantly across the counties, with the differences mainly reflect the scale of each BMP in terms of total acres treated. Regardless of the varying levels of BMP activity (measured in acres) across the counties, the key takeaway is that the total FTE requirement within each jurisdiction is small. All counties face challenges of having sufficient scale to warrant at least one FTE on a regular basis for many of the BMPs.

With BMP implementation for the localities anticipated to occur at a significantly smaller scale than this, labor requirement is not likely merit establishing dedicated staff. At the same time, the O&M activity is important enough to not be overlooked. Counties will likely address O&M needs on an ad hoc basis, by assigning these activities to the workloads of existing staff.

This ad hoc approach results in costly inefficiencies from a resourcing and effectiveness perspective. Examples of possible cause of the inefficiencies include O&M activities may be at risk of not happening with regular frequency or in a timely manner or responsibilities being assigned to various staff resulting in disjointed knowledge and familiarity with the history of a BMP.

Table 3: FTE Required to Support O&M Activity for Selected BMPs by County

BMP	Shenandoah	Page	Clark	Warren	Frederick	Regional Total
Bioretention / Rain gardens	1.4	0.9	0.4	0.8	1.2	**4.7**
Street Sweeping	0.8	0.5	0.3	0.5	1	**3.1**
Urban Tree Planting &/or Canopy	0.01	0.01	0.01	0.01	0.01	**0.04**
Wet Ponds & Wetlands	4.6	2.9	1.5	2.8	4.8	**16.5**
Total	**6.8**	**4.3**	**2.2**	**4.2**	**6.9**	**24.4**

However under a regional approach, aggregating the O&M responsibilities and the accompanied resources would generate an economy of scale that could lead to dedicated staff providing continuity and consistency in O&M of BMPs. In turn, benefits could arise from:

- greater effectiveness and efficacy through skilled, trained staff familiar with history and performance of BMPs;
- cross fertilization of knowledge through dedicated staff servicing BMPs across the region rather than each county facing the learning curve separately; and
- cost savings in procurement through design and managing a more regular O&M program.

Conclusions

IMPLAN results suggest that a regional approach to stormwater BMP implementation could benefit Northern Shenandoah Valley localities. While this finding seems intuitive, this analysis provides a simple approach to identifying and illustrating which BMPs are viable candidates for regionalization. A regional model offers an approach to strategically pooling resources particularly as it applies to BMP operation and maintenance that can improve the efficiency and effectiveness without necessarily changing each jurisdiction's resource commitments if it were to act independently. In other words, this approach would allow the FTE requirements of the BMPs to be aggregated across the jurisdictions, thereby justifying the need for dedicated personnel while simultaneously not increasing a BMP's FTE cost requirement. As noted, efficiency and efficacy gains are likely to be realized through: (1) greater knowledge share; (2) lower "learning" costs; and (3) more holistic and consistent approach to a given BMP's implementation.

Next Steps in Developing a Regional Model

The above analysis is a starting point in identifying the potential opportunities and benefits associated with a regional approach to addressing local stormwater management priorities and requirements. It suggests a methodology for identifying candidate BMPs where pooling resources and managing activities under a regional model may deliver efficiency and improved outcomes. This analysis, however, is illustrative in that it considers a small subset of urban BMPs.

Fully applying this approach to develop a regional model for BMPs implementation will require additional efforts, including a more detailed assessment of opportunities. This would likely need to include an inventory of existing resources including both capital assets and labor skills held by each jurisdiction that could be used regionally; an evaluation of the logistical and technical feasibility of pooling candidate resources; identification of appropriate cost share arrangements for regionalized activities; and, construction of a transparent system for prioritizing and funding regional activities.