

**Northern Shenandoah Valley County Regional  
Phase II**

**Watershed Implementation Plan**

**For the Counties of Clarke, Frederick, Page, Shenandoah, and Warren**

**Compiled and Submitted by the**

**Northern Shenandoah Valley Regional Commission**

**February 1, 2012**

### **Northern Shenandoah Regional County WIP II Report**

This report was prepared by the Northern Shenandoah Valley Regional Commission (NSVRC) on behalf of the Counties of Clarke, Frederick, Page, Shenandoah, and Warren as input to the forthcoming Virginia Phase II Watershed Implementation Plan (WIP) for the Chesapeake Bay TMDL in response to the Department of Conservation and Recreation's (DCR) invitation to provide input in the WIP II process. The goal of the regional effort is to provide to the DCR documentation of local engagement and serious consideration of BMP strategies that meet the 2025 pollutant reduction goals. This report is to be considered in conjunction with the supplemental material submitted to DCR through VAST and represents goals developed through a collaborative process including locality staff, regional TMDL stakeholders, local TMDL stakeholders, and agencies.

This report is formatted to describe the regional TMDL process, the five deliverables requested by the DCR, and a summary of recommended steps for consideration in future TMDL progress reports.

#### **Regional Stakeholders for the Chesapeake Bay TMDL Phase II Watershed Implementation Plan**

Clarke County, Alison Teetor

Frederick County, Joe Wilder

Frederick County, Ed Strawsnyder

Page County, Charles Newton

Page County, Julian Price

Page County, Linda Campbell

Shenandoah County, Brandon Davis

Shenandoah County, Joyce Fadeley

Warren County, Taryn Logan

Warren County, David Beahm

Winchester City, Kelly Henshaw

Agricultural Extension Office, Bobby Clark

Virginia Department of Conservation and Recreation, James Davis-Martin

Lord Fairfax Soil & Water Conservation District, Jed Rau

In addition, numerous others were instrumental in the data gathering, development of regional strategies, and review including:

Virginia Department of Forestry, Joe Lehen

Virginia Department of Mines, Minerals, and Energy, David Spears and Alan Bishop

Virginia Department of Transportation, Robert (Bill) Jones

Virginia Department of Health, Scott Fincham

Lord Fairfax Soil & Water Conservation District, Board of Directors

Shenandoah Valley Soil & Water Conservation District, Board of Directors

Shenandoah River Keeper, Jeff Kelbe

Friends of the North Fork of the Shenandoah River, Leslie Watson

Federal landholders located within the planning region were invited to participate in the regional stakeholder meetings; however, due to lack of time and staff, no federal partners were included in this regional TMDL exercise. The BMP scenarios were evaluated in the Counties with the federal lands excised. A scenario comprised of a suite of BMPs applied to nonfederal lands only was selected by the region. Given the portion of land use in the planning region which is federal, future scenarios, results, and recommendations may be adjusted significantly if federal lands become included in the BMP

scenarios. The regional 2025 preferred water quality management scenario for the Counties of the Northern Shenandoah Valley Region provides a level of treatment similar to the Virginia Phase I WIP.

Funds for this effort were provided by member jurisdictional contributions and a grant from the DCR 2011 Chesapeake Bay Regulatory Accountability Program.

### **Qualifications and Conditions**

The regional 2025 water quality management scenario represents aggregate information for the Counties of the Northern Shenandoah Valley region. Neither the Shenandoah Valley localities nor the NSVRC are able to make unconditional commitments at this time given a host of factors, including Phase II WIP submittal time constraints, funding limitations, competing demands for finite resources in a poor economy, incomplete or inaccurate land use data, the absence of an approved cost estimation methodology, and approved alternative BMPs, and the absence of an authorized expanded nutrient credit exchange. Therefore, while the information in this report is representative of local government planning efforts, it does not reflect local government commitments and should not be interpreted to constitute local-level actions or future programs adopted by these localities. The planning approach and assumptions applied by NSVRC staff were developed for the purposes of providing the preferred regional management scenario only. Therefore, the utility of the information is limited to the regional scale, and any attempt to interpret or distribute the aggregate information contained herein across individual Northern Shenandoah Valley localities or at any smaller scale likely will result in false conclusions and misrepresentation of local information. In summary, the regional scenario proposed herein is expected to change as new information and data, management tools, and sources of funding are made available to the localities.

The regional scenario generally reflects the BMPs and programs that have proven to be effective in the region. Although not yet approved, alternate BMPs that will be cost effective and support other locality goals are proposed herein. However, the regional scenario is just one possible solution to meeting the Phase I WIP level of effort. Changes in state policies and funding would influence BMP selection. Most importantly, the scenario cannot be implemented by 2025 without additional research to support alternative BMPs and the creation of new funding sources to assist the localities with their implementation.

### **Background**

The U.S. Environmental Protection Agency (EPA) established a Total Maximum Daily Load (TMDL) for the Chesapeake Bay watershed on December 29, 2010. The TMDL identified nitrogen, phosphorus, and sediment reductions that each Bay State needs to achieve in order for the Chesapeake Bay to meet water quality standards. The TMDL included Phase I WIPs developed by States within the Bay watershed. The Commonwealth of Virginia Phase I Watershed Implementation Plans (WIP I) outlined strategies of wastewater sector, urban/stormwater sector, agriculture sector, and on-site sewage sector in order to meet statewide nutrient and sediment reduction goals.

The next step in the TMDL process is for states to develop Phase II WIPs that describe strategies to implement the Phase I WIP. EPA expected Phase II WIPs to more significantly engage local governments, watershed organizations, conservation districts, citizens and other key stakeholders in reducing water pollution. The DCR, acting as primary coordinator for development of the Phase II WIP in Virginia requested that Planning District Commissions throughout the Chesapeake Bay watershed assist with the collection of input from localities for Virginia's Phase II WIP and suggested that the information be submitted regionally. NSVRC assisted localities in the Virginia's Phase II WIP development process.

The Phase II WIP is part of the accountability framework for the Chesapeake Bay TMDL, wherein EPA will track and assess Bay restoration progress and, as necessary, implement specific federal actions if jurisdictions do not meet their commitments. The deadline for submittal of Virginia's Phase II WIP to EPA is March 2012. Virginia asked localities to develop nutrient management strategies to address the level of treatment described in the Phase I WIP and submit local strategies by February 1, 2012 for inclusion in the Phase II WIP.

### **Northern Shenandoah Valley Characteristics**

The North Fork, South Fork, and Main stem of the Shenandoah River flow through the Valley northward to join the Potomac River in Harpers Ferry WV. The Shenandoah River (both North and South Forks) drains most of northwestern Virginia. The South Fork flows northward through Page Valley into Warren County. The North Fork flows from Rockingham County north through Shenandoah County and eventually north east to Warren County. The confluence of the North and South Forks occurs in the Town of Front Royal to form the main stem of the Shenandoah River that flows northward through Clarke County to drain into the Potomac River at Harpers Ferry WV.

Nearly half the land use in the Northern Shenandoah Valley (NSV) is agricultural due to the fertile soils from centuries of alluvial depositions. The land in region is underlain with limestone carbonate or karst which is characterized by seeps, springs, caverns, caves, and disappearing streams. The surrounding mountains contain Wissahickon schist, granite, and other rocks typical of the Valley & Ridge province. Carbonates and alternating fractured bedrock shales comprise the Valley floor.

It is important to note that the federal, state, and local (town) partners' BMPs and other capacity building efforts to improve water quality were not included in this report. Future TMDL programmatic efforts in the region will target quantifying the BMPs from all landowners and apply appropriate levels of credit to each locality.

Federal agencies not included within this TMDL exercise include the following: the U.S.D.A. Forest Service's George Washington National Forest located within the Counties of Frederick, Page, Shenandoah, and Warren; the U.S. Department of Interior's National Park Service's Shenandoah National Park located within the Counties of Page and Warren; the U.S. Department of Interior's Smithsonian Research and Biology Institute facility in Warren County; and the Department of Homeland Security owns facilities located in Frederick, Warren, and Clarke Counties.

Two state agency-owned large land holdings in the planning region include the DCR's Andy Guest State Park and the Department of Forestry's Devil's Backbone. As with the federal partners, insufficient time precluded detailed dialogue between localities and state agencies. Future TMDL programmatic efforts should include more intensive federal, state, and local interaction to coordinate reporting metrics and BMP accounting.

The five counties include 14 towns listed below:

Clarke County: Town of Berryville and Town of Boyce,

Frederick County: Town of Middletown and Town of Stephens City

Page County: Town of Luray, Town of Shenandoah, and Town of Stanley

Shenandoah County: Town of Edinburg, Town of Mount Jackson, Town of New Market, Town of Strasburg, Town of Toms Brook, and Town of Woodstock

Warren County: Town of Front Royal

Communication with the fourteen Towns was not conducted to a detailed degree. Where NSVRC understood programmatic overlaps or projects that might result in credits for a County, these were considered (i.e., tree preservation ordinance in the Town of Front Royal, a Groundwater Well Head Protection Ordinance in the Town of Stanley) but ultimately not addressed within this report due to the lack of clear metrics to capture the BMP and assign credit to a locality. Likewise, tree planting programs along greenways were not included in this first attempt to quantify BMPs in the region.

In a November 9, 2011 letter to local governments, DCR Director Mr. David Johnson identified Virginia's data needs for the Phase II WIP and requested that the following information be submitted by interested Counties and Cities to DCR by February 1, 2012:

1. Evaluate the land use/land cover information.
2. Develop a current BMP inventory.
3. Review the BMP scenarios as identified in the Phase I WIP and develop preferred local scenarios that provide a similar level of treatment.
4. Develop strategies to implement the preferred BMP scenarios.
5. Identify any resources needed to implement the strategies in the current scenario and other future BMPs as they become available

Although there were significant technical concerns that limited the ability to provide DCR with a detailed representation of the five deliverables, the localities of the NSV remain grateful for the opportunity to provide input to the WIP II process. In general, the regional County-wide preferred 2025 scenario was more preferred to the WIP I scenarios. The NSVRC staff and localities noted concerns with the U.S. EPA model 5.3.2 database that was used to calculate loads for the State. In addition, there were concerns with the evaluation and reporting model called Virginia Assessment Scenario Tool (VAST). VAST limits included the tendency to merge data from separate accounts when viewed from the same IP computer address, not accounting of Agricultural Nutrient Management plans in the NSV region, the delayed release and availability of the VAST model, the technological challenges in which data was submitted into VAST, the inability of VAST to easily regionalize data, and the lack of VAST's recognition and ability to reflect changes to land uses and manure exports. It was also noted that the urban BMPs in VAST were limited by not providing a locality with credit for stacking urban BMPs as it does in agricultural BMPs. While a series of urban BMPs means the subsequent BMP in a series is less than 100% efficient, it still provides a level of pollutant reduction which should be considered and accounted for in urban BMP scenarios with stacked BMPs.

### **Deliverable 1 - Land Use**

The land use was not corroborated at a detailed level due to the lack of statewide uniform geographical information systems GIS). The locality land use data was given a cursory overview and stream mileages were calculated as presented below. To calculate the stream mileages with agricultural frontage, two GIS layers (the blue-line GIS layer intersected with the agricultural layer) were overlaid and identified as footage per County, where the layers intersected. The local stakeholders concurred that a valid general assumption for the region is 50% of the streams running through agricultural lands, lies within pastures. This calculation of footage for both sides of stream banks was used to form the degraded riparian pasture available for fencing for livestock exclusion. In two Counties, the WIP I data applied a BMP with the footage of livestock exclusion fencing that exceeded the total stream footage of agricultural lands within a County. The data in the chart below quantifies the stream frontage in agricultural lands and the regional assumption that half of that will be streams in pasturelands.

Septic data was provided for the region by the Department of Health (VDH). The current septic numbers were misrepresented in VAST and where overestimated they were called septic hookups, to make the overage “disappear” in the model world (per DCR advice). The regional total of septics is provided in the chart at the end of this section, as provided by VDH.

The EPA land use model data for agriculture seemed close to the 2007 agricultural Census data and known uses in the Counties. The regional agricultural data review teams provided a preliminary review of the data and were deemed accurate for this level of submission; and will be quantified when more time is provided. There was the concern that orchard land uses were listed under the VAST model as high till without manure along with tree farms and root crops. In one locality, the EPA modeled land use of crop was 10,000 acres; however, half of this is actually in orchards. The aggregation of orchards into cropland does not seem valid as the levels of fertilization and land use practices vary greatly for these two agricultural uses. Likewise the pollutant loading associated with orchard land use is very different than the loads associated with crops. However, the County elected at this time to continue to categorize their orchards under cropland until a more accurate land use category is available.

Other land use concerns include the inconsistent methods for collecting and verifying data from other agencies. The format and availability of data varied by agency. For example, the Department of Mines, Mineral, and Energy (DMME) indicated concern with their pollutant loads exiting from their permitted mining sites. Given more time, NSVRC staff and localities would have compared the DEQ permit outfall measurements from each mining site to the loads attributed in the EPA model. Based on DMME website and agency communications, the EPA land use data for the mining sites was overly estimated in both mining land acreage and attendant pollutant loads.

The localities also noted the impervious to pervious ratio seemed inaccurate for this region. Without more accurate and consistent GIS technology to verify the land uses, the impervious to pervious ratios cannot be quantified. For example, in the region, the category called ‘nonregulated impervious developed’ was 19,378 acres compared to the 66,125 acres of category called ‘nonregulated pervious developed’ acres. That translates to just under a third of the non MS4 lands being impervious, the remainder of the lands were considered pervious. The localities indicated they wanted this ratio verified by detailed statewide land cover data.

It is strongly recommended that a statewide baseline land use dataset be updated and made available that includes high resolution land cover information detection and tracking systems to support local, regional and watershed level land cover information and change detection to help target cost-effective BMP implementation and measure progress in achieving various BMP implementation strategies, as well as other environmental, economic and community planning benefits. Without this land use data, it is difficult to evaluate the specific mischaracterizations of lands or identify the acreages to accurately develop feasible and appropriate BMP scenarios. Additional time and analysis will be required to incorporate local land use corrections to the 2011 current conditions and the preferred Regional scenario. Below is a summary of the land use changes recommended to the model based on available information at this time.

<b>BMP Verification Land Use Validation</b>	
<b>Land Use</b>	<b>Status / Comments:</b>
Septics	Communicated with VDH from Sept - Jan. Have septics, denitrifying AOSS, and pump information per County. Tabulated to be included in report. Regionally, 25,466 septics.

Forests	The acreage of private harvested forests was not available. In addition, detailed forest lands cannot be assessed until a statewide detailed land use database is established.
Nurseries	The type, size, and number of nurseries were not possible to corroborate for this submittal. Future TMDL efforts will need to verify the number and type of nurseries. The pollutant loads associated with nurseries varies depending upon technology (high tunnel, etc.)
Extractive Mines	Communicated with DMME state geologist and permit division. In vernal, DMME expressed concern over three things: 1) possible overestimates of sediment loads associated with their active mine sites (this can be corroborated with a review of DEQ VAPDES permits of outfall data per site); 2) concern that there should be three land use types within the surface mining category with different loads associated with each land use types (disturbed, undisturbed, a AND reclaimed mining sites).
Pasture Stream Lengths for Past-Fence BMP	Under degraded pasture riparian land, the model evaluates potential stream frontage available for livestock exclusion fencing BMP. The regional total of rivers was 11,483,684 ft, of which 6,802,489 ft was in agricultural land. Without detailed land use data available, the agricultural team consensus was that 50% of the ag land was pasture. Therefore, 3,401,245 feet of stream frontage in pasture land is available for the exclusion fencing BMP. (Regional assumption was 70% of that pastureland will implement exclusion fencing or 2,380,872 feet or minus the existing fencing, a total of new fencing would be implemented up to 1,764,067 ft. along streams in pasturelands.)
Crop land	Concern that orchards should be removed from Cropland and placed in a land use separate category.
Unmanaged Grass	With the technology available it was not possible to confirm this land use type. Localities request more detailed land use database available. This comment applies to all ag land uses.

## Deliverable 2 - Verification of BMP's in place from 2006-Present

There was a similar inability by the regional stakeholders and NSVRC staff to verify the BMPs in place from 2006 through the present. The agricultural data review team expressed concern that there was a need to corroborate the agricultural BMPs implemented through U.S.D.A.'s National Resources Conservation Service (NRCS) and Farm Service Agency, Soil and Water Conservation District (SWCD), and the Ag Extension Office. The SWCD and NRCS data was reviewed however, this was cursory until additional time and staff resources are provided to detail the BMPs and ensure there is no double counting when cost shared through multiple agencies. Concerns about agency BMP estimates received by the NSVRC staff have been forwarded to the WIP II coordinator for the Commonwealth and it is understood that DCR, EPA and the NRCS will continue to review BMP data.

The current urban, forestry and agricultural BMPs were preliminarily agreed to but not verified with the level of confidence necessary to ensure proper accounting. Likewise, accounting for recent (2006 to present) nontraditional BMPs have not been fully verified (stem density count). The resources to verify this include funding, time, and staff to review the BMPs and develop an accurate reporting system for the future. Overall, the preferred regional 2025 scenario reflects more closely the current on the ground BMPs for agricultural BMPs (especially for mortality composting and animal waste management systems).

Another concern is the raingarden BMP that is to include the impervious land draining to the BMP. Until the State provides a detailed land cover database, it will not be possible to report accurate drainage estimates.

Other BMPs that were not corroborated and should be in future progress runs were from agencies and towns. NSVRC staff requested BMPs in place from 2006 through present from Virginia's Department of Forestry, Department of Transportation, and Department of Mines, Minerals, and Energy; however, none of these State agencies had the time to respond to our regional requests, and NSVRC staff did not have the time and manpower to follow through with these agencies. Town BMPs such as tree canopy ordinances, urban stream cleanup programs, and street sweeping pounds were noted; however, not credited into the VAST model due to model limits to credit these BMPs. Again the reporting metrics would need to be developed to support consistent reporting of BMPs.

Septic BMPs were challenging to quantify. The VDH provided the number of septic systems in the region, and the quantity of the BMP denitrifying alternative on-site septic systems (AOSS) and an estimate of pumpouts. Detailed pumpage rates were not available; however, the regional septic pumpout was estimated to be 15%. In future TMDL efforts, pumping practices will be quantified.

Below is a summary of the current BMPs that were considered for inclusion in this submittal. In the future, localities request that these BMPs can be further corroborated and revised.

<b>BMP Verification:</b>	<b>Status / Comments:</b>
Septic Connections to Municipal Systems	Not tracked by VDH or Sanitation Authorities. All 14 Towns were contacted to ascertain the estimated # of septic connections to municipal sewer since 2006 through present. Some Towns have this data, but not all. Where available, it was included. Else, this BMP needs further investigation and follow up with each town. (Regional total 25 + CWP findings)
Septic Denitrification Systems	Based on talks with State VDH the MicroFast is the only 245 unit installed in Virginia based on recent data. Others are approved, but we do not have information that those models under the 245 listing have actually been installed in Virginia From VDH: Based on a recent discussion with a VDH Engineer the only AOSS that is currently recognized as meeting the 50% reduction of TN as compared to a conventional gravity system under NSF 245 would be MicroFast. So the total number of TN reducing systems installed in LFHD is estimated. This number needs to be corroborated and possibly increased as other AOSS become recognized as denitrifying. For this BMP, VDH indicated there are 808 AOSS TN-reducing systems in the region.
Septic Pumping BMP	From VDH estimated 203 pumping BMPs in the region. This figure needs corroboration in future Progress runs and does not include vault, dirt privies, private haulers, or other TMDL-costshare pumpout program estimates. 203 is considered to be significantly underestimated and future scenarios maintain there is a 15% pumpage rate for the region.
Extractive Mines BMP	No credit attributed to applying the extractive mine E&S BMP in our regional VAST 2025 scenario. Also, future mine reclamation is estimated as a strategy, communication with DMME is that there are no plans to remediate any orphaned mine sites within our planning region during the time period from present through 2025.
Street Sweeping BMP	Of the 14 Towns contacted; only 4 reported street sweeping at least once a month. The regional total of Town streets swept is 197.34 acres. In addition, VDOT is concerned that their non-Town and Town street sweeping data might be duplicated in reports to DCR. Therefore, the regional non-Town VDOT streets swept of 5275.95 lane miles is not being included in this submittal. There is a need to calculate street sweeping frequency, length of roads swept, tonnage swept, and location of deposition collected in future TMDL reports.



Rain Gardens; Dry Detention Basins, Infiltration and Filtration BMPs	Inability to detail the drainage area of impervious surface without statewide land use data. Future TMDL reports will report the bioretention and other urban BMPs installed since 2006.
Rain Barrels	Inability to capture rainbarrels distributed from localities and nonprofits.
Urban Stream Restoration	Inability to report stream cleanup efforts by localities and nonprofits (Scouts, Earth Korps, Friends, etc.) and correlate a sediment reduction from debris cleanups.
Urban Canopy/ Street Trees	There was a lack of consistent data and inability of time to obtain the stem density of trees planted in programs in Towns from 2006 through present. Future TMDL reports will need to address these BMPs along Greenways, etc.
Ag Animal Waste Management Systems	General consensus is 20% for livestock and poultry in AFOs, 100% for CAFOs and 40% for both Horses in AFOs and CAFOs
Mortality Composters	These ag BMPs are usually 90% for all CAFOs, and likely to be 20% for AFO's. The ag consensus team felt this BMP was underestimated.
Forestry BMPs	It was not possible to verify the forestry BMPs in place for this submittal. Future TMDL efforts need to include BMPs on forest and harvested forests.

### Deliverable 3 - Development of a scenario using a combination of BMPs to best meet the target goals

A preferred water quality management scenario for the Counties of the Northern Shenandoah Valley Region that provides the level of treatment similar to the Virginia Phase I WIP was developed collaboratively during local stakeholder meetings repeated throughout the region. This preferred assumption has been submitted to the DCR through VAST regionally at the PDC scale, without federal lands or the City of Winchester. The results of the preferred scenario yield close to the WIP I decreased pollutant loads, as seen below.

Pounds	NSVRegional Counties	WIP I	% Attaining WIP I Goal
Land Use N	11,754,311	10,907,297	92.79%
Land Use P	1,067,534	902,638	84.55%
Land Use Sediment	336,950,039	330,848,783	98.19%

Additional decreases in pollution are anticipated with the land use changes requested, accurate credit for existing BMP installations, and the export of animal manure. It is worth noting that the pounds of Phosphorous will be significantly less than that listed above from VAST with 38,000 tons/year of manure exported (37,000 poultry litter and 1,000 tons from horses). While 5,000 tons may be redistributed to lands within the planning region, about 33,000 tons will be shipped out of the planning region to other localities within the Bay watershed, outside the Bay watershed and in the future to poultry litter to energy conversions. Based on the assumption each ton of litter has at least 40 pounds of phosphate, the preferred scenario will equate to annual removal of at least 558,952 pounds of phosphorous per year (based on estimates from Ag Extension Office, Bobby Clark) which is not credited at this time through the VAST model.

The following were collaboratively developed: (Again, the premise is implementation of these BMPs will require resources and represent the best professional judgment at this time. If in the near future, new BMPs become economically or technologically feasible, they will be considered.)

**Animal BMP Assumptions for 2025:**

Animal Waste Management Systems - 20% for livestock and poultry in AFOs, 100% for CAFOs and 40% for both Horses in AFOs and CAFOs

Mortality Composters - 90% for all AFOs and CAFOs for both livestock and poultry

Dairy Precision Feeding or Forage Management - 25% both AFOs and CAFOs

Poultry litter treatment (alum) AFOs and CAFOs - Broilers 63%; turkeys 37%.

Poultry and Swine Phytase - 100% (no credit for swine phytase)

Under Forest buffers - 10%

Manure Transport - 38,000 tons/year are exported. Of the 38,000 tons, 37,000 tons are from poultry litter from both AFOs and CAFOs and 1,000 tons are from horse manure. It is assumed that 5,000 tons of poultry litter are redistributed back within the planning region. The remaining 32,000 tons of poultry litter is sent to other localities within the Bay watershed, outside of the Bay watershed, or used for energy production and the 1,000 tons of horse manure is exported to other localities within the Bay watershed in Pennsylvania.

**Urban BMP Assumptions for 2025:**

Abandoned mines 95% reclamation for active and orphaned (no credit given)

Dry detention ponds and hydrodynamic structures 4.26% (from WIP) to all land use types CSS regulated & nonregulated both pervious and impervious

Dry detention extended basins 8.83% nonregulated and regulated impervious and pervious

Region 4% for CSS pervious and impervious developed

4% for nonregulated impervious and pervious developed

10% nonregulated and regulated impervious developed

4% regulated impervious and pervious developed

E&S 100% for all regulated construction

E&S 95% on all extractive sites

Street Sweeping monthly 50%

Impervious urban surface reduction 7.5%

Urban Filtering Practices 1.2% on all CSS, nonregulated and Regulated for both impervious and pervious developed

Urban Forest Buffers 4%

25% bioretention rain garden in urban sector

Urban Infiltration Practices (sand underdrain) – 4.5% to regulated and nonregulated impervious and pervious developed

Urban Nutrient Management Plans 60%

Urban Stream Restoration (Interim BMP credit applied) total should be 7,500 feet for the NSV region

Urban Canopy Tree Planting 1%

Urban Wetponds and Wetlands – 3% to regulated and nonregulated impervious and pervious developed

**Septic BMP Assumptions for 2025:**

Hook ups 5% region

Septic denitrification 3% for region

Septic pumping 15% for region

**Wastewater**

No ability to add BMPs or revise data here

**Forest BMP Assumptions for 2025:**

For both harvested forests and forested lands the following BMPs were applied:

- Dirt & gravel road erosion & sediment controls, driving surface aggregate and raising the roadbed 500 feet to each forested and harvest forest
- Dirt & gravel road E&S control – outlets only 0%
- Dirt & gravel road E&S control – with outlets – 100 feet to both forests and harvested forests
- Forest Harvesting practices (suite of BMPs) – 95% applied to harvest forests

**Agriculture BMP Assumptions for 2025:**

- Barnyard runoff control (20% AFOs, 100% CAFOs)
- Conservation tillage 70% of high till with manure
- Continuous no-till 60% of low till with manure
- All cover crop will be represented by Standard Drilled Rye and will be applied to 50% of all lands (high till with and without manure, low till with manure, and nutrient management version of those just stated, i.e., nutrient management high till with manure.)
- Decision agriculture was applied to 45% to alfalfa, and high till both with and without manure and low till (presumption is alfalfa is a crop here) and to low till with manure. Also applied 20% to hay with nutrients.
- Forest buffers applied to 3% to hay, alfalfa, high till with and without manure, low till with manure, and pasture.
- Grass buffers (same assumption to applied to as forest buffers – 3%)
- Horse pasture management applied 20% to both pasture and nutrient management pasture with horses
- Nursery irrigation capture and water reuse – 40%
- Land retirement to hay 3.4% from WIP (or remove entirely)
- Nonurban stream restoration – total 22,500 feet of stream in NSV region
- Nonurban stream restoration in degraded riparian pasture is included as part of the nonurban stream restoration
- Nutrient Management Plans – 30% on hay, alfalfa and crops; 50% on pasture
- Offstream watering without fencing – 10% in pasture and nutrient management pasture
- Prescribed grazing – 30% applied to pasture and nutrient management pasture
- Streamside forest and grass buffers – 4%
- Soil & Water Conservation Plans – 75% applied to alfalfa and crops; 50% to all hay and 50% to pastures.
- Stream Access Control with fencing – apply to 70 of the pasture with stream frontage
- Tree planting in pasture – 10%
- Wetland Restoration – 10% in pasture and high till with and without manure

**Deliverables 4 and 5 - Strategies and Resources**

The regional and local stakeholders collaboratively identified potential strategies to help meet the target pollutant reduction goals. The full list of strategies to be considered by the NSV localities and resources necessary to implement those strategies are provided in a spreadsheet appended to this report and sent separately to the DCR.

**Recommended Next Steps for Future Progress Reporting:**

It is understood there will be numerous opportunities for localities to provide DCR with update of their BMPs and land uses. There will likely be annual progress reports submitted to DCR on the achievements made (BMPs implemented) as well as a biannual forecasted scenario to best meet the 2025 goals. For example, the 2014/2015 biannual reporting cycle will likely initiate in Spring of 2012. It is recommended localities in the NSV region continue to try to bridge the gap between the desire and commitment to clean the Bay and an unfunded mandate. This would mean a follow up meeting with the regional stakeholders after the February submittal of the regional WIP II report to develop how to best proceed regionally in light of forthcoming reporting needs. It is important to follow up with agency and Town communications to better include these partners in the annual reporting for the Counties.

Future regional scenarios may want to evaluate the results from VAST that indicated predominantly agricultural reducing opportunities in the land uses listed below.

**Land Uses to Consider in Future BMP Implementations due to high pollutant loadings:**

- AFOs (nutrients)
- Degraded Riparian Pasture (all pollutants)
- Forests
- Hay with nutrients (all pollutants)
- Hightill with Manure (all pollutants)
- Nonregulated extractive (P & Sediment loads high)
- Nutrient Management Pasture (all pollutants)
- Nursery (Nutrients only)

Other next steps will be to monitor closely the results of the Shenandoah Valley SWCD pilot study to verify the voluntary BMPs and incorporate similar accreditation for the voluntary BMPs within our planning region. Future metrics can begin to be collected for street sweeping, septic hauling, and even for the atmospheric deposition of Nitrogen and sediment by the ride sharing and subsequent reduction in vehicular automobile pollutants from the region. Future efforts could also include continued evaluation of DEQ and USGS water quality monitoring stations to look for trends of improved water quality in the streams through increased implementation of BMPs and sound land use practices by increased awareness.