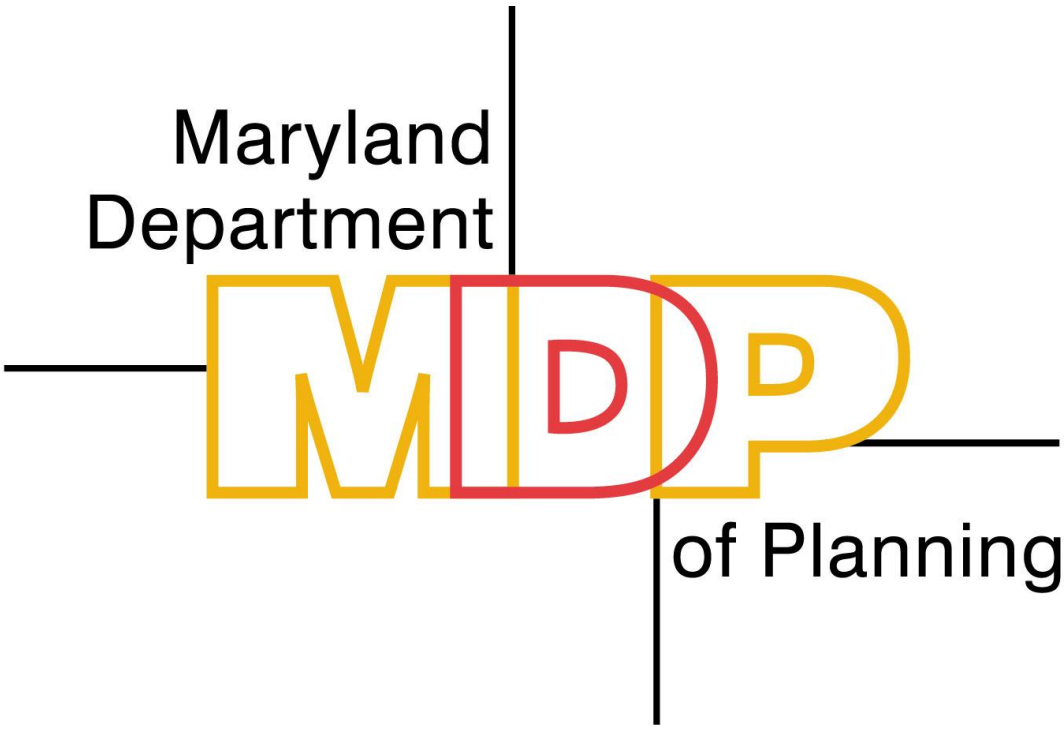


Estimating Potential Supply of Offset Credits in Maryland

March 15, 2013

In order for the Accounting for Growth Policy to succeed there must be a supply of credits for purchase. Currently, there is no market demand for credits to speak of because there are essentially no requirements to drive demand. No one knows how great the demand will be or how much developers – who will comprise most of the demand side of the market – will be able or willing to pay for credits. Consequently, potential credit generators – those who will eventually comprise the supply side of the market – have little or no reason to generate credits or even to take the idea of doing so seriously.

Under these circumstances, it is difficult to estimate what the supply of credits and the associated costs will be in any given area or in the State of Maryland as a whole. However, since offset credits must be generated by reducing nutrient loads delivered to the Bay from existing sources and BMPs implemented by regulation cannot be sold, one way to gain some insights about potential credit supplies is to estimate how much potential there is to reduce nutrient loads delivered to the Bay from various sources over and above the reductions needed to achieve the nutrient caps established for existing sources under Maryland's Watershed Implementation Plan for the TMDL.

We reviewed possible load reduction opportunities that could become available as offset credits from several source sectors using various sources of information. These include:

- The Chesapeake Bay Watershed Model data, for several source sectors
- For the agricultural source sector, a sampling of agricultural load reduction opportunities in Maryland compared to Chesapeake Bay Watershed Model data
- For the on-site sewage disposal/ septic system source sector, tax parcel and sewer service data compared to Bay Watershed Model data
- Data specific to Maryland's minor wastewater treatments plants (those discharging less than 500,000 GPD). The major plants (those discharging 500,000 or more GPD) are all scheduled to be upgraded with the Bay Restoration Fund, and cannot be used to generate credits.

Before reviewing this information, it is important to understand that not all load reduction opportunities have the potential to become offset credits. Maryland's WIP commits the State to reduce existing loads from each source sector by 2025 to achieve the nutrient caps established through the TMDL. These "baseline load reduction commitments," or "target load reductions" to existing sources, are not available as offset credits. Only load reductions above and beyond those needed to achieve baseline target load reductions may qualify as offset credits. Thus, when considering load reduction opportunities in order to estimate the potential supply of offset credits from each source sector – agriculture, septic/ on-site wastewater disposal systems, stormwater, wastewater treatment plants – it is important to account for both baseline/ target load reductions and potential offset credits at the same time.

All Source Sectors, Chesapeake Bay Program Watershed Model

The Chesapeake Bay Program Watershed Model is an important tool used to examine the relationships between pollution sources, load reducing Best Management Practices (BMPs), and pollution loads; it is a major part of the basis for these relationships under the TMDL. The Model was used to identify best management practices that could be implemented by 2025 to reduce loads from existing sources to achieve target load reductions. For reference purposes, we will call this analysis the "2025 Strategy

Scenario." The Model also provides estimates of a more all-encompassing set of load reductions practices that could be implemented if everyone everywhere in the Bay Watershed (including Maryland) did everything possible to reduce loads by using the repertoire of established BMPs. We will call this for reference purposes the "Everyone, Everywhere, Everything," or "E3" Scenario.

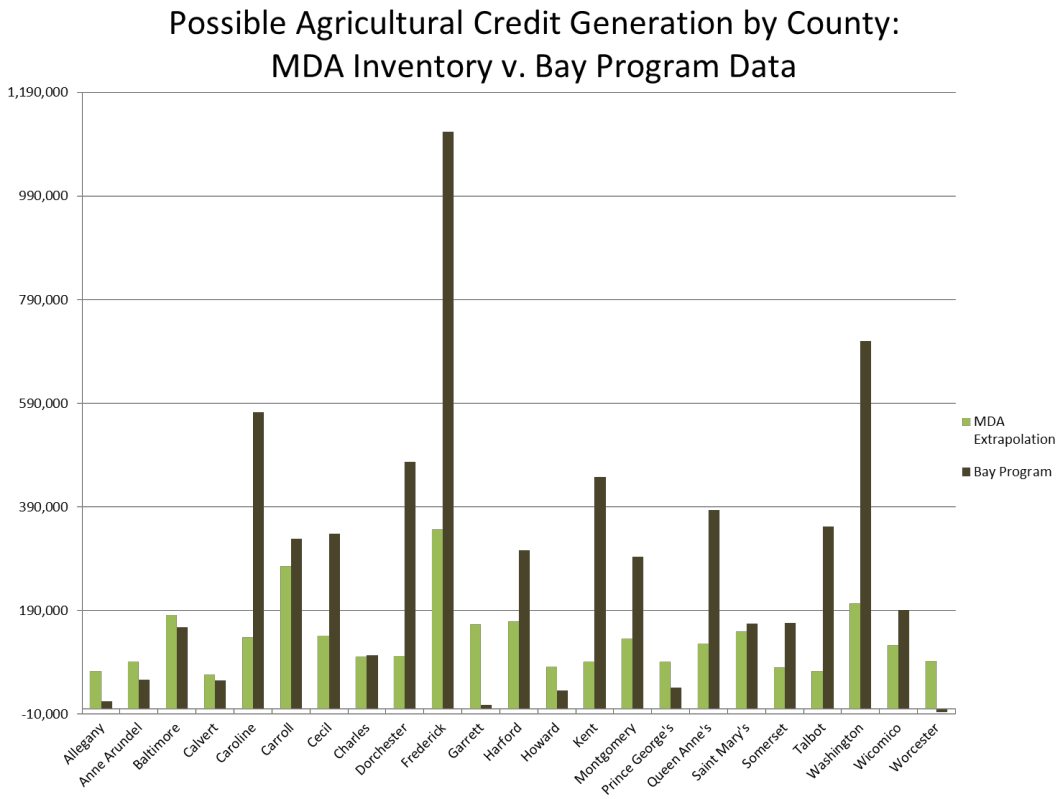
For both scenarios, the results are based on the Model's inventory of existing sources in each source sector as of 2010. This inventory is presumed to reasonably represent the possible universe of load reduction opportunities in the watershed. In general terms, the differences in pollution loads between the 2025 Strategy (achieved to reach the nutrient caps) and the E3 Scenario (achieved by doing "everything everywhere") provide generalized estimates of offset potential, or the number of pounds of nitrogen load reduction that might qualify/ become available as offset credits. The comparison suggests that approximately 9 million pounds of offset credits (nitrogen per year delivered to the Bay) may be available statewide.

This aggregate estimate of credit availability is quite large relative to estimates of new or increased loads from future development. Depending on the assumptions made about future development, new or increased loads delivered to the Bay are expected to equal at least 2 million pounds of N per year. Not all of the new or increased load will require offsets under Maryland's draft Policy, which tentatively exempts stormwater loads from redevelopment and wastewater loads from plants under their nutrient caps. Though it is large relative to expected future loads, the aggregate 9 million pounds of possible offset credits per year tells us little about availability of credits from individual source sectors or the circumstances under which they might become available. Examination of the other sources of information discussed below provides additional insights.

The Agricultural Source Sector

Local Soil Conservation Districts (SCDs) have collaborated with MDA and interested farmers to estimate the credit generation potential of individual farms to varying degrees throughout the State. The exercise represents only a sampling, as the number of farmers participating ranges from a few in some counties to dozens in others. The process considered the suite of best management practices already installed and functioning on each farm; determined additional practices (if any) that would be needed to achieve baseline/ target load reductions; and then identified additional practices that could be installed to further reduce loads and thereby generate offset credits.

For statewide purposes, the average statewide number of offset credits potentially available per farm was extrapolated to all farms by county. In the following figure, these estimates are compared side-by-side to another estimate of potential agriculturally-derived offset credits, using the difference between the 2025 and E3 Bay Watershed Model scenarios by county for the agricultural sector only.

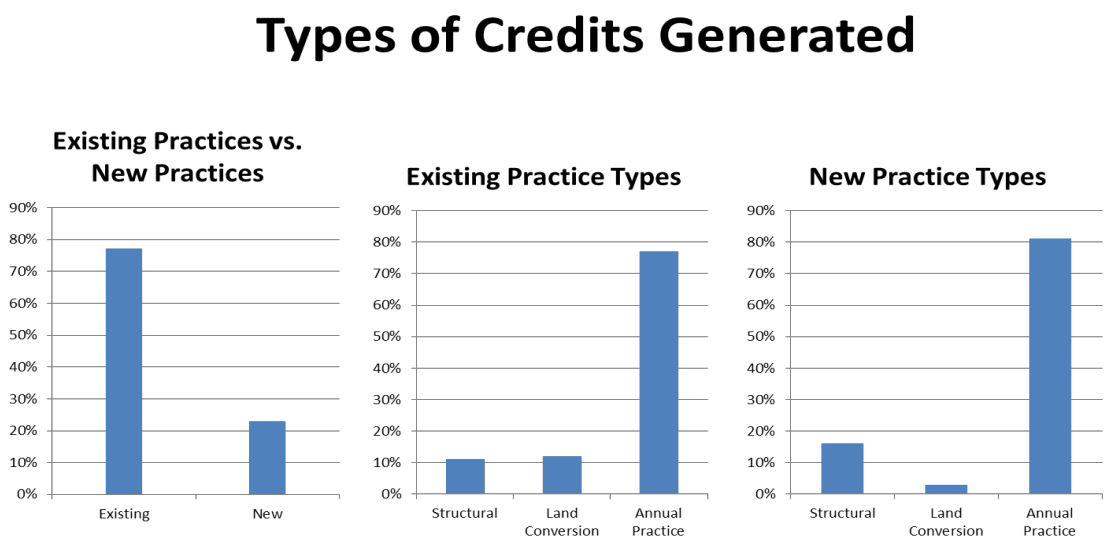


In 15 of 23 counties, the offset potential estimated by the Bay Model data is larger than the estimate made using MDA/SCD data. The discrepancy tends to be greatest in counties highly dominated by agricultural land uses (Caroline, Dorchester, Frederick, Kent, Queen Anne's, Talbot and Washington). In the remaining 8 counties, estimates derived by extrapolating MDA/ SCD data are larger. With the exception of Worcester County, all of these are counties with considerably more developed/ urban land uses and/or less dominated by agricultural land uses, for which the Bay Program derived estimate is relatively small (less than 190,000 pounds).

Given the uncertainties of estimates derived from either source of data for this purpose, the actual supply of possible offset credits statewide may lie somewhere between the two estimation sources. The Bay Model calculation of potential credits of 9 million pounds includes about 6 million pounds from agriculture. Voluntarily inclusion of potential in a farm-by-farm, field-by-field, practice-by-practice inventory study data suggests considerably less potential offset supply credits from the AG sector, as much as 75% less than suggested by the Bay model data or about 1.5 million pounds Because they were developed from farm specific, detailed analyses, we believe that the MDA/ SCD data are better indicators of offset potential. At the same time, it must be recognized that these estimates are based on very few observations in numerous counties, and were developed without the benefit of an existing market to stimulate landowner interest.

Looking further at the numbers derived by MDA/SCD it is also clear that there is a divide between the types of practices used to generate credits. These differences include credit-generating practices that

have already been installed versus new practices yet to be installed, and structural, non-structural, and annual practices. All of these divisions are lumped together to estimate offset potential according to MDA/SCD but in the graph below we've broken them out to clarify what the breakdown is between them and how limits on eligible practices may affect potential offset supply from the agricultural sector.

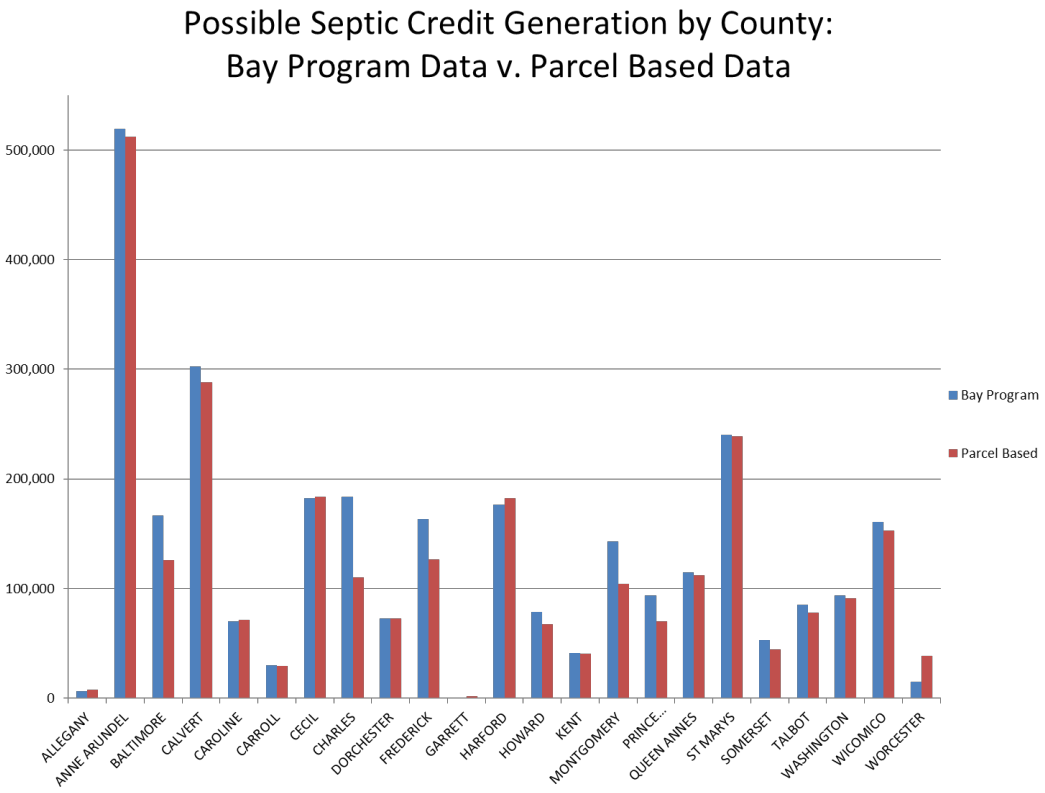


The On-site Sewage Disposal/ Septic System Sector

Maryland identified in its WIP the number of existing septics and identified the number of systems it expects to upgrade or connect to Wastewater Treatment Plants (WWTPs) as part of its baseline/ target load reduction strategies.

In the graph below, the difference between the Bay Program 2025 and E3 scenarios for loads from septic/ on-site disposal systems is compared by county with estimates based on the more detailed Maryland data. To estimate a Maryland-specific version of the E3 Scenario for this source sector, it was assumed that sewer service from WWTPs could be extended to all septic systems within Priority Funding Areas (PFAs, which are local/ state designated growth areas with or planned for sewer service); and that all systems outside PFAs could be upgraded to nitrogen removal technology that approximately halved the amount of nitrogen transported from septic drainfields to surface water.

Estimates from the two information sources are compared by county in the following graph. Though they do differ considerably in a few cases (most notably Baltimore, Charles, Frederick, and Montgomery counties), the two sources are generally in agreement as a whole and for most individual counties.



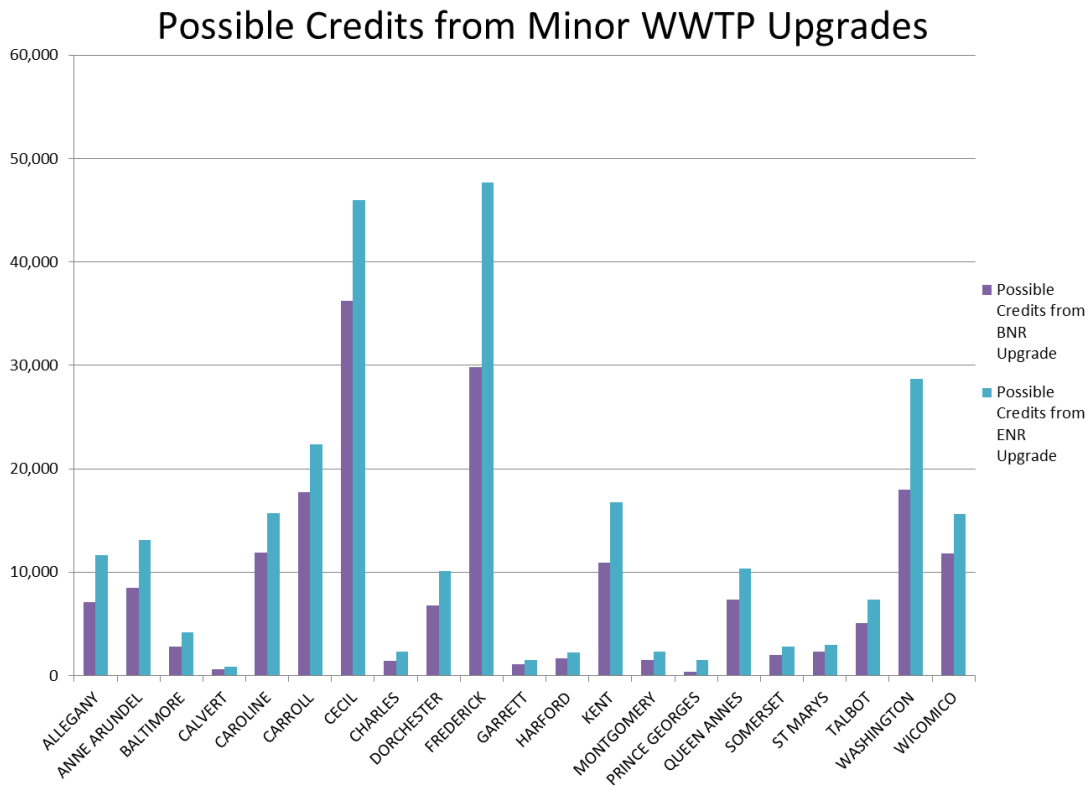
Minor Waste Water Treatment Plants

Another source of potential offset credits could be created by upgrading (improving treatment efficiency to lower the concentration of nitrogen in discharge effluent) minor (less than 500,000 GPD discharge) WWTPs. Some Minors discharge effluent with concentrations higher than 8mg N/L (the standard for Biological Nutrient Removal technology, or BNR). Some discharge at these or lower concentration levels. We used average flow and concentration data for (SFY 2008-SFY 2011[1]) for each minor plant (excluding those planned for upgrades to achieve baseline/ target load reductions) to produce a simplified estimate of approximately 351,779 pounds of nitrogen per year from these plants statewide currently.

To estimate load reduction and offset credit potential from this source, we made two hypothetical assumptions: first, that all plants discharging at more than 8mg N/L were upgraded to BNR (8mg N/L); and second, that all Minors were upgraded to ENR (Enhanced Nutrient Removal discharging at 4mg N/L). The BNR alternative yields approximately 179,835 pounds of nitrogen per year as possible offset credits; the ENR alternative yields approximately 206,807 pounds of nitrogen per year. The graph below shows these comparative offset credit potentials by county for the two scenarios.

[1] Data provided by MDE based on annual wastewater treatment plant permit reports.

It is possible that in some cases, minor WWTPs could be converted to discharge through spray irrigation. Under Maryland standards, spray irrigation applies effluent to fields and/or forests at rates under which all nitrogen can be incorporated in biomass for sequestration and/or removal, resulting in essentially no nitrogen delivery to surface waters. If this approach were used on some plants, additional load reductions beyond those enumerated above and illustrated below would be possible.



Conclusions

We were unable to produce estimates for the stormwater source sector comparable to those made for the other sectors. For that sector, however, two observations can be made. First, while considerable retrofitting of developed landscapes lacking stormwater management is being required of local governments to comprise baseline/ target load reductions from that sector, considerable additional stormwater retrofitting opportunities will exist because the majority of existing development has little or no stormwater management. Second, stormwater retrofits are fairly costly to install and maintain per pound of nitrogen load reduced annually, when compared to many other load reduction practices. Many believe that the stormwater sector will be the offset load reduction option of last choice for this reason.

In terms of the potential supply of offsets from all source sectors in the aggregate, it is impossible to make definitive statements about the magnitude of supply that will exist, given the general and

incomplete nature of data available and the lack of existing market forces. Demand from offset consumers, competition among willing offset generators, and the offset fees for which offset consumers will be willing to pay will undoubtedly affect the degree to which supply materializes as a whole and from individual source sectors. However, if one assumes that the potential offset supply from all source sectors together was half of the estimate derived from Bay Program data as described above, it would result in an estimate of roughly 4.5 million pounds of nitrogen per year (delivered to the Bay). This does not include possible offset supply derived from upgrades to minor WWTPs.

With all of the uncertainties involved, considering that loads from future development may accrue to at least 2 million pounds per year by the year 2035, and that not all of that load will require offsets, it would appear that there is good potential for a supply that will be commensurate with demand as it develops over time. Given that development is expected to continue in Maryland through this century, the ability to accommodate future growth longer term is dependent upon the potential to implement nutrient reducing practices and growth that results in less pollution.