

Six Steps to West Virginia Agricultural Nutrient and Sediment Credit Calculations

WV Potomac Trading Program, April 2009



This brief provides a general description of and the rationale for some of the primary agriculture-related policy elements included in West Virginia's trading program guidance.

WV's Agricultural Credit Calculation Workgroup has worked closely with The World Resources Institute (WRI) to develop a methodology for calculating potential nutrient reduction credits that result from various agricultural practices applied in West Virginia. Calculations are largely based on those developed by WRI for Pennsylvania's Water Quality Trading Program; however they are specific to West Virginia's landscape and agricultural practices. WRI is currently integrating the calculations into West Virginia's online water quality trading platform that WRI is developing, called NutrientNet.¹

There are six steps to calculate Nitrogen, Phosphorus and Sediment Credits using the West Virginia Calculation. These six steps involve the concepts of Ratios, Factors and Baselines as described below.

Step 1: The Farmer enters **site-specific information** about their farm (e.g., crop type, amount and type of manure applied, manure application method, current conservation practices, etc.)

Step 2: NutrientNet automatically generates a "**Nutrient Balance**" on the field depending on information the farmer has entered about their farm. A "Nutrient Balance" subtracts the nitrogen and Phosphorus outputs of the cropping system (i.e. crop uptake) from the nutrient inputs to the cropping system (i.e. amount of fertilizer applied) and adjusts for current Best Management Practices (BMP's).

Step 3. The farmer selects one or more BMP's that are to be implemented on the farm. NutrientNet calculates the estimated nutrient/sediment reductions using the Chesapeake Bay Model effectiveness.

Step 4. The estimated nutrient/sediment reductions are multiplied by the Chesapeake Bay Model's Edge of Segment (EOS) factor to adjust for the amount of nutrients/sediment that is transported to the stream. The EOS factor is a ratio that estimates the amount of nutrients and sediment that travels from the edge of the farm field to the edge of the watershed segment.

Step 5. The EOS nutrient reductions calculated in step 4 above are multiplied by a Chesapeake Bay Model Delivery Factor to adjust for the nutrient/sediment load delivered from the watershed segment to the Bay.

Step 6: Risk Reserve and Uncertainty Ratios are applied as appropriate, to account for 1) uncertainty associated with BMP efficiencies due to errors in estimation, quality of implementation, completeness of verification and enforcement and 2) risks associated with BMP failure due to natural disaster or other unpreventable failures of credited practices.

¹ More information on NutrientNet's online water quality trading marketplace and credit calculations can be found at www.nutrientnet.org & at <http://www.wri.nrcce.wvu.edu/programs/pwqb>.



A. BACKGROUND

The WV Potomac Nutrient/Sediment Trading Program is intended to be a legal, fair, and effective voluntary tool for advancing water quality improvement and regulatory compliance in the Potomac drainage related to nutrient loadings of Nitrogen and Phosphorous. In drafting the Program Guidance, special attention has been given to creating agriculture sector provisions that promote flexibility and credibility in the development and exchange of agriculture sector-produced Nutrient Reduction Credits (NRCs). Fairness, flexibility, and credibility are necessary conditions for implementing a trading program that encourages agricultural sector participation in the

production of Nutrient Reduction Credits *and* that encourages point source interest and confidence in purchasing real and verifiable agricultural sector credits.

While this approach may seem complicated, it is because the issue at hand - managing the effects of landuse on water quality through a political system – is indeed complex, but important. While the public/user interface of this program needs to be simple, it is the responsibility of the program designers to understand and address Program complexities to ensure that a credible program is created; otherwise Credit buyers will not participate and water quality goals will not be attained.

In order to ensure permit compliance, Credit buyers – regulated permittees- must ensure that real and verifiable NPS pollution load reductions are used to offset increases in point source nutrient loads. Consequently, Credit buyers must buy real pollution load reductions; they are not simply buying BMPs (as some other programs may do). Rather, the performance of BMPs – or the effective load reduction - is the product that Credit suppliers must market and sell to Credit buyers. The NutrientNet Credit Calculation program helps suppliers and buyers define this product more clearly.

This programmatic distinction is important for two reasons: 1) the delivered load reduction of a given BMP can vary depending on where it is installed within the watershed and under what conditions it is installed and maintained – accordingly, the same BMP will hold a different value to the buyer depending on the specific situation in which it is applied – Ratios and Factors help account for these variations; and 2) the agriculture sector does not have exclusive rights to supply Reduction Credits – farmers will increasingly compete with other potential credit suppliers as nutrient trading develops in the region and therefore must develop, price, and market their credits competitively in terms of reliability and cost.



B. KEY CONCEPTS

The following concepts are a part of the WV Potomac Trading Program Guidance and are important to understanding how nutrient and sediment credits are proposed to be calculated in the agricultural sector. These concepts include the following: **I. Segment & Delivery Factors**, **II. Uncertainty & Risk Ratios**, and **III. Baselines**.

EXAMPLE 1 Segment & Delivery Factors

Suppose two farmers, Al & Bob, have 40 acres of pasture with 80 head of cattle grazing. Al & Bob would both like to install fenced stream buffers along several hundred feet of pasture land streams.

Al farms in Jefferson County, close to the Potomac River and on relatively flat land.

Bob farms in Grant County, much farther from the Potomac mainstem but on land with steep slopes where water and soil run off the land faster and in greater quantities.

The **Segment Factor** reflects, among other factors, topography; so a buffer on Bob's fields with the same *rate* of efficiency will see more *total* nutrients running off the steeper slopes and through the buffer. This difference is captured by the Segment factor.

A **Delivery Factor** captures the part of the story in which the higher total load of nutrients leaving Bob's stream segment in Grant County are less likely to reach, *or be delivered to*, the Potomac and Bay, because they are diminished by physical and biological factors. The smaller load of nutrients that leave Al's watershed segment are more likely to arrive at the Potomac and then be delivered to the Bay.

I. SEGMENT & DELIVERY FACTORS –

Segment & Delivery Factors are used to help calculate various land management activities implemented in different locations throughout the WV Potomac River Basin that translate into different nutrient load reductions in the Chesapeake Bay, which is the product that is sought by credit buyers.

A **Delivery Factor** *accounts for the natural attenuation or loss of a nutrient load as it travels through a watershed*. The delivery factor is important because it ensures credit equivalency among various points in the basin and accounts for the actual load reduction at the Chesapeake Bay. Therefore land management efforts applied closer to the Bay are generally more valuable to a permittee than the same efforts applied in a tributary higher upstream with a very low effective Delivery Factor.

A **Segment Factor** *accounts for the soils, topography, hydrological, and land use characteristics of each Chesapeake Bay Model watershed segment in WV in the calculation of load reductions*. The segment factor is used to incorporate local landscape factors into to the nutrient credit estimation process.

II. RISK RESERVE AND UNCERTAINTY RATIOS - Point sources will be required to purchase 1.2 Agricultural Nutrient Reduction Credit pounds at for every one pound in excess of their waste load allocations. This 20% increment will be **reserved** for the risk of uncontrollable credit supply failures such as flooding or deer damage – just like crop insurance. The uncertainty ratio is used in water quality trading to compensate for two factors: 1. Random variability in weather that affects the pollutant removal efficiency of BMPs; and 2. Uncertainty associated with the pollutant reduction effectiveness (efficiency) of the various BMPs. However, the Chesapeake Bay Program has incorporated uncertainty into the nutrient and sediment removal effectiveness of their approved BMPs. These practices have been rigorously peer reviewed by the Bay Program and the associated pollutant removal efficiency of these practices incorporates the above factors. Therefore, where Bay Program-approved BMPs are implemented additional uncertainty ratios will not be applied. If water quality

monitoring data show that the actual P/N stream loads do not decrease in accordance with expectations after a few years of trading then WVDEP reserves the right to adjust the uncertainty ratio.

III. BASELINE - In the WV Potomac Tributary Strategy and in jurisdictions throughout the Chesapeake Bay Watershed, various economic/land use sectors have been assigned target nutrient and sediment loads. These targeted loads are set at levels that, if achieved collectively, would help restore and protect local water quality and the Chesapeake Bay. Currently, load reductions needed to achieve goals are being implemented through voluntary incentive programs in the non-point sectors and permit-based nutrient load limits in the regulated point source sector.

Because Nutrient Reduction Credits are used as a currency to help point sources meet their regulatory pollution load limits, the WV Potomac Trading Program cannot be used in a manner that allows an increase in total loadings to the Potomac. Nutrient reduction activities must result in *real net* load reductions in the watershed in order to allow load increases in the point source sector. Therefore a baseline is established to ensure that credits generated are “additional” water quality improvements that would not otherwise have taken place.

A **baseline** essentially answers the question, “when is it reasonable and fair to start *crediting* agriculture load reductions – that is, allowing them to justify increased loads elsewhere?” This answer can either be defined by listing a suite of mandatory practices that must be installed before credits can be generated by *additional* efforts (like Pennsylvania and Virginia), or baselines can be set by a numeric load-per-acre goal (Maryland’s approach and what WV has proposed). WV’s proposed guidance establishes a per acre baseline equal to the 2005 *per acre* loading (existing land use and practices) as calculated by the Chesapeake Bay Model.

WV has chosen this baseline for a number of reasons described below:

1. *Fairness*: By establishing a baseline, farmers who have been good land stewards do not face unfair competition from farmers who have “low hanging fruit” or severe nutrient loading problems. For farmers with land use challenges, public incentive programs provided through the Farm Bill are available to help them achieve baseline loading levels.

2. *Flexibility*: The Agricultural stakeholders group in WV underscored feedback from other states: the Program should not specify what practices are or are not mandatory; farmers are best able to determine what investments in water quality improvements will result in the greatest benefits to the environment and their operation.

3. *Elimination of the distinction between restoration and conservation (existing and new) practices or land use since the 2005 establishment of the point source waste load allocation*. By allowing land management practices initiated and maintained prior to 2005 to be eligible to generate credits, farmers who began land stewardship/conservation practices early will not be at a disadvantage relative to farmers who are only now opting to adopting such practices. Similarly, eliminating this distinction removes the incentive for farmers to wait for either the trading program to develop or for credit prices to increase before investing in practices.

4. *Elimination of the need to achieve the agricultural sector cap prior to allowing trading in the sector*. While the state has committed to achieving a nutrient load cap in all sectors identified in the Tributary Strategy, only the permitted point source sector which discharges above 50,000 gpd is

required to do so. These regulated point source sector facilities are investing significant amounts of money into facility upgrades, increased treatment and other strategies to ensure the sector achieves and maintains its sector cap. While the equity in this overall approach is not open to debate, the point source sector is not willing to fund its own sector's cap load achievements and the achievement of other sectors' caps.

Farmers willing to voluntarily invest or participate in nutrient reduction activities should not be penalized for slow or inadequate state, federal or private investment in water quality improvement activities that delay the sector from meeting its reduction goals. With the baselines, each farmer is responsible only for his/her own loadings to the Bay. If the farmer has already installed practices, a portion of benefits (pounds reduced or avoided by maintaining existing practices) will generate water quality benefits (as they have been in the past). The farmer will then have the opportunity to sell the additional reductions (or loads avoided) as Credits to a point source buyer that is increasing its load elsewhere in the watershed.

5. *Coordination with other Bay trading programs.* If nutrient trading can be shown to work, WV may have a future opportunity to sell nutrient credits to other states in the Bay Watershed. Maryland, being adjacent to and downstream of WV and within the Potomac Basin, would be a particularly likely trading partner. The baseline approach in the WV guidance is designed to coordinate with both MD and PA guidance, in order to keep that door of opportunity open.
