Special Report on the Importance of Meeting Pennsylvania's Chesapeake Bay Nutrient Reduction Targets

Executive Summary

Figure 1. Source: PennFuture

The Commonwealth of Pennsylvania has economic and environmental incentives to step up its efforts to comply with U.S. Environmental Protection Agency (EPA) requirements to reduce nutrient and sediment pollution in the Chesapeake Bay watershed, which extends throughout much of the central and eastern parts of Pennsylvania.

A 2010 federal mandate requires the Commonwealth, by 2025, to reduce an assigned share of the nitrogen, phosphorus, and sediment affecting the unhealthy Bay.[1] To achieve the mandated pollution reduction levels, Pennsylvania memorialized its pollution reduction strategies in a Watershed Implementation Plan[2] (WIP).

EPA's oversight includes a 2017 mid-point check-in, by which time 60 percent of the WIP strategy must be in place; otherwise, regulatory consequences (e.g., requiring additional pollution reductions from point sources such as wastewater treatment plants, increasing federal enforcement and compliance in the watershed, and prohibiting new or expanded pollution discharges[3]) will be imposed by EPA. In order to ensure compliance with the required reductions, the Commonwealth must accelerate its work to reduce the amount of nitrogen and sediment released into the Chesapeake Bay watershed by 2017.
Currently the Commonwealth appears to be close to target for phosphorus reduction; however, nitrogen and sediment reduction is not on target to hit the 2017 goals. Numerous studies have shown that the principal sources of nitrogen pollution are from the agricultural sector, municipal stormwater runoff, and sewage treatment plants.

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Excess nutrients and sediment — transported to the Bay by the Susquehanna and Potomac rivers and their tributaries — contribute to "dead zones" in the Chesapeake Bay.

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The Chesapeake Bay Foundation's 2014 State of the Bay report gives a grade of D+ for the current health of the Bay. The grade represents an improvement in water quality indicators from 2010, but also indicates that significant improvement is still needed.

Because of Auditor General Eugene DePasquale's long-standing concern about water quality and potentially negative economic impact if the Commonwealth does not meet the 2017 nutrient reduction targets, the Department of the Auditor General reviewed this critical issue. There would be significant economic consequences for Pennsylvania taxpayers if the EPA mandates further regulatory changes such as costly pollution discharge

[1] EPA's Notice for the Establishment of Total Maximum Daily Load (TMDL) for the Chesapeake Bay. *See http://www.epa.gov/chesapeakebaytmdl/*
[2] http://www.depweb.state.pa.us/portal/server.pt/community/chesapeake_bay_program/10513
[3] http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/FrequentlyAskedQuestions.html

prohibitions. However, the Commonwealth and stakeholder industries still have time to implement solutions to meet the 2017 and 2025 sediment and nutrient reduction targets. Developing its own solution might be more efficient and could be less costly than the EPA's possible mandates. The primary goal should be to protect Pennsylvania taxpayers while protecting and improving the water quality in the Chesapeake Bay region.

One of the more financially appealing options is an effective and efficient nutrient credit trading program that provides for a more cost efficient method for National Pollutant Discharge Elimination System (NPDES) permittees to meet their effluent nutrient limits[4] because it allows local choice while using the market system to create competition and innovation. However, this is not a silver bullet resolution to the complex factors affecting waterways. It is important for the Commonwealth to continue to review and implement other industry best practices, in dealing with both agricultural and municipal stormwater run-off issues. Specifically, Pennsylvania's Department of Environmental Protection (DEP) must continue to work with the agricultural sector, as well as municipalities, to implement the necessary practices to achieve the nutrient reduction targets, future benchmarks and regulatory mandates.

Background

Given that both the Susquehanna and Potomac rivers feed into the Chesapeake Bay, Pennsylvania plays a significant role in the regional ecosystem of the Chesapeake Bay Watershed. Although Pennsylvania has only a small portion of the Potomac watershed, the Susquehanna River and its corresponding streams and tributaries contribute 50 percent of the water that empties into the Chesapeake Bay. While providing necessary resources, these waterways also contribute to the pollution of the Chesapeake Bay, which occurs through an accumulation of sediment and various nutrients as their waters flow out into the Bay.

In 1983, the Chesapeake Bay Program was established based on a cooperative partnership between the EPA, Maryland, Pennsylvania, Virginia, and Washington, DC with the hope of restoring health to the Bay. In 2000, the Bay signatories signed a new agreement to establish allowable levels, which were to be achieved by 2010, for various point and non-point sources of nutrients. These newly established levels included such sources from agriculture, wastewater treatment plants, stormwater management systems, and products such as phosphorus-laden detergents.

From 2004 to 2006, Pennsylvania worked with its watershed partners to develop a nutrient-credit trading program. This program was established to help municipalities achieve newly established pollution limits for wastewater treatment plants in a more cost-effective manner. The nutrient-credit trading program allowed entities that exceeded their own requirements to sell their extra credits to municipalities that were unable to meet their limits.

In 2008 it became clear that the 2010 goal would not be achieved, thus the partnership was transformed by the EPA into a mandatory pollution-reduction program under the auspices of the Clean Water Act. The program to reduce the nutrients and sediment established Total Maximum Daily Loads (TMDL), or levels of pollutants that were essentially "pollution allowances" for the whole Chesapeake Bay watershed. These levels were then extrapolated over time to provide milestones that would achieve acceptable levels in order to stabilize the environment and reverse some of the effects of pollution on

[4] http://www.portal.state.pa.us/portal/server.pt/community/nutrient_trading/21451

the Chesapeake Bay. In 2010, the EPA issued TMDLs and established final goals to be achieved by 2025, as well as a 2017 interim goal of completing 60 percent of the commitments.

This special report by the Department of the Auditor General explores a number of potential options available to the Commonwealth in order to improve its chance of meeting the targets at their corresponding deadlines and avoiding costly sanctions.

Discussion

Each state that is part of the Chesapeake Bay Watershed ecosystem has been allowed to design its own nutrient reduction plan, referred to as a Watershed Improvement Plan (WIP). The EPA reviews and enforces these plans and is authorized to mandate additional regulations[5], for instance, affecting Pennsylvania farmers and/or municipal sewage treatment plants. Therefore, the Commonwealth must continue in earnest to ensure that Pennsylvania develops programs and technologies to meet nutrient reduction targets.

Wastewater Treatment

Rather than mandating upgrades to all major sewage treatment plants, Pennsylvania chose the more cost-effective option of allowing municipalities to meet their more stringent permit limits by investing in other practices to achieve nutrient reductions in the watershed. These off-site alternatives are referred to as nutrient trading programs.

For example, a Lancaster municipality provided funding assistance to a local farmer who put more acres into nitrogen-reducing farm practices, such as no-till farming. This investment, combined with a more modest plan for upgrading its sewage treatment facility, achieved the same total pollution reductions at reduced costs for that municipality. This is an example of a partnership between multiple sectors, which may not single-handedly bring the Commonwealth into compliance, but is one necessary step toward reaching the 2025 goals.

Very few municipalities, however, chose the nutrient trading option for achieving compliance and instead chose to upgrade their sewage treatment infrastructures. Low participation in the nutrient trading program may have been as a result of several factors, including lack of familiarity, the difficulty in calculating costs of credits, uncertainty about outcomes, and concerns expressed by the environmental community about accountability.

There are many reasons other than nutrient reductions that a municipality may choose upgrades over trading, despite the higher cost. Aging sewage treatment infrastructures are a significant concern for most municipalities in Pennsylvania. This concern arises not as a result of the TMDL for the Chesapeake Bay, but from fundamental problems with antiquated systems where improvements were deferred for a long period of time. Many municipal sewage treatment facilities are in need of upgrades to:

1) replace leaking pipes and inadequate tanking,
2) address insufficient capacity to properly treat sewage, and

[5] *See http://www.epa.gov/chesapeakebaytmdl/*

3) reduce the amount of untreated sewage discharged into waterways when it rains.

Most sewage systems in Pennsylvania were built in the 1960s and 1970s when federal construction grants were available for up to 75 percent of the costs. Many systems have not been significantly upgraded in decades. The Governor's Sustainable Water Infrastructure Task Force in 2008 found that over $25 billion was needed to rebuild the sewage treatment infrastructure across the Commonwealth over the next 20 years.[6] The lack of significant upgrades in the past several decades means that pipes, tanks, and other problems with this antiquated infrastructure potentially can cause increased costs on taxpayers' water and sewer bills.[7] When a major upgrade is needed, it may be cost-effective for growing municipalities to include nutrient treatment. It is important to note that the typical nutrient reduction portion amounts to no more than 10-15 percent of a major upgrade project cost.

Agricultural Reductions

The greatest opportunity for achieving nitrogen reduction targets is in the agricultural sector. Unfortunately, nitrogen reduction in the agricultural sector is lagging behind expectations, according to the EPA Milestone [8] and Legislative Budget and Finance Committee[9] (LBFC) reports. Pennsylvania is responsible for about 46 percent of the nitrogen that flows into the Chesapeake Bay, and so nitrogen reduction is a specific target for the Commonwealth, much of which is produced by the agricultural sector. Therefore it is imperative that Pennsylvania's reduction plan relies heavily upon reductions in the agriculture sector. The EPA noted in its 2012-13 milestone progress report that Pennsylvania failed to meet 2013 targets for nutrient reduction, and also failed to meet implementation targets for best management practices. This second point is significant because the Pennsylvania WIP relies heavily on best management practices to achieve reduction targets.

Pennsylvania's Options Regarding Mandated Nutrient Reduction Targets

1. Default on EPA mandates.

Currently there are fewer than 689 days to put into place the practices that will reduce the amount of sediment, nitrogen, and phosphorus required under the TMDL. Given the level of effort in place today, the Commonwealth will be unable to meet these 2017 milestones, thereby forcing the EPA to adopt backstop measures.

If the Commonwealth defaults on the EPA mandates and fails to meet nutrient reduction targets, the EPA can then require the Commonwealth to make improvements that could be extremely costly, specifically related to stormwater management. In fact, the EPA noted that Pennsylvania's current program depends on 75 percent of its reductions coming from the agricultural sector, which has not achieved its milestones, as compared to the stormwater management sector. The EPA has also threatened to require additional reductions from the wastewater sector.[10] This option is rampant with short- and long-term costs affecting the health, safety, and welfare of the Commonwealth.

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[6] Entitled, *Creating a Sustainable Solution for Pennsylvania*, Governor's Sustainable Infrastructure Task Force Report, 2008. pp. 5-6

[7] http://www.chesbay.us/Publications/nutrient-trading-2012.pdf

[8] Entitled, *EPA Evaluation of Pennsylvania's 2012-13 Milestone Progress and 2014-15 Milestone and Commitments to Reduce Nitrogen, Phosphorus, and Sediment*, June 26, 2014.

[9] Entitled, *A Cost Effective Alternative Approach to Meeting Pennsylvania's Chesapeake Bay Nutrient Reduction Targets*, January 2013.

[10] Ibid., at page 7

2. Maintain current reduction strategy.

While the Commonwealth is meeting some of its targets, it is not yet fully compliant. Thus, for certain pollutants, this option would be effectively the same as defaulting on the EPA mandates. The LBFC has estimated that the current plans could exceed $1.5 billion in expenses.[11] This means that the Commonwealth could end up not only being non-compliant, but also spending millions of dollars even if it remains non-compliant.

3. Accelerate implementation of current strategy.

a. Increase DEP enforcement of existing regulations

Pennsylvania's WIP calls for the implementation of an agricultural compliance strategy. The regulations include agricultural management programs as well as erosion and sediment control plans. Pursuant to an agreement with the EPA, from meetings held in June 2014, DEP is required to monitor and update the reduction strategy on an annual basis. In fact, similar to the Department of the Auditor General's report on DEP's oversight of water quality during the Marcellus Shale natural gas boom, the EPA has noted that the DEP needs to improve reporting on its "Agriculture Compliance Policy and Compliance Inspections." DEP is required to:

- provide details on the types of non-compliance actions and how they are being resolved,
- ensure that farms are implementing manure-management plans, and sediment erosion or conservation plans pursuant to Pennsylvania regulations, and
- improve its tracking, verification, and reporting of the agricultural sectors management best practices.

This is not to say that DEP should create additional regulatory requirements, but instead should ensure compliance with regulations that already exist.[12] DEP would have to take a more proactive approach in order to ensure the agricultural sector's compliance with existing regulatory mandates.

b. Accelerate implementation of best management practices

The Commonwealth has established a number of programs at DEP, through *Growing Greener*, a joint program between the Department of Agriculture and the State Conservation Commission, which are engaged in the delivery of the cost effective agricultural best management practices such as cover crops, no-till, manure management, the legacy sediment restoration program, and riparian buffers. Pennsylvania should continue to evaluate and provide resources for the most effective of these programs using adaptive management approaches as intended by the milestone process. More consistent state funding and advocating for federal resources through the farm bill and other programs are needed to revitalize these programs that are already designed to deliver on-the-ground farm improvements.

[11] http://lbfc.legis.state.pa.us/Resources/Documents/Reports/453.pdf

[12] EPA Guidance Report, July 2014

4. Revise and promote the nutrient trading program.

While Pennsylvania already has an existing nutrient trading program, it has become stagnant because few entities use the program, and the intended buyers—those operating major sewage facilities—are generally already implementing their compliance choice, be it trading or upgrading their plants. However, opportunities do exist to expand the current nutrient trading program so that it can provide direct incentives for innovative investment in nutrient reduction technologies, such as manure to energy systems.

The LBFC performed a study in 2012, which was issued in January 2013, reviewed the effect of a state-operated nutrient management trading program[13] designed to have the Commonwealth use the trading platform at PENNVEST, which could directly invest in nutrient-reducing projects using state funds. Presumably, this concept would be an alternative to new grants or regulatory programs for achieving reductions. Assuming that municipalities and the agricultural sector become involved in a revised nutrient trading program, the study shows that, with effective monitoring, a state-operated program could be a low-cost alternative strategy to help the Commonwealth achieve the necessary reductions. The creation of a new trading platform could incentivize technological innovation and provide a monetary benefit through trading along with the use of cutting edge environmental and agriculture technology.

It should be noted that the LBFC estimated that if no other reductions were performed, a trading program could save the Commonwealth over $1.2 billion in costs by 2025.[14] It is important to note that DEP's original work with PENNVEST as a host of live-trading auctions was rated as a strong proposal by the EPA.

5. Enhance municipal waste water treatment grants and upgrades.

Many municipal waste water treatment facilities are severely antiquated and could require hundreds of millions of dollars to achieve necessary enhancements. However, even if the best technologies are implemented in the overall sewage treatment infrastructure, it appears as though nitrogen reduction targets cannot be achieved without the agricultural and stormwater sectors' full participation to reduce pollutants. According to an early and well-received study by the Chesapeake Bay Commission, for sewage treatment infrastructure improvements, the pounds of reduction would be achieved at a very high cost per pound, estimated in excess of about $10 per pound, as compared with about $4 per pound from available agricultural best management practices.[15] Many other cost evaluations have been done with different absolute numbers, depending upon what is counted, but the relative economic efficiencies remain similar in that the agricultural reductions are more cost effective than sewage treatment upgrades for nitrogen reduction. Furthermore, there are more opportunities in agriculture for major reductions than in numerous small sewage treatment plants.

This does not mean that certain wastewater upgrades are not valuable or even necessary, but they should be evaluated as part of a thorough cost-benefit analysis.

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[13] Entitled, *A Cost Effective Alternative Approach to Meeting Pennsylvania's Chesapeake Bay Nutrient Reduction.*
[14] Ibid.
[15] *Cost-effective Strategies for the Bay* , Chesapeake Bay Commission, Dec. 2004

Recommendations

There is no silver bullet that will help Pennsylvania resolve its pollution problems affecting the Chesapeake Bay. Instead, a hybrid approach, which includes commitments from several different sectors and a combination of methods, is the most appropriate and cost-effective approach for the Commonwealth to achieve mandated nutrient reductions for the Chesapeake Bay by 2025.

- The Commonwealth's commitment to ensuring that the nutrient reduction milestones are met requires that DEP and the Department of Agriculture have adequate staffing levels so that important practices are implemented.

- DEP and the Department of Agriculture should more thoroughly examine TMDL requirements and existing regulations and join with the agriculture community to achieve mutually beneficial objectives and mandated goals. DEP and the Department of Agriculture should also work together on an ongoing basis to review and update reduction levels and to ensure compliance targets are being met.

- Revision of the existing nutrient trading program, as discussed by the Legislative Budget and Finance Committee, should be thoroughly examined. Better use of the existing nutrient trading program appears to be a necessary step to help Pennsylvania meet the 2025 nutrient reduction levels.

- DEP should support using low-cost solutions as alternatives to higher-cost public infrastructure projects, where possible. As one example, DEP should work with existing stakeholders to develop and implement a Commonwealth offset program that will provide additional methods for entities exceeding TMDL limits to meet the necessary goals while allowing them to work within budgets yet encouraging the various sectors to work together.

- While it appears that an effective trading program could help achieve the required reductions, it is imperative that DEP and municipalities continue to enhance and support existing treatment facilities to ensure that the Commonwealth hits the 2017 target reductions and the 2025 target.

- Municipalities must review all available options and strive to utilize the most cost-effective practices. Financial considerations should be included when considering any treatment facility enhancement because large financial commitments could end up adversely impacting taxpayers and the community as a whole.

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