

Attachment 3: Overview of the Agriculture Sector's participation in Nutrient Trading

Recommendations for Initial Nutrient Trading Program:

In March 2006, at the request of the Chesapeake Bay Tributary Strategy Steering Committee, the Agricultural Workgroup began meeting to develop recommendations for the participation of the agricultural community in the PA DEP Nutrient Trading Program. The following are the Agricultural Workgroup's recommendations for the Steering Committee.

Baseline Requirements

- Compliance with Act 38 Nutrient Management Regulations, Chapter 102 Erosion & Sedimentation Regulations, Chapter 91.36 (Agricultural Operations), and Chapter 92 (CAFOs) as applicable.
- Compliance can be determined through a site visit OR verification of the development and implementation of a nutrient management plan, E&S Plan or an acceptable Conservation Plan, as well as a Manure Management Plan, as applicable.
- Compliance must be verified by DEP, Conservation District, or other agent approved by DEP.

Threshold Requirements

- 100 Foot setback or equivalent; this is achieved when *ONE of the following* is met:
 - Manure is not mechanically applied within 100 feet of surface water¹
 - There are no surface waters on or within 100 feet of the farm.
 - Farm uses no manure application and applies commercial fertilizer at or below the Penn State recommended agronomic rates.
- *OR*
- 35 Foot buffer or equivalent; this is achieved when all of the following are met:
 - A minimum of 35 feet of permanent vegetation is established and maintained between the field and surface water.
 - Area can be grazed or cropped under a specific management plan, and permanent vegetation must be maintained at all times. (*Permanent vegetative buffers 50' or greater in width may qualify to generate nutrient reduction credits.*)
- *OR*
- 20 % Reduction Option
 - A reduction of 20% in the farm's overall nutrient balance beyond baseline compliance.

¹ As applicable; for instance, setbacks for CAFOs apply to a broader range of surface waters than non-CAFO operations.

Trading Ratio

In order to provide the greatest opportunity for credit generation and a fair market for all participants, all nutrient reduction credits generated by agricultural operations should be traded at a 1:1 ratio.

Edge of Segment Ratio

The Workgroup recommends applying the Edge of Segment (EOS) Ratio associated with each watershed segment as developed from the EPA Chesapeake Bay Model. The Workgroup has tried to develop alternate solutions. However, at the present time the group has not developed a scientifically defensible alternate strategy to determine EOS nutrient loads on an individual farm basis. Individuals on the Workgroup plan to continue studying this topic and will provide further recommendations when a suitable alternate strategy is available.

Credit Generation Methodology

The following methodology is recommended by the Ag Workgroup for calculation of nutrient reduction credits on agricultural operations. The Workgroup understands that this may not be the only methodology that could be utilized for the generation of credits from agricultural operations

- 1) Determine if farm is in Baseline Compliance and meets the Threshold for trading
- 2) Determine current rates of nutrient application
- 3) Account for any overall reductions in applications
 - Commercial Fertilizer Applications – Reduction in commercial fertilizer applications below PSU agronomic rate
 - Manure Applications – Reduction in total manure applications below current practices (and below minimal acceptable PSU agronomic rates) through better manure management practices.
 - Combination – Reduction in total nutrient applications (manure and commercial fertilizers) below current practices (and below PSU agronomic rates) through better manure management practices.
- 4) Calculate new nutrient load not going to crop production.
- 5) Apply EOS factor to load
- 6) Calculate nutrient reductions from BMP efficiencies. BMP Efficiencies can be calculated from the following methods:
 - *Table 1: Nonpoint Source Best Management Practices that have been Peer-Reviewed and CBP-Approved for Phase 5.0 of the Chesapeake Bay Program Watershed Model, Revised 1/12/06*
 - *Table 2: Nonpoint Source Best Management Practices requiring additional Peer-Review for Phase 5.0 of the Chesapeake Bay Program Watershed Model, Revised 1/12/06*
 - Additional methods or Tables that have been approved by the Department
- 7) Total all nutrient reductions in terms of Pounds
- 8) Apply Delivery Ratio
- 9) Apply Retirement Ratio
- 10) Total Credits available

Retirement of Agricultural Land

In order to address the concern that productive farmland might be retired for the sole purpose of generating credits, the Workgroup offers the following language to the Steering Committee for the Nutrient Trading Program Policy.

The Trading Program is not intended to accelerate loss of productive farmland. Therefore, credits will not be generated under this policy from the purchase and idling of whole or substantial portions of farms to provide nutrient credits for use offsite.

Individuals are eligible for nutrient credit generation when converting one land use to another, where the post-construction reduced nutrient loading can be established.

January 2005 Implementation Date

The Agricultural Workgroup endorses the DEP Policy that non-structural BMPs (*e.g., no-till practices, cover crops, advanced nutrient management*) that were implemented prior to January 2005 and continue to be utilized and maintained on an annual basis shall be eligible to earn nutrient reduction credits.

**Table 1: Nonpoint Source Best Management Practices that have been Peer-Reviewed and CBP-Approved for Phase 5.0 of the Chesapeake Bay Program Watershed Model
Revised 1/12/06**

<i>Agricultural BMPs</i>	<i>How Credited</i>	<i>TN Reduction Efficiency</i>	<i>TP Reduction Efficiency</i>	<i>SED Reduction Efficiency</i>
Riparian Forest Buffers and Wetland Restoration - Agriculture ¹ :	Landuse conversion + efficiency	Efficiency applied to 4 upland acres	Efficiency applied to 2 upland acres	Efficiency applied to 2 upland acres
Coastal Plain Lowlands	Efficiency	25%	75%	75%
Coastal Plain Dissected Uplands	Efficiency	40%	75%	75%
Coastal Plain Uplands	Efficiency	83%	69%	69%
Piedmont Crystalline	Efficiency	60%	60%	60%
Blue Ridge	Efficiency	45%	50%	50%
Mesozoic Lowlands	Efficiency	70%	70%	70%
Piedmont Carbonate	Efficiency	45%	50%	50%
Valley and Ridge Carbonate	Efficiency	45%	50%	50%
Valley and Ridge Siliciclastic	Efficiency	55%	65%	65%
Appalachian Plateau Siliciclastic	Efficiency	60%	60%	60%
Riparian Grass Buffers - Agriculture:	Landuse conversion + efficiency	Efficiency applied to 4 upland acres	Efficiency applied to 2 upland acres	Efficiency applied to 2 upland acres
Coastal Plain Lowlands	Efficiency	17%	75%	75%
Coastal Plain Dissected Uplands	Efficiency	27%	75%	75%
Coastal Plain Uplands	Efficiency	57%	69%	69%
Piedmont Crystalline	Efficiency	41%	60%	60%
Blue Ridge	Efficiency	31%	50%	50%
Mesozoic Lowlands	Efficiency	48%	70%	70%
Piedmont Carbonate	Efficiency	31%	50%	50%
Valley and Ridge Carbonate	Efficiency	31%	50%	50%
Valley and Ridge Siliciclastic	Efficiency	37%	65%	65%
Appalachian Plateau Siliciclastic	Efficiency	41%	60%	60%

¹ These peer-reviewed BMP efficiencies and/or landuse conversions will be refined with more recent data for use in Phase 5.0 of the Chesapeake Bay Program Watershed Model based on results of the EPA CBPO FY2006 BMP Literature Synthesis project. Estimated Completion Date: TBD.

<i>Agricultural BMPs (continued)</i>	<i>How Credited</i>	<i>TN Reduction Efficiency</i>	<i>TP Reduction Efficiency</i>	<i>SED Reduction Efficiency</i>
Conservation Plans - Agriculture ¹ (Solely structural practices such as installation of grass waterways in areas with concentrated flow, terraces, diversions, drop structures, etc.):	Efficiency			
Conservation Plans on Conventional-Till	Efficiency	8%	15%	25%
Conservation Plans on Conservation-Till and Hay	Efficiency	3%	5%	8%
Conservation Plans on Pasture	Efficiency	5%	10%	14%
Cover Crops ¹ :	Efficiency			
Cereal Cover Crops on Conventional-Till:	Efficiency			
Early-Planting - Up to 7 days prior to published first frost date	Efficiency	45%	15%	20%
Late-Planting - Up to 7 after published first frost date	Efficiency	30%	7%	10%
Cereal Cover Crops on Conservation-Till:	Efficiency			
Early-Planting - Up to 7 days prior to published first frost date	Efficiency	45%	0%	0%
Late-Planting - Up to 7 after published first frost date	Efficiency	30%	0%	0%
Commodity Cereal Cover Crops / Small Grain Enhancement on Conventional-Till:	Efficiency			
Early-Planting - Up to 7 days prior to published first frost date	Efficiency	25%	0%	0%
Late-Planting - Up to 7 after published first frost date	Efficiency	17%	0%	0%
Commodity Cereal Cover Crops / Small Grain Enhancement on Conservation-Till:	Efficiency			
Early-Planting - Up to 7 days prior to published first frost date	Efficiency	25%	0%	0%
Late-Planting - Up to 7 after prior to published first frost date	Efficiency	17%	0%	0%
Off-stream Watering with Stream Fencing (Pasture)	Efficiency	60%	60%	75%
Off-stream Watering without Fencing (Pasture)	Efficiency	30%	30%	38%
Off-stream Watering with Stream Fencing and Rotational Grazing (Pasture)	Efficiency	20%	20%	40%

¹ These peer-reviewed BMP efficiencies and/or landuse conversions will be refined with more recent data for use in Phase 5.0 of the Chesapeake Bay Program Watershed Model based on results of the EPA CBPO FY2006 BMP Literature Synthesis project. Estimated Completion Date: TBD.

<i>Agricultural BMPs (continued)</i>	<i>How Credited</i>	<i>TN Reduction Efficiency</i>	<i>TP Reduction Efficiency</i>	<i>SED Reduction Efficiency</i>
Animal Waste Management Systems - Applied to model manure acre where 1 manure acre = runoff from 145 animal units:	Reduction in manure acres			
Livestock Systems	Reduction in manure acres	100%	100%	N/A
Poultry Systems	Reduction in manure acres	100%	100%	N/A
Barnyard Runoff Control / Loafing Lot Management	Reduction in manure acres	100%	100%	N/A
Conservation-Tillage ¹	Landuse conversion	N/A	N/A	N/A
Land Retirement - Agriculture	Landuse conversion	N/A	N/A	N/A
Tree Planting - Agriculture	Landuse conversion	N/A	N/A	N/A
Carbon Sequestration / Alternative Crops	Landuse conversion	N/A	N/A	N/A
Nutrient Management Plan Implementation - Agriculture	Built into simulation	135% of modeled crop uptake	135% of modeled crop uptake	N/A
Enhanced Nutrient Management Plan Implementation – Agriculture ¹	Built into simulation	115% of modeled crop uptake	115% of modeled crop uptake	N/A
Alternative Uses of Manure / Manure Transport	Built into preprocessing	Reduction in nutrient mass applied to cropland	Reduction in nutrient mass applied to cropland	N/A
Poultry Phytase	Built into preprocessing	N/A	Reduction in nutrient mass applied to cropland	N/A

¹ These peer-reviewed BMP efficiencies and/or landuse conversions will be refined with more recent data for use in Phase 5.0 of the Chesapeake Bay Program Watershed Model based on results of the EPA CBPO FY2006 BMP Literature Synthesis project. Estimated Completion Date: TBD.

<i>Agricultural BMPs (continued)</i>	<i>How Credited</i>	<i>TN Reduction Efficiency</i>	<i>TP Reduction Efficiency</i>	<i>SED Reduction Efficiency</i>
Dairy Precision Feeding / and Forage Management ¹	Built into preprocessing	Reduction in nutrient mass applied to cropland	Reduction in nutrient mass applied to cropland	N/A
Swine Phytase	Built into preprocessing	N/A	Reduction in nutrient mass applied to cropland	N/A
Continuous No-Till:				
Below Fall Line	Efficiency	10%	20%	70%
Above Fall Line	Efficiency	15%	40%	70%
Water Control Structures	Efficiency	33%	N/A	N/A
<i>Urban and Mixed Open BMPs</i>				
Stormwater Management::	Efficiency			
Wet Ponds and Wetlands ¹	Efficiency	30%	50%	80%
Dry Detention Ponds and Hydrodynamic Structures ¹	Efficiency	5%	10%	10%
Dry Extended Detention Ponds ¹	Efficiency	30%	20%	60%
Infiltration Practices	Efficiency	50%	70%	90%
Filtering Practices	Efficiency	40%	60%	85%
Erosion and Sediment Control ¹	Efficiency	33%	50%	50%
<i>Urban and Mixed Open BMPs (continued)</i>	<i>How Credited</i>	<i>TN Reduction</i>	<i>TP Reduction</i>	<i>SED Reduction</i>

¹ These peer-reviewed BMP efficiencies and/or landuse conversions will be refined with more recent data for use in Phase 5.0 of the Chesapeake Bay Program Watershed Model based on results of the EPA CBPO FY2006 BMP Literature Synthesis project. Estimated Completion Date: TBD.

		<i>Efficiency</i>	<i>Efficiency</i>	<i>Efficiency</i>
Nutrient Management (Urban)	Efficiency	17%	22%	N/A
Nutrient Management (Mixed Open)	Efficiency	17%	22%	N/A
Abandoned Mine Reclamation	Landuse change converted to efficiency	Varies by model segment	Varies by model segment	Varies by model segment
Riparian Forest Buffers – Urban and Mixed Open	Landuse conversion + efficiency	25%	50%	50%
Wetland Restoration – Urban and Mixed Open	Landuse conversion	N/A	N/A	N/A
Stream Restoration – Urban and Mixed Open ¹	Load reduction converted to efficiency	0.02 lbs/ft	0.0035 lbs/ft	2.55 lbs/ft
Impervious Surface and Urban Growth Reduction / Forest Conservation	Landuse conversion	N/A	N/A	N/A
Tree Planting – Urban and Mixed Open	Landuse conversion	N/A	N/A	N/A
<i>Resource and Septic BMPs</i>				
Forest Harvesting Practices ¹	Efficiency	50%	50%	50%
Septic Denitrification	Efficiency	50%	N/A	N/A
Septic Pumping	Efficiency	5%	N/A	N/A
Septic Connections / Hook-ups	Removal of systems	N/A	N/A	N/A

¹ These peer-reviewed BMP efficiencies and/or landuse conversions will be refined with more recent data for use in Phase 5.0 of the Chesapeake Bay Program Watershed Model based on results of the EPA CBPO FY2006 BMP Literature Synthesis project. Estimated Completion Date: TBD.

**Table 2: Nonpoint Source Best Management Practices Requiring Additional Peer-Review
for Phase 5.0 of the Chesapeake Bay Watershed Model
Revised 1/12/06**

(Note: Credit and Efficiencies are listed in parenthesis
since they have not received formal peer review)

<i>Agricultural BMPs Requiring Peer Review</i>	<i>How Credited</i>	<i>TN Reduction Efficiency</i>	<i>TP Reduction Efficiency</i>	<i>SED Reduction Efficiency</i>	<i>CBP Lead Status Estimated Completion Date</i>
Precision Agriculture	(Built into simulation)	N/A	N/A	N/A	Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency for Phase 5.0 Completion Date: TBD Delaware Maryland Agribusiness Association plans to work with CBPO to provide tracking data for this BMP.
Manure Additives	TBD	TBD	TBD	TBD	Agriculture Nutrient Reduction Workgroup TBD TBD
Ammonia Emission Reductions	(Built into preprocessing)	(Reduction in ammonia deposition)	N/A	N/A	Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency Completion Date: TBD
Precision Grazing	Efficiency	(25%)	(25%)	(25%)	Agriculture Nutrient Reduction Workgroup Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency Completion Date: TBD
Mortality Composters	Efficiency	(14%)	(14%)	N/A	Tributary Strategy Workgroup EPA CBPO 2006/2007 project will determine efficiency June 2008
Horse Pasture Management	Efficiency	(20%)	(20%)	(40%)	Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency Completion Date: TBD

<i>Agricultural BMPs Requiring Peer Review (continued)</i>	<i>How Credited</i>	<i>TN Reduction Efficiency</i>	<i>TP Reduction Efficiency</i>	<i>SED Reduction Efficiency</i>	<i>CBP Lead Status Estimated Completion Date</i>
Non-Urban Stream Restoration	Load reduction converted to efficiency				
Non-Urban Stream Restoration on Conventional-Till and Pasture	Load reduction converted to efficiency	(0.026 lbs/ft)	(0.0046 lbs/ft)	(3.32 lbs/ft)	Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency Completion Date: TBD
Non-Urban Stream Restoration on Conservation-Till, Hay	Load reduction converted to efficiency	(0.02 lbs/ft)	(0.0035 lbs/ft)	(2.55 lbs/ft)	Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency Completion Date: TBD
<i>Urban and Mixed Open BMPs Requiring Peer Review</i>					
Non-Urban Stream Restoration on Mixed Open	Load reduction converted to efficiency	(0.02 lbs/ft)	(0.0035 lbs/ft)	(2.55 lbs/ft)	Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency Completion Date: TBD
Dirt & Gravel Road Erosion & Sediment Control on Mixed Open	Load reduction converted to efficiency	(0.02 lbs/ft)	(0.0035 lbs/ft)	(2.55 lbs/ft)	Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency Completion Date: TBD
Roadway Systems	TBD	TBD	TBD	TBD	Urban Stormwater Workgroup (USWG) USWG will meet with Departments of Transportation to identify roadway BMPs and efficiencies TBD
Urban Street Sweeping and Catch Basin Inserts	Efficiency	(10%)	(10%)	(10%)	Urban Stormwater Workgroup EPA CBPO street sweeping project will provide efficiency recommendations for the Urban Stormwater Workgroup review in Fall 2007

Urban and Mixed Open BMPs Requiring Peer Review (continued)	How Credited	TN Reduction Efficiency	TP Reduction Efficiency	SED Reduction Efficiency	CBP Lead Status Estimated Completion Date
Riparian Grass Buffers – Urban and Mixed Open	TBD	TBD	TBD	TBD	TBD
Resource BMPs Requiring Peer Review					
Non-Urban Stream Restoration on Forest	Load reduction converted to efficiency	(0.02 lbs/ft)	(0.0035 lbs/ft)	(2.55 lbs/ft)	Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency Completion Date: TBD
Dirt & Gravel Road Erosion & Sediment Control on Forest	Load reduction converted to efficiency	(0.02 lbs/ft)	(0.0035 lbs/ft)	(2.55 lbs/ft)	Tributary Strategy Workgroup EPA CBPO FY2006 BMP Literature Synthesis project will determine efficiency Completion Date: TBD
Voluntary Air Emission Controls within Jurisdictions (Utility, Industrial, and Mobile)	Built into preprocessing	(Reduction in nitrogen species deposition)	N/A	N/A	Nutrient Subcommittee TBD TBD
Off-shore breakwater	Water Quality Model	TBD	TBD	TBD	Sediment Workgroup TBD TBD
Headland control	Water Quality Model	TBD	TBD	TBD	Sediment Workgroup TBD TBD
Breakwater systems	Water Quality Model	TBD	TBD	TBD	Sediment Workgroup TBD TBD

