APPENDIX A

Phase II WIP Narrative Strategies to Meet 2017 Interim Targets

State Plan to Meet Target Allocations: Identified Gap Closers

The sections below describe the key implementation strategies that cumulatively will achieve by 2017 the interim statewide goal of 60% of the final reduction targets for nitrogen, phosphorus and sediment.

1. Municipal and Industrial Wastewater

Options to decrease and maintain loads from major and minor municipal and industrial wastewater treatment plants (WWTP) are described below.

Base Programs that Provide Annual Reductions

Background on base program strategies and funding are described in Section 2.2.2.1 of Maryland's Phase I WIP.

A) Continue ENR Retrofits at Major Municipal Wastewater Treatment Plants (>0.500 MGD)

There are a total of 71 Major Municipal Wastewater Treatment Plants (WWTPs) in the Bay watershed in Maryland with flows of greater than 0.5 million gallons per day (MGD). Four facilities, Boonsboro, Piney Orchard, Marlboro Meadows and Eastern Correctional Institution (ECI) were added to the original list of 67 for a count of 71 major WWTPs requiring ENR upgrades. The 71 WWTPs include Maryland's portion of the Blue Plains facility.

MDE included these four facilities in the major category based on the design flow criteria, and accounted for the projected reductions from these facilities. In accordance with NPDES permits, Boonsboro, Piney Orchard and ECI are required to upgrade to ENR. Marlboro Meadows will be connected to Western Branch. These facilities are not eligible for Bay Restoration Fund (BRF) funding. Boonsboro became a major WWTP due to expansion to design capacity of more than 0.5 MGD. Boonsboro WWTP has been upgraded; no additional funding is needed. Piney Orchard is a privately owned WWTP. Cost estimates for upgrading Piney Orchard are not included in BRF estimates.
ECI is now identified as a major plant because, upon completion of an expansion and connection of a Water Treatment Plant, ECI's permitted flow will increase from the current 0.48 MGD up to 1.14 MGD. The ECI WWTP is not party to the ENR agreement, nor does it receive BRF funding; however, this State facility is assigned a wasteload allocation (WLA) to meet both local (Manokin River) and Bay TMDL requirements. At these higher flows, the facility will need to perform at or beyond ENR levels of treatment process to stay within compliance.

The strategy description below reflects information that pertains to the 67 publicly owned facilities, including Blue Plains, for which ENR upgrades have been or are being done. Following this overall strategy description, additional information is provided specific to Blue Plains, a multijurisdictional facility for which the BRF will be part of a cost share funding plan with other jurisdictions, including DC and Virginia.

2017 Strategy

Maryland plans to upgrade 67 Public Major WWTPs by 2017 to Enhanced Nutrient Removal (ENR).

23 of the 67 public plants have been upgraded to ENR as of January 31, 2012. The remaining 44 are expected to be upgraded by 2017, including Maryland's portion of Blue Plains.

Implementation Commitments:
January 2012: Propose amendment to Bay Restoration Fund statute to change fee to generate the necessary revenue to complete the ENR strategy commitment.

Continual:
ENR discharge limits are incorporated into the NPDES permit renewals to ensure ENR implementation.

Contingency:
If the Bay Restoration Fund statute is not changed in 2012 to generate the necessary revenue to complete the ENR strategy commitment, all funding for ENR projects will be reduced from 100% grant to provide partial grant funds for each remaining project. Local governments would be responsible for the balance of the necessary funding. State low interest loan funds would be available to assist.

Additional Discussion:
This contingency is not anticipated to be necessary. During the 2010 and 2011 legislative sessions, the Maryland General Assembly acknowledged the Bay Restoration Deficit and provided that it is the intent of the committees that the Bay Restoration Fund Advisory Committee work in consultation with the Maryland Department of the Environment and the Department of Budget and Management recommend a plan to eliminate the deficit for funding the upgrade of the State's 67 major public wastewater treatment plants to enhanced nutrient removal technology. In addition, it is the intent of the General Assembly that this funding plan be implemented during the 2012 legislative session.

The Strategy outlined by the Bay Restoration Fund Advisory Committee includes work in 2012 to at least double the fee to ensure that the necessary revenue will be generated to complete projects. Other funding sources include the State Revolving Loan Fund, local or community funding or match, USDA Rural Development Funds, federal funding, and revenues from offset requirements or trading programs.

In 2012 MDE will evaluate sector requests, all available staff resources, opportunities for reassignment of existing staff; funding sources, including availability of federal funding and legislative approaches to address additional sector needs.

B) Blue Plains Upgrades

The Blue Plains Wastewater Treatment Plant is the largest advanced wastewater treatment plant in the world, with a rated capacity of 370 million gallons per day (MGD). During extreme wet weather events, flows can reach 1.076 billion gallons per day. Maryland's portion of the Blue Plains flow is 169.6 MGD. It is one of 67 facilities included in ENR Strategy and eligible for BRF grant funding.

Strategy
Upgrade Blue Plains to ENR by 2015.

Implementation Commitments:
As part of Maryland's commitment to installing ENR at the largest 67 facilities, Maryland will contribute about $203 million in Bay Restoration Fund (BRF) and $28 million in Biological Nutrient Removal (BNR) to the Washington Suburban Sanitation Commission (WSSC) share of the upgrade at the Blue Plains facility. The remaining WSSC share (about $170 million) can be funded by the State Revolving Loan Fund or local funding.

The implementation commitments discussed above for Maryland's ENR program also are applicable for this facility.

Additional Discussion:
In addition, EPA recently reissued the NPDES discharge permit for the Blue Plains facility imposing ENR compatible discharge limits. Blue Plains is required to place the new facility in operation by July 14, 2014; and to begin compliance with total nitrogen (TN) limits by January 1, 2015.

Maryland intends to continue to advocate for increased federal funding for the upgrades of the Blue Plains facility that are commensurate with the federal contribution to the wastewater load.

Additional Program, Practices and Policies to Meet 2017 Goal for Point Sources

C) Retrofit/Optimization at Major Industrial Treatment Plants to meet the Tributary Strategy Goal

Strategy
Complete issuance in 2012 of NPDES permits with wasteload allocations identified in Maryland's Tributary Strategies. The following are schedules to implement allocations for significant industrial treatment plants that either do not have a current permit limit or the permit limit has only recently become effective, or the permit limit is not yet in effect:

July 1, 2011: Grace Davison has a major manufacturing plant located in the Baltimore Harbor. Grace Davison-Bay limits became effective July 1, 2011. Limits of 310,737 lbs/yr TN and 1809 lbs/yr TP represent over 50% reduction since 2003 and over 80% reduction since tracking of loadings was first initiated.

September 2013: Erachem Comilog is a company located in the Baltimore Harbor area that is engaged in manganese ore reduction and the manufacture of manganese chemicals. New permit limits of 13,800 lbs year TN are effective in 2013.

2015: Upper Potomac River Commission POTW – This is the treatment plant for the process wastewater from Newpage Corporation in western Maryland discharging to the North Branch Potomac River. The discharge permit renewal is being processed with an anticipated three year compliance schedule.

2015: Naval Support Facility at Indian Head - The Department of Defense operates a major facility at Indian Head, Maryland. Renewal of their wastewater discharge permit from their industrial operation is pending, with nutrient limits anticipated to be effective in 2015.

2015: Severstal Sparrows Point (the steel manufacturing facility formerly known as Bethlehem Steel) has a discharge permit renewal pending. This facility uses source water from the Back River POTW and as a result their Bay limits will be tied to the schedule of reductions at Back River POTW since Back River is a major source of nutrients in Severstal's discharge. However, one outfall of process wastewater at Severstal will include new technology based limits that will reduce ammonia nitrogen as much as 82,000 lbs/year, with anticipated effective date of three years.

During 2015: Masonville Dredge Material Containment Facility is a new facility to be operated by the Maryland Port Administration to dewater dredge materials from the Baltimore Harbor. Existing permitted TN and TP loads are required in the discharge permit to become zero (net after offsets) in 2015.

2012-2017: MDE will monitor compliance with schedules and load caps.
Report progress to the Bay Stat and EPA/Bay Program.

Funding Strategy:
Private; dependent on plant-specific situation.

D) Minor Industrial Dischargers

Approximately 955 minor industrial facilities of varying type and size may also have some potential for discharging nutrients beyond *de minimus* levels. The number of minor industrial facilities identified by MDE as potentially discharging nutrients has increased significantly since 2009, when only 480 facilities were included in MDE's WIP Phase I analysis. MDE has performed a preliminary evaluation of the potential for reductions from subcategories of minor industrial sources. MDE has established a target for edge-

of-stream nitrogen reduction from current loads of approximately 15.6 percent by 2017. This evaluation is the basis of the strategy option for the minor industrial sector, which is included in the set of options that together are projected to achieve reductions beyond those needed to meet the 2017 Interim Target Load for point sources.

Implementation Commitments:
2012: MDE will conduct an extensive survey to determine the nature as well as quantity of nutrients produced by existing minor industrials with a reasonable expectation of the use of nutrients in their production sources or treatment process. Such facilities will be required to provide appropriate combinations of effluent data and/or material balance for nutrients. MDE will evaluate survey results and continue to refine the loading estimates to identify and verify the non-significant industrial discharges of nutrients;

2013: MDE will finalize evaluation of the survey and complete refinement of the loading estimates.

2013-2017: Based on the outcomes of the survey and estimates, where appropriate MDE will propose NPDES permits that will include loading targets and schedules for reductions. MDE will monitor compliance with schedules and load caps, and report progress to the Bay Stat and EPA/Bay Program.

Funding Strategy:
The majority of the costs will likely be borne by the private sector. Industries would be responsible for necessary retrofits and funding.

In 2012 MDE will evaluate sector requests, all available staff resources, opportunities for reassignment of existing staff; funding sources, including availability of federal funding and legislative approaches to address additional sector needs.

E) Continue ENR Retrofits at Major Federal WWTPs

Originally there were seven federal facilities, three of which were privatized. One of these three plants is accounted for in the major municipal category (APG Main). The remaining two privatized plants are included in this category, for a total of 6 plants.

Strategy:
MDE issued NPDES permits for all federal facilities requiring the following schedules to meet ENR limits during 2011-2015:

1. 2011: Ft. Detrick WWTP
2. 2012: Naval Support Facility Indian Head
3. 2015: United States Naval Academy WWTP.
4. 2013 USDA BARC East (non-DOD federal)
5. 2012: APG-Edgewood (To be privatized)
6. 2010 Fort Meade (Private) (effective upon permit modification)
7. 2013 APG Main (Privatized, included in the major municipal category)

2012-2017: MDE will continue to monitor compliance with schedules and permit limits (ongoing) and refer violations to EPA for follow-up actions as necessary. APG Edgewood has been delayed and referred to EPA. The Naval Support Facility Indian Head (NSFIH) upgrade was completed in August 2011 and is currently meeting ENR permit limits that became effective January 2012. The United States Naval Academy has advised MDE that it will meet the 2015 permit milestone for meeting ENR limits. MDE has finalized a consent order with the City of Aberdeen for APG Main to address ENR schedule delays. USDA, Ft. Detrick and Ft. Meade are compliant.

F) Evaluate the Largest Minor Municipal Treatment Plants (0.1-0.5 MGD)

Evaluate the feasibility of upgrading at least five of the more significant minor municipal WWTPs to ENR treatment by 2017.

Strategy:
Evaluate the more significant minor municipal WWTPs for potential upgrade based on load capacity needs, community interest, technical feasibility and cost-effectiveness.

2012-2013: MDE, in consultation with the stakeholders, will make final determinations regarding requirements for minor plants, their delivered load reductions, cost effectiveness, permitting and funding options, including funding recommendations of the Septics Task Force.

The following top 10 minor municipal WWTPs are projected to achieve the highest nutrient load reductions as a result of the upgrade to ENR. Based on the evaluation of the current, FY 09-FY10 delivered nutrient load data, the list includes some, but not all of the facilities recommended by the Septic Task Force. Following public review, load data confirmation, local input and funding availability, at least five of the top 10 facilities would be considered for upgrade. The BRF and other funding sources listed below are will potentially be utilized to fund upgrades of the selected minor wastewater treatment plants.

FACILITY	COUNTY
ANTIETAM WWTP	WASHINGTON
BOONES MOBILE ESTATES WWTP	ANNE ARUNDEL
CHERRY HILL WWTP	CECIL
GREENSBORO WWTP	CAROLINE
POINT OF ROCKS WWTP	FREDERICK
QUEENSTOWN WWTP	QUEEN ANNES
RISING SUN WWTP	CECIL
SHARPTOWN WWTP	WICOMICO
TRAPPE WWTP	TALBOT
TWIN CITIES WWTP	DORCHESTER

This list of candidate minor wastewater treatment plants for upgrades is based solely on the reduction in nitrogen loads. Before a final decision is made other factors, including Smart Growth, will be considered.

2014: Based on final determination, MDE will propose revised NPDES permits and seek funding (where available) to assist local governments with upgrades. Selected minor dischargers will be assigned the wasteload allocations (WLA) of no more than 6,100 pounds per year total nitrogen load and no more than 457 pounds per year total phosphorus load. Tributary Strategy allocated loads in excess of 6,100 pound per year total nitrogen and 457 pounds per year total phosphorus will revert back to the State. Expanding facilities would have to comply with all local, state and federal environmental laws, regulations and programs.

2015-2017: MDE will monitor compliance with schedules and permit limits.

Funding Strategy:
These upgrades may be funded by the State Revolving Loan Fund, local or community funding or match, USDA Rural Development Funds, federal funding, and revenues from offset requirements or trading programs. The options to address funding for this sector include increasing the BRF fee revenue up to 100%. Decisions are expected following legislative session.

In 2012 MDE will evaluate sector requests, all available staff resources, opportunities for reassignment of existing staff; funding sources, including availability of federal funding and legislative approaches to address additional sector needs.

G) Combined Sewer Overflows

Older combined sewer systems were designed to collect sewage and transport it to sewage treatment plants during dry weather but also serve as stormwater sewers during rain events. During rain events, rainwater is mixed with raw sewage and conveyed to WWTPs. Once combined sewers are full, however, the blended effluent is discharged directly to waterways resulting in Combined Sewer Overflows (CSOs), which can contribute to local water quality and public health problems and are of particular concern because of the contribution of pathogenic organisms from these untreated sources.

Sanitary sewer overflows occur when sewer systems fail due to power outages at pumping stations, breaks or clogs in sewer lines and other factors that may cause sewage to overflow and contaminate surface and groundwater.

Strategy:
Eliminate sewer overflows. Maryland will continue to oversee CSO separation and the elimination of CSOs through enforcement of existing consent orders and Revolving Loan Fund financing of repairs.

Status

In Maryland a number of communities with CSOs have completed the required upgrades prior to 2011: Snow Hill in 2002, Baltimore City in 2006, Salisbury in 2008 and Federalsburg in 2010. Snow Hill blocked off all of its diversion manholes and had not reported any subsequent problems in the collection system. Federalsburg installed new separate sewer lines and new storm drains replacing the deteriorated combined sewer lines and eliminating CSOs. The new storm drain system includes a treatment device for the storm drain outfall to Marshyhope Creek. This project was partially funded by the American Recovery and Reinvestment Act of 2009 (ARRA) funds and was completed in 2010.

In Maryland, CSO-related consent orders are in effect in six communities: Allegany County, Cumberland, Frostburg, La Vale, Westernport and Cambridge. The Long Term Control Plans (LTCP) to address the elimination of the CSOs have been developed and submitted to MDE by jurisdictions.

The Cambridge CSO upgrade is scheduled to be completed by 2013. The remaining CSO communities are in the process of evaluating, designing and completing various stages of the upgrades by 2023.

H) Dredge Material Containment Facilities

Waste Load Allocations (WLAs) for six dredge material containment facilities (DMCFs) are included in the Chesapeake Bay TMDL and Phase II WIP. Two DMCFs managed by the Maryland Port Authority (MPA) discharge into the Baltimore Harbor. Three Upper Chesapeake Bay DMCFs are managed by the Army Corps of Engineers' Philadelphia District. Finally, the Poplar Island DMCF is jointly managed by MPA and the Corps of Engineers.

Currently, MPA has an allocation for the DMCFs located in the Baltimore Harbor. This allocation was derived using the current Baltimore Harbor nutrients TMDL allocation that was transferred from Hart-Miller Island DMCF and is now shared between Masonville and Cox Creek DMCFs. As required in its discharge permit, the Masonville DMCF TN, TP and TSS loads (net) are required to become zero by 2015, therefore the current allocation to the Harbor DMCFs will be reduced by 50%. The State will retain custody of half of the reduced load, to be used as a statewide industrial reserve allocation. This reserve allocation is potentially applicable for existing dischargers that did not previously receive an allocation representative of their discharge after implementing appropriate reduction efforts, and/or for new entities with a demonstrated commitment to green practices.

For DMCF facilities located outside of the Baltimore Harbor, MDE used Poplar Island DMCF monitoring discharge data to estimate their current TN, TP and TSS loads. Loads were estimated for Poplar Island and the three Upper Bay facilities that will replace the

Open Water disposal site (Site 92). These non-Harbor facilities will be required to reduce their current TN and TP loads by 15% and 25%, respectively, by 2025.

It is envisioned that the Harbor and non-Harbor WLAs can be treated as an aggregate WLA that can be shared among all DMCFs as old facilities reach capacity and new facilities come on line, provided that local water quality standards are maintained. An additional condition for applying portions of this aggregate WLA to dischargers is that WLAs for existing or new DMCFs within the Baltimore Harbor cumulatively must not exceed the final allocation currently established in the Chesapeake Bay TMDL, which represents a 50% reduction of the DMCF allocation previously included in the Baltimore Harbor TMDL.

2. Urban Stormwater Loads

The general strategy will increase watershed restoration requirements for municipal separate stormwater sewer systems (MS4) by requiring nutrient and sediment reductions through a combination of treatment of existing developed acres with little or no stormwater management and alternative methods. Stormwater management systems help control storm drain discharges and pollution through the use of structural and non-structural techniques that intercept, filter and treat runoff from developed lands.

Additional Program, Practices and Policies to Meet the 2017 Goal for Urban Stormwater

A) Increase NPDES Watershed Restoration Requirements for MS4 Phase I County permits, including SHA.

The strategy requires reductions in nutrients and sediments equivalent to retrofitting 30% of the pre-1985 impervious cover for Maryland's ten largest counties and the State Highways Administration (SHA) subject to Phase I Municipal Separate Storm Sewer System (MS4) permits. The load reduction associated with this strategy is estimated on the basis of an average reduction efficiency of 25% for total nitrogen. Specifically, the strategy calls for requiring, in renewed federal NPDES stormwater permits, the retrofitting of 20% of previously developed land with little or no controls within the next five year permit term. This strategy will apply to both Phase I and Phase II municipal separate storm sewer system (MS4) permits (See Section 2-B below for Phase II retrofit requirements). Previous Phase I permit terms required retrofitting of 10% of impervious area not controlled to the maximum extent practical.

The Septics Task Force funding strategy explicitly recognizes that, to achieve nutrient and sediment reductions in the accelerated time frame dictated by the Bay Watershed Implementation Plan, more cost-effective reduction methods will be necessary, including increased funding for SWM and the funding of reductions from other source sectors.

The following key elements of the strategy support reasonable assurance of the implementation of this element of the Plan:

- Establish impervious acreage treatment requirements in NPDES municipal separate storm sewer system (MS4) permits to achieve specific reductions in sediment, phosphorus and nitrogen consistent with this Phase I Watershed Implementation Plan. These permits will require the development of a detailed watershed restoration strategy that contains the following elements:
  - A systematic watershed assessment shall be conducted and a detailed restoration plan developed for all watersheds;
  - Stormwater watershed implementation plans for each EPA approved stormwater wasteload allocation (WLA).

  - Completion of restoration efforts for twenty percent of the counties' impervious surface area that is not already restored to the maximum extent practicable (MEP).
  - Use of alternative stormwater management practices that may include street sweeping, catch basin cleaning, storm drain vacuuming, nutrient management, grass/meadow buffers, stream restoration, impervious surface removal, tree planting, shore line erosion control, and impervious area disconnects, when cost effective.
  - Development of an ongoing, iterative process that continuously implements structural and nonstructural restoration projects, existing program enhancements, new and additional programs, and alternative BMPs where EPA approved TMDL WLAs are not being met according to the benchmarks and deadlines established as part of the counties' watershed assessments.
- The State increased SWM plan review staff in 2009 to address increased workload.
- MDE proposed to use grant allocations from the Chesapeake Bay Implementation Grant Program (CBRAP) to develop a GIS Municipal Stormwater Permit Data Tracking and Reporting System, as well as technical outreach and training to regulatory community.
- The State will continue to support the development of local stormwater utility fee systems, which will provide greater support for county and municipal stormwater programs, including enhancing watershed restoration activities required under the NPDES MS4 permits.
- The State is providing Chesapeake and Coastal Bays Trust Fund cost-share grants (See Funding section) to local governments to advance SWM implementation.
- To reduce costs and assure the feasibility of achieving allocations of nutrient and sediment targets in MS4 permits, MDE will work collaboratively with a coalition of stormwater professionals and the Chesapeake Bay Program Urban Stormwater Workgroup to explore and assess additional strategies and best management practices that can be used to restore urban watersheds, establish criteria for evaluating and certifying best management practice efficiencies for new practices, refine modeling representation for the large acre-lots and rural residential sites; and continue evaluating local watershed restoration efforts to determine which strategies are most cost effective at achieving nutrient and sediment reductions.
- MDE will conduct program audits to ensure that regulated municipalities and counties meet MS4 permit requirements.

Implementation Commitment:

County Permits: MS4 permits require stormwater Waste Load Allocation implementation plans to be submitted for approval by MDE within one year of the adoption of a TMDL. These plans will describe local funding strategies.

MDE has met several times with each Phase I locality to discuss specific requirements that will be included in reissued NPDES municipal stormwater permits. MDE has also met with several environmental stakeholder organizations regarding draft permit provisions, and anticipates additional stakeholder meetings as these permits are finalized

prior to issuance of tentative determinations. In addition to the above outreach, MDE will provide an outreach effort to accompany MS4 permit reissuance to raise local knowledge and technical capacity to meet new requirements. Outreach to MS4s will include information on program administration, legal authority, source identification, erosion and sediment control, stormwater management, litter and floatables, municipal industrial permitting, illicit discharge detection and elimination, watershed assessments and restoration, assessment of controls, and financial obligations under the permit. Additionally, further watershed assessment and restoration outreach will be provided in MDE's "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" (June, 2011). MDE commits to finalizing the stormwater retrofit guidance and making it consistent with forthcoming recommendations from the CBP's Urban Stormwater Work Group.

MDE will submit for review all outstanding draft Phase I MS4 permits to EPA by no later than July 1, 2012, and intends to issue tentative determinations for these permits by November 1, 2012.

Funding Strategy:
While permit requirements assure implementation, the State recognizes the significant cost for stormwater controls and commits to two additional implementation strategies as follows:

State and Local Revenue:
State law enacted in the 1982 authorized local governments to collect fees (e.g., plan review, inspection, grading fees, etc.) to implement stormwater management programs. In 1991, Maryland enacted a law authorizing local jurisdictions to develop a "system of charges" or a stormwater utility. To date, five jurisdictions (e.g., Tacoma Park, Montgomery County, Prince George's County, City of Rockville, and City of Annapolis) have enacted these fees to fund stormwater projects. State legislation proposed during 2010 would have required each county and municipally to establish a "stormwater remediation fee" and create local "watershed protection and restoration funds" to pay for implementation of local stormwater management plans. The legislation did not pass. In 2011, the State convened a formal discussion with stakeholders to identify potential options for adequate revenues, a period of time for research, development and enactment of local revenue systems. To assist with start-up costs, MDE offers financial assistance through low interest loans involving the State Revolving Loan Fund, to create these fee systems. MDE also offers a delayed payment plan contingent upon starting a "system of charges." Grants may also be made available in a cost sharing arrangement.

In addition to stormwater fee systems, local governments may use volunteers to implement various labor-intensive elements of programs such as tree planting, and installing rain barrels and gardens. Other funding may include a combination of State Revolving Loan Fund, the Chesapeake Bay 2010 Trust Fund, local, community and non-profit funding, regulatory fees, and various other grant funding.

The Chesapeake Bay 2010 Trust Fund is a major commitment to finance nonpoint source restoration programs. The Fund was designed to provide $50 million annually. The $50 million annual commitment will enable Maryland to leverage that revenue to increase local capacity to finance stormwater retrofit costs. While the funding level is currently lower due to revenue decreases associated with the current economy, this is anticipated to be a short term problem.

The Final Report of the Task Force on Sustainable Growth and Wastewater Disposal was issued in December 2011. The Task Force recommendations recognize that, to achieve nutrient and sediment reductions identified in the Bay Watershed Implementation Plan, revised authorized uses of BRF funding to allow increased funding for SWM and the funding of reductions from other source sectors will be needed. The Task Force recommendations provide a broad estimate of the revenues that would be generated if adopted by the State General Assembly. Not accounting for trading and other means of reducing costs, the difference between the Task Force revenue estimate and stormwater strategy cost estimates provides information about the remaining funding gap.

Federal Revenue:
The federal government has also long recognized the stormwater funding need. By way of example, the Clean Water Needs Survey designed to assess water related infrastructure needs includes stormwater projects. The State is pursuing federal funding for stormwater projects on three tracks:

1) In 2011, Maryland asked its Congressional delegation to work to pursue the authorization for federal funding for the Chesapeake Bay jurisdictions through either pending or new legislation. This process will continue in coordination with federal partners.
2) In 2012, Maryland will continue working directly with federal agency representatives to refine cost estimates, refine estimates of State and local potential to generate revenues, determine the federal share of stormwater costs and develop a strategy with a time line to secure federal share of funds. Maryland will also ask its federal facilities to enter into a schedule providing for stormwater controls and retrofits on a schedule similar to that required of local governments.
3) In 2012, Maryland will request that the U.S. Army Corps of Engineers formally pursue the necessary prioritization of stormwater projects in Maryland within it capital project improvement plan.

Additional Discussion:
In addition to convening a formal discussion with stakeholders to identify potential options for adequate revenues, a period of time for research, development and enactment of local revenue systems, and assisting with start-up costs, and providing delayed payment contingent upon starting a "system of charges," MDE will also convene a group of experts to identify the most cost effective practices to achieve retrofit requirements.

Costs may be controlled by using additional innovative strategies to meet Bay TMDL nutrient and sediment loads. For example, needed reductions may be achieved by additional reductions from WWTPs or nonpoint sources pursuant to the State trading policies. This will not relieve the stormwater sector from other restoration goals that have longer time horizons, but rather could be designed to allow the stormwater sector to meet nutrient and sediment goals sooner than would otherwise be financially feasible.

See: Section 2.2.2.4 "Regulated Stormwater" subsection "Stormwater and Financial Capacity" of Maryland's Phase I WIP for background and supporting material.

State Highway Administration Permits:

For the Maryland Department of Transportation (MDOT) funding is provided by the Maryland Transportation Trust Fund, which is currently constrained to dedicated revenue sources, the two largest being the motor fuel tax and the vehicle titling tax. For mitigation projects expected to be funded from the Transportation Trust Fund, substantial additional funding is needed for project site searches, design, permitting, construction and land acquisition. Additionally, increased staff capacity will be required to undertake management and implementation of the pollutant reduction activities proposed (i.e. engineering, specialized project design management, construction management and inspection).

In 2010 the Maryland General Assembly appointed the "Blue Ribbon Commission on Maryland Transportation Funding" to identify options for sustainable, long-term revenue sources for transportation funding including sources to fund TMDL commitments. The Blue Ribbon Commission, which first met on September 27, 2010, has reviewed, evaluated and made recommendations concerning Maryland Transportation Funding and submitted a final report to the Governor and General Assembly. TMDL funding was also a consideration of the commission in developing final determinations.

MDOT is anticipating additional funding for surface transportation projects in the 111th Congress through surface transportation authorization legislation. If no other funding can be identified for these commitments, MDOT will be faced with balancing safety and highway operational needs against TMDL reductions. State Highway Administration efforts are already being redirected towards meeting the TMDL within currently available funding levels.

Sector Additional Need**:**
It's critical that staffing at the state and local levels be boosted in the very near term to manage the accelerated implementation.

B) Increase NPDES Watershed Restoration Requirements for Phase II MS4 Jurisdictions

The strategy for MS4 Phase II jurisdictions is similar to the Phase I MS4 strategy with the exception that the 2017 target is based on the nutrient and sediment reduction that would be achieved by treating 20% of existing developed acres with little or no stormwater management in Phase II jurisdictions, including the State Highway Administration (SHA) within these jurisdictions. The load reduction associated with this strategy is estimated on the basis of an average reduction efficiency of 25% for total nitrogen. This strategy will also apply to federal lands. Information regarding the federal Lands was provided by EPA to Maryland. The information regarding the facilities and the loads are provided in Appendix H3.

In 2011 the State has met with federal facilities representatives to discuss WIP process and reduction strategies. Maryland expects federal facilities to meet retrofits requirements on a schedule similar to that required of local governments.

The Septics Task Force proposed a funding strategy that explicitly recognizes that, to achieve nutrient and sediment reductions dictated by the Bay watershed implementation plan, more cost-effective reduction methods will likely be necessary, including the funding of reductions from other source sectors. The Task force recommended revised authorized uses of BRF funding to allow increased funding for SWM.

The following key elements of the strategy support reasonable assurance of the success of this plan:

- MDE will begin drafting and distributing for comment its two Phase II general permits for small storm drain systems during the first half of calendar 2012. These general permits will require small municipalities and state and federal storm drain owners in urban Maryland to retrofit 20% of their respective impervious surface areas similar to the Phase I jurisdictions. MDE intends to submit drafts of these permits to EPA for review by the end of calendar 2012.
- The remaining actions that demonstrate reasonable assurance for Phase II MS4 jurisdictions are the same as for Phase I jurisdictions discussed above.

<u>Funding Strategy</u>
The funding strategy for achieving the Phase II MS4 sector targets will have many of the same elements described in the Phase I MS4 section above. However, given the varied characteristics of Phase II jurisdictions, funding strategies will depend on more detailed assessments conducted during the initial year of the Phase II MS4 General permits and outcome of 2012 legislative session.

<u>Sector Additional Need</u>:
It is critical that staffing be increased in the very near term to manage implementation.

Local Government Permits:
The average annual cost over six years, 2012-2017, is to a great degree a completely new cost. The State and local needs are expected to be consistent with the Phase I needs. In addition, approximately fifty Phase II jurisdictions with no current retrofit programs would need program implementation resources.

C) Existing Urban Nutrient Management Law – Reporting of Regulatory Compliance

MDA regulates 275,000 acres for managed turf and landscape under the authority of the Water Quality Improvement Act of 1998. Although documentation of compliance has been ongoing, MDA was not reporting implementation of urban nutrient management and it was not included in Maryland's 2009 progress run.

Inspections of regulated entities allow establishment of an average compliance rate which was first applied to total regulated acres to report progress in 2010. During that period compliance rate was 80% and Maryland reported urban nutrient management on 220,000 acres of land. Maryland will continue to utilize this reporting convention.

Strategy:
Require soil sampling and fertilizer applications according to University of Maryland (UMD) recommendations on 275,000 acres of commercially managed lawns (for example, golf courses and athletic fields) through Maryland's Water Quality Improvement Act. Since 1998, MDA has regulated approximately 700 applicators who apply fertilizer to 10 or more acres of non-agricultural land, including private lawns managed by lawn care companies, golf courses, public parks, airports, athletic fields and state owned land such as restoration areas and highway right-of-ways. Applicators are required to take soil tests, follow University of Maryland Extension guidelines when applying nutrients, and maintain certain records of fertilizer applications.

Funding:
Currently, MDA has 1 FTE to provide inspection for 700 operations. To provide adequate inspection, tracking and accountability an additional 3 FTE are required.

Funding Strategy:
The strategy to increase funding for the inspections needed to meet EPA expectations for reasonable assurance is to request funds through the EPA Accountability and Tracking Grant.

D) Urban Nutrient Management - Expanded

Maryland enacted the Fertilizer Use Act of 2011 in May of 2011. It expands the scope of regulatory authority for fertilizer use on non-agricultural land. This law will also result in an additional estimated 220,000 acres under regulatory authority. The law will be phased in and fully implemented by October 1, 2013.

Under the Law:

- Eliminate phosphorus in fertilizers used on lawns and use only slow release nitrogen fertilizers on lawns and managed turf.
- Discontinue inappropriate use of fertilizers as deicers.
- Create economic disincentives for the use of fertilizers used by homeowners.
- Assure sound nutrient recommendations on residential turf.

Strategy:
Currently legislation (HB 553/SB 609) passed during the 2009 Maryland General Assembly defines "low phosphorus fertilizer" as containing not more than 5% phosphorus and sets application rates not to exceed .25 lb P /1,000 sq. ft. and .5 lb/1,000 sq. ft. per year. Beginning April 1, 2010, phosphorus in newly registered lawn fertilizers may not exceed 1.5%. Beginning April 1, 2011, fertilizers with more than 5% P may not be used on established lawns and must not be labeled for lawn use. Retail establishments are prohibited from selling fertilizer for lawns unless it is a "low phosphorus fertilizer". Licensed lawn and landscape firms are not required to use "low P fertilizers".

The Fertilizer Use Act of 2011 restricts phosphorus amounts in lawn fertilizer products, restricts the amount of phosphorus applied to turf, established maximum application rates for nitrogen and specifies that 20% is applied as slow release, prohibits labeling a fertilizer as a deicer, requires certain labeling on fertilizer to protect water resources; restricts professionals from applying fertilizers between November 15 and March 1 and within 10-15 feet of waterways , and prohibits application of fertilizers on impervious surfaces. Fines for violations are set at $1000-$2000. MDA will also establish education programs and certify professional who provide urban nutrient management services.

Funding:
Funding for administration of authorized programs, education programs, and one inspector.

Funding Strategy:
MDA will utilize revenues received by authorized fees in the law to fund staff and operating to implement this law.

E) Regenerative Stormwater Conveyance

A regenerative stormwater conveyance (RSC) system is a method of conveying stormwater that is often applied to down-cut headwater streams and stormwater outfalls. The system typically consists of a series of beds separated by weir structures that moderate stream flow, promote infiltration and reconnects the stream with the flood plain. Well designed systems incorporate organic materials that promote subsurface biological processes with denitrifying potential.

Stream restoration and connection to the flood plain mimics natural stream conditions and provides a nutrient and sediment reduction in some places. Although this methodology is currently implemented in Maryland, it is relatively new and guidelines

for site selection are needed so that fish barriers and other non-desired side effects are not created from implementing this practice. This practice also does not have defined design specifications or yield pollution reduction estimates. Bay Program partners must produce site selection criteria for determining the most appropriate locations for regenerative stormwater conveyance, as well as develop definition and nutrient and sediment reduction estimates. Once pollutant reduction and habitat improvement data have been collected on these practices Bay partners should work together to submit a proposal to the CBP for approval as a BMP. Based on the projects already underway that include monitoring of these practices, Maryland estimates a request will be submitted in 2012.

Maryland will work with local governments to develop tracking and reporting protocols for this type of practice to ensure no double counting occurs with other restoration activities. Use of the National Environmental Information Exchange Network (NEIEN), outlined in Element 6, will provide the platform to ensure accurate, consistent, non-duplicative implementation data.

Funding Strategy:
The Chesapeake and Coastal Bays Trust Fund, local government funds, and non-profit implementation programs provide additional potential funding sources. Specifically, the National Fish and Wildlife Foundation is interested in convening a "Blue Ribbon Panel" to evaluate these practices. The Chesapeake Bay Trust awarded a Pioneer Grant to the Severn River Keeper of $65,000 for the scientific analysis lead by Chesapeake Biological Lab to develop the nutrient efficiencies of the regenerative stormwater conveyance BMP. The project started in May 2010 and runs through April 2012. The latest round of Chesapeake and Coastal Bays Trust Fund proposals included 22 submissions. Of those 18 were exclusively for regenerative stormwater conveyance or included at least one site proposed for implementation. Many Maryland counties have implemented these practices with their own funds and are actively pursuing additional sites for project implementation.

Where credit is taken for these practices under MS4 permits, it will be necessary to account for additional actions to achieve the overall nutrient reduction targets estimated for this practice above. This accounting matter will be addressed in the Phase II watershed implementation planning process.

F) Rural Residential Reforestation

Rural residential tree planting addresses properties of limited housing density that include lawns and fields but are not used for agricultural purposes. These rural areas often include single family homes located on lots of five or more acres where there is the opportunity to reforest larger low-density parcels. This action would reduce nutrient and sediment runoff by converting landuse from turf grass or open fields to forest. EPA watershed model land use loading factors for turf grass versus forest will provide the nutrient and sediment benefits.

Strategy:

- (2011) Begin GIS analysis to identify the opportunities for planting.
- (2012) Work with existing local government programs on opportunities for transferring their concepts to other jurisdictions. Choose a pilot area and cluster potential planting areas in high priority watersheds.
- (2013) Begin implementation in pilot area, continue outreach to transfer existing local program concepts to other jurisdictions, and identify additional planting areas.
- (2013-2017) Continue to identify planting areas and identify funding sources that leverage both public and private dollars. There is also a potential for markets based on carbon sequestration, etc. to be identified in these out years.

Rural resident tree planting will include the conversion of turf grass into trees. It could also facilitate the conservation of home owner association properties into forest cover. Another aspect is to conserve existing forest in new rural residential development (i.e. farmland being developed), supported by regulations for Forest Conservation Act, Chesapeake Bay Critical Area, and Non-tidal Wetlands. Maryland has substantial guidelines for stream and waterway buffers, with 100-foot minimums in most of the Chesapeake Bay Critical Area and 50 foot or better priority forest conservation/restoration through Forest Conservation Act implementation (applicable in all but Allegany and Garrett Counties). Efforts to move towards no net loss of forest may pursue additional overlay zones to more fully mitigate forest clearing outside of Priority Funding Areas.

These lots, because of their land use and density, are not currently serviced by traditional agricultural and forestry programs, such as the Soil Conservation Districts, and are typically not managed under county stormwater programs. Maryland has existing State and county level programs in place that could be combined to implement reforestation, and other forestry practices, on rural residential lands. Baltimore County coordinates their Rural Residential Stewardship Initiative project where the county designs and plants trees along with the landowners, who then agree to monitor and maintain the projects. Landowners are provided information materials describing why the County reforested their land and what the landowner can do to maintain the newly planted acres. For some landowners, participation in this project provides their property with enough forest that they enroll in the Department of Natural Resources FCMA/WAP programs. These programs provide property tax credits and result in continued management under a Forest Stewardship Plan.

GIS mapping of rural reforestation opportunities by land conservation status (publicly owned, conservation easement, low density not in easements, and different development potentials) should be conducted to show the opportunities for implementation. Bay Bank's Land Server may be able to determine eligible properties. Land Server also has the ability to link targeted lands to markets such as carbon sequestration to generate a higher incentive for the land owner. Once targeting is complete, outreach to these targeted landowners would be extensive. To successfully implement reforestation on

rural residential lands there needs to be a stewardship outreach and education component. This could be conducted by University of Maryland Extension Forestry Stewardship Educators and the watershed restoration specialists from the Watershed Assistance Collaborative. This could build on the recently developed trainings and landowner guide, "The Woods in Your Backyard". Another strategy to reach potential participants would be to solicit news coverage of planting projects in local newspapers, the outreach strategy that has been most successful for encouraging participation in the Backyard Buffers program that targets neighborhood streams. .

DNR forestry staff, Maryland Extension Service, and Forestry for the Bay can serve as a technical resources and train non-profit partners to implement this practice. The potential opportunity for these reforestation projects is high but requires extensive coordination and planning because there are so many different land owners. This is likely to require further development of a variety of techniques for tree planting and maintenance that are cost-effective and easily accepted by landowners and their neighbors. Non-profit organizations can be well-received and very effective in working with private property owners, so partnerships for implementation will be sought.

Estimated potential is 100 acres a year. Reductions are based on benefits of converting turf grass and open fields to trees. Tracking of forest cover is a fundamental need, and MD DNR Forest Service will develop techniques and pursue funding for biannual adequate tracking.

Implementation practices of this type are likely to become part of future stormwater nutrient reduction strategies for Phase I and Phase II MS4 jurisdictions. Where credit is taken for these practices under MS4 permits, it will be necessary to account for additional actions to achieve the overall nutrient reduction targets. This accounting matter will be addressed in the Phase II watershed implementation planning process.

Funding:
Beyond DNR assistance and county participation, the Hughes Center for Agro-Ecology is also a potential partner for funding and outreach support.

G) Urban Tree Canopy

Creating 200 acres a year of urban tree canopy (20,000 trees) has been identified as part of the 2017 reduction strategy. This has been incorporated in the modeling conducted by the Chesapeake Bay Program for this Phase II WIP development; current model credits use the difference between urban pervious and forest loading.

Strategy:
Maryland's commitment to the Chesapeake Bay Forest Conservation Directive has committed the State to implementing urban tree canopy goals based on reasonable expectations in gains by accounting for available lands and hydrologic flow paths in urban areas. The intent of the urban tree canopy in Maryland's goals was to target half of the older developed areas, particularly those developed prior to stormwater management, where urban trees may be particularly valuable for water and air quality. These areas are

established communities and city centers that the state has been encouraging to develop canopy assessments. Urban tree canopy is defined as at least 100 trees to an acre.

By March 2012, in time for the final WIP submission, Maryland will be assisting cities and communities in determining their goals based on existing urban tree canopy assessments. The Marylanders Plant Trees and TreeMendous Maryland programs and tracking mechanisms will be used. Existing programs including Tree City USA, Tree Campus USA, PLANT (People Loving and Nurturing Trees), and Green Schools will be used to encourage tree planting in developed environments. Urban tree canopy assessments and associated implementation plans will be used to the extent possible to effectively target future plantings.

Funding Strategy:
Implementation these practices are likely to become part of future stormwater nutrient reduction strategies for Phase I and Phase II MS4 jurisdictions. Consequently, the funding strategy for this practice will likely be embedded in the MS4 strategies in the future. MD DNR Forest Service will pursue continued funding and staff support for key implementation programs. Grant funding will be pursued for further supporting targeted planning and tree planting programs.

Schedule and Accounting of Implementation:
Some of the implementation practices of this type are likely to become part of future stormwater nutrient reduction strategies for Phase I and Phase II MS4 jurisdictions. In such cases the schedule of implementation will follow that of the MS4 pace of implementation. Where credit is taken for these practices under MS4 permits, it will be necessary to account for additional actions to achieve the overall nutrient reduction targets estimated for this practice above. Given the interest in urban reforestation, it is also possible that non-MS4 jurisdictions will contribute to this implementation strategy.

H) Strategies for Non-NPDES Regulated Urban Land

Non-Regulated Urban refers to those jurisdictions that do not have an NPDES MS4 permit or those areas not served by a stormwater collection system owned and operated by an MS4 jurisdiction. These areas are generally characterized as very low-density residential and rural residential urban land. These areas include lawns or large open areas that are not classified as Agricultural.

The strategies for these areas are contingent upon the implementation scenario submitted by the local jurisdiction. If the jurisdiction supplied a 2017 scenario, the scenario was adopted as is. If no scenario was provided, the following scenario was assigned for the non-regulated areas:

For all pervious areas, percentages of the E3* BMPs of Urban Forest Buffer and Urban Nutrient Management were used. E3 for forest buffer is 10% of all pervious urban land and urban nutrient management is 100% of all pervious urban land. Since the 2017 interim statewide goal is 60% of the final reduction targets (which is based on E3) a

simple calculation of 60% times the E3 percentage was used (i.e., Forest Buffers are applied to 6% of pervious urban land and Urban Nutrient Management is applied to 60%).

It is important to note, however, that these non-NPDES regulated urban areas have been subject to State Stormwater Management regulations since 1984, and all new development is required to comply with Maryland's Stormwater Management Act of 2007.

Funding Strategy:
The funding strategy for implementing these non-NPDES regulated urban practices will have many of the same elements described in the Phase I MS4 and Phase II MS4 sector target sections above.

* E3 refers to a theoretically maximum feasible implementation strategy developed by the Chesapeake Bay Program partners and is shorthand for "Everything implemented by Everyone Everywhere."

3. Natural Filters

Increasing forest acreage will directly result in nutrient and sediment reductions. Stricter preservation of forest will decrease the loads from new development. Both approaches are utilized in Maryland's WIP. The following list of practices is included in Maryland's 2009-2011 Milestone and implementation is expanded until 2017. One new strategy has been added, "Natural Filters on Other Public Lands." These natural filters are for implementation on public lands, specifically lands managed by the Department of Natural Resources, as well as other state agency lands and federal and local lands. Natural filter implementation on private lands is captured in the agricultural section of this report.

A) Tree Planting

Plant trees for a total of 3,450 acres by 2017

Strategy
Forests are our most strategically important natural resource. Trees protect water quality, clean our air and provide wildlife habitat. One large tree can eliminate 5,000 gallons of stormwater runoff each year, and well placed trees can help reduce energy costs by 15 to 35 percent.

Funding Strategy
Existing funding is available from the Chesapeake and Atlantic Coastal Bays Trust Fund, state operating and capital budgets and existing federal programs. A wide range of implementation options will be developed during Phase II WIP development. Two examples include tax incentives and statewide regulation for natural filter implementation. Maryland will also explore shifting its existing state work force to meet WIP staffing goals. Additional potential funding sources include Maryland's Ecosystem enhancement Program, Program Open Space, Chesapeake and Atlantic Coastal Bays Trust Fund, as well as competitive funding programs such as the Transportation Enhancement Program and Corporate Wetlands Restoration Partnership.

B) Wetland Restoration

Maryland will continue to restore wetlands on public lands through 2017. Wetlands are highly valuable lands in terms of their abilities to both improve water quality and as important habitat for many species.

Strategy
The strategy is to restore an additional 555 acres to meet the 2011 milestone commitment and, annually, through 2017, to restore 100 acres.

Funding Strategy
Dedicated funding is available through Maryland's Tributary and Wetland Restoration Fund. Additional existing funding is available from the Chesapeake and Atlantic Coastal

Bays 2010 Trust Fund, state operating and capital budgets and existing federal programs. A wide range of implementation options will be developed during Phase II WIP development. Two examples include tax incentives and statewide regulation for natural filter implementation. Maryland will also explore shifting its existing state work force to meet WIP staffing goals. Other potential funding sources include Maryland's Ecosystem Enhancement Program, Program Open Space, Chesapeake and Atlantic Coastal Bays Trust Fund, as well as the Transportation Enhancement Program, and Corporate Wetlands Restoration Partnership.

D) Streamside Forest Buffers

Plant forest buffers from 2010-2017

Strategy
Increase streamside forest buffers by 645 acres by 2017. Streamside forest buffers are linear wooded areas along rivers and streams that help filter nutrients, sediments, and other pollutants from runoff. These buffers remove nutrients from groundwater. In addition to their ability to improve water quality, their value for enhancing terrestrial and aquatic habitat make forest buffers a highly desirable practice.

Funding Strategy
Dedicated funding is available through Maryland's Tributary and Wetland Restoration Fund. Additional existing funding is available from the Chesapeake and Atlantic Coastal Bays Trust Fund, state operating and capital budgets and existing federal programs. A wide range of implementation options will be developed during Phase II WIP development. Two examples include tax incentives and statewide regulation for natural filter implementation. Maryland will also explore shifting its existing state work force to meet WIP staffing goals. Other potential funding sources include Maryland's Ecosystem Enhancement Program, Program Open Space, Chesapeake and Atlantic Coastal Bays Trust Fund, as well as the Transportation Enhancement Program, and Corporate Wetlands Restoration Partnership.

E) Natural filters on other public lands

Maryland will increase partnerships with local governments, non-profits and universities and also partner with other state agencies and federal lands to explore potential for additional natural filter implementation.

Strategy
Maryland will increase partnerships with local governments, non-profits and universities and also partner with other state agencies and federal lands to explore potential for additional natural filter implementation. DNR initiated a meeting with other large state public land owners to begin evaluating opportunities for natural filters on state lands. The state natural filter effort is expanding its scope to lands owned by the University of Maryland System, the Departments of Education, Health and Mental Hygiene, and Corrections, County Departments of Education, Health, and Parks and Recreation, and the Federal Departments of Defense, Education, Transportation, and Health and Human

Services. The current DNR Natural Filters program and Watershed Assistance Collaborative will coordinate and implement local land natural filter projects. The combination of both state and local public lands will allow implementation to occur whenever opportunities arise. Chesapeake and Coastal Bays Trust Fund priority watersheds will help define the target areas for potential buffer restoration projects and projects will be focused on these areas first.

Funding Strategy

The Chesapeake and Coastal Bays 2010 Trust Fund will be used to fund Natural Filters projects. Additional existing funding is available from competitive funding sources, the state operating and capital budgets and existing federal programs.

A wide range of implementation options will be developed during Phase II WIP development. Two examples include tax incentives and statewide regulation for natural filter implementation. Maryland will also explore shifting its existing state work force to meet WIP staffing goals.

Also, Maryland may provide additional restoration on Program Open Space (POS) purchases. The amount of acres that will be purchased is unknown from year to year but POS is typically a viable source for restoration acres given funding levels remain at current levels. Enhancement of existing easement programs may be an additional source of funding. To accomplish this modify the state land preservation programs (MALPF, Rural Legacy) by establishing a water quality BMP set-aside component, whereby a percentage of the monies paid to new enrollees in these preservation programs is sequestered and dedicated to implement natural filters. Tree plantings, wetland restoration and buffer plantings may be implemented on these properties.

4. Septic Systems

The installation of best available technology (BAT) to a septic system reduces nitrogen discharges by approximately 50%. The strategies below describe how BAT and other controls are being proposed to reduce septic system loads. The intent of this strategy is to provide a viable way for septic systems to achieve their fair share of the load reductions. It is acknowledged that this particular strategy is very costly and that less expensive alternatives, funded by septic system owners, might be identified in the future.

Base Programs that Provide Annual Reductions

The following list of practices is included in Maryland's 2009-2011 Milestone.

A) Continue Use of Best Available Technology for Septic Systems

The initial 2-Year Milestone (2009-2011) set a goal of upgrading 3,000 septic systems to best available technology (BAT)

Strategy
Maryland will continue the existing program of upgrading septic systems with BAT nitrogen removal technology. Based on this program and the estimated annual BRF funding of $7.8 million, Maryland projects the upgrade of 600 septic systems annually from FY 2012 thru FY 2017 for an additional 3,600 systems over six years. 90% or 3,240 of these systems are expected to be upgraded in Critical Area (CA).

Through fiscal year 2011, a total 2,959 systems were upgraded with BAT (2,854 in the Bay watershed; 1,724 in CA.

By the end of calendar year 2011, a total of 3,132 were upgraded with BAT; 1,880 of these systems are located in CA.

As of February 2012, a total of 3,170 were upgraded with BAT; 1,909 of these systems are located in CA.

Based on the design of the current program, and current funds, Maryland expects to upgrade a total of about 6,560 systems statewide through FY 2017. (See Strategy "C" below for a discussion of additional upgrades beyond the current program.)

Ensuring that nitrogen treatment and alternative systems are properly operating and maintained is a high priority for the State. As part of the approval process to be considered a best available technology for removing nitrogen (BAT) in Maryland, manufacturers and venders have been notified that a five-year service operation and maintenance contract must be included in the original purchase price. This is to include a limited warranty. The following items detail what is to be included in the five-year service contract and limited warranty.

- The manufacturer shall warrant all components of the treatment system financed through the Bay Restoration Fund to be free of defects in material and workmanship for five years from the date of purchase. The manufacturer may fulfill the terms of the warranty by repairing or replacing any components that show evidence of defect.
- The property owner shall be provided with an owner's manual that includes a description of the service policy and warrantee.
- A five-year service policy shall be provided to the property owner through the manufacturer or manufacturer designee and be in included in the initial purchase price.
- To provide service on a manufacturer's units, a service provider must be certified by the manufacturer.
- The manufacturer is responsible for certifying that service providers have adequate education and training to properly service the manufacturers units.
- It is the manufacturer's responsibility to revoke certification of any service provider that is not performing consistent with manufacturer's recommendations.
- Service visits must be performed at least at the frequency necessary to ensure that the system performs to the BAT approving standard. Unless stated otherwise, the approving standard is total nitrogen of 20 mg/l or less or at least 50 percent reduction in total nitrogen.
- Service visits should occur at a minimum of once per year and include inspection, adjustment and service of electrical, mechanical and other components of the system as deemed necessary by the manufacturer.
- Service visits should include observations of effluent quality including an assessment of odor, color, turbidity and scum.
- A report shall be completed and submitted to MDE after each service visit. The report shall include any condition that requires further attention and any corrective action that took place during the service visit.
- The property owner and MDE should be notified about any condition that could not be remedied at the time of inspection including an estimated date of correction.
- The service contract does not include the actual pumping and disposing of residual solids. The service provider shall notify the property owner of the necessary residual pump-out frequency.
- The manufacturer or designee shall make available for purchase, to the property owner, an extended service policy.
- Emergency service shall be available within 48 hours of a request.

B) Septic hookups to ENR plants

Strategy

MDE has been able through to fund connection of about 700 failing septic systems to Wastewater Treatment Plants with advanced nutrient removal technologies as part the 2-year milestone ended in 2011. The SRF loan and State Supplemental grants were used to cost-share these important projects as part of the 2-year milestone ended in 2011.

In the future, some BRF funds could be used for septic hookups. However, the BRF law is very restrictive in allowing the use of the Septic portion of the fund for Septic hookups to ENR plants. HB 57/SB539 signed into law during 2011 legislative session, expanded the use of BRF fees to include providing grants or loans for connecting properties in Critical area served by onsite sewage disposal systems to an existing ENR facilities. The grants or loans may be for up to the cost of BAT upgrade. In addition, in order to achieve 600 upgrades annually, all available BRF-Septic funds have to be committed to the BAT upgrades.

Based on MAST scenarios submitted by local jurisdictions and included in Maryland's input deck of BMPs to meet Phase II WIP interim targets, approximately 7,895 septic connections are proposed to be completed between 2012 and 2017, depending on the local government priorities and the availability of State funds.

Funding Strategy

These projects are funded by the Water Quality Revolving Loan Fund (WQRLF) loans and supplemental assistance grants. In addition, as described above, some projects could be funded by BRF.

The Supplemental Assistance Program provides grant assistance to local governments for planning, design, and construction of needed wastewater facilities. This program provides state grant funding for sewerage projects that are needed to address high priority public health or water quality problems. Funding priority is given to disadvantaged communities and/or communities that are non-compliant with their water quality permits. This Program helps pay for the connection of older, established communities with failing septic systems to public sewers. In addition, the Maryland Water Quality Revolving Loan Fund (WQRLF) established by the Federal Government in the Clean Water Act of 1987 (P.L. 100-4) makes below market rate of interest loans to local governments for water quality improvement projects.

Connection of 700 failing septics to WWTPs is being funded by the above programs as well as local government. In addition, over $1 million was provided by federal government to complete these projects. No additional funding will be needed to complete these projects.

The possible connection of 230 systems can also be funded by the above programs. To date, MDE provided almost $3.6 million in SRF and $0.5 million in Supplemental Assistance grants.

Additional $3.6 million in SRF and $1.4 million in Supplemental Assistance grants was authorized in FY 2011. No additional State funding will be needed. Local government will provide the remaining $3.6 million to complete these projects.

C) Upgrade septic systems with BAT

Strategy (beyond current program)
Upgrade of approximately 43,181 additional septic systems not planned for connection to WWTPs. These upgrades consist of 15,141 additional systems in the Critical Area, 15,498 additional systems outside the CA but within 1000 feet of a perennial stream, and 12,542 additional systems outside the CA and beyond 1000 feet of a perennial stream.

Of those systems, the existing program will fund upgrade of a total of 4,964 septic systems through FY 2017, leaving a remainder of about 38,200 upgrades to be accomplished through additional local, state requirements and cost-share loan and grant funding.

Upgrading septic systems in the Critical Area will be accomplished through a combination of funding and regulatory requirements. Current regulatory requirements will be gradually expanded. State law requires that new and replacement systems in the Critical Area are to be upgraded and, through calendar year 2012, that grant funds be provided for those upgrades of replacement systems.

During FY2012- FY13, Maryland will continue to assess options for upgrade and funding of septic systems. These options will account for recommendations in the Final Report of the Task Force on Sustainable Growth and Wastewater Disposal of the Septic Task Force and local WIP strategies. The State will develop a detailed strategy for implementation with the timeline and funding options which may account for owner's income and could increase the number of systems that can be upgraded using BRF funds. Other options being discussed are the potential for tax incentives or credits to incentivize upgrades. More detailed plan will be completed by the end of next milestone period.

D) Septic Systems Pumping

Strategy
Pumping of septic tanks is a BMP that results in the reduction of total nitrogen from this sector. This requires that a septic tank be pumped every three years on a routine cycle. To receive credit for this practice a tracking and reporting system is necessary. Records must also be maintained to ensure that the activities can be verified. For the Interim Strategy, local teams provided plans that include pumping of 25,325 septic systems on the requisite cycle between 2010 and 2017.

Funding Strategy
Currently there is no funding mechanism in place to implement this practice. The $250-$500 cost of pumping would most likely be borne by the homeowner; however, who pays may vary among local programs. Additional costs could be incurred to ensure that the wastewater treatment plant that accepts this waste has the hydrologic and treatment capacity to do so. Given the high concentrations of nutrients and other constituents in septage, investments might be need in pre-treatment works or upgrades to the main treatment plant itself for this strategy to be viable on a large scale.

5. Agriculture

Process

To develop the Phase II Watershed Plan for Agriculture, the Maryland Department of Agriculture facilitated a series of local Agricultural workgroup meetings in the summer and again in the fall of 2011 within each of the twenty-three counties of Maryland. The Agricultural Workgroups were modeled after the Tributary Strategy Workgroups and included a broad spectrum of stakeholders that represented and specialized in working with the agricultural community. These special teams were led by the local Soil Conservation Districts and focused on pollution reduction plans at the county level. The participants included farmers, Soil Conservation District planners, engineers, technicians, NRCS, FSA, University of Maryland Extension, County Agricultural Coordinators, agro-business, representatives from local watershed organization, Chesapeake Bay Foundation, Sierra Club, River Keepers, Maryland Farm Bureau, Delmarva Poultry Institute, Dairy Industry, county planning staff, DPW staff, and Health Department staff. Over 1,000 people participated in the meetings.

Because of the compressed time frame to develop a Phase II WIP, the preliminary meetings in all twenty-three counties were held in June and July prior to EPA providing the state the final loading reduction targets. Workgroup members began with information on current agricultural practices installed and discussed opportunities for further implementation with existing farm management practices and programs. The meetings also focused on local capacity to provide further reductions and the commitment of the participants to implement and develop a workable local strategy.

In September, 2011, EPA and MDE released the final TMDL allocation for all source sectors. The Agricultural load estimates changed with the new model and required the Agricultural Workgroups to reconvene and re-examine the individual local strategies. Meetings were scheduled from mid September to the end of October in all twenty-three counties. The Maryland Department of Environment had developed a new tool to assist all sectors with developing the WIPII by allowing test runs of management options to determine nutrient reductions. This tool, the Maryland Assessment and Scenario Tool (MAST) was first utilized by the Agricultural Workgroups. However, at the time, two of the three agricultural modules were not functioning and the tool was never calibrated so the results were of limited value.

Because the new model estimates required agricultural load reductions beyond the workable strategies developed in the first meetings, workgroup members were asked to develop a new set of plans that would require increased technical assistance and increased support for existing programs to achieve a greater load reductions.

Based upon the Agricultural Workgroup meetings the Agricultural Phase II WIP contains ten new Best Management Practices that provide additional water quality pollution reductions and are not part of the Phase II plan for Agriculture. The Agricultural Workgroups

developed strategy targets for each practice and they are incorporated into the Agricultural plan. The following are those new practices:

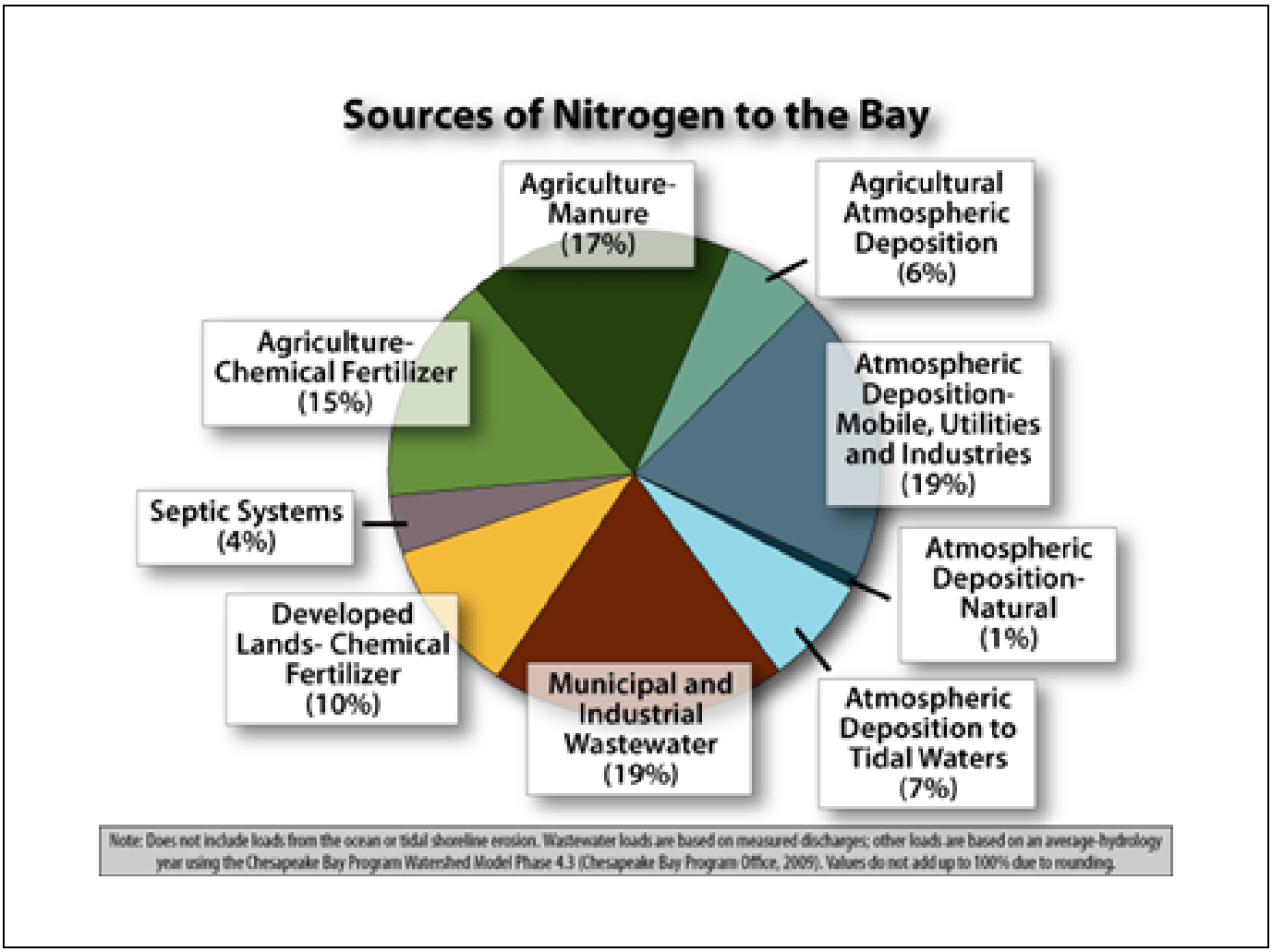
A. Enhanced Nutrient Management Tier I
B. Enhanced Nutrient Management Tier II
C. Enhanced Nutrient Management Tier III
D. Heavy Use Livestock Area Pads (Loafing Lots)
E. Structural, vegetative, non structural shore erosion control
F. Irrigation Water Capture and Reuse
G. Prescribed Grazing
H. Precision Intensive Grazing
I. Horse Pasture Management
J. Heavy Use Poultry Concrete Area Pads

Loads

Maryland agriculture loads to the Bay have reduced significantly over the last 25 years.[1] Implementation progress through 2010 show a 68% decline in agricultural loads for nitrogen, an 81% decline in phosphorus loads (delivered) as required to meet the TMDL goal. The agricultural sector will need to achieve an additional 23.7% reduction in nitrogen, and 11.5% in phosphorus loading from 2010 to meet the Final Target Load. Current agricultural loads to the Bay, in Maryland, constitute 38% of the total source sector loading in 2009, as the figure below illustrates.

[1] Data source: Chesapeake Bay Program Watershed Model P5.3_Loads-Acres_07302010 files for 1985 No Action compared to 2009 progress run.

Relative Responsibility for Loads to the Bay



Data source: Chesapeake Bay Program Watershed Model P5.3_Loads-Acres_07302010 files for 1985 No Action compared to 2009 progress run.

These figures represent 2009 Progress Delivered to the Bay (CBP Phase 5.3.2)

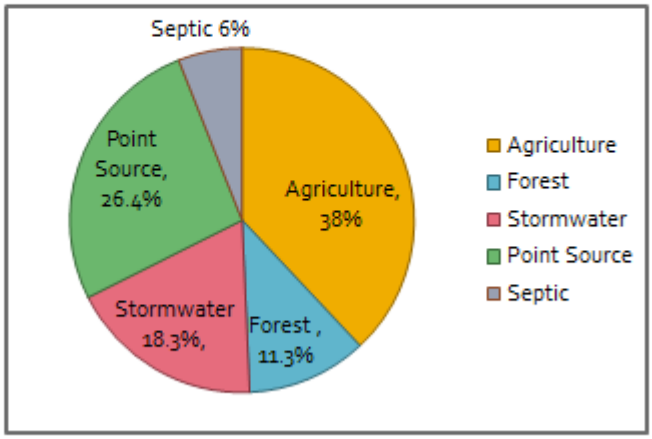
MD Sources of Nitrogen to the Bay

5.3.2 Bay Model

MD Nitrogen reductions needed to meet TMDL:

TOTAL
10.77 mill lbs.

AGRICULTURE
4.86 mill lbs.



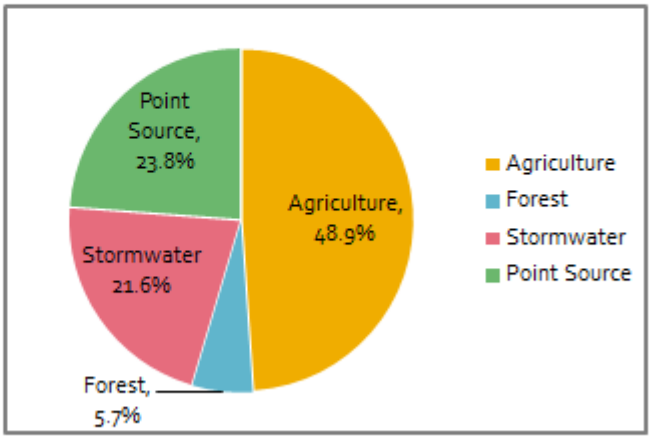
MD Sources of Phosphorus to the Bay

5.3.2 Bay Model

MD Phosphorus reductions needed to meet TMDL:

TOTAL
.49 mill lbs.

AGRICULTURE
.16 mill. lbs.



To meet the TMDL source sector goal Maryland Agriculture is required to achieve an additional 4.73 million lbs. of nitrogen reduction, and 189,000 lbs. of phosphorous reduction from 2010.

According to the Bay models from 2009 Progress, Agriculture is currently providing, on an annual basis, 8.9 million lbs. of nitrogen reduction, 555,000 lbs of phosphorous reduction, and 355 million tons of sediment reduction.

Maryland's agricultural plan to meet the sector goal will mainly focus on a nitrogen reduction strategy since this is the largest challenge. However, through additional implementation of the BMPs phosphorous and sediment reductions will be realized for these practices.

Working with the Bay Model

With the development of the Phase II WIPs, the Chesapeake Bay Program and EPA provided the states their associated load allocations and reduction targets utilizing a new model (version 5.3.2). Due to the time schedule to complete the TMDL process insufficient time was available to fully test and debug the model. Some of the major issues and concerns with the new model have occurred in the Agricultural component of the model that may ultimately affect the load associated with agriculture and our ability to account for our current progress in nitrogen, phosphorous, and sediment reductions. EPA has acknowledged this fact and with the Bay Program staff and the state's agricultural representatives has set up a process to evaluate and correct, where appropriate, any inaccurate assumptions within the model and develop a process to quantify the reduction potential for new Best Management Practices that the Agricultural community may be utilizing.

Maryland's Agricultural reduction plan contains a number of management actions that may not be receiving any credit in the current model or will not be reflected in the annual progress runs for the first 2 to 5 years. Accounting for and measuring progress towards clean up goals is critical and improving the accuracy of the model is of paramount importance if we are to assess the benefits for the farming practices that are planned.

Therefore, Maryland believes that the WIP Agricultural Strategy provides an implicit margin of safety that will exceed the reduction goals once the model's accuracy improves.

Maryland agriculture continues to be challenged by how the model treats animal manure. The issues revolve around the fact that even though farmers continue to implement animal waste management systems, barnyard roof runoff and heavy use areas/loafing lot management the CBP model indicates that we have already achieved 100% coverage. In addition, how manure is applied, crop uptake and disposal are also at issue as it relates to cropland. For 2012 the Chesapeake Bay Agricultural workgroup has committed to establish three expert review panels to evaluate and correct model assumptions as they relate to nutrient management, enhanced nutrient management, pasture and nursery nutrient management, cover crops, commodity cover crops, and continuous no till. Additional BMPs and model assumptions to be worked on by the Chesapeake Bay Program Agricultural

workgroup by 2017 include: crediting of livestock practices, utilizing current nutrient values of poultry litter, animal estimates for 2025, cropland irrigation management, phosphorus-sorbing materials (PSMs), liquid manure incorporation, poultry manure incorporation, vegetative environmental buffers, shoreline erosion practices adjacent to agricultural land, heavy use concrete poultry pads, shallow water wetlands, vegetated open channels, nutrient use efficiency for agronomic crops, non cost share BMPs, and container nursery and greenhouse runoff recovery and reuse.

In order to develop programs and policies to accelerate our implementation and gain further reductions, we need to recognize where within the agricultural sector the loads are coming from and focus our efforts to target our resources in effectively managing these loads. As mentioned previously, agriculture is responsible for 38% of the Maryland loading to the Bay in 2009. Within the 38% total Ag load, chemical fertilizer represents 22% of the nutrient inputs and animal manure contributes 12% of the load, with air deposition from chemical fertilization and livestock emissions providing an additional 5% of the total loading. The manure loads for livestock, that comprise 12% of the total loading, are derived mainly from poultry (6% of the total Maryland load) and an expanding horse population with beef cattle and dairy and swine providing a small percentage of the remaining load. Going forward, Maryland's plan to address further load reduction within the agricultural sector should recognize and reflect the diverse nature of where the agricultural loadings are originating and how to effectively manage them effectively.

Enhanced Programs that Provide Annual Reductions

Meaningful strategies to reduce nutrient and sediment loads in the agricultural sector will be based on three key elements. The first group of strategies focuses on applying effective conservation technologies in the management of agricultural land. Existing and evolving tools will provide water quality benefits locally and to the Chesapeake Bay as well as enhancing capacity to produce food and fiber. The second group of strategies revolves around the proper management of animal waste and related phosphorus issues. Using best available technology, Maryland will address critical challenges related to animal agriculture. The third group of strategy elements key on the sound use of crop nutrients and how to apply the latest refinements in agronomic recommendations, timing and methods of applications to maximize crop utilization and minimize potential for nutrient losses.

Agricultural Sector Capacity

<u>Staffing Capacity and Technical Assistance for Soil Conservation Districts</u>:
A comprehensive analysis of the resource needs to implement Maryland's Phase II Watershed Implementation Plan was conducted in 2011. The agricultural components of the strategy would require over 140 technical staff in the local soil conservation district and associated administrative staff to fully implement by 2025. In order to increase current levels of soil conservation and water quality plan coverage to 80% and to meet the WIP goal for this practice will require a doubling of the current planning staff in the SCDs. To meet the WIP goal for installing the 9,000 BMPs outlined in the plan will require a 50% increase in the current engineering and technical resources for Soil Conservation Districts.

Current state technical staffing in Soil Conservation Districts supports 79 FTE's. In addition, funding from the new Chesapeake Bay and Atlantic Coastal 2010 Trust Fund provided funding to Soil Conservation Districts to hire 15 temporary staff. In FY 2012, agricultural technical assistance funding from the Trust Fund was increased to support 5 additional technical positions previously funded by federal grants.

For FY 2013, the governor has proposed, pending legislative approval, to increase the support for Soil Conservation District technical assistance. The additional funding through the Trust Fund will provide Soil Conservation Districts support to hire 23 additional staff to help meet the agricultural WIP strategy goals.

MDA will continue to pursue additional staffing assistance through available funding opportunities.

Legal and Regulatory Capacity:
Through an EPA Chesapeake Bay Reporting and Accountability grant (CBRAP) the Maryland Department of Agriculture has created a position to assist CAFO and MAFO poultry operations with maintaining their compliance with their discharge permits and assisting with complaints about suspected pollution concerns with agricultural operations.

Additional Resources

USDA Farm Bill - Chesapeake Bay Watershed Initiative Summary:
NRCS has established three focus areas to demonstrate water quality improvements through expanded producer outreach efforts and intensive conservation planning and implementation activities. Maryland's "Showcase Watershed" was announced in June 2010 in the Upper Chester River watershed. The Upper Chester watershed covers about 23,300 acres. Fifty percent of the watershed is in Kent County and 49 percent is in Queen Anne's County. The majority of the land is farmland, poultry facilities, horse farms, nurseries and cattle farms. The SCDs have completed the initial phase of the project and have visited and inventoried 123 farms covering 23,000 acres. Current levels of conservation implementation planning have been assessed and staff are working to update soil conservation and water quality plans with the information.

Maryland is initiating a comprehensive program, through third party data collection, to inventory the significant number of BMPs that farmers have installed on their farms without technical or financial assistance. This under reporting of practices fails to accurately reflect the conservation efforts applied and how water quality benefits are measured. These previously unreported practices are not included in Maryland's Conservation Tracker database and have not counted towards our nutrient reduction crediting in the Bay model. Of greatest value are those BMPs implemented since 2006, that meet existing practice standards, when the model was last calibrated. This work will help to further our Conservation planning goals and assist in inventory existing resource concerns.

Maryland's Existing Nutrient Trading Program

The Maryland Nutrient Trading Program is expected to play a critical role in enhancing water quality in the Chesapeake Bay and its tributaries by providing economic incentives for the reduction of nitrogen and phosphorus loads. To ensure consistency with the Bay TMDL, State WIP II Strategy and EPA growth offset requirements, current trading policies will need to be updated. Updates may include changes to trading regions, credit values, credit sources, and offset requirements.

In the development of its nutrient trading program, the State of Maryland defined the role of water quality trading as an offset to accommodate both population and economic growth under a cap structured to produce no net increase in loadings and uses the local water quality standard of the TMDL as the baseline that applies to all sources.

MDE, through a public process, has developed the Maryland Policy for Nutrient Cap Management and Trading (Policy), which took effect on April 17, 2008. One aspect of Maryland's approach is unique. Other states allow trading in lieu of upgrading a WWTP. In Maryland, upgrade of major WWTPs is required and the Bay Restoration Fund (BRF) was instituted to fully fund these upgrades. Trading is not available as a substitute for the upgrades.

Nutrient reductions achieved through the upgrades must be maintained to meet Bay water quality goals. The Policy addresses both the need to achieve early nutrient load reductions from point sources through enhanced nutrient removal (ENR) upgrades and the need to address new or increased point source nutrient loads associated with a growing population. The need to address planned growth at point sources is met through various offset/trading options and requirements outlined in the Policy. Point source trades are implemented and enforced through discharge permits. This approach ensures that trades do not create cause or contribute to local water quality impairments. The permits also provide the vehicle for enforcement of the trade condition. The use of the discharge permit program ensures that credits are accountable, reliable, and enforceable. The Department will give the public notice when any conditions implementing trading have been included in the draft permit.

New point source dischargers with no allocation or existing point source dischargers requesting to increase their discharge load allocation must fully offset the resulting increased point source loading. Trading/offsets are being used to *maintain* caps by providing opportunities for growth, and secondarily as an option for providing an additional margin of safety to meet permit requirements.

Permittees may acquire either permanent or temporary credits/offsets or both. All permanent and temporary credits/offsets must be consistent with Maryland's trading policy with regard to being reliable, measurable, accountable, and verifiable

Maryland has not executed temporary trades. It's anticipated that a new treatment plant relying on credits from nonstructural practice whose credits might vary year to year, might show as a net limit of zero in their permit. It may also warrant more frequent verification.

In contrast, a new treatment plant that obtains credits/offsets via permanent trades, such as hookups of septic systems, would not show a permit limit of zero but instead would have a nonzero permit limit based on the existing wasteload allocation and the allocations obtained from the permanent trade (in this example BAT loads from septic connections).

In addition, the Maryland Policy recognizes redirection of flows and loads among facilities as part of an NPDES permit renewal or modification application. Such flow management is not considered trading. However, such flow management does not provide any relief from any federal, State or local requirements and provisions of the trading Policy.

Maryland retains authority over loadings that were allocated to a facility by the State but whose permit has since been terminated. These allocations may be used for future growth or for updated determinations regarding existing facility loads consistent with requirements to not cause or contribute to local water quality impairments.

Maryland will continue to work with EPA/Bay Program to further discuss/address if needed all unresolved recommendation common to all jurisdictions by the end of 2013.

Facts about the Nutrient Cap Management/Trading Policy (Phase I) are available with a summary of the Policy and frequently asked questions on the MDE website. For further information see the Policy for Nutrient Cap Management and Trading website: http://www.mde.maryland.gov/programs/Water/Pages/water/nutrientcap.aspx

Maryland nonpoint source trading policy supports offsets between point sources and nonpoint source, primarily from the agricultural sector. This nonpoint source framework allows trades to offset permitted point source loads as well as trades for other purposes, for example, environmental advocacy organizations purchasing loads to permanently retire credits. Offsets can only be generated once a farm has met certain baseline levels of conservation treatment and related load reductions.

The Maryland nonpoint source trading platform, an on-line system, incorporates both the Chesapeake Bay Program models and the national Nutrient Tracking Tool (or NTT) developed by USDA's Natural Resources Conservation Service. This system will initially begin with nutrient trades, but was designed with the capacity to add or "stack" both sediment and carbon. This same platform could also serve as the base for trading supplementary environmental credits generated by other ecosystem services such as wetland mitigation and habitat restoration. For more information on Maryland's Nonpoint Source Trading Program, visit http://www.mdnutrienttrading.com/

Much work has been put into the development of Maryland's Nutrient Trading Program, and a limited number of credit certifications have taken place to date. Maryland's Trading Program anticipates significant increase in agricultural credit certification during the first half of 2012. Through the Maryland Association of Soil Conservation Districts' Eco-Trading Project and three new initiatives in Kent, Howard, and Baltimore counties a large number of farms are currently being evaluated for trading potential.

Managing the Land to Improve Water Quality

A) Cover Crops

Nutrients may remain in the soil after a crop is harvested, regardless of nutrient uptake by summer crops, especially during drought years. During the winter, these nutrients, particularly nitrate, are subject to leaching to groundwater. To help prevent nitrate leaching, small grains (rye, barley or wheat) are planted without fertilizer in September or early October on land otherwise fallow over winter. The plants, in turn uptake the residual nitrogen into their tissues as they grow, preventing it from leaching to groundwater. In addition, the plants and roots of cover crops help anchor the soil to decrease erosion and reduce phosphorus losses, add organic matter to soil and help suppress weeds.

Strategy

Annually plant approximately 417,000 acres to cover crops by 2017. MDA's Winter Cover Crop Program provides cost share support to promote the planting of cover crops. Cover crops, no fall fertilizer is applied. Maryland has incentivized payment rates to maximize the program's effectiveness through increase funding for certain grain types, location, planting dates, and application methods. Maryland has an annual goal of 417,000 acres of cover crops on private lands.

B) Soil Conservation Water Quality Plans

A Soil Conservation and Water Quality Plan (SCWQP) is comprehensive plan that addresses natural resource management on agricultural lands and utilizes best management practices (BMPs) that control erosion and sediment loss and manage runoff. SCWQPs include management practices such as crop rotations and structural practices such as sediment basins and grade stabilization structures. At the request of a farmer, a Soil Conservation District, Maryland Department of Agriculture (MDA) or USDA professional works with the farmer to determine the group or system of practices needed to address specific erosion and runoff concerns on the farm. The practices are designed to control erosion within acceptable levels and to be compatible with management and cropping systems. A SCWQP can be used for up to ten years without revision if substantial changes in management do not occur. Nutrient reduction is only one of many benefits derived from SCWQPs. Also included in a SCWQP are recommendations concerning forestry management, wildlife habitat and plantings, pond construction and management, and other natural resource management recommendations.

Strategy

Local soil conservation district staff write plans for landowners and operators through a combination of state, federal and local trained planner staff. Plans need constant updates due to changes in the landscape, ownership or the operation and plans that expire after 10 years. All current plans that expire every ten years will need to be rewritten. Soil Conservation and Water Quality Plans will cover a total of over 1 million acres by 2017.

BMPs implemented as part of a SCWQP include grass swales, grass waterways, diversions, drop structures, contour strips, etc.

Funding
Soil conservation planners are funded through state general funds, federal Farm Bill funds, Chesapeake Bay and Coastal 2010 Trust fund and Chesapeake Bay Implementation grant funds. For staffing needs, see (P) Technical Assistance for Soil Conservation Districts below.

Funding Strategy
Cost share funding provided by MACS, and federal Farm Bill programs. (See Agricultural Sector Capacity, p. A-30)

C) Conservation Tillage

Conservation Tillage involves planting and growing crops with minimal disturbance of the surface soil. No-till farming, a form of conservation tillage, is used to seed the crop directly into vegetative cover or crop residue with no disturbance of the soil surface. Minimum tillage farming involves some disturbance of the soil, but uses tillage equipment that leaves much of the vegetative cover or crop residue on the surface.

Strategy
Maintain coverage at about 761,000 acres of conservation tillage. MDA will collect information on Conservation Tillage acres utilizing the National Agricultural Statistics Service (NASS) farmer survey data on the level of tillage implementation.

Funding
Incentives for farmers to utilize conservation tillage are currently farmer funded. (Funding strategy: see Agricultural Sector Capacity, p. A-30)

Funding Strategy
Continued incentive payment through Farm Bill programs

D) Water Control Structures / Drainage Management

A structure in a water management system that manages runoff from farm fields, controls the direction or rate of flow, maintains a desired water surface elevation or increases the retention time of the water.

Strategy
The practice may be applied as a management component of a water management system to control the stage, discharge, distribution, delivery, or direction of water flow. Water control structures function similar to a stormwater pond and provide in field retention of water to allow denitrification to occur. Maryland plan provides for up to about 10,000 acres of cropland managed by water control structures.

Funding Strategy
Currently 87.5% of the funding for this practice is available through the Maryland Agricultural Cost Share program and Farm Bill programs.

E) Stream Protection with Fencing

Direct animal contact with surface waters and resultant streambank erosion often results in nutrient loss from pastures and damage to waterways. Stream protection with fencing involves the fencing of narrow strips of land along streams to completely exclude livestock. The fenced areas may be planted to trees or grass, but are typically not wide enough to act as streamside buffers. If this is done, remote watering and stream crossings must be provided.

Strategy
Maryland's 2017 strategy includes installing an additional 20,956 acres of fencing.

Funding Strategy
Funding is provided by the Maryland Agricultural Water Quality Cost Share program (MACS) and Farm Bill programs.

F) Stream Protection without Fencing

This BMP involves the use of troughs or "watering holes" in remote locations away from streams, as well as the placement of stream crossings. Despite its designation in the Tributary Strategy documents, the stream crossings usually have some length of fencing adjacent so that livestock will not bypass the crossings. In some instances, trees are planted away from the stream to provide shade for the livestock.

Strategy
Maryland's 2017 strategy includes installing an additional 4,800 acres of the BMP.

Funding Strategy
Funding is provided by the Maryland Agricultural Water Quality Cost Share program (MACS) and Farm Bill programs.

G) Streamside Grass Buffers

Grassed Buffers are linear strips of maintained grass or other non-woody vegetation between the edge of fields and streams, rivers or tidal waters. Grassed buffers help filter nutrients, sediments and other pollutants from runoff, as well as remove nutrients from groundwater.

Strategy
Farmers and operators utilize grass buffers where forest buffers are not appropriate. New CAFO regulations require additional buffers. As part of Maryland's 2017 strategy up to 2,200 acres will be implemented.

Funding Strategy
Funding provided by MDA and USDA, Farm Service Agency through the CREP program.

H) Streamside Forest Buffers

Riparian Forest Buffers are linear wooded areas along rivers and streams that help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. In addition to their ability to improved water quality, their value at enhancing terrestrial and aquatic habitat make forest buffers an important BMP for natural resources managers.

Strategy
Maryland landowners and farmers utilizing the CREP program continue to convert land to riparian buffers. New incentive rates and stepped up outreach activities will encourage more participation. Part of Maryland's 2017 strategy will provide for an additional 900 acres.

Funding Strategy
Funding is provided by MDA and USDA for implementation and land rental rates

I) Wetland Restoration

Wetlands are highly valuable lands in terms of their abilities to both improve water quality and as important habitat for many species. A wetland is an area of land where the soil is wet or covered with water. Wetlands are often called swamps, marshes, or bogs. This strategy entails the reintroduction of wetlands in agricultural settings where they have been lost in the past.

Strategy
Focus on hydric soil and marginal lands and partner with government and private entities and landowners. Maryland's 2017 strategy calls for about 2,700 acres for this practice.

Funding Strategy
Cost-Share funds are available for the implementation of wetlands on eligible agricultural land through the Maryland Agricultural Water Quality Cost-Share (MACS) program, 2010 Chesapeake Bay Trust Fund, USDA's Conservation Reserve Enhancement Program (CREP), and other State and federal cost share programs. Funding for wetlands creation, restoration, and enhancement is also available from various federal sources, State and local governments and nonprofit organizations.

J) Retirement of Highly Erodible Land (HEL)

This option involves the removal of highly erodible land from crop or hay production. The land is planted into either grass or forest and is usually not disturbed for at least 10 years.

Strategy
Focus on steeply sloped areas. Maryland's 2017 strategy includes a goal of approximately 21,000 acres for this option.

Funding Strategy
Funding provided by MDA and USDA-Farm Services Agency through the CREP program.

K) Cropland Irrigation Management

Cropland under irrigation management is used to decrease climatic variability and maximize crop yields. The potential nutrient reduction benefit stems not from the increased average yield (20-25%) of irrigated versus non-irrigated cropland, but from the greater consistency of crop yields over time matched to nutrient applications. This increased consistency in crop yields provides a subsequent increased consistency in plant nutrient uptakes over time matched to applications, resulting in a decrease in potential environmental nutrient losses.

Strategy
Utilizing NASS data Maryland will begin tracking acres under irrigation for reporting to the Chesapeake Bay program. It is estimated that this will impact 119,000 acres.

Funding Strategy
Funding provided by Farm Bill programs.

L) Vegetative Environmental Buffers

A vegetative environmental buffer, or VEB, is the strategic dense planting of combinations of trees and shrubs around poultry houses to address environmental, production, and public relations issues. Research conducted by the University of Delaware have indicated that mature tree plantings can offer filtration benefits for poultry operations by entrapping dust, odor, feathers, and noise emitted by air exhaust from ventilation systems. Documentation on the effectiveness of VEB's in reducing nitrogen losses to the environment through ammonia emission reductions needs further research. This practice has been proposed as a land use change for the area directly planted to trees and shrubs. In 2012-2017, 500 acres vegetative environmental buffers will be implemented.

Strategy
Currently utilized and promoted by farmer and the poultry integrators. New research by ARS will help quantify benefits. Will resubmit results to the Chesapeake Bay Program for approved BMP efficiency.

Funding Strategy
The practice is currently promoted and being implemented with Farm Bill cost-share incentives.

M) Vegetated Open Channels

A suite of innovative alternative practices designed to enhance the removal of nutrients once they leave the field. These include increasing vegetative buffers that protect and process nutrients and sediment in drainage channels. This may include reengineering of drainage channels to slow flow, reestablish floodplains or redirect storm flows to offline wetland areas, and converting to environmentally friendly maintenance practices to mimic original stream characteristics.

Strategy
To manage on the eastern shore, draining to channels with vegetative buffers (see Grass Buffers). Maryland's Drainage Management program would incentivize cost share funding for maintenance activities to promote environmentally friendly options and practices.

Funding Strategy
Reestablishment of funding for Public Drainage Association maintenance activities as required under COMAR Agricultural 8-602 and 2 new FTE to manage maintenance and inspection activities. Investigate Trust funding and grant programs NFWF, CIG, etc.

N) Non-Urban Stream Restoration

Restoration of drainage channels and streams utilizing stream restoration techniques. Options include in-stream and riparian wetlands, tree shading, designing channels to reestablish natural flow paths and establishing habitat.

Strategy
Farmers and landowners could adopt this strategy to enhance in-stream flow and habitat improvements on about 29,000 linear feet.

Funding Strategy
Explore grants and Chesapeake Bay and Coastal Trust Fund for demonstration projects. Possible tax incentive to pay for implementation.

O) Structural, vegetative, and non-structural shore erosion

Stabilization of tidal shoreline from wave erosion. RIP RAP provides a 90% or greater reduction in erosion and vegetative shoreline with off-shore groins provides 75% reduction in erosion. Implementation of this practice to protect shorelines adjacent to agricultural land provides nutrient and sediment reductions as well as reducing erosion and stabilizing shorelines.

Strategy
Seven miles of shore stabilization projects on land that reduces erosion and stabilizes shorelines have been implemented and an additional 15,000 linear feet. Mitigation options to protect shorelines provide nutrient and sediment reductions.

Funding
Funding provided through the State Revolving Loan Fund, private landowners, and other federal and State sources. Explore options through the Farm Bill and the Chesapeake and Coastal Bays Trust Fund, and Living Shorelines Grant from the Chesapeake Bay Trust in partnership with NOAA and the Department of the Environment.

P) Prescribed Grazing

This practice utilizes a range of pasture management and grazing techniques to improve the quality and quantity of the forages grown on pastures and reduce the impact of animal travel lanes, animal concentration areas or other degraded areas. PG can be applied to pastures intersected by streams or upland pastures outside of the degraded stream corridor (35 feet width from top of bank). The modeled benefits of prescribed grazing practices can be applied to pasture acres in association with or without alternative watering facilities. They can also be applied in conjunction with or without stream access control. Pastures under the PG systems are defined as having a vegetative cover of 60% or greater.

MDA has 5 equine specialists to assist SCD staff in working with beef, dairy and horse community. Maryland's WIP calls for over 10,900 acres of grazing plans.

Q) Precision Intensive Rotational Grazing

This practice utilizes more intensive forms pasture management and grazing techniques to improve the quality and quantity of the forages grown on pastures and reduce the impact of animal travel lanes, animal concentration areas or other degraded areas of the upland pastures. PIRG can be applied to pastures intersected by streams or upland pastures outside of the degraded stream corridor (35 feet width from top of bank). The modeled benefits of the PIRG practice can be applied to pasture acres in association with or without alternative watering facilities. They can also be applied in conjunction with or without stream access control. This practice requires intensive management of livestock rotation, also known as Managed Intensive Grazing systems (MIG), that have very short rotation schedules. Pastures are defined as having a vegetative cover of 60% or greater.

MDA has 5 equine specialists to assist SCD staff in working with beef, dairy and horse community. Maryland's WIP calls for over 1,600 acres of new grazing plans.

R) Horse Pasture Management

Stabilizing overused small pasture containment areas (animal concentration area) adjacent to animal shelters or farmstead.

MDA has 5 equine specialists to assist SCD staff in working with beef, dairy and horse community. Maryland's WIP calls for over 2,990 acres of new grazing plans.

Managing Animal Waste, Biosolids and Phosphorus

A) Soil Phosphorus Balance

Maryland's goal is to provide sufficient soil phosphorus availability for agronomic optimum crop production while simultaneously minimizing the potential for off-site phosphorus losses from agricultural production fields to natural water bodies. Addressing this soil phosphorus balance requires a systematic approach to provide tools and technology that will work synergistically for the farmer and the environment. Our ability to accurately assess and meet the phosphorus needs of crop production must be balanced with implementation of our best science on phosphorus transport that will minimize the movement of phosphorus through surface or sub-surface drainage pathways. The best tools to evaluate the risk of phosphorus movement need to consider a wide array of factors and site conditions. As the understanding of off-site phosphorus dynamics has advanced it has become clear that less manure and biosolids will be land applied. These outcomes require management solutions that must also include economically viable alternative uses of animal manures, biosolids and other organic wastes. Development of market-based solutions that include value-added or energy-related technologies is essential.

<u>P Site Index</u>

The P Site Index is a site-specific assessment tool that identifies the relative risk for phosphorus losses from agricultural production fields to nearby bodies of water. The P Site Index is currently used in the development of agricultural nutrient management plans.

The State of Maryland currently is supporting development of a revised P Site Index that incorporates the best available science in an effort to more appropriately identify the risk for phosphorus loss from agricultural lands. The revised P Site Index will offer site-specific management options for not only reducing off-site phosphorus transport but also addressing soil phosphorus levels where elevated.

The P Site Index has been used in Maryland to implement nutrient management requirements since 2001. The length of program implementation has yielded a large

data-set allowing University of Maryland scientists to assemble information from 9000 fields from 2001-2008. University of Maryland researchers have analyzed this data to refine the P Site Index tool and better calibrate phosphorus risks. The methodology for calculating risk partitions nutrient pathways rather than averaging results as in original tool.

The process of revising the current P Site Index is a collaborative effort that began in late 2010 with a highly focused working session for soil P scientists from regional land-grant universities, hosted by the University of Maryland's College of Agriculture and Natural Resources, on December 9 and 10, 2010. The P science working session was followed by a technical workshop in spring 2011, at which draft revised P Site Index scenarios were vetted with technical, science policy and regulatory agency professionals with the goal of gathering input and suggestions for modification, improvement and refinement of the revised P Site Index. The expected revisions of the current P Site Index will more accurately assess P transport and delivery pathways across different landscapes, will incorporate site-specific soil P saturation information, and emphasize the importance of immediate manure and biosolids incorporation following land application. The science re-evaluation will improve prediction of the risk of off-site P transport by surface loss pathways in the western region of Maryland and more accurately assess the risk of off-site P transport by subsurface drainage pathways on the Eastern Shore. Initial preliminary review of probable revisions to the P Site Index indicates significant reductions in cropland eligible to receive additional phosphorus, particularly in areas of historically high concentrations of animal agriculture.

The information garnered at the technical workshop will be used to produce the revised P Site Index. Work began in 2011 to field test the new P index tool alongside the existing tool on over 400 sites. Soil test data has been completed and analysis is expected to be completed in the coming months. It is anticipated that the revised P Site Index will create an increased need for alternative uses of manure and biosolids, as opposed to land application on agricultural fields, especially in western Maryland and the lower Eastern Shore.

Beginning in 2013, the State will report aggregated data reflecting phosphorus applications to cropland within specifically defined geographic areas. Data will be gathered from annual nutrient management reporting information and will reflect phosphorus applications by crop type before and after changes to the P-site index. Additionally, the entire P-site index will be peer reviewed every five years by a scientific panel of subject matter experts, appointed by BayStat, beginning in 2011. This review of the P-site index will be based on the pounds of reduction of phosphorus applied for crop production as it relates to achieving the intended goal of minimizing transport and reducing phosphorus reserve levels in soil.

B) Manure Transport

The Manure Transport Program provides grants to help poultry and dairy producers transport excess manure off their farms. Animal producers with high soil phosphorus

levels or inadequate land to utilize their manure in accordance with the nutrient management plan can receive cost-share assistance of up to $20 per ton to transport excess manure to other farms or alternative use facilities that can use the product in an environmentally sound manner. Cost-share rates are 20 percent higher for farms located in Dorchester, Somerset, and Wicomico and Worcester counties in response to legislative requirement to target the Lower Eastern Shore due to the large number of poultry operations in this region and their potential impact on water quality.

Strategy
The Maryland Department of Agriculture coordinates and tracks manure transport to assure manure that is relocated to another farm or out of the watershed is utilized appropriately according to the sending and receiving farms nutrient management plan. Annually 35,000 tons of manure is relocated. Approximately 29,000 tons are transported out of the watershed. By 2017, the total relocated will be 60,000 tons, with 51,000 tons removed out of the watershed. Excess manure is transported away from farms with high soil phosphorus levels to other farms or locations that can use the manure safely.

Funding Strategy
Funding is provided by the poultry companies, state general funds,

C) Dairy Manure Incorporation

On fields that utilize dairy manure as fertilizer, the manure is incorporated into the soil at the time of application using low disturbance technology. This practice can reduce ammonia loss to the atmosphere by up to 95% compared to traditional surface application

Strategy
To help offset the cost to the farmer, custom applicators with the equipment are available if the demand is sufficient with an additional 16,700 acres of cropland utilizing this technology.

Funding Strategy
Cost share funding to offset the costs could be available from the Chesapeake and Coastal Bays Trust Fund and the Farm Bill programs. Equipment costs are currently eligible for income tax subtraction modification.

D) Poultry Litter Incorporation

Poultry litter is incorporated into the soil at the time of application as fertilizer utilizing minimum tillage technologies which significantly reduce ammonia loss. Research has shown it extremely effective in reducing both volatilization of N and sediment/P losses from rain events. Further N reductions will be realized by reducing the total N application because more ammonia is captured in the soil for plant utilization and less ammonia is lost to the atmosphere.

Poultry litter is incorporated into the soil at the time of application as fertilizer utilizing minimum disturbance technologies which significantly reduce ammonia loss.

Strategy
Currently farmers are utilizing vertical tillage equipment such as the "turbo till" to incorporate manure. A new injection technology is being used and demonstrated on the Eastern Shore of Maryland. Initial 2 years of funding through Conservation Innovative Grants (CIG) and National Fish and Wildlife Foundation (NFWF) grant sources are working with University of Maryland, Penn State and University of Delaware researchers to improve earlier prototypes for improved efficiency. Maryland has set a 2017 milestone goal of about 100,300 acres utilizing various incorporation options.

Funding Strategy
Funding incentives for incorporation are currently available through Farm Bill programs. MDA will investigate income subtraction modification legislative revision to offset equipment costs during the 2013 General Assembly session.

E) Poultry Litter Storage Structures

Animal Waste Management Systems are designed for the proper handling, storage, and utilization of wastes generated from animal confinement operations. Storage sheds are used for storing for solid wastes. Adequate storage ensures wastes are only applied when crops can use the accompanying nutrients and soil and weather conditions are appropriate.

Strategy
Provide adequate storage of poultry litter for all poultry operations.

Funding Strategy
Funding provided by the Maryland Agricultural Water Quality Cost Share program, the Chesapeake and Coastal Bays Trust fund, and Farm Bill programs.

F) Livestock Waste Storage Structures

Animal Waste Management Systems are designed for the proper handling, storage, and utilization of wastes generated from animal confinement operations and includes a means of collecting, scraping, or washing wastes from confinement areas into appropriate waste storage structures.

Strategy
Provide adequate storage for all livestock operations. Lagoons, ponds, or steel or concrete tanks are common structures used for the treatment and/or storage of liquid wastes while storage sheds or pits are used to store solid wastes. Controlling runoff from roofs, feedlots, and "loafing" areas are also part of these systems. Adequate storage ensures wastes are only applied when crops can use the accompanying nutrients and soil and weather conditions are appropriate.

Funding Strategy
Funding provided by the Maryland Agricultural Water Quality Cost Share program, the Chesapeake and Coastal Bays Trust Fund and Farm Bill programs.

G) Barnyard Runoff Control Systems

This practice retrofits existing animal waste storage structures that may not have runoff control. Runoff controls help prevent runoff from upslope areas and roofs to the feedlot or "loafing" area of animals. By controlling this runoff, potential waste nutrients to streams is kept in an area where it can be better managed. Animal confinement runoff control consists of practices such as upslope diversions and directed downspouts to minimize offsite water entering the facility.

Strategy
Retrofit older operations with roof runoff controls, or clean water diversions. Maryland's 2017 strategy is to retrofit about 430 acres.

Funding Strategy
Funding provided by the Maryland Agricultural Water Quality Cost Share program, the Chesapeake and Coastal Bays Trust Fund, and Farm Bill programs.

H) Phytase Enhancement

With the advent of phytase addition to the diet and feed for all poultry in Maryland we have seen a steady reduction in the phosphorus levels in the manure. In early 2004 the Bay Program documented a 16% reduction in P. More recent results show a 24% reduction. The research shows up to a 33% reduction is easily achievable. The current reduction efficiency is 16% current and would increase to 32% by 2017 based on field and production demonstrations. .

Strategy
Update the Chesapeake Bay model with the current 24% reduction. Continue monitoring of P levels in poultry manure to document further reductions.

Funding Strategy
None-Integrator funding

I) Drainage Phosphorus-sorbing Materials (PSMs)

The University of Maryland and the USDA Agricultural Research Service (ARS) have demonstrated through an existing research project at the University of Maryland-Eastern Shore the application of "Phosphorus-sorbing" materials to absorb available dissolved phosphorus in cropland drainage systems for removal and reuse as an agricultural fertilizer. These in-channel engineered systems can capture significant amounts of dissolved phosphorus in agricultural drainage water by passing them through phosphorus-sorbing materials, such as gypsum, drinking water treatment residuals.

Strategy
Based upon the research expand the use and retrofit ditches with water control structures with PSM filters. Provide for up to 3,000 acres of cropland drainage with additional P removal.

Funding Strategy
Potential funding through Farm Bill programs or the Maryland Agricultural Water Quality Cost Share program (MACS).

J) Poultry Litter Treatment

A surface application of alum, an acidifier, is added to poultry litter to acidify poultry litter and maintain ammonia in the non-volatile ionized form (ammonium) (reference see Developing Best Management Practice Definitions And Effectiveness Estimates For Nitrogen, Phosphorus And Sediment In The Chesapeake Bay Watershed Final Report December 2009 Dr. Thomas Simpson and Sarah Weammert University of Maryland Mid-Atlantic Water Program).

Strategy
Expand the use by growers by offsetting the cost for utilization. The proposed option could apply to 270 operations of poultry manure.

Funding Strategy
Limited funding through Farm Bill programs for 3 year usage. Work with NRCS to expand utilization and contract limits.

K) Mortality Composting

Composting provides a safe and desirable method for disposing of dead birds by converting nitrogenous materials (manure and birds) and carboniferous materials (straw or sawdust) into a humus-like substance that can be used as a nutrient source for soil building and healthy plant growth. Composting substantially reduces the volume of carcasses, kills pathogens, prevents odors and produces a stable, odorless, humus-like material that is useful as a nutrient source and soil amendment.

Strategy
Requires separate dead bird composters at all poultry operations for bird mortality as part of all CAFO operations. The proposed option could apply to 87 operations.

Funding Strategy
Funding provided by MACS and Farm Bill program.

A) Heavy Use Livestock Area Pads

Provide stabilization by installing concrete pads to protect an area on a farm which is being utilized frequently and intensively by livestock or farm equipment. The purpose of this practice is to stabilize facility areas on the farm which are disturbed due to frequent and intense livestock or equipment use in order to prevent or abate pollution of the waters of the State. This practice is currently required for all CAFO livestock operations by EPA Compliance Program to provide protection for manure to come in contact with the ground. However, EPA Chesapeake Bay Program asserts that this practice provides no water quality benefit but may serve as a source of increased impervious cover,

Strategy
This practice may be applied only to farms which have been determined to have severe erosion and existing or the potential for water quality issues along areas of frequent and intense livestock or equipment use, and where there is a need for properly designed artificial or vegetative cover in order to prevent the delivery of animal waste, sediment and nutrients to the waters of the State. Maryland's 2017 goal is to implement pads at 145 acres. Funding provided through the Maryland Agricultural Water Quality Cost Share Program.

Funding
Funding provided through the Maryland Agricultural Water Quality Cost Share Program and Farm Bill program.

B) Heavy Use Poultry Area Concrete Pads

Provide stabilization by installing concrete pads to protect an area on a farm which is being utilized frequently and intensively by livestock or farm equipment (only if specifically for areas adjacent to the entrance of a poultry house or poultry waste storage structure). The purpose of this practice is to stabilize facility areas on the farm which are disturbed due to frequent and intense livestock or equipment use in order to prevent or abate pollution of the waters of the State. This practice is currently required for all CAFO poultry operations by EPA Compliance Program to provide protection for manure to come in contact with the ground. However, EPA Chesapeake Bay Program asserts that this practice provides no water quality benefit but may serve as a source of increased impervious cover

Strategy
This practice may be applied only to farms which have been determined to have severe erosion and existing or the potential for water quality issues along areas of frequent and intense livestock or equipment use, and where there is a need for properly designed artificial or vegetative cover in order to prevent the delivery of animal waste, sediment

and nutrients to the waters of the State. Maryland's 2017 goal is to implement pads at 74 acres. Funding provided through the Maryland Agricultural Water Quality Cost Share Program.

Funding
Funding provided through the Maryland Agricultural Water Quality Cost Share Program and Farm Bill program.

Managing Fertilizer and Manure Applications

A) Nutrient Management

Nutrient management plans outline the optimum use of nutrients to minimize nutrient loss while maintaining crop yield. Soils, plant tissue, manure and/or sludge tests are used to develop application rates that meet projected crop yields based on soil productivity or historic yields of a site. With plan implementation, farmers follow guidelines for the amount, timing, and placement of nutrients on each crop. Plans are prepared by the University of Maryland Extension and certified private consultants and are typically revised every year but may be written for up to three years to incorporate management, fertility and technology changes.

Strategy
Plans are written by certified private sector nutrient management planners and local University of Maryland Extension staff. Regulatory compliance and enforcement is the responsibility of MDA. Maryland's 2017 goal is for 808,617 acres to be under a nutrient management plan, the rest of the acreage will be covered under decision agriculture and enhanced nutrient management tier I, II, and III.

Funding Strategy
Funding is provided by state general funds and the Chesapeake and Coastal Bays Trust fund to support MDA regulatory compliance staff and UM Extension technical assistance to farmers. MDA will continue to work with the EPA Tracking and Accountability grant to support program enforcement capacity.

Nutrient Management Nursery
Nutrient management plans outline the optimum use of nutrients to minimize nutrient loss while maintaining plant growth. Species specific plant fertilization rates are used to develop applications. With plan implementation, nursery operators follow guidelines for the type, amount, timing, and placement of nutrients for each variety of plants. Plans are prepared by the University of Maryland Extension and certified private consultants and are typically revised every year but may be written for up to three years to incorporate management, fertility and technology changes.

Strategy
Plans are written by certified private sector nutrient management planners and local University of Maryland Extension staff. Regulatory compliance and enforcement is the

responsibility of MDA. Maryland's 2017 goal is for 1,836 of nursery acres to be under a nutrient management plan

Funding Strategy
Funding is provided by state general funds and the Chesapeake and Coastal Bays Trust fund to support MDA regulatory compliance staff and UM Extension technical assistance to farmers. MDA will continue to work with the EPA Tracking and Accountability grant to support program enforcement capacity.

B) Decision Agriculture

Decision Agriculture is used to improve the agronomic, environmental and economical management of crop production in accordance with in-field variability. This management requires the use of a GPS (Global Positioning System) and information management tools such as GIS (Geographic Information System) to input field conditions and assess management information and understand variable management requirements. Precision soil sampling, PSNT testing, variable rate nutrient application, and record keeping/yield monitoring using GPS/GIS software are implemented by agricultural operations to nutrient rates and placement are optimized. There are numerous software programs and agricultural equipment on the market that a program participant may use.

Strategy
Maryland's 2017 goal is for 358,944 acres of cropland utilizing this management option. MDA is working with the University of Maryland in demonstrating and testing innovative equipment, and conducting research to quantify the nutrient reduction. This will be submitted to the Chesapeake Bay Program to adopt as a nutrient reduction efficiency. The University of Maryland Extension and agri-business community will provide equipment and training for operators.

Funding Strategy
Chesapeake and Coastal Trust Fund is providing demonstration funding and technical staff to work with farmers. Farm Bill program is providing a per acre payment for adoption of management option on the farms.

C) Enhanced Nutrient Management Tier I

Based on research, the nutrient management rates of nitrogen application are set approximately 35% higher than what a crop needs to ensure nitrogen availability under optimal growing conditions. In a yield reserve program using enhanced nutrient management, the farmer would reduce the nitrogen application rate by 15%. An incentive or crop insurance is used to cover the risk of yield loss. This BMP effectiveness estimate is based on a reduction in nitrogen loss resulting from nutrient application to cropland 15% lower than the nutrient management recommendation. The effectiveness estimate is based on conservativeness and data from a program run by American Farmland Trust.

Strategy
Maryland's WIP provides for 31,223 acres of cropland utilizing this management option by 2017. MDA is working with the University of Maryland in demonstrating and testing innovative equipment, and conducting research to quantify the nutrient reduction. This will be submitted to the Chesapeake Bay Program to adopt as a nutrient reduction efficiency. The University of Maryland Extension and agri-business community will provide equipment and training for operators. A number of field days have been held with the farm community to increase the education and utilization of this option.

Funding Strategy
Chesapeake and Coastal Trust Fund is providing demonstration funding and technical staff to work with farmers. Farm Bill program providing a per acre payment for adoption of management option on the farms.

D) Enhance Nutrient Management Tier II

Based on research, the nutrient management rates of nitrogen application are set approximately 35% higher than what a crop needs to ensure nitrogen availability under optimal growing conditions. In a yield reserve program using enhanced nutrient management, the farmer would reduce the nitrogen application rate by 30%. An incentive or crop insurance is used to cover the risk of yield loss. This BMP effectiveness estimate is based on a reduction in nitrogen loss resulting from nutrient application to cropland 30% lower than the nutrient management recommendation. The effectiveness estimate is based on conservativeness and data from a program run by American Farmland Trust.

Strategy
Maryland's 2017 goal is for 31,223 acres of cropland utilizing this management option. MDA is working with the University of Maryland in demonstrating and testing innovative equipment, and conducting research to quantify the nutrient reduction. This will be submitted to the Chesapeake Bay Program to adopt as a nutrient reduction efficiency. The University of Maryland Extension and agri-business community will provide equipment and training for operators.

Funding Strategy
Chesapeake and Coastal Trust Fund is providing demonstration funding and technical staff to work with farmers. Farm Bill program providing a per acre payment for adoption of management option on the farms.

E) Enhanced Nutrient Management Tier III

Based on research, the nutrient management rates of nitrogen application are set approximately 50% higher than what a crop needs on hayland and pasture to ensure nitrogen availability under optimal growing conditions. In a yield reserve program using enhanced nutrient management, the farmer would reduce the nitrogen application rate by greater than 50%. This BMP effectiveness estimate is based on a reduction in nitrogen

loss resulting from nutrient application to hayland and pasture 50% lower than the allowable nutrient management recommendations. The effectiveness estimate is based on conservativeness and data from a program run by American Farmland Trust.

Strategy

Maryland's 2017 goal is for 54,495 acres of cropland utilizing this management option. MDA is working with the University of Maryland in demonstrating and testing innovative equipment, and conducting research to quantify the nutrient reduction. This will be submitted to the Chesapeake Bay Program to adopt as a nutrient reduction efficiency. The University of Maryland Extension and agri-business community will provide equipment and training for operators.

Funding Strategy

Chesapeake and Coastal Trust Fund is providing demonstration funding and technical staff to work with farmers. Farm Bill program providing a per acre payment for adoption of management option on the farms.

F) 100 foot or 35 foot required setbacks for CAFO manure application

There are different strategy options and each CAFO or MAFO will have a slightly different mix of BMPs depending on the specific farm. There are a number of agricultural management practices that will be implemented on CAFO/MAFO farms (e.g., nutrient management, heavy use area pads, manure storage, manure transport) and we have not accounted for them under the permit section. When the benefits of the permit are accounted for the agricultural practices can be added. Based upon EPA regulations for CAFOs the field spreading of manure is restricted to maintain a 100 foot setback from streams. The setback restriction is reduced to 35 feet if the setback area is vegetated.

Strategy

This is a regulatory requirement of the CAFO permit for field spreading. It will require farmers who spread manure to maintain up to 1,500 acres of current cropland in a permanent buffer for compliance.

G) 10 foot required setbacks for all fertilizer application

MDA and MDE have discussed this option as a way to bring consistency to several programs regulating nutrients, and ensure that commercial fertilizer and sludge is applied in a manner that provides adequate buffer protection. Application of this option requires buffering of 3,168 acres. The strategy would require a regulatory change.

H) Irrigation Water Capture Reuse

This practice involves the collection of runoff water from container nursery operations where runoff of irrigation water and leachate from plant containers grown on plastic or in greenhouses is routed to lined return ditches or piped to lined holding ponds. Ponds

would be designed to retaining all excess irrigation water runoff or leachate and capturing the first one-half to one-inch of stormwater runoff. Water would be re-circulated for irrigation in nursery and greenhouse operations or irrigated at the proper times of year on other vegetation capable of trapping nutrients at agronomic rates, such as cool season grasses. Proposed BMP efficiency would be the same as for an animal waste storage system: 75% N reduction, 75% P reduction. This BMP is requested by Virginia DCR.

Strategy
Maryland's 2017 goal is for 1,900 acres to be included in irrigation water capture reuse.

Contingencies for Slow or Incomplete Implementation in the Agricultural Sector

Maryland's 2017 Interim Target Strategy for the agricultural sector is projected to achieve 83% of the Final Target. The mix of BMPs is sufficient to ensure that if some of the strategies are not achieved, then others will enable Maryland to achieve an implementation pace of 60% progress toward the Final Target by 2017.

In addition, conservation program evaluations document a significant number of BMPs that farmers install on their farms without technical or financial assistance. The undocumented "voluntary BMPs" provide further assurance in a way that addresses the intent of contingencies. Below is a description of Maryland's strategy for tracking and reporting the benefits of voluntary BMPs in coordination with the Chesapeake Bay Program.

Voluntary BMPs

Many voluntary practices are not reported, because routine reporting mechanisms are based on government cost sharing programs. Because voluntary practices vary in their design and construction, reporting them is complicated by the question of whether or not they meet existing practice standards. The under-reporting of voluntary practices fails to accurately reflect the conservation efforts applied and how water quality benefits are measured. While these practices are currently not included in Maryland's Conservation Tracker database, Conservation Tracker has the structural capacity to house this information. Of greatest value are those BMPs implemented since 2005 when the model was last calibrated. Maryland plans to implement a system by which to more accurately identify such BMPs and work with the CBP to determine the appropriate nutrient reduction efficiencies to be assigned to these practices.

Strategy
MDA is working collaboratively with other Bay State partners to develop a definition and reporting protocol for voluntary BMPs. Funded by NRCS and led by the National Association of Conservation Districts, the project will establish a means by which to credibly identify and track BMPs implemented outside state and federal cost share programs.

Maryland will also be initiating a pilot program where soil conservation districts would conduct on farm walking inventories of all of the current practices farmers have installed

without incentives. An on-farm nutrient calculation tool will be utilized to assess the farm and to analyze additional management options. EPA CBP needs to set BMP efficiencies for practices that provide water quality protection but do not meet NRCS standards and specifications.

In 2011 the Upper Chester River Showcase Watershed Assessment was conducted and quantified the strong conservation commitments of the farm community as well as the extent that farmers install conservation practices on their own outside of government cost share assistance. Within the 23,000 acre watershed farmers had installed over 931 Best Management Practices of which 320 or 33% were previously unreported. Also in 2011 the Howard Soil Conservation District is inventorying over 250 farms which will assess all the existing practices that have never been documented and reported as providing a water quality benefit. In 2012 Baltimore Soil Conservation District will be utilizing a similar approach to report on the extent of their non cost shared Best Management Practice implementation.

Funding

In addition to the funding provided by NRCS to NACD, MDA has received a Conservation Innovation Grant (CIG) to pilot the process to conduct on-farm assessments.

6. Air

MDE's Air and Radiation Management Administration (ARMA) continues to implement aggressive nitrogen oxide (NOx) emission reduction programs in Maryland to help the State meet Clean Air Act Requirements and to reduce air deposition to the Bay. ARMA research shows that states upwind of Maryland are responsible for about 70% of Maryland's air quality problem. Because of this, ARMA has also pushed EPA to adopt federal rules to reduce NOx emissions from these upwind states. ARMA is also working with other states to use other tools in the Clean Air Act (Sections 126, 110, 176A and 184) to insure that these reductions in upwind states become effective.

The total NOx reductions in 2020, from both the Maryland rules and the potential federal rules, will be almost twice as large as the NOx reductions currently used to determine air benefits as part of the Bay allocation process. Examples of State NOx reduction efforts include the Maryland Healthy Air Act, one of the countries most aggressive power plant control programs, the Clean Cars Program, which requires that cars sold in Maryland meet the toughest NOx emission standards allowed by law and several consent orders that reduce NOx emissions.

Federal rules that are in the works that will dramatically reduce NOx emissions east of the Mississippi include the Cross State Air Pollution Rule # 1 (a power plant rule to meet older standards); the Cross State Air Pollution Rule #2 (a second federal rule, needed to meet the new ozone standard, will include additional NOx reductions in the 2020 time frame from power plants, industrial and commercial boilers and cement kilns); and the Tier 3 Vehicle/Low Sulfur Fuel program (a mobile source rule that will dramatically reduce NOx emissions in the 2017 time frame).

Base Programs that Provide Annual Reductions

A) Maryland Healthy Air Act

Implement Maryland's Healthy Air Act (effective January 1, 2009). More than one-third of the pollution entering the Chesapeake Bay comes from the air. Pollutants released into the air (primarily from power plants and vehicle emissions) eventually make their way back down to the earth's surface and are dispersed onto the land and transported into waterways. The emission controls on power plants will reduce nitrogen entering the Bay by up to 300,000 pounds each year and will reduce mercury significantly.

Additional Program, Practices and Policies to Meet the 2017 Goal for Air

B) Low Emission Vehicle Requirement

Maryland is implementing the California low emission vehicle requirements. Small reductions will begin in 2013 and be annual.

C) Expand Diesel Engine Retrofit Program

Currently the Port of Baltimore is partnering with the Environmental Finance Center to use stimulus money to retrofit dirty diesel truck engines to 'clean diesel' technologies. One possible strategy is to expand this program to reduce emissions and ultimately a portion of deposition.