CREDITING CONSERVATION

Accounting for the Water Quality Value of Conserved Lands Under the Chesapeake Bay TMDL

CHESAPEAKE BAY COMMISSION · JUNE 2013

There is an undeniable link between the health of the waters of the Chesapeake Bay and our stewardship of the huge area of land that comprises its watershed. The land-to-water ratio is larger than any other estuarine water body on earth. With a water surface for the tidal Bay of only 4,000 square miles and a watershed of 64,000 square miles, land surface exceeds water surface by more than 16 times. How we treat the land profoundly influences the quality of the water. Thus, land-use decisions may well be the most important factor in the success or failure of our efforts to restore and protect the Chesapeake Bay.

Keeping Our Commitment: Preserving Land in the Chesapeake Watershed
Chesapeake Bay Commission, February 2001

INTRODUCTION

Land conservation and sound land use are fundamental components of restoring and protecting the resilience of the Chesapeake Bay watershed. This is not a new concept. Land conservation has been supported throughout the history of the Chesapeake Bay Program Partnership. The 1983 and 1987 agreements, *Chesapeake 2000,* and, most recently, the 2010 Watershed Implementation Plans of Pennsylvania, Maryland and Virginia, all incorporate land conservation elements in their goals. Public support for land conservation throughout the region has resulted in not only the achievement of acre goals for land conservation but also the setting of new goals to protect even more acres.

The benefits of land conservation are numerous and multifaceted; no one denies the inherent value of preserved land to the achievement of a healthy Chesapeake Bay. However, even though land conservation is critical to protecting against water quality degradation,[1] its specific role in water quality protection has not been recognized as a critically important tool for reducing nitrogen, phosphorus and sediment pollution under the Chesapeake Bay Total Maximum Daily Load (TMDL). The simple reason is that conserving land doesn't effectuate major reductions in pollution; rather, it prevents increases in pollution by precluding conversion.

When the Chesapeake Bay Agreements were the primary driver behind Bay restoration efforts, land conservation received much attention. Now that the Bay TMDL has become the primary driver, its numeric nature of counting pounds of pollution entering the Bay from various sources has made integrating the water quality values of conserving land an awkward fit – not unlike "fitting a square peg into a round hole."

1. Forests account for approximately 60% of the land area in the Bay watershed and contribute only about 15% of the total load of nitrogen and 2% of the phosphorus load to the Bay. In addition, river basins with the highest percentage of forest cover have the lowest annual sediment yields in the Bay region.

Recognizing this problem, the Chesapeake Bay Commission engaged with a panel of experts to determine if there were credible and defensible means to link land conservation with pollution reduction explicitly within the Bay TMDL framework and, in so doing, soften the sharp edges of the square peg so it may more neatly fit into the round hole of the accounting constraints of the Bay TMDL. This report, *Crediting Conservation: Accounting for the Water Quality Value of Conserved Lands Under the Chesapeake Bay TMDL,* reflects the work and the findings of this investigation by the Commission.

THE BENEFITS OF LAND CONSERVATION

Land conservation within the Chesapeake Bay watershed has long been an important means to protect open spaces, provide for recreational use, preserve both terrestrial and aquatic habitat, and conserve a wide range of natural resource values. With the growth of concerns about the conversion of undeveloped lands to urban and suburban uses, an increasingly targeted approach to land conservation has evolved in the three primary Bay states (Pennsylvania, Maryland, and Virginia) – an approach that has proven successful in protecting forest and wetland resources, agricultural working lands, and historic and cultural areas.

Protecting land from conversion is one means of securing the ecosystem services that are a natural by-product of the functioning environment. Ecosystem services from preserved lands include:

- stormwater runoff control
- erosion control
- waste treatment/pollutant uptake
- groundwater purification
- flood control
- water flow regulation
- water supply filtering
- habitat restoration and protection
- soil formation
- pollination
- climate regulation and adaptation

Research has identified a $1 to $100 ratio of investment to benefit on the preservation of intact ecosystems.[2]

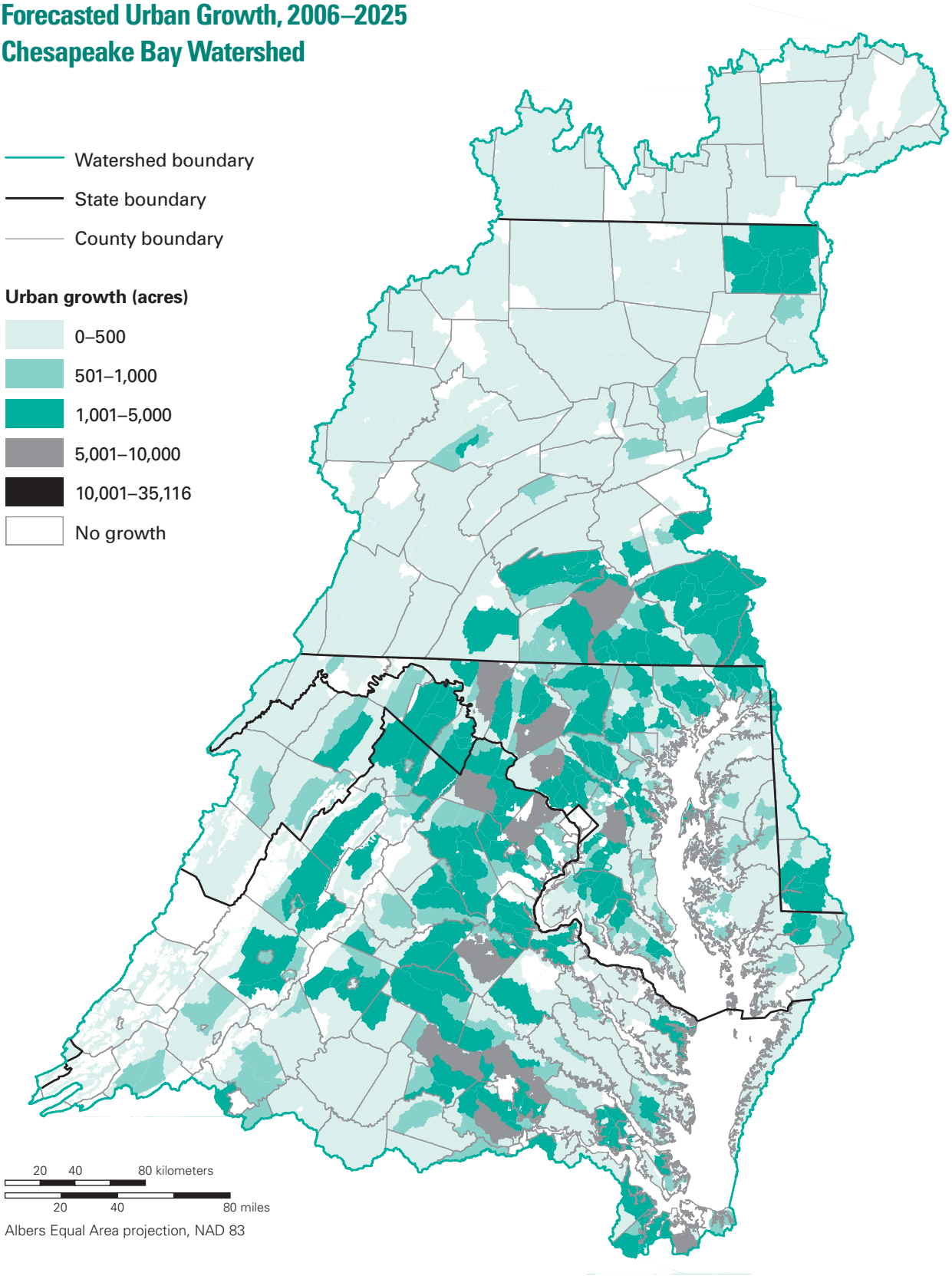
Another important benefit of land conservation is the contribution it makes in maintaining the quality of life for those living in the Bay watershed.[3] This contribution, so essential for human existence, is directly linked to economic development and community vitality. For the past 20 years, the Bay Program Partnership has recognized these benefits.

Private landowners hold the majority of forest resources and agricultural working lands that provide the Bay region with food and fiber. Preservation of these land uses helps to stabilize the local and regional

2. For discussions on ecosystem services and economic contributions of conserved lands, see, *The Role of Natural Landscape Features in the Fate and Transport of Nutrients and Sediment,* Chesapeake Bay Program Science and Technical Advisory Committee (March 8, 2012). See, also, *Science Daily*, at http://www.sciencedaily.com/releases/2002/08/020812070301.htm). See, also, de Brun, *The Economic Benefits of Land Conservation,* Trust for Public Lands (2007).

3. See, Geis, *Conservation: An Investment That Pays,* Trust for Public Lands (2009).

Forecasted Urban Growth, 2006–2025
Chesapeake Bay Watershed

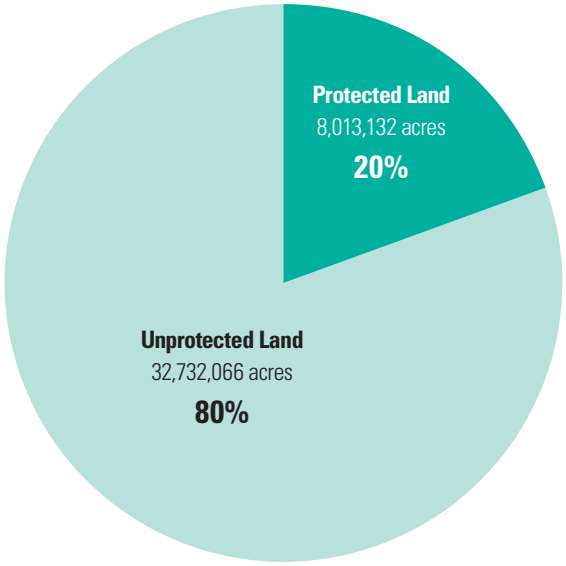


SOURCE: CHESAPEAKE BAY PROGRAM. BASED ON CHESAPEAKE BAY LAND CHANGE MODEL V2

economies by supporting local business suppliers and providing consumers with locally-sourced goods and services. And in contrast to the costs of services that result from suburban-style residential development, agricultural and forest lands generate more local tax revenue than the services they require, producing a positive influence on local economies.

Similarly, public lands have also long been recognized as a valuable influence on the economy. Studies have for decades calculated this economic value through the lens of their value for recreational use and as a community amenity. As early as 1971, studies showed that parkland acquisition precipitated increased land values in the five years after acquisition.[4] Forty years later, the benefits of public lands are still well-documented.[5]

Protected Land in the Chesapeake Watershed through 2011



CHESAPEAKE BAY PROGRAM

Conversely, the fragmentation and conversion of both private and public lands has long-term implications for the agricultural and forestry industries. As the population of urban and suburban areas increases, it spreads development outward over the adjacent agricultural and forest lands. For agriculture and forestry to be successful industries, they must have sufficient lands dedicated to the production of food and fiber resources. Forestry and agriculture are the largest industries in all three of the Commission's member states of Pennsylvania, Maryland, and Virginia. These industries will only be sustained if suitable land remains available. Virginia's Department of Forestry estimates that a typical paper mill needs a minimum of one million acres of harvestable timberland available annually within a 75-mile radius. Similar comparisons exist for dairies, beef processors, grain handlers, and other related businesses. As expanding development converts rural working lands to more urban uses, the farm supply businesses, equipment dealers, and labor pool all begin to shrink and eventually either close or shift their focus to serve a changed market.

LAND CONSERVATION AND *CHESAPEAKE 2000*

On June 28, 2000, the Chesapeake Executive Council signed *Chesapeake 2000,* which reaffirmed the commitment to a "shared vision" of an ecosystem with "abundant, diverse populations of living resources, fed by healthy streams and rivers, sustaining strong local and regional economies, and our unique quality of life." Reflecting the recognition that land conservation is fundamental to the long

4. Epp, Donald J., *The effect of public land acquisition for outdoor recreation on the real estate tax base,* Journal of Leisure Research 3(1), 17-27. (1971).

5. See, e.g., Banzhaf, et al, *Public Benefits of Exurban Open Space,* Resources For The Future (2005); Watchman et al, *Assessing the Wealth of Nature: Using Economic Studies to Promote Land Conservation Instead of Sprawl,* Defenders of Wildlife (2007); also, Nelson, et al, *Evaluating the Economic Impact of Community Open Space and Urban Forests: A Literature Review,* Univ. of Georgia/USDA (2004).

term restoration and protection of the resilience of the Chesapeake Bay as well as the economic vitality and quality of life of its citizens, the new agreement incorporated the following strategy:

> Strengthen programs for land acquisition and preservation within each state that are supported by funding and target the most valued lands for protection. Permanently preserve from development 20 percent of the land area in the watershed by 2010.

In the years since, the Bay jurisdictions and their federal partners have met and exceeded this commitment. As of the end of 2011, over 8 million acres of land had been permanently protected throughout the Chesapeake Bay watershed.

THE TRANSITION TO THE BAY TMDL

Chesapeake 2000 and its predecessor Bay agreements drove a large number of successes, from improved crab management to sophisticated new water quality criteria and standards. Yet by the end of the first decade of the 21st century, it became clear to the members of the Chesapeake Bay Program Partnership that the agreements alone were not sufficient to accomplish the necessary restoration and, in particular, the necessary pollution reductions for restoring the water quality of the Bay. A new approach was required to ensure the achievement of the water quality goals that had long been among the most important but hardest to achieve elements of Bay restoration efforts.

As a result, the Chesapeake Bay is now subject to the largest and most complex Total Maximum Daily Load (TMDL) in the nation. This "pollution diet" or "blueprint" is designed to restore the water quality of the Bay and its tributaries in order to enable the recovery of the living resources for which the Bay is so well known. Under the Bay TMDL, the Bay jurisdictions, the Chesapeake Bay Commission and the U. S. Environmental Protection Agency (EPA) have committed to a 2025 deadline to have all the practices and programs in place to achieve the reductions in nitrogen, phosphorus and sediment pollution necessary to restore the Bay's water quality.

Through the Bay TMDL, EPA has provided each of the jurisdictions with pollution load allocations for nitrogen, phosphorus and sediment. In response, each jurisdiction has developed Watershed Implementation Plans (WIPs) describing actions it will take to accomplish its specific pollution load allocations. EPA is tracking each jurisdiction's performance through the use of two-year milestones and has discretion in the types and level of consequences that it may apply if a jurisdiction fails to meet its reduction goals. The TMDL not only requires the accomplishment of reductions in pollution loads, but also requires the maintenance of those reductions over time, even in the face of population growth and resulting land conversion.

Whereas *Chesapeake 2000* and the other Bay agreements included goals addressing multiple aspects of a healthy Chesapeake Bay, the Bay TMDL focuses exclusively on reducing nitrogen, phosphorus and sediment pollution. This is because water quality is the parameter under which a TMDL operates within the federal Clean Water Act framework and because the achievement of the specific pollution reduction goals is fundamental to a resilient Bay. Improved water quality is the base for the restoration of living resources, which rely upon measures extending beyond pollution reduction to habitat protection and fisheries management.

While the Bay TMDL is legally limited to pollution reduction goals, each of the Pennsylvania, Maryland, and Virginia WIPs contain either direct or indirect references to land conservation as a strategy for

reducing pollution. Maryland's WIP, for example, highlights land conservation within the context of its smart growth program and its contributions to minimizing "stormwater pollution by reducing the amount of land consumed to accommodate new growth." (*Maryland Phase I WIP, Accounting for Growth,* p. 3-1.) Similarly, Virginia's plan includes "promoting and requiring … land use practices to minimize development's impact on water quality. …" (*Virginia Phase I WIP, Accounting for Growth,* p. 85.) Some also acknowledge the limitations in the linkage between land conservation and the current accounting for pollution load reductions under the Bay TMDL. For example, Pennsylvania's plan states, "While the Chesapeake Bay watershed model does not currently provide nutrient pollution reduction credit for land conservation activities, it is anticipated that this will occur in the future." (*Pennsylvania Phase I WIP,* p. 190.)

In spite of these references to the conservation of land, it is not seen as measurably contributing to targeted nutrient and sediment reductions in the Bay TMDL and its WIPs. The generally accepted benefits of land conservation are more forward looking: preventing increased loads that might result from land conversion and continuing existing ecosystem services in the future. The benefits are not directly linked to numerically-based pollution load reductions. Consequently, the act of conserving land is not prominently featured as a means to achieve measurable pollution reductions within the Bay TMDL and WIP scheme.

MOVING TOWARD CREDITING CONSERVATION UNDER THE BAY TMDL

In December 2010, the Chesapeake Bay Commission released a report entitled *Conserving Chesapeake Landscapes*. Developed in partnership with the Chesapeake Conservancy, the report reviewed the accomplishments of the previous decade and considered what additional tools, strategies, partners and policies would be needed to continue aggressive land conservation activities throughout the Chesapeake Bay watershed. One of the recommendations suggested that land conservation actions could contribute to the achievement of the Chesapeake Bay pollution limits established under the Bay TMDL.

The Chesapeake Bay Program's Maintain Healthy Watersheds Goal Implementation Team (GIT 4) embraced this idea. As a first step, it requested the Bay Program's Science and Technical Advisory Committee (STAC) to convene a workshop to consider whether there is a scientific basis for changing how the Chesapeake Bay Program Watershed Model assigns nutrient and/or sediment loadings rates of natural features based on their ecological health/condition, management status, and/or landscape position. (STAC Report 12-04, Edgewater, MD.)

The STAC Workshop (held in March 2012) resulted in a consensus among participants "that there is a scientific basis for adjusting Chesapeake Bay Program Watershed Model nutrient and sediment processing rates that are assigned to natural landscape features to better reflect the influence of landscape feature attributes that significantly affect actual rates." STAC recommended future improvements to the Watershed Model, including:

- The addition of new land use classifications for lands having greater functional capacity for nutrient and sediment retention.
- The adjustment of loadings rates for new land use classes, based upon spatially explicit landscape attributes.

- The use of directional connectivity and the adjustment of loading rates based upon landscape attributes such as type, condition, and forest age.

To expand this work, the Chesapeake Bay Commission secured a grant from the National Fish and Wildlife Foundation (NFWF) to support efforts to explore and evaluate opportunities to provide nutrient and sediment reduction credits, under the Watershed Model, to land conservation actions. The Commission, again in partnership with the Chesapeake Conservancy, obtained the pro-bono services of the law firm of Hogan Lovells US LLP to evaluate the legality of incorporating land conservation into the Chesapeake Bay TMDL and its water quality accounting scheme. The Commission asked the firm to determine: "What statutory, regulatory, or agency policies provide support for, or present obstacles to, incorporating land conservation into the total maximum daily load ("TMDL") compliance? Additionally, can land conservation be used to offset prospective loadings?"

In the summer of 2012, Hogan Lovells performed this evaluation through a review of several sources, including the federal Clean Water Act (CWA), the Chesapeake Bay TMDL, Presidential Executive Order 13508, and guidance issued by the Environmental Protection Agency (EPA). The firm specifically evaluated the opportunity for land conservation to contribute to nutrient and sediment load reductions and its value in offsetting prospective loads.

The key findings of the 2012 Hogan Lovells study were:

- Language found in the CWA, the President's Chesapeake Bay Executive Order and the Bay TMDL provide a sufficient legal basis for incorporating land conservation into the water quality accounting of the Bay TMDL.

TIME TO UPDATE THE MODEL

Changes in conserved land and "granularity:" two problem areas in the Chesapeake Bay Watershed Model

The Commission's investigation into crediting conservation highlighted the fact that the Chesapeake Bay Watershed model treats all conserved forests in the same manner when it comes to valuing their water quality benefits. Whether it is a young forest under easement or an old growth forest under easement, the modeled pollution load contributed by the two forests are the same. Similarly, conserved open space or conserved farmland, even when it reverts to forestland, has the same modeled load as its original condition. That is, changed conditions of open land, from young forest to old or from fallow land to forest, do not receive different water quality credit in the model, although the aging of a forest or the reversion of a farmfield to a forest actually does alter the nitrogen, phosphorus and sediment load being contributed. In addition, because the Bay model best replicates reductions achieved on a large landscape scale, the "granularity" of the model is often too gross to allow for the integration of these land conservation changes at the scale at which they happen. Understanding this aspect of the model led the expert panel to conclude that the Chesapeake Bay Program Partnership should examine ways to more extensively account for differences among conserved lands and recognize those differences in the Bay model's accounting system.

- Land conservation's water quality values could provide offsets for prospective loadings.
- Requirements for sustainability under the TMDL can be met for conserved lands that provide offsets.
- EPA has considerable discretion in how it may incorporate land conservation in its "reasonable assurance" determinations.
- Obstacles to credit for land conservation include requirements for pollution reduction credit calculations with verification and assurance of performance.

A copy of the Hogan Lovells analysis can be found at *www.chesbay.us*.

Building upon these findings and using the funds provided by NFWF, the Chesapeake Bay Commission conducted an analysis of how to better account for the water quality benefits of land conservation within the Bay TMDL framework. The work began with a very open-ended examination of the possibilities that might exist to accomplish this challenge.

Calling on a panel of experts, the Commission held a brainstorming session with the panel to elicit ideas and possibilities. There were no predetermined or suggested outcomes; rather, the Commission relied on the panel's expertise and experience to provide the first level of idea generation. The panel included attorneys proficient in conservation easement development and negotiation as well as local land conservation; senior planners and policy makers who had years of state and local government experience; Chesapeake Bay Program modeling staff; and former natural resource leaders from Commission jurisdictions. The members of the expert panel, along with their affiliation are listed on Page 15.

The Commission also sought input and guidance from high-level water quality policymakers from jurisdictions across the watershed. This also included representatives from EPA Headquarters, its Chesapeake Bay Program Office, and EPA Region III.

Finally, follow-up phone calls, both individual and collective were held during the course of this project, allowing the experts to provide concrete ideas, raise questions about implementation of these ideas, and suggest other professionals to contact for input and dialogue. The deliberations concluded with the development of a series of key concepts that were then vetted with leading water quality and restoration scientists in the Bay watershed (their names and affiliations are also listed on Page 15). These additional consultants critiqued the expert panel concepts, suggested new avenues to pursue, and provided additional perspectives on the task of integrating land conservation's water quality values into the Bay TMDL.

After full consideration of all the information provided and ideas generated, groundtruthing and analyzing the concepts presented, the Commission identified four potential policy changes for additional discussion and evaluation to determine their suitability and acceptability for advancing land conservation as a measurable, verifiable strategy for achieving TMDL pollution reduction targets.

These four policy changes, each in their own way, reflect one or two of the following overarching conclusions that the Commission's work precipitated:

1. **Incremental Advancements on Crediting:** Efforts to incorporate land conservation into the Bay TMDL's water quality regime are important but are likely to remain incremental for some time. As such, it is important that we do not allow the TMDL process to relegate land conservation – which is in and of itself a critical, long term strategy in promoting the health and resilience of the Bay – to "sidebar" status in Bay restoration. The importance of continuing the historical, broad-based land conservation

and Bay restoration activities becomes even more critical in light of the narrow focus on water quality currently defined by the Bay TMDL, and the fact that maintenance of water quality objectives, when they are met, will require large areas of conserved land to continue to perform important natural functions. Restoring and protecting the resilience of the Bay's living resources will require a level of attention to the terrestrial and aquatic habitats and dependent fisheries that parallels the level of attention that the Bay TMDL currently provides to water quality.

2. **Existing Deficiencies in Modeling and Valuation:** Current systems at the jurisdictional level and at the Chesapeake Bay Program Partnership level are inadequate for capturing land use data and tracking land use change sufficiently for crediting the water quality values of land conservation under the Bay TMDL. This includes insufficiencies in the construct of the Watershed Model and the level of differentiation of land uses it incorporates; the Watershed Model could not value much of the conservation information directly even if jurisdictions were able to track and report it. A finer differentiation of land uses within the Watershed Model and refinement of associated pollution reduction efficiencies is necessary to establish the basis for assigning differing levels of pollutant reduction value to conserved landscape characteristics. Opportunities for crediting conservation do exist if relevant changes are made to the Watershed Model during planned updates in 2017 and beyond.

POLICY CHANGES FOR CREDITING WATER QUALITY VALUES OF LAND CONSERVATION IN THE BAY TMDL

The policy changes offered in this report do not represent major new policy directions or significant changes in process or accounting; the Commission found no "silver bullet" or major policy alteration that would dramatically elevate or shift the role of land conservation within the Bay TMDL structure. Rather, these changes, if implemented, would round the sharp edges of the square peg of land conservation. Even with these changes, however, land conservation and its water quality values still do not fit neatly into the round hole of the Bay TMDL. The suggested policy changes represent measured adjustments along the path toward a future where land conservation practices are measurably valued, and verified, as directly contributing toward TMDL goals.

✔ Policy Change 1: PERPETUAL BMP CREDIT MULTIPLIER

Modify the "all BMPs created equal" principle of the Chesapeake Bay Watershed Model and provide a credit multiplier to BMPs linked to permanent land conservation.

This first policy change recognizes that the Bay Program Partnership's Watershed Model, which serves as the calculator for determining regional and state-specific nutrient loadings, generally gives the same credit to a specific best management practice (BMP) regardless of its permanency. For example, when the model calculates the pollution reduction that a forested 35-foot riparian buffer provides, the buffer receives the same value for pollution reduction credits regardless of whether a conservation easement secures the perpetual existence of the buffer. Neither the permanency of the buffer nor the lack of permanency is a factor in determining the buffer's value in reducing pollution.

This policy change argues for incorporating new criteria into the Bay TMDL equation so that it accounts for the durability of a preserved BMP. That is, a riparian buffer with a conservation easement

on it, that incorporates maintenance standards and preserves the buffer in perpetuity, receives a greater value for its role in protecting water quality or in reducing pollution than one with only a finite lifespan – that is, a 35-foot riparian buffer with a permanent conservation easement would receive greater pollution reduction credit than one without easement protection.

The rationale for this credit multiplier is that permanency provides a greater degree of verification, and thus certainty, of the ongoing pollution load reduction provided by the BMP. Conservation easements incorporate inspection and maintenance obligations, as well as enforcement opportunities, to ensure compliance with the terms of the easement. This increased level of inspection and verification achieves greater certainty of continued performance when compared with a BMP lacking a conservation easement. The assurance of long-term functionality is of value in determining expected water quality outcomes, and provides a basis for assigning a greater pollution reduction value when accounting for a BMP within a permanent easement within the Bay TMDL pollution metrics. This would, however, require a significant level of geographic specificity to be used within the context of the Watershed Model.

✔ **Policy Change 2: PREMIUM CREDIT FOR TARGETED CONSERVED LANDS**
Identify those conserved lands that provide a greater water quality benefit and provide them with more reduction credit than those conserved lands that provide less water quality benefit.

Under this second policy change, all conserved lands are not treated equally when it comes to water quality values. Policy Change 2 suggests that conserved lands which possess certain characteristics – for example, lands that incorporate a certain level of restoration, or lands that contain certain enhancing topographic features (e.g., large acreages of forests or wetlands) or provide targeted functions – receive greater water quality credit than conserved lands lacking one or more of these attributes. This policy change would rely on a sliding scale for crediting water quality value: conserved lands displaying the

A TOOL IN THE 'REASONABLE ASSURANCE' TOOLBOX

Land conservation and "reasonable assurance"

In tracking the implementation of the Bay TMDL, EPA must determine whether the state jurisdictions have provided "reasonable assurance" that the stipulated pollution reductions will occur. EPA determines whether the "reasonable assurance" requirement is satisfied by considering the numerous federal, state and local regulatory and non-regulatory programs identified in a Watershed Implementation Plan. Land conservation offers a jurisdiction the opportunity to enhance its reasonable assurance by providing a level of certainty against increased pollution loads: Permanent land conservation reduces the risk of land conversion and the resultant risk of increase in pollution loads. In this way, a jurisdiction can directly integrate land conservation into the Bay TMDL process, even if not into the Bay TMDL pollution reduction accounting. Whether conserved land actually provides reasonable assurance and how much it is counted towards providing reasonable assurance is neither known nor specified at this point in EPA's determinations.

greatest number of the advantageous attributes receive the greatest pollution reduction value. However, there are at least two unanswered questions that surround this policy change.

First, what are the appropriate attributes of conserved lands that provide a greater water quality benefit and how do those attributes relate, in a defensible manner, to the final water quality value given to the conserved land? Examples of such attributes could be:

- Located in a watershed with healthy streams.
- Located in an area with a high risk for conversion to development.
- Surrounding or located adjacent to spawning grounds of targeted fish.
- Containing large contiguous forested areas or areas with mature trees and dense understory.

Identification of the proper set of attributes would need to be based on a subsequent scientific and policy investigation.

The second question is whether the Bay Program Partnership could incorporate this policy change into its existing accounting scheme. Some members of the expert panel believed that Policy Change 2 simply could not be accomplished with the current Watershed Model. They concluded that at this time there is both insufficient science and insufficient modeling capability to incorporate a complex matrix of the attributes and resultant water quality values for a particular parcel of conserved land. Others disagreed, believing that there is currently sufficient knowledge with regard to certain land cover types.[6] Still others concluded that given the TMDL's exclusive focus on water quality, this change, if made, must incorporate only those attributes directly linked to pollution reductions and not to other benefits that land conservation provides (e.g., habitat protection).

Recognizing that a multi-factor site-specific value may not be feasible, what might be an alternative? Dialogue among the expert panel as well with outside consultants led to a recognition that there was a highly defensible, rather simple, single attribute that the Chesapeake Bay Program Partnership could incorporate into the modeling system which would allow for the incorporation of the concepts underlying Policy Change 2:

> Provide greater water quality value to forested lands that 1) have zero order (spring seeps), first order, and/or second order streams (often collectively known as "headwater" streams) within the land's geographic boundaries, and 2) are conserved in perpetuity.

Stroud Water Research Center has conducted substantial research to establish that protected or restored zero, first, and second order streams do more for nitrogen reduction in the Bay than other waterways. Riparian forested buffers along these streams provide significantly increased ecological functionality when compared to those along meadow streams; in fact, these headwater streams, when protected by forested buffers, show a two to eight-fold increase in nitrogen pollution processing.[7] Additionally, many of these headwater streams are particularly vulnerable to land use changes. And, because zero, first, and second order streams are located widely across the watershed, they have the potential to individually receive greater impacts from pollution than the larger waterbodies.

This "instream processing" functionality of headwater streams is not currently incorporated into the pollution reduction efficiencies of the Chesapeake Bay Watershed Model. However, high value streams

6. Note that the Land Use Workgroup of the Partnership is looking to provide some additional specificity in the definition of land types for the 2017 Bay TMDL reassessment, categorizing them by certain attributes. This includes, for example, defining forests as "floodplain forests," "riparian forests," and "harvested/managed upland forests."

7. Sweeney, Bernard W. et al., *Riparian deforestation, stream narrowing, and loss of stream ecosystem services,* PNAS, Vol. 101, no. 39 (Sept. 28, 2004).

and their enhanced ecological functions could be recognized by placing an additional water quality value on conserved lands that are identified as "protected headwaters" lands. As with a buffer along a zero, first, or second order stream, conserved land that protects the catchments of these small streams provides greater water quality benefits than conserved land located elsewhere.

✔ Policy Change 3: CREDITING CONSERVATION IN OFFSET CALCULATIONS

Adopt an approach similar to Clean Water Act wetlands mitigation, allowing for land conservation to earn some level of credit for mitigating against new pollution loads.

Under the federal Clean Water Act (CWA), when an applicant seeks a permit to impact a wetland (for example, filling ten acres of wetland to build a new development), the law requires that the applicant mitigate that impact in order to receive a permit. The "compensatory mitigation sequencing" established under the CWA works as follows:

- First, the applicant must seek to avoid the impact;
- Second, the applicant must seek to minimize the impact; and
- Third, the applicant must compensate for any impact that does occur.

When reaching the third level of the sequence (i.e., compensation), the law requires the restoration, creation, enhancement and/or preservation of other wetlands within the impacted watershed. The restore, create, enhance, and preserve options exist in a hierarchy. Preservation, because it does not provide any acreage to offset the loss of impacted wetland acres, is the lowest rung on this hierarchy ladder. As a result, preservation does not receive as much credit for offsetting the impact as does restoration, creation or enhancement. However, the hierarchy does allow preservation to be included as part of the overall compensation package when used in conjunction with the other forms of mitigation.

The concept of this compensatory hierarchy could be applied to land conservation as follows: the TMDL accounting would provide greater nutrient pollution reduction credit when conserved land is included in a nutrient pollution reduction or offset plan.

Consider, for example, this hypothetical:

- A discharger of a new load of 100 pounds of nitrogen pollution must, under the TMDL calculation, offset this new load.
- The jurisdiction in which the discharger is located has a 2:1 offset policy. That is, the jurisdiction requires a reduction of 200 pounds of nitrogen pollution to compensate for the new 100-pound load.
- The discharger seeks to offset the new load by the establishment of a 5-mile riparian buffer. But the buffer achieves only a 190-pound offset towards the required 200 pounds.
- The discharger places a permanent conservation easement on the riparian buffer and the adjoining 50 acres of forest.
- The jurisdiction allows the discharger to increase the offset value of the riparian buffer with 10 additional pounds of nitrogen because of the linkage of the conserved buffer to the adjoining conserved forest.

This Policy Change 3 could easily fit into a nutrient credit trading program, allowing for conserved to land to contribute additional value to a trade.

✔ **Policy Change 4: 2025 LAND USE BASELINE**

Utilize a 2025 land use baseline scenario in the 2017 TMDL re-assessment, allowing for credit for conserved lands previously included as part of a growth scenario.

The Bay TMDL uses a 2010 land use landscape in calculating the load reductions necessary to achieve healthy water quality. That is, the Chesapeake Bay Watershed Model, when determining the total load of nutrients entering the Bay and the corresponding necessary load reductions, used the land use conditions that existed in 2010.

This, in a sense, froze the TMDL in time based on the pollution loads that the landscape generated in 2010. Calculating the TMDL based on 2010 land use conditions creates a reality gap: it ignores the reality that growth has occurred and will continue to occur between 2010 and the TMDL deadline of 2025. With population growth in the Bay watershed predicted to increase from 17.4 million in 2010 to over 20 million by the year 2030, increases in nitrogen, phosphorus and sediment loads to the Bay are highly likely. Absent some unforeseen technological advance, the pollution that comes from the activities of 2.5 million more human beings and from converting farms and forests to homes will cause the watershed to experience new loads of additional pollution.

Under the current 2010 land use structure for TMDL accounting, new loads must be offset so that there is a net zero gain. For every pound of nitrogen, phosphorus or sediment pollution added to the waters of the Bay from a new sewage treatment plant or a new shopping mall parking lot, a pound must be subtracted from the load of some other existing source. Because conserving land does not provide an immediate offset on the subtraction side for any increased load, it cannot by itself compensate for these new loads. Thus, the current accounting and modeling framework does little to promote land conservation.

ADDING TO RESILIENCY

"It's just a matter of time."

There is a fundamental difference between conserved and unconserved lands and their impact on water quality that goes beyond the simple pre and post conservation measurement of nitrogen, phosphorus and sediment loadings from the land. Conservation of land can reduce or even eliminate the inevitable impacts of development, providing a receiving waterbody with greater ecological and functional stability. It can alter the timing and severity of the impacts of land conversion, slowing down, or in some cases preventing entirely, the degradation of water quality. In essence, conservation of land provides, quite literally, a healthy watershed with the ability to maintain its healthy condition. It can also provide a damaged watershed more time to recover.

Given this time element associated with conserved land, it may be useful to consider providing jurisdictions which achieve a certain ratio of conserved to unconserved land in a designated watershed an extension of time to achieve other pollution reduction allocation targets on the theory that the land conservation will, over time, slow high impact development in that watershed, and reduce the need for additional sewage capacity or stormwater BMPs, to achieve the Bay TMDL pollution reduction goals. It would also provide for the maintenance of existing watershed health as other changes on the land occur over time.

If, however, the TMDL load allocations include the anticipated loads that will occur from growth, the accounting changes, yielding an incentive for conserving land by recognizing its value in preventing increased future loads. By looking forward and including in the allocations the additional future loads that will occur due to projected land conversion, an incentive is provided for conserving land. Specifically, if a state or local government conserves land that it otherwise projected for growth, the government has reduced the anticipated load. Thus, there is value for this reduction within the TMDL accounting structure; i.e., for the prevention of loads not generated but previously anticipated. Conversely, if land currently conserved or projected for conservation is developed, there would be an increase in the overall projected load.

In this way, use of the 2025 projected landscape could not only provide a water quality accounting incentive for conserving land, it would also help show where unprotected lands are most likely to be developed over a specific time frame. It would help the prioritization of conservation work by directing the focus of preservation and improved local land use management efforts to areas that are both ecologically valuable and highly vulnerable to development.

Bay Program Partners are currently discussing the 2017 mid-point assessment of the TMDL and at least some of these discussions have raised the possibility of using a 2025 projected landscape for calculating loads and allocations for the development of the next phase of the Watershed Implementation Plans.

CONCLUSION: RETHINKING THE EXCLUSIVE FOCUS ON POLLUTION REDUCTION

In the history of the Bay restoration program there has been long-standing support for efforts to set aside and conserve land, driven by historical demand for recreation, open space and wildlife habitat, and in more recent years by desires to mitigate the impacts of fragmented landscapes that destroy working agricultural and forest lands. There has also always been a deep understanding that natural lands provide valuable ecosystem services that help deliver clean water. But as the TMDL program has developed, the focus has shifted from pollution prevention to pollution reduction. This shift precipitated an incomplete restoration agenda: by focusing on counting reductions exclusively, the Bay TMDL, as a restoration tool, misses a crucial opportunity to focus on retention of natural systems that are already effectively contributing water quality protection. This realization led the expert panel and the Commission to the conclusion that there must be a critical "parallel track" to pollution reduction for land conservation efforts, whereby land conservation becomes an integral part of our Bay restoration and water quality protection and improvement strategy.

The proposed Policy Changes contained in this report, whether implemented independently, in conjunction with another, or comprehensively as a package, are but first steps in furthering the integration of land conservation into the Bay TMDL. This integration will not occur merely as a result of the identification of the four Policy Changes detailed in this report. An important next step will be for the Chesapeake Bay Program Partnership to explore each option in greater detail, embrace the Policy Changes that hold the greatest promise and integrate their implementation in the work of the Partnership. This will require thoughtful discussions among the Chesapeake Bay Program Partnership players, from state agency officials to Region 3 EPA leaders to the advisory committees and Partnership stakeholders.

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