Nutrient Trading:
Cost Containment – The Missed Opportunity

Summary

Saving the Chesapeake Bay by keeping nitrogen pollution out of waterways can be achieved at much lower cost to the taxpayers by capturing farm nutrient loss at its source, rather than paying for expensive upgrades to human wastewater treatment plants that will achieve only incremental improvements. Rapid collection and improved treatment of livestock waste on a large scale represents a major unrealized opportunity to generate substantial farm nutrient loss reductions while containing costs. A dairy cow's annual nitrogen load averages that of 25 humans. The more than 8 million dairy cows in the U.S. by themselves generate the nitrogen production of 200 million humans. Enabling farms to convert to cleaner, more cost-effective technology, however, will require improvements to state nutrient credit trading programs (similar to those that successfully reduced the cost of addressing acid rain). The improvements would allow livestock farms to reduce nitrogen pollution that is currently unregulated, and sell the resulting credits as verified offsets to state nutrient reduction mandates. The projected savings to federal and state taxpayers and local ratepayers in addressing this national problem will be in the billions of dollars annually.

I. Introduction

A 1990 update to the Clean Air Act created a cap-and-trade system to permanently reduce sulfur dioxide (SO_2) emissions from coal-fired power plants, and thereby reduce acid rain. The EPA cap-and-trade program allowed individual coal-fired power plants (or "point-source emitters") who reduced their sulfur dioxide emissions by more than the required amount to sell those excess reductions to other point-source emitters in the form of "verified credits." The point-source buyers could then use these verified credits to meet their mandates, instead of having to make more costly capital plant upgrades to reduce their own sulfur dioxide emissions.

The program was a tool that enabled companies to significantly reduce environmental impacts and meet the overall requirements at costs below projections for stand-alone, plant-by-plant reductions. The cap-and-trade program tool empowered each privately-owned EPA-regulated entity to independently decide whether to utilize its capital to build new facilities, or to purchase verified credits. A partnership was

created under which the regulatory agency provided the tools, and the free market then determined the most efficient use of those tools to achieve the mandated emission reductions and environmental benefits at the least cost – and it has been very successful.

The success of the cap-and-trade program for air emissions led to the creation of individual state nutrient credit trading programs to promote water quality. The objective was to reduce nutrient pollution that is choking both locally and federally regulated waterways at significantly lower cost than by regulating point-source and nonpoint source dischargers with existing approaches. Most states have now proposed or adopted such programs to save money on very costly waste and storm water remediation programs.

Nutrient credit trading programs largely consist of trading between and among regulated point sources, such as municipal waste treatment authorities, primarily over short time frames, since excess nutrient reduction capacity at municipal treatment facilities is generally constructed to meet future projected needs. The predominant nutrient involved, subject to reduction mandates by EPA for federally protected waterways such as the Chesapeake Bay, is nitrogen.

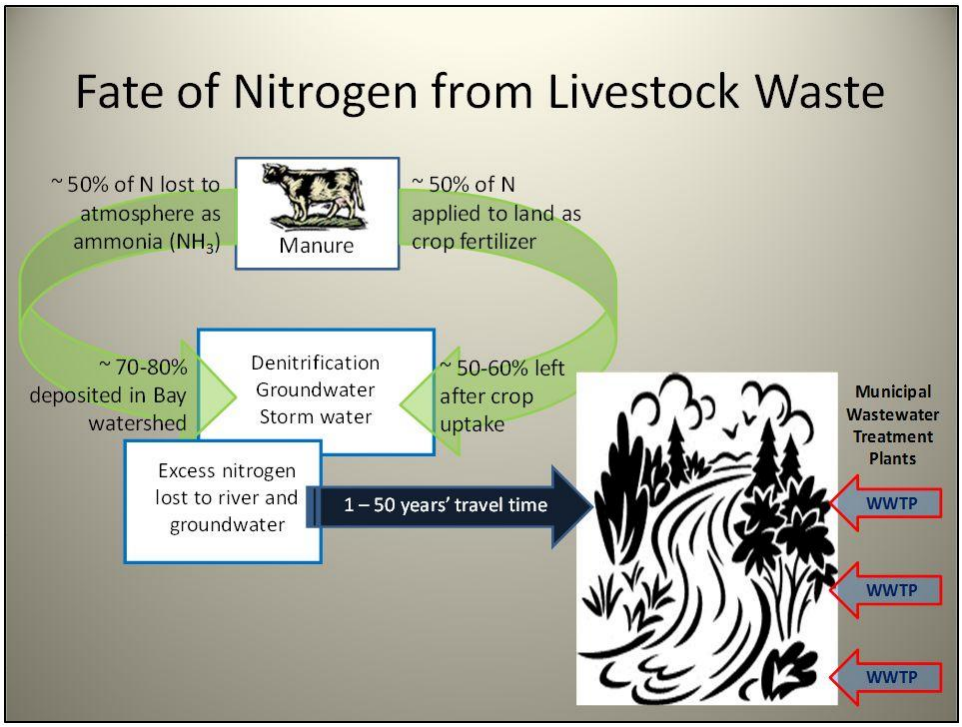


Figure 1. A dairy cow releases approximately 345 pounds of nitrogen a year into the environment. Roughly half of the excreted nitrogen escapes to the air as ammonia, most of which is then rapidly deposited into nearby watersheds. Such air emissions are unregulated, yet this nitrogen still enters storm water and pollutes downstream waterways. Land-applied manure also releases large amounts of nitrogen, because crops don't absorb the majority of it. This nitrogen pollution increases the costs to taxpayers and ratepayers of downstream municipal waste treatment plants charged with meeting mandated reductions.

The primary opportunity now is to generate verified nutrient credits from unregulated nonpoint sources – which deliver pollution from many diffuse sources such as farms – for sale under long-term agreements to regulated point sources, such as municipal waste treatment plants. This approach would enable the treatment plants to avoid unnecessarily costly upgrades while still meeting the mandated overall nitrogen reductions.

The biggest missed cost containment opportunity is with the livestock sector of agriculture, and specifically its enormous nitrogen impact on both the local environment (aquifers, streams, lakes, rivers) and on downstream federal waterways such as the Chesapeake Bay.

This opportunity to reduce nitrogen pollution on a national level is being missed because:

a. Livestock agriculture is a major unregulated source of nitrogen pollution, yet requires an economic incentive to participate in its solutions;

b. Nitrogen loadings from livestock operations have typically been underestimated by half, because the impact estimates leave out much of the nitrogen escaping through ammonia emissions to the air, which primarily re-deposits into nearby watersheds; and,

c. The potential purchasers of nitrogen credits under EPA mandates, rather than being power plants with a profit motive to seek tools that would reduce costs, are largely made up of quasi-local government entities (i.e., a municipal wastewater treatment authority), funded by federal, state and local ratepayer dollars – and therefore historically have had insufficient incentive to seek least-cost solutions.

Therefore the livestock industry has not been able to utilize the ingenuity of the marketplace to provide a comprehensive cost-effective solution, especially in areas where livestock's nitrogen loadings represent a major portion of the overall nitrogen impacts to the environment, such as in the Susquehanna Watershed of the Chesapeake Bay basin. Absent structural and regulatory reform at the federal and state level, credits from unregulated nonpoint sources will be unable provide the desired long-term, cost-effective solution to regulated point-source and nonpoint-source facilities.

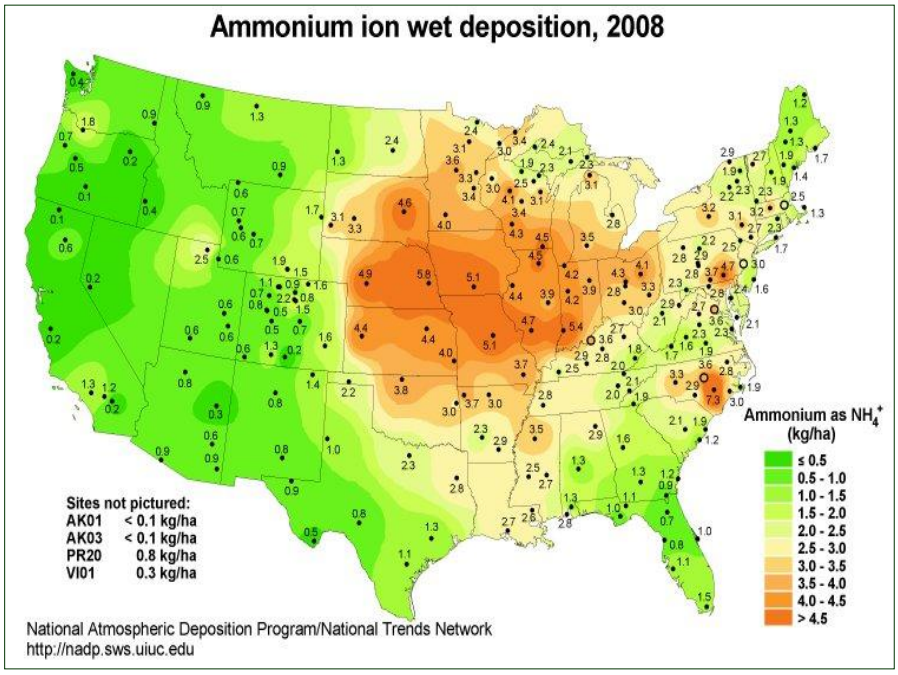


Figure 2 Map shows how ammonia emissions in areas with a concentration of animal livestock operations are deposited into area watersheds, creating nitrogen hotspots, including in Pennsylvania's Susquehanna Watershed, which drains into the Chesapeake Bay.

Essentially, a trading tool for regulated point-source dischargers has not been appropriately designed to enable the cost-effective utilization of credits from unregulated nonpoint sources. As a result, verified nitrogen credit reductions from livestock waste that can provide the desired economic and environmental benefits to the taxpayers in the form of a 60 to 90 percent reduction of existing nutrient remediation costs remains unavailable to the trading market.

i. Cost Containment Missing

Cost containment in nutrient credit trading programs has not been the driving factor for either the EPA or the respective state regulatory agencies that design these programs. For example, cost containment has not been a major criterion in meeting the EPA's nutrient reduction mandate for the Chesapeake Bay,

a major objective throughout the basin that has received a great deal of attention from state leaders. cost containment has not been a major criterion. As a result, when proposed solutions are reviewed using a cost-benefit analysis approach, it becomes obvious that the EPA draft strategy, which is focused primarily on *regulated* point source and nonpoint source dischargers, is significantly more expensive on a per-capita basis for Pennsylvania's Susquehanna Watershed ratepayers than for those in Washington, D.C., on a per-capita basis.

The simple reason is that Pennsylvania's nitrogen loading is predominately due to livestock, and EPA lacks a comprehensive plan to address the livestock issue. Therefore, EPA focuses its resources on the more expensive downstream nitrogen sources and channels, such as municipal wastewater and storm water remediation, over which it has regulatory authority. The problem is that what may be a cost-effective strategy to achieve nutrient reductions for an urban area such as Washington, D.C. (with its nitrogen pollution coming overwhelmingly through regulated sources) will not be cost-effective for a relatively rural area such as the Susquehanna Watershed, where unregulated livestock waste is the predominant nitrogen source impacting the Chesapeake Bay.

Achieving effective cost containment requires solutions specifically designed to meet the mandated reductions in the most cost-effective manner for each of the major sources of nutrient loadings – whether those reductions come from regulated or unregulated sources. Because the focus is on regulated sources, where the largest nutrient source in a specific watershed is livestock agriculture, an unregulated, nonpoint source, the currently proposed EPA approach ends up requiring unnecessarily high-cost solutions.

ii. Bion Nutrient Management Facility at Kreider Farms Dairy

Better alternatives exist. Bion Environmental Technologies, Inc. (www.biontech.com) is now developing a project in conjunction with Kreider Farms Dairy in Lancaster, Pa., that will reduce Kreider Farms' nitrogen impacts to the environment by over 4 million pounds.

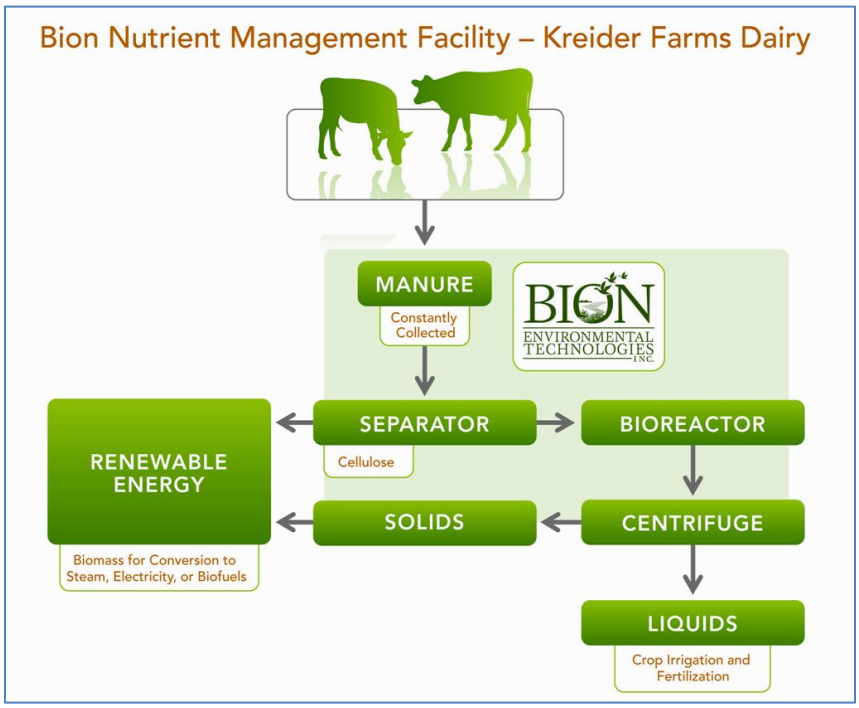


Figure 3 Bion Environmental Technologies has designed a manure waste treatment system based on rapid collection, separation, and treatment using a patented microbiological process which significantly reduces much of the air and water pollution associated with livestock. The system reduces odor, and offers energy efficiency and renewable energy benefits as well.

More than half the nitrogen loss reductions at Kreider Farms will come from controlling the airborne nitrogen that escapes from the dairy and poultry operations. Bion estimates that will translate into over 1.5 million pounds less nitrogen that reaches the Chesapeake Bay each year.

In addition, the project includes a renewable energy component that will convert the biomass from the Kreider Farm's livestock waste into renewable energy. The renewable energy facility will also be able to convert other compatible biomass from the local community into energy, thereby further reducing nitrogen impacts. Besides nitrogen reductions, other benefits to the local environment from the Kreider Farms project will include the generation of more than a quarter million pounds of tradable phosphorous credits, plus NOx, SOx, and pathogen reductions, and significantly less odor.

The projected economics of the Kreider Farms project are based on being able to sell Pennsylvania Department of Environmental Protection-verified, Chesapeake Bay-eligible nitrogen reductions on a long-term basis at approximately $8 per pound. To achieve its financial projections, the Kreider Farm project will require regulatory reform to remove the risk factors embedded in the Pennsylvania DEP's trading policy and EPA legacy regulations. Absent EPA and DEP regulatory reform, the credits will be limited to being sold on a short-term basis, or else the price of the credits will need to be increased to offset the risk factors embedded in a long-term sale.

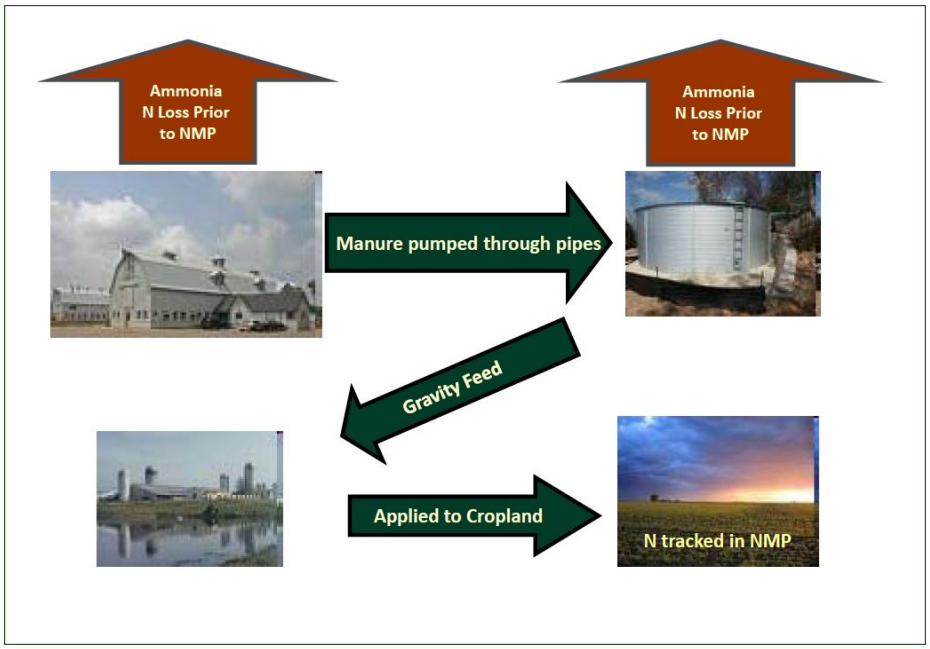


Figure 4 Through a partnership with Bion Environmental Technologies, Kreider Farms, a leading Lancaster, Pa., dairy, will reduce its nitrogen emissions by over 4 million pounds a year, with a significant portion from controlling airborne ammonia emissions. Such emissions are not covered by today's Nutrient Management Plans (NMPs), yet they swiftly result in water pollution as the ammonia, and the nitrogen it contains, deposits into the nearby watershed. This illustration shows what such NMPs leave out.

Existing rules and regulations do not provide offsetting environmental benefits, and greatly increase the cost to the taxpayer. The needed modifications will enable Bion and other unregulated nonpoint source credit generators to provide verified credits on a long-term basis to the various municipal and wastewater authorities, thereby saving them approximately 75 percent or more from their present projected blended municipal storm water and wastewater treatment costs of $40 per pound.

Bion has provided papers from independent, respected scientists to support its regulatory reform requirements related to National Pollutant Discharge Elimination System point-source permits.

If adopted by EPA, these regulatory reforms can be a major part of a comprehensive toolkit to provide a cost-effective solution to the Chesapeake Bay's excess nitrogen loadings problem.

In conclusion, the Chesapeake Bay remediation plans need to require that all proposed solutions meet or exceed the reduction mandates – with *cost* being the defining criteria. Absent such an approach, the taxpayer-funded effort will be financially unsustainable, resulting in a continued failure to remediate the treasured Bay. Bion's proposal will provide nutrient reductions at a cost of 60 to 90 percent less than projected blended waste-water and storm water costs, while also providing long-term local environmental benefits by treating the environmental impacts from livestock waste at their source. Further, the success of this program could provide a template to achieve similar cost-effective environmental results nationally.

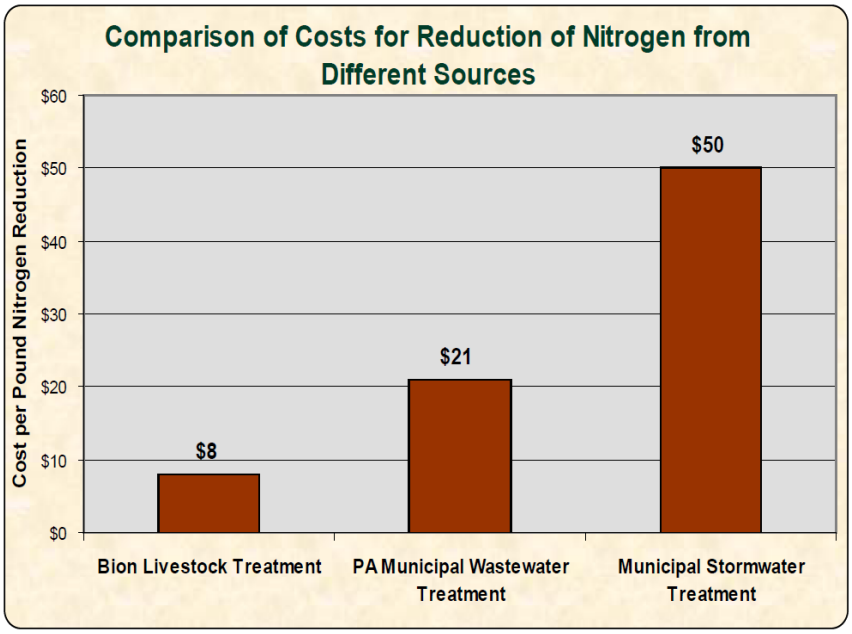


Figure 5 The cost of reducing Pennsylvania's nitrogen loading of the Susquehanna watershed could be much lower with treatment of livestock waste. Bion calculated average municipal waste treatment costs from a study published by Metcalf & Eddy (http://lbfc.legis.state.pa.us/).

II. The Reality of Nutrient Trading

Existing nutrient credit trading programs have failed to fulfill the potential of a 60 to 90 percent reduction in remediation costs available from unregulated nonpoint sources, such as livestock waste, with the primary issues being:

i. EPA Legacy Regulation

- To achieve these reduced cost objectives, EPA needs to modify its National Pollutant Discharge Elimination System (NPDES) regulatory requirements as they relate to the use of nonpoint source verified credits by point-source facilities to meet facility discharge standards.
- EPA's legacy NPDES regulatory policy significantly limits the ability of a regulated point source to use nonpoint source generated credits as an offset to its regulatory discharge limits. Insistence on applying NPDES rules regarding the utilization of nitrogen credits from nonpoint sources discourages livestock nitrogen reductions by unnecessarily devaluing these credits for both the buyer (point sources) and the seller (nonpoint sources), without providing any corresponding environmental benefit.

- Nonpoint source livestock facilities are prohibited by law from directly discharging into a navigable waterway. Yet EPA regulations require that when a point source uses nonpoint source credits as verified offsets, the credits be applied in compliance with NPDES regulations designed specifically for point sources that discharge into navigable waterways. In effect, point source NPDES regulations regarding discharging into navigable waterways are indirectly applied to nonpoint source credits that are generated from non-discharge facilities, to the same extent as they are to point sources.
- EPA's own models project that nitrogen from nonpoint source facilities takes from one to 50 years to reach the Chesapeake Bay (CB), yet short-term NPDES averaging continues to be the requirement for nonpoint source credits within the trading programs. Bion has provided an opinion from a noted Chesapeake Bay authority that allowing nonpoint source credits to be averaged over 3-5 years (or longer) will have essentially no negative impact on the Chesapeake Bay (see opinion by Dr. Robillard also posted on the Bionpa.com website).
- In summary, NPDES requirements create significant financial risk factors that cannot be cost-effectively managed (hedged) by the nonpoint source credit generators. The result is a significant increase in pricing to "insure" the NPDES regulatory risk, which significantly increases the cost to the ultimate buyers (federal and state taxpayers, and local ratepayers), without any commensurate environmental benefit.

ii. Misallocation of Nitrogen Load

- The NPDES "handcuff" problem is further compounded by EPA's misallocation of nitrogen loads from unregulated nonpoint sources, such as airborne nitrogen from livestock, to regulated nonpoint sources, such as storm water. This misallocation has a significant negative impact on cost to the taxpayer, since storm water is the most expensive source of nitrogen to remediate.
- EPA models primarily attribute to agricultural impacts only that portion of livestock waste nitrogen that is land-applied. The models significantly underestimate the total nitrogen loadings to the Chesapeake Bay from livestock agriculture because approximately half of livestock nitrogen loss is via ammonia volatilization prior to land application. As the volatile ammonia nitrogen rapidly re-deposits in the watershed, it gets categorized into other delivery load sources such as storm water. The combination of airborne and land-applied nitrogen generated from livestock in Pennsylvania's Susquehanna Watershed is estimated at 345 million pounds annually, which would make it the largest regulated or unregulated source of nitrogen (regulated and unregulated) in the watershed.
- The Susquehanna Watershed is unique in that livestock agriculture and not human-based activity is the primary source of nutrient loading to the environment. This watershed is the single largest source of fresh water *and* nitrogen delivered to the Chesapeake Bay. According to PA's Tributary Strategy, 89 percent of the nutrients in the watershed originate from nonpoint sources. Most models concur that agriculture is the largest contributor to nonpoint source nitrogen, and that livestock agriculture is the largest source within the agricultural category. Therefore the relative lack of population centers (and subsequent tax base) in the Susquehanna Watershed makes point-source and storm water remediation costs on a per capita basis significantly greater than in more densely populated watersheds. At the same time, the lack of regulatory authority over the key nutrient contributors (i.e., livestock agriculture sources) leads regulators back to the same strapped federal and state taxpayers and local ratepayers to pay the bill.

iii. Lack of Transparent Cost-Benefit Accountability

- The cost to implement established goals and objectives is rarely mentioned in EPA's recently released strategy to remediate the Bay, and is not mentioned at all in EPA's settlement agreement with the Chesapeake Bay Foundation. The cap-and-trade tool was intended to produce a cost-effective solution to the environmental problem. Unfortunately, comparable tools have not been developed for state-run nutrient credit trading programs, because transparent and competitive cost considerations are not the mandate of EPA or state environmental agencies.
- Rather, a series of local government authorities, using a combination of federal, state and local ratepayer funds, are empowered to decide whether to use nonpoint source credits from unregulated sources to fulfill a mandated reduction, or to engineer and construct an expensive "bricks-and-mortar" solution.

  This approach is riddled with conflicts of interest and with numerous regulatory and political obstacles for those who seek potential least-cost trading solutions. The combination of conflicts and obstacles, the lack of incentives to seek a low-cost solution, and the politics of a local stimulus program result in the inevitable build-versus-buy decision, as has been evidenced to date in the Susquehanna Watershed.

  The result is that the largest source of low-cost nitrogen reductions to meet the Bay's nitrogen reduction mandate (livestock nitrogen) is marginalized in favor of existing high-cost bricks-and-mortar solutions that leave local environmental impacts relatively untouched, to be addressed at a future date at additional cost, most likely to local tax and ratepayers.

iv. Lack of Integration of Bay and Upstream Watershed Solutions

- EPA's regulatory focus is Chesapeake Bay-centric. It is left to state environmental agencies to manage the impact on and benefits of EPA's basin remediation strategy regarding their local watersheds and overall environment.
- EPA's basic approach to reducing nutrient flows to the Chesapeake Bay is to exert more regulatory authority on, and greater mandated reductions from, regulated sources – which in turn directs more federal and matching state resources to those high-cost regulated sources, such as municipal waste treatment authorities and regulated municipal nonpoint sources such as storm water utilities. This approach is both environmentally and economically ineffective where livestock concentrations are the major nutrient source, as is the case with Pennsylvania's Susquehanna Watershed.
- While a reduction in nutrient flows from point source discharges help to improve the Chesapeake Bay basin, it does not benefit the local waterways and aquifers in the way that reductions in nutrient loss from local livestock would. While the reduction of nutrients released from storm water would also benefit local watersheds, capturing and treating the nutrients in these dispersed streams is prohibitively expensive.

A more cost-effective approach that provides the required Chesapeake Bay mandated nitrogen reductions is to reduce the nutrient impacts from livestock waste at the source (livestock facilities), thereby providing a cost-effective solution to both the local and Chesapeake Bay nutrient impacts.

III. EPA's Approach to Reducing Nutrient Loss from Livestock Agriculture in the Susquehanna Watershed

The EPA strategy adopts primarily a two-fold approach to reducing nitrogen loadings from livestock waste in the Susquehanna Watershed: 1) expanded implementation of Best Management Practices (BMPs) and, 2) the mandated expansion of Nutrient Management Plan authority to cover smaller (and therefore a greater number of) livestock facilities.

1) **Best Management Practices** have been deployed for decades to reduce nitrogen loss from farm operations, primarily from runoff and infiltration to groundwater. Some BMPs effect small reductions in ammonia emissions to the atmosphere, but they primarily do not impact the major airborne nitrogen losses, which occur prior to land application. BMP solutions therefore only address about half of the nitrogen from livestock waste – the portion that is land applied – while having virtually no impact on the other 50 percent – the airborne nitrogen losses that occur prior to land application.

2) EPA's Chesapeake Bay strategy also proposes an expansion of **Nutrient Management Plan** authority to livestock operations with a smaller number of head, and therefore to a greater number of facilities. While this approach will secure reductions from small livestock producers who presently over-apply manure, it will not address that portion of livestock nitrogen that is lost prior to land application. Unfortunately, expanded NMP regulations will impose yet another burdensome cost to cash-strapped small livestock producers and farmers who are presently in compliance, without achieving any tangible positive environmental impact. The net effect of this approach is to penalize those in compliance, as opposed to addressing the issues resulting from those producers and farmers who are not in compliance.

IV. Nutrient Management Plans Don't Mandate Environmental Protection

Nitrogen from livestock waste that is land-applied can be measured by its bioavailability factor and its uptake ratio. Simply put, bioavailability represents the percentage of the nitrogen that is in a form which will enable it to be utilized (taken up) by a crop in that growing season. For example, assuming a bioavailability factor for dairy manure of 40 percent, and an uptake ratio of 50 percent of the bioavailable nitrogen (assumptions reflected in actual farm Nutrient Management Plans as certified under Pennsylvania DEP and Pennsylvania State University guidelines), that would result in 80 percent of the land-applied nitrogen being lost to the environment (i.e., that is the portion not taken up by the crop). NMPs do not have bioavailability nor nutrient uptake efficiency standards; they are only designed to ensure sufficient nitrogen is land-applied to meet the uptake needs of the crop (referred to as an agronomic rate of application).

In comparison, commercial nitrogen has a bioavailability of 60 percent, and therefore using the same uptake ratios, it would reduce the portion of nitrogen lost to the environment to 70 percent versus 80 percent for dairy manure. In short, Nutrient Management Plans are an agronomic tool and not an environmental efficiency or protection tool, and the farmer is under no requirement to use the most environmentally efficient form of nitrogen; he simply has to apply nitrogen at the agronomic rate required by the crop. Therefore, requiring NMPs for smaller and smaller livestock operations will not help remediate the Chesapeake Bay excess nitrogen loadings issue, absent some new requirement to use nitrogen forms with greater bioavailability and uptake percentages.

Airborne nitrogen losses from livestock take place at the ground level absent the convection, heat, and pressure that accompanies ammonia releases from industrial stack operations such as power generating facilities. As a result, current science indicates that a significant amount of this airborne nitrogen re-deposits near where it is lost, with the vast majority depositing within the same larger water basin.

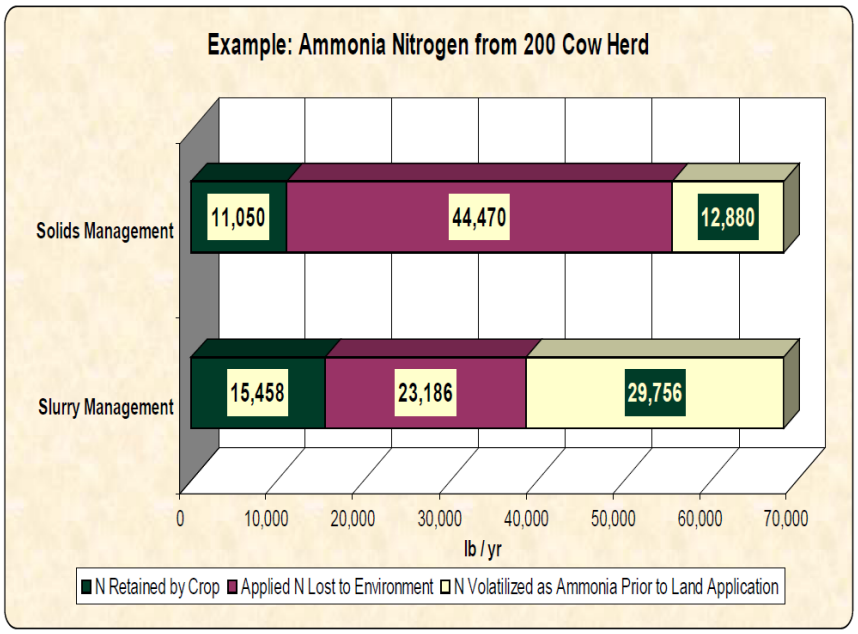


Figure 6 The method of managing manure – whether land-applying it as a solid, as most small farms do, or as a slurry, as most medium-to-large farms do – has a major impact on how much of its nitrogen is lost in runoff, versus lost to the air as ammonia, although the total amount of nitrogen lost doesn't change much.

When the ammonia nitrogen re-deposits on the surrounding farmland, it is above and beyond the Nutrient Management Plan-monitored nitrogen land applications, so it is entirely excess to crop needs, and therefore lost to the environment.

The result is that even at livestock operations with a fully compliant Nutrient Management Plan that utilize the latest Best Management Practices, the combination of airborne and land-applied nitrogen that is not utilized by crops is about 80 to 90 percent of the total produced by the livestock when airborne nitrogen impacts are included in the evaluation. Some of this lost airborne nitrogen will re-deposit in and be utilized by forests; some will reside in the soil and be either utilized subsequently or denitrify harmlessly to the atmosphere over time. Regardless of the number of benign scenarios one can imagine, the reality is that a significant volume of airborne nitrogen will be lost to groundwater and thus to an aquifer where it will be stored. Eventually, some portion of this excess nitrogen will make its way to the Chesapeake Bay.

According to EPA models, that nutrient journey from aquifer to the Chesapeake Bay can take from one to 50 years, depending upon location within the watershed. Nationally, where large concentrations of livestock nitrogen impacts exceed the nitrogen cycle capacity of the watershed, there exist high nitrogen levels in local aquifers where this nitrogen is "stored."

V. The Regulatory Challenge

In summary, simply extending a requirement for Nutrient Management Plans to compliant smaller livestock operations using manure will do little to help address the problem of nitrogen loading to either the local watershed or nitrogen impacts on the Chesapeake Bay, not to mention potentially driving small agricultural producers out of business as these mandates are extended. The compliant and proactive scenario in EPA's remediation model will result in a continued massive loss of nitrogen to the environment from livestock waste in the Susquehanna Watershed.

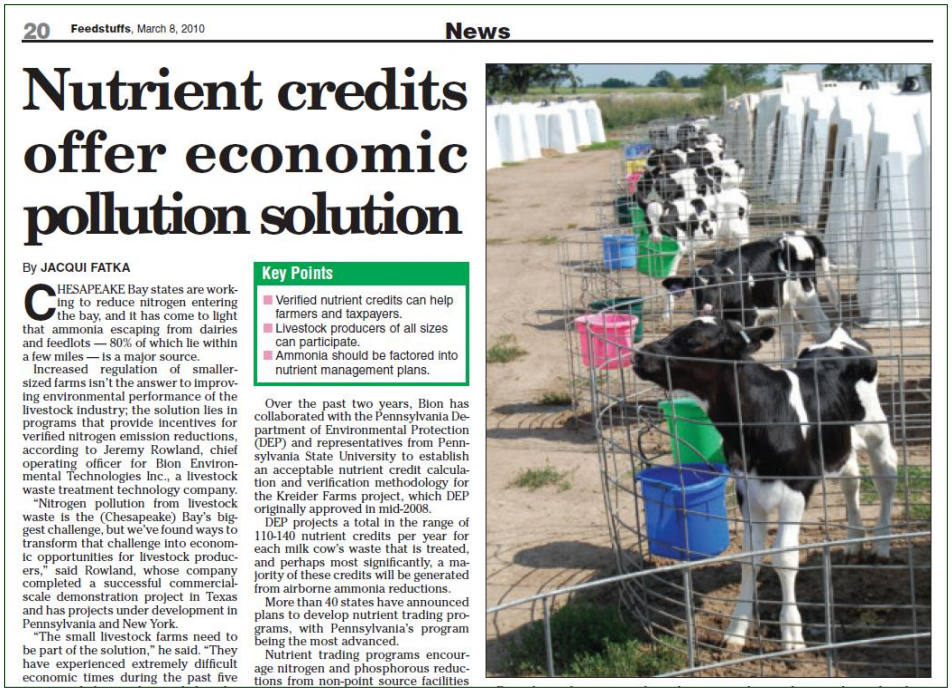
If a basin solution does not address reducing livestock waste impacts to the local environment (such as focusing scarce resources on capturing and treating downstream storm water), nitrogen levels in drinking water will continue to rise, resulting in additional costs to the local community to provide drinking water that will meet federal standards. These will be the same communities that are absorbing rate increases to reduce nitrogen impacts to the Bay. The linkage between reducing nitrogen from the Bay, and reducing nitrogen in local groundwater sources, is not readily made – as state regulatory programs to remediate nutrient flows to the Chesapeake Bay are managed as separate and apart from other state programs charged with improving local drinking water quality. We believe these programs need to improve their coordination.

Concentrated livestock populations represent both the problem and the potential low-cost solution to the regional excess nitrogen loadings to their respective basin. The opportunity is akin to that of the "cash for clunkers" program. Today, the environmental impacts from livestock in the Susquehanna Watershed exceed the economic value of the business enterprise. With a projected 10 to 20 percent crop utilization of livestock nitrogen, and a projected blended cost for municipal and storm water remediation of $40 per pound of nitrogen reduced, the annual environmental impact cost of livestock waste as presently managed under the Nutrient Management Plans easily exceeds the economic value of the business enterprise. Although the nitrogen impacts to the Bay will vary depending upon location of the livestock facility within the Susquehanna Watershed, if one assumes an average of 150 pounds of nitrogen loss per dairy cow annually, that would represent a $6,000 annual cost per milker.

VI. Nutrient Credit Trading – Benefits of Introducing Cost-Benefit Analysis

Nutrient credit trading programs are basically programs funded by federal and state taxpayers, plus local ratepayers, to reduce the nutrients (primarily nitrogen) emitted to state waterways which discharge into federally-regulated basins such as the Chesapeake Bay.

Figure 7 *Feedstuffs,* the weekly newspaper for agribusiness, covered the economic value of nutrient credits in March 2010. Its list of Key Points says verified nutrient credits "can help farmers and taxpayers;" that livestock producers of all sizes can participate; and, that nitrogen loss via ammonia volatilization is not factored into Nutrient Management Plans.



20 Feedstuffs, March 8, 2010 News

Nutrient credits offer economic pollution solution

By JACQUI FATKA

CHESAPEAKE Bay states are working to reduce nitrogen entering the bay, and it has come to light that ammonia escaping from dairies and feedlots — 80% of which lie within a few miles — is a major source.

Increased regulation of smaller-sized farms isn't the answer to improving environmental performance of the livestock industry; the solution lies in programs that provide incentives for verified nitrogen emission reductions, according to Jeremy Rowland, chief operating officer for Bion Environmental Technologies Inc., a livestock waste treatment technology company.

"Nitrogen pollution from livestock waste is the (Chesapeake) Bay's biggest challenge, but we've found ways to transform that challenge into economic opportunities for livestock producers," said Rowland, whose company completed a successful commercial-scale demonstration project in Texas and has projects under development in Pennsylvania and New York.

"The small livestock farms need to be part of the solution," he said. "They have experienced extremely difficult economic times during the past five

Key Points

- Verified nutrient credits can help farmers and taxpayers.
- Livestock producers of all sizes can participate.
- Ammonia should be factored into nutrient management plans.

Over the past two years, Bion has collaborated with the Pennsylvania Department of Environmental Protection (DEP) and representatives from Pennsylvania State University to establish an acceptable nutrient credit calculation and verification methodology for the Kreider Farms project, which DEP originally approved in mid-2008.

DEP projects a total in the range of 110-140 nutrient credits per year for each milk cow's waste that is treated, and perhaps most significantly, a majority of these credits will be generated from airborne ammonia reductions.

More than 40 states have announced plans to develop nutrient trading programs, with Pennsylvania's program being the most advanced.

Nutrient trading programs encourage nitrogen and phosphorous reductions from non-point source facilities

The term “nutrient trading” does not necessarily imply a scenario whereby for-profit entities execute trades to achieve a least-cost advantage. The buyers of credits are almost exclusively regulated and quasi-governmental point source entities which are the recipient of both the reduction mandates and the taxpayer and ratepayer funds to execute such a reduction. Time has shown that this governmental entity to governmental entity approach to trading has been demonstrated as one of the least cost effective ways to achieve nitrogen reductions in watersheds where livestock is the primary nitrogen source, such as the Susquehanna Watershed.

Nutrient credit trading programs have an objective (nitrogen reductions to the Chesapeake Bay) absent cost-benefit criteria. The objective is designed to focus on near-term measurable reductions to the drainage basin. Financial cost does not enter the equation. Once cost becomes the criteria in evaluating proposed solutions, then issues such as legacy regulatory impact, load allocation and local environmental impacts all become relevant because, as part of a comprehensive solution, they significantly impact long-term cost. They are no longer a litany of diverse issues but become unified under one banner, which is meeting the mandate in the most cost-effective manner possible. Cost as the criteria will create order in a disorderly process. A cost-benefit analysis approach would force a more permanent and global solution, since reducing the impacts in rural areas and not preserving the farmland will only result in future development that brings with it greater environmental loadings, and subsequent additional costs.

A cost-benefit analysis approach will take into account issues such as local environmental benefits and long-term stability factors such as conservation and environmental easements. The mechanism to implement such a program would be a request for proposal (RFP), issued by a program administrator who would solicit bids, rather than a trading program.

VII. Traits of a Successful Chesapeake Bay RFP Program

Any successful livestock nutrient reduction program needs to address the following, where heavy concentrations of livestock exist within a watershed:

- **Scoring:** The program would be designed to provide scoring specifically for the livestock-heavy Susquehanna Watershed, versus the situation faced by other more urban portions of the greater Chesapeake Bay watershed. The scoring program would include local environmental benefits extending beyond nitrogen and phosphorous reductions, such as NOx, SOx, pathogens, and odor. It would value long-term stability factors such as conservation and environmental easement programs.
- **Load allocation:** The program would address air *and* water impacts, so that the total impact is properly allocated in agency modeling. This is very important in identifying both the potential contribution from livestock to the nitrogen problem, and its potential to contribute to the environmental solution in the Bay.
- **Adopt treatment technologies:** It should promote policies that will encourage the utilization of technologies that address both the airborne and land-applied nitrogen impacts from livestock. Weighting should be given to reductions that are verified under state nutrient credit verification programs.

- **Recognize the value of scale:** Livestock waste treatment technologies are similar to any other waste treatment technology in that their cost effectiveness is tied to scale, i.e. the smaller the scale, the more expensive the treatment.
- **Need for waste aggregation:** The Susquehanna Watershed is comprised almost exclusively of small livestock producers; therefore, individual treatment systems are cost-prohibitive. In order to enhance cost-effective treatment, livestock waste needs to be aggregated either by transporting the livestock waste locally, or by the development of aggregated livestock facilities to replace existing fragmented facilities, or some combination of both. In other parts of the nation, individual producer facilities and herd concentrations are larger and the need for aggregation is diminished significantly.
- **Regulatory structure:** Support for a regulatory structure that allows verified nitrogen reductions to be utilized (traded) seamlessly between regulated point sources and unregulated nonpoint sources, for example NPDES rule modifications allowing the use of nonpoint source credits based upon multi-year averaging.

VIII. Bion's Proposal

Bion's proposal is for a voluntary, comprehensive, incentive-based nutrient reduction program that will meet the federal Chesapeake Bay mandate by comprehensively reducing local environmental impacts from livestock waste, with overall effectiveness based on a cost-benefit analysis. The program would be designed so that it could be implemented by any major national watersheds, and so could be implemented wherever large concentrations of livestock exist.

Elements of the proposed program include:

- **Request For Proposal (RFP):** A competitive RFP would be generated to purchase on a least-cost basis verified nutrient credits that could then be used as offsets to the nitrogen and phosphorous loadings to federal waterways. The credits could then be applied to overall basin reductions mandated by EPA. The reductions would be verified by the respective state's environmental agency under a state-approved nutrient credit verification plan. The credits would be verified periodically by the state agency (quarterly or annually), based on data reported by the credit generator, and consistent with the requirements of the credit verification plan. Such an approach would add flexibility and reduce costs as compared to the existing trading program, under which conflicted municipal authorities are the predominate credit buyers in the marketplace.
- **Program manager:** The U. S. Department of Agriculture (USDA). The livestock industry is USDA's constituency, and USDA has both the regional and national infrastructure to market and administer such a program effectively. USDA is the agency that manages the Best Management Practices program, which for decades has been working with farmers and livestock producers who adopt BMPs to reduce environmental impacts. The agency's knowledge, supported by its databases of the values in each area related to agricultural issues, such as conservation programs, would be invaluable – especially since this voluntary incentive program will in many instances be part of an overall conservation program plan for the farmer or livestock producer.
- **Comprehensive and cooperative:** In the Susquehanna Watershed, the fragmented nature of the livestock industry will require a comprehensive approach that will range from conservation planning, BMPs, waste aggregation options, etc., as part of an incentive-based voluntary

approach to reduce nitrogen loadings. It will also require a cooperative effort to aggregate livestock waste to achieve cost-effective nutrient reductions. The USDA possesses the experienced staff and infrastructure to both manage and implement such a comprehensive program.

- **Local environmental benefits:** The program would reduce environmental impacts to the local community where livestock facilities are located.
- **Long-term:** The RFP program would give preference to credit generators capable of providing verified reductions with long term-certainty. This would be mutually beneficial, since such credit generators will need to make significant capital investments in treatment facilities, and would require long-term off-take agreements to secure financing for the projects.
- **Certainty:** The projects would require voluntary, long-term agreements with the livestock producers, consistent with the generation of long-term, 10- to 20-year verified credits, to insure both the reductions to the environment and the revenue to the credit generators.
- **Voluntary:** The proposed USDA basin-specific nitrogen credit RFP program would be a voluntary nitrogen reduction program under USDA management that allows the livestock industry to take a free-market approach to constructing low-cost nitrogen reduction proposals.

  This program would be the tool to enable agriculture, including livestock, to be the source of low-cost nutrient reductions, and as a result, become a major contributor to restoring the health of the nation's water supplies and waterways.

  Such a tool would enable individual livestock producers to evaluate their various options, such as, but not limited to:

  - Voluntarily participate or continue to operate their existing livestock operations;
  - Expand independently or in partnership with other producers;
  - Create a cooperative with other livestock producers that could potentially include agricultural input providers that do not have livestock;
  - Sell their livestock baseline and simply farm their land, potentially receiving additional funding by agreeing to conservation and environmental easements, etc.

  The options and opportunities would be limited only by the creativity of the marketplace.
- **Negotiated:** The negotiations would be between individual livestock producers and other market participants, who could include technology providers, outside investors, lenders, and other industry participants. USDA's local support organization would assist the livestock producers in evaluating proposals and hosting educational seminars for all interested stakeholders.

  Essentially, free-market participants would negotiate and determine outcomes which they have determined are in their best economic interests.
- **Marketplace-driven:** The RFP program will provide the tools; the marketplace will develop the proposals. The USDA-administered program will determine which are cost-effective and will be accepted, under scoring guidelines to be developed.

IX. Conclusion

Comparison with the federal government's recent "cash for clunkers" is one way to understand the potential benefit of the proposed new approach to livestock pollution. In both cases, the overall environmental impact costs to society greatly exceeds the economic value of the existing activity, whether that is owning an old car or a livestock production facility in a watershed where livestock concentration has resulted in excess nutrients (primarily but not exclusively nitrogen loadings) to the local aquifer and subsequently to its larger drainage basin.

Livestock producers would be faced with the same decision as the owner of an older vehicle: either to continue with their existing activity or receive payment for changing behavior in a way that is beneficial to all parties. In both cases, the activity is legal but expensive to society, and therefore providing an incentive for change is in the greater public good. It would be in the taxpayers' best interest to provide the funding to effect the desired change in behavior, since participating livestock producers will need compensation to absorb necessary transition costs, including, but not limited to, retiring debt from developing the infrastructure to support their existing way of operating.

The RFP program proposed in this paper will be the tool to enable environmental impacts from livestock waste to be addressed using cost as the criteria. Presently, the focus is on the Chesapeake Bay basin, but the problem associated with excess livestock concentrations extends well beyond the Chesapeake to the Mississippi, Great Lakes, and other major drainage basins. The objective of the RFP program is to develop a cost-effective solution to these impaired regional basins, as a direct consequence of addressing the local environmental impacts from concentrated livestock waste.

A successful proposal will enable the industry to grow and prosper, while not imposing an undue economic, environmental and social cost on the local community. It will enable producers to be more competitive and to provide the consumer with more of the "green" attributes in their food purchases they are seeking, and to do so in a cost-effective manner.

What could be greener than a label that says this product was produced in an environmentally-sustainable facility that provides U.S. federal, state and local taxpayers with significant savings in clean water treatment costs through the voluntary generation of nutrient credits?