American Farmland Trust

What Water Quality Trading Programs Need To Know Before Setting Agricultural Baselines

AMERICAN FARMLAND TRUST
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INTRODUCTION

Reducing nutrients additions to rivers and lakes to improve water quality is one of the most costly and challenging environmental issues faced by our nation. One promising approach (water quality trading (WQT)) allows regulated point sources like municipal wastewater treatment plants and utilities to invest in conservation practices that reduce nutrient run-off on farmland. The point sources can then use the resulting nutrient credits to meet part of their permitted discharge limits. Determining what farmers are required to do under current statutes and rules and deciding if they need to do more to reduce nutrient run-off before being allowed to generate a credit is one of the key elements that can affect the outcome of trading when agriculture is involved. Known as "baselines," these are the pollutant control requirements that apply to both credit sellers (farmers) and buyers (regulated point sources) in the absence of trading. To enter the trading market and generate credits, farmers must first meet the market's baseline requirements. The wide variability among agricultural baselines in existing markets is notable. Some use the farmer's current practices as the baseline, some require that farmers install specified conservation practices first (technology-based), others require that farmer reduce nutrient run-off by a certain amount (performance-based) and some use a combination of both technology-based and performance-based requirements. This summary discusses the types of agricultural baselines used primarily in WQT programs that trade nutrient credits and why it is important to choose the right approach. It has been excerpted from a much lengthier analysis (AFT 2013).

THE ROLE AND FUNCTION OF BASELINES IN TRADING PROGRAMS

Baselines are the conservation practices or level of performance that must be in place before credits can be generated with additional conservation practices

The EPA WQT Toolkit for permit writers (US EPA 2009) defines Baseline as: "*the pollutant control requirements that apply to buyers and sellers in the absence of trading. Sellers must first achieve their applicable baselines before they can enter the trading market and sell credits. Buyers can purchase credits to achieve their applicable baselines once they have met their minimum control levels."*

Baselines impact the quantity, costs and quality of credits from agricultural watersheds

Markets have to decide whether to set baselines that require multiple conservation practices to be in place prior to trading and might limit participation or require fewer practices and maybe increase participation (Chesapeake Bay Environmental Markets Team 2010). This decision can determine which farmers benefit—the ones who have already voluntarily implemented BMPs or the ones who need to but have not yet done so, an equity issue that may be "inherently a political decision" (Ghosh et al. 2011). And regardless where the baseline is set, the need to ensure that the credits generated are a direct result of the market must be balanced against the costs and difficulties of documenting it (Marshall and Weinberg 2012).

So far, the most active markets have the least stringent baselines

The WQT programs with the highest number of completed point source (PS) to nonpoint source (NPS) trades are those with less stringent baselines—the Great Miami Conservancy District program (Newburn and Woodward 2011) and the Alpine Cheese/Holmes County program (Sugar Creek Project of the OARDC 2006), both in Ohio. Both programs saw WQT as an opportunity to reach out to farmers who were not responding to federal cost-share incentives or other grant opportunities. The Great Miami program required farmers meet existing Ohio regulatory requirements. In Ohio, farmers are assumed to be in compliance unless complaints are filed against them. If there is a complaint, the SWCD asks the farmer to comply, provides any assistance (including cost-share funds) and gives the farmer a voluntary period to correct the problem. The Great Miami program provided a source of funding for farmers who needed additional practices to avoid triggering an enforcement process. The program believed that bringing conservation practices to farms that were not currently using BMPs had a much greater potential to improve water quality. However, the program excluded any nutrient load reductions funded by other cost-share or granting opportunities. Program developers believed that any additional baseline requirements would create yet another obstacle to water quality improvements (Dusty Hall, personal communication). In Holmes County, private funding from Alpine Cheese to implement BMPs was acceptable to the Amish farmers in the county whereas funds from government sources were not (Sugar Creek Project of the OARDC 2006). Since both programs used current farm practices as the baseline and were easy for farmers to understand and document, they had broad appeal to farmers in their watersheds. Programs that require an additional level of conservation practices are not nearly as active but this may or may not be related to the baseline they have set since so many variables impact activity.

TYPES OF BASELINES

Setting baselines for farmers with and without a TMDL

We find it helpful to separate baselines into two different contexts: without a Total Maximum Daily Load (TMDL) allocation and with a TMDL. Without a TMDL, effluent limitations serve as the primary mechanism in point source NPDES permits for controlling discharges of pollutants to receiving waters. NPS, including agriculture, do not have any required reductions. In contrast, in most TMDL situations, agriculture can be considered part of the solution to achieve water quality goals and is also assigned load reductions based on their load allocations (AFT 2013). As part of the state plans to achieve the TMDL goals, agriculture must meet its share of the reduction.

Baselines in non-TMDL situations

In non-TMDL situations, effluent limitations serve as the primary mechanism in point source NPDES permits for controlling discharges of pollutants to receiving waters. When developing effluent limitations for an NPDES permit, permit writers consider limits based on both the technology available to control the pollutants (i.e., technology-based effluent limits) and limits that are protective of the water quality standards of the receiving water (i.e., water quality-based effluent limits). For NPDES permit holders, WQT can represent a more flexible compliance tool. For example, buyers who

volunteer to purchase credits during the pilot phase of the Ohio River Basin WQT pilot may be eligible for flexible compliance schedules to achieve regulatory reduction requirements that are imposed in the future if those requirements are more stringent than the reductions achieved through pre-compliance trading (EPRI 2012). Here, early participation may make it possible for point sources to postpone upgrades for a short period of time until an upgrade serves multiple purposes or the plant is decommissioned.

Discussions about baselines for farmers center around existing or current land uses, some documentation of prior land use, the use of reasonable or appropriate BMPs and compliance with local, state and federal regulations—or some combination thereof (coupled with the issues of methods/techniques). In the case of NPDES permits, the permit deals solely with the PS discharge. Discussions do not have to consider if any of the proposed farmer reductions are already "counted" in the overall plan to reduce nutrients. However, setting and implementing baselines still requires decisions on who may qualify.

Defining "comply with existing regulations" raises two important issues. First, programs must determine if the existing regulations are specific enough to define clear baseline eligibility. Some states have minimal regulations while others establish aspirational goals for farmers not to pollute at all that could exclude trading. Second, programs have to decide what "comply" with existing regulations means. While many states have broad "bad actor" laws that authorize enforcement actions against activities that generate NPS pollution, they typically operate on a reactive complaint-driven basis (US EPA 2011b). As such, farmers may lack some practices or not quite meet the performance envisioned in the regulations but are legally considered in compliance since they haven't been cited (Environmental Law Institute 2000). How programs resolve these issues affects whether farmers who are poor stewards or good stewards participate and their competitive advantage in offering the lower cost credits.

Baselines in TMDL watersheds

A TMDL can create a framework for WQT by setting an overall cap on a specific pollutant and dividing it amongst the various sources (ID DEQ 2010). In some cases, a TMDL can act as the driving force that motivates the participation of key players, particularly PS who may have previously been governed only by effluent concentration limits (US EPA 2008). Under a TMDL, all sectors are included, load allocations are calculated and reductions are assigned. All sectors are "required or counted on" to reduce nutrients by their load allocation amount. In this case, allowing farmers to trade before they meet their load allocation means they could be selling credits to a PS from expected reductions that have already been factored into the overall strategy. Those reductions are not seen as "additional." WQT must avoid shifting the reductions that NPS are expected to make without the market as part of the overall TMDL cap to PS who then use them to offset reductions they were required to achieve. To ensure additional reductions, many insist that NPS achieve their assigned load reductions first (so this becomes the baseline) and then trade any "surplus" reductions. This can be a very stringent standard especially since the assigned load allocations are future

oriented and represent goals of the TMDL over some set time period like 15 years. In addition, unlike regulated PS, NPS are, for the most part, expected to meet their TMLD load allocations voluntarily.

Current baselines span a continuum of stringency

The baselines established in current WQT programs or proposed in emerging frameworks span a continuum from allowing all farmers to trade to possibly restricting the number of farmers who will participate, at least in the short- to mid-term. Program developers must decide among the following types of baselines that are generally arrayed along a continuum of stringency, starting with the least and moving to most (adapted from Kieser 2011).

Current Practice	Comply with Existing Laws	Set level of BMPs	Comply with Laws & Ad'l BMPs	Phased or Graduated to TMDL	TMDL Load Allocation or higher
many	⇒	# of farmers eligible		⇒	few
many	⇒	# of credits available		⇒	few
less	⇒	Additionality		⇒	more

Farm's Current Practices

The least stringent baseline accepts current practices on each farm or is set at existing BMPS that were being used at a specific date for a given farm. Some programs require a few years of farm practice history to help establish that proposed practices are indeed new to the operation. All producers are eligible (unless, one assumes, egregious violations exist) and any new nutrient load reduction practices they implement could generate credits. This approach allows the maximum number of farmers to participate and the maximum number of credits to enter the market. Good stewards are not eliminated from the market although they may face more competition (Ghosh et al. 2011). This approach lowers the cost of credits and provides an incentive for "late adopters" to adopt BMPs, at least in Pennsylvania where the analysis was conducted (Ghosh et al. 2011). However, the baseline may not result in the same total reductions if farmers in the future fully comply with all target reductions from other rules and regulations. It may also put the best stewards at a disadvantage by pricing them out of the market since they already have adopted many of the appropriate BMPs and have fewer possible nutrient reductions left.

Examples:

- The Alpine Cheese Trading Program (Holmes County, Ohio) accepts a farm's current practices. The Program offers incentives if 75 percent of producers in tributaries participate and also offers sign-up incentives to new participants (Sugar Creek Project of the ORARDC et al. 2006).
- The Rahr Malting Company (Minnesota) accepts current practices but implemented BMPS need to be visually tracked or monitored and BMPs that are already widely used (like reduced tillage) are excluded through the use of trading ratios (US EPA 2009a).

- Southern MN Beet Sugar Cooperative Permit: Farms submit five years of farm practice history to set a load reduction baseline for each farm (US EPA 2007).
- Minnesota WQT: Baseline conditions are the conditions existing immediately before the execution of the trade. It is the same for post-TMDL or baseline conditions may be specifically established in a TMDL (MPCA 2011).

Minimum Level of Agricultural Management Practices (*may be either more or less stringent than compliance with regulations*)

Programs can set a specific minimum level of performance or a minimum set of conservation practices to be the baseline. This could be set based on some measure of appropriate practices for farmers in the watershed. This approach can help address the early/late adopter issue and incentivize farmers to achieve a minimum level to participate in the program. Theoretically, this type of baseline could be set below full compliance with all existing regulations, if the program determines that significant numbers of farmers are not in compliance. This would provide flexibility for the trading program to allow farmers into the market even though they are not in full compliance. By adopting a package of practices, they could get into compliance and produce credits above the compliance level. For example, a livestock farmer who is not in compliance with state regulations that require fencing livestock out of waterways, could adopt a package of nutrient management practices that included fencing, holding ponds and plans for manure management. However, all of the programs to date also assume or require compliance with regulations.

Examples:

- Wisconsin WQT framework: In watersheds without TMDLs, farms must meet the applicable statewide performance standard before trading (WI DNR 2011; 2013).
- The WI Red Cedar River Trading Program set the baseline at the applicable statewide performance standard or the TMDL load allocation, whichever was lower (WI DNR 2011).
- The Michigan Kalamazoo River Basin Demonstration Project set generally accepted agricultural management practices as the baseline but producers who were not yet using these practices could receive discounted credits (50 percent) for practices that brought them into compliance (US EPA 2009a). No trades were ever completed.
- The Michigan WQT rules stipulate the most protective of cap and load allocation of a TMDL, WMP, remedial action plan or lake-wide management plans plus three years of farm practice history to set loads (MI DEQ 2002).
- Colorado WQT rules stipulate that if the NPS is not subject to applicable requirements, the baseline is existing land uses and reasonable and appropriate BMPs, if any. The “applicable requirements” include loading allocations assigned by a TMDL, a watershed management plan or remedial action plans (CO DPHE 2004).

Compliance with Existing Regulations

A few programs deem farmers eligible to sell credits from newly installed conservation practices as long as farmers comply with all local, state and federal regulations. This appears straightforward but programs still must resolve additional issues before proceeding. For instance, determining which farmers are in compliance can complicate implementation. In every state or watershed, some portion of farmers may be out of

compliance, having not adopted all the practices required by existing regulations. However, with insufficient funding for technical assistance, verification and enforcement, most areas do not have the means to track these farmers. In many states, farmers are assumed to be in compliance unless the responsible agency is aware of the farm or someone has filed a complaint. So even though the baseline requires farmers to have adopted the practices required by existing regulations, it might allow farmers to participate who have not met those standards but are not considered out of compliance because there are no complaints against them. In this case, the baseline would operate more like those described above depending on whether any minimum practice would be required for farmers to participate even if they are not reported. One option would be if the applicable regulation is practice based, a baseline could allow all farmers to participate but only allow credits generated from practices beyond those required. A second complicating factor is if the state regulation is very stringent or vague making it either extremely difficult for farmers to comply or unclear whether they are in compliance.

Examples:

- The Great Miami River WQT program in Ohio does not require a practice history and all farmers in the watershed are eligible to apply for funding. Practices are eligible for credits if they are voluntary, above or beyond what is required by local, state or federal law, and have not received funding from any federal or state cost-share programs (Newburn and Woodward 2012).
- The Ohio WQT rules use pollutant load associated with existing land uses and management practices and compliance with federal, state and local regulations. These rules also delegate the responsibility down to the entity that creates the WQT management plan and then OH EPA approves the plan (OEPA 2012).
- Ohio River Basin WQT program requires that farmers must comply with all local, state and federal regulations and submit three years of farm practice history (EPRI 2012).
- The Oregon Temperature and Oxygen Demanding Substances program set the baseline at compliance with existing regulations (OR DEQ 2009).
- Montana WQT rules set baselines at the level of pollutant load associated with existing land uses and management practices that comply with applicable state, local or tribal regulations—even in waters with a TMDL (MT DEQ 2012).
- Oregon WQT rules set baseline at pollutant load level associated with existing land uses and management practices that comply with existing state or local regulations (OR DEQ 2009).

Compliance and Additional Level of Agricultural Management Practices

Programs may require both compliance with existing regulations and a specific level of performance or a specific set of conservation practices as the baseline. This level can be set above the requirements already in existing regulations. This approach represents a tradeoff between increasing participation in the trading program and promoting farmers to move to higher levels of performance.

Examples:

- In the West Virginia WQ Nutrient Trading Program, farmers must meet existing regulatory requirements and have implemented the BMPs contained in a whole-farm nutrient plan that achieve a stipulated load for the field (WV DEP 2009).
- Pennsylvania WQT Rules use a combination approach. First the seller must meet the legal requirements and the pollutant load associated with the location applicable on January 1, 2005 or later (= "baseline"). The second requirement is the "threshold." This requirement is defined as either a 100-foot manure set back, a 35-foot vegetative buffer or a reduction of 20 percent in the farm's overall nutrient balance beyond baseline (PA DEP 2009).

Phased or Graduated:

In this approach, trading eligibility requirements become more stringent over time. This creates an incentive for farmers to achieve the initial phase baseline in order to trade, while over time working to achieve the higher standard. Phasing in over time gives producers a window of opportunity to install a required BMP or meet a certain load requirement. Within any "phase," eligible farmers would be able to generate credits for any actions beyond the baseline for that phase. This approach is most applicable with a TMDL that has a future reduction goal for the agriculture sector. As noted earlier, existing regulations are not working to achieve compliance by all farmers for a variety of reasons. Moreover, the CWA does not provide EPA with the authority to directly regulate farms. Finding ways to create incentives for farmers to adopt as many new conservation practices as quickly as possible is critically important to improving water quality.

Examples:

- Wisconsin: Wisconsin's proposed WQT Framework (WI DNR 2011; 2013) allows for interim trades to meet TMDL Load Allocations or Statewide performance standards. Under their proposed framework, two types of credits can be generated: interim pollutant reduction credits (to meet baseline) and long-term pollutant reduction credits (after baseline has been met). The baseline (credit threshold) is set at applicable statewide performance standards or at the load allocation calculated in the TMDL. Farmers can generate interim pollutant reduction credits for reductions achieved above the credit threshold for a maximum of five years. At that point they are lost and need to be replaced with new interim pollutant reduction credits or final pollutant reduction credits. The interim credits help agricultural sources come into compliance with the performance standards.
- Florida (SB 754, effective July 1, 2013): Does not discuss baselines per se, but appears to provide language that indicates a willingness to consider a phased or graduated baseline: "*In developing and implementing the TMDL for a water body, the department, or the department in conjunction with a water management district, may develop a basin management action plan that addresses some or all of the watersheds and basins tributary to the water body. Such plan must integrate the appropriate management strategies available to the state through existing water quality protection programs to achieve the TMDLs and <u>may provide for phased implementation of these management strategies to promote timely, cost-effective actions</u> as provided for in S. 403.151."* (Florida Senate 2013).

- Idaho: Idaho basically anticipates pending TMDL load allocations for the NPS and sets this part of the load reduction as a "water quality contribution." The remaining credits can be traded. In a phased-in fashion, the water quality contribution = 10 percent of the NPS credit amount up to five years when the TMDL is completed and 20 percent for any time remaining until the point source compliance date. When the implementation plan is complete, the water quality contribution is set at 20 percent of the NPS credit amount. Once fully implemented, the baseline becomes the load allocation amount (ID DEQ 2010).

TMDL Load Allocation

Collectively, farmers in watersheds with a TMDL have an assigned TMDL load reduction target that they are expected to reach, e.g., a 40 percent reduction in nitrogen within 10 years. In these watersheds, the TMDL load allocation becomes the baseline and farmers cannot generate credits until that farmer achieves the farm level performance or has adopted all the practices spelled out in the U.S. EPA-approved TMDL implementation plan. With this baseline, every credit generated is truly additional after considering full compliance with all regulations and achieving the future TMDL target for agriculture (possibly as many as 15 years in the future). The tradeoff is that there will be fewer credits, at a higher cost, and less incentive for farmers to adopt conservation practices earlier. Recently, the Ohio EPA, in commenting on changes to its WQT rules, rejected this option as too restrictive saying it would seem to preclude any point source-nonpoint source trading from happening, at least in the near term (OEPA 2012). An analysis of credit supply and demand in the Chesapeake Bay expressed similar concerns (Selman et al. 2010).

Examples:

Specific BMPs

- In Virginia's Chesapeake Bay Watershed Credit Exchange Program, producers must *first* implement the five priority BMPs required as part of the state's plan to achieve its TMDL reduction targets, called their Tributary Strategy (soil conservation plans, nutrient management plans, cover crops, livestock stream exclusion and riparian buffers) within an entire USDA Farm Service Agency tract before generating credits (VA DEQ 2008).

Specific pollutant reduction

- In the Idaho Snake River WQT plan, producers must reduce their loading *below* the load allocation set by the TMDL before they are eligible to generate credits (ID DEQ 2003).
- In the Lower Boise Effluent Trading Demonstration, the TMDL load allocation is applied to each BMP where the percent load reduction required is retired for the TMDL and the remaining reductions are creditable for trading (ID DEQ 2003).

TMDL Load Allocation Plus Additional Requirements

A few programs require farms to meet their TMDL load allocation baseline and then some:

Examples

- The Pennsylvania WQT rules require producers to be in compliance with any load allocation specified under a TMDL and they must implement a 100-foot mechanical

setback or a 35-foot buffer or achieve a 20 percent reduction *below* the farm's total nutrient balance beyond baseline compliance before being eligible to sell credits (PA DEP 2009). If the setback or buffer are not in place, the Commonwealth reduces the amount of credit generated by 20 percent.

- In the Maryland WQT program, farmers must meet the Tributary Strategy load allocation and the TMDL load allocation for the *portion* of the farm that is being used to generate credits and also have a current nutrient management plan and an updated Soil and Water Conservation Plan (MDA 2008).

WHICH BASELINES WORK?

There are a wide variety of baselines but we can only speculate which are more likely to lead to better environmental results

The establishment of baseline requirements (and even the definition of the term) is subject to a great deal of professional judgment. In addition, other WQT program elements like the tools being used to quantify a credit or program decisions—whether a program wants to increase net benefits for the water resource—can play a role in setting the baseline. In the case of higher trading ratios, additional benefits for the water resource may be placed directly on the buyer and do not involve the seller so these programs can have less stringent baselines and more will be accomplished because the buyer has to buy more credits. For example, the Southern MN Beet Sugar Cooperative permit set a 2.6 to 1 trade ratio. For every one credit used as an offset, the point source must purchase 2.6 credits. One credit is retired for the net benefit of the river and 0.6 credit is retired to meet the "engineering safety factor reflecting potential site-to-site variations," leaving the remaining credit for the basic load offsetting (i.e., 1 + 0.6 + 1 = 2.6) (Fang et al. 2005). In addition, a baseline and/or the trading program must be structured in such a way that sufficient credits can be generated for the life of the buyer's proposed discharge so context is important. For example, if the Chesapeake Bay plans to collect and treat stormwater-related nutrient loads down to, or near zero in the future, a graduated baseline for trading to allow for new growth may be justified. If all sources have to reduce to a very low limit to make a TMDL work then requiring TMDL load allocations be achieved before generating credits makes more sense. If the water body is slightly impaired, then using the load allocation as the baseline in the short-term may not make sense (personal communication with Jim Klang 8/29/13).

***Accept current practices*:** This baseline emphasizes credit quantity. It allows the creation and sale of credits for most environmental improvements in the subject community, regardless of the current environmental practices of participating landowners. Just as with many PS, where the incremental costs of treatment climb steeply from primary to secondary to tertiary treatment, the first BMP's applied to a farm landscape are likely to be the most cost-effective because, in the absence of conservation practices, the farm may be generating a large nutrient load (Selman et al. 2010).

Another potential advantage of a current practices baseline is that it offers program managers the opportunity to target the small percentage of rural landowners who are responsible for the majority of serious environmental problems and achieve water quality improvements more rapidly with fewer transactions before switching to more random procurement of credits. However, producers on critically undertreated acres may be hard to identify and even more difficult to engage, driving up costs. Current markets might not offer enough of an inducement to persuade poor stewards to implement conservation practices since farmers who are actively trading are only partially reimbursed for the costs of the conservation practices they install. Still, the University of Maryland School of Public Policy recently suggested that the current level of nutrient loadings is an appropriate baseline which would allow credit for coming into compliance with regulatory requirements: "*One option to consider thus is whether agricultural baselines should be set at less than the full legal requirements for agriculture, acknowledging the uncertainty of immediate legal compliance, and thus potentially accelerating the improvement of farmer nutrient management practices (a particularly important goal given the large share of total Bay nutrient loads that originate in agriculture and the low cost of many potential agricultural nutrient reductions)*." (Bodine 2013).

***Ask for more practices*:** Setting a minimum level of performance before generating credits will result in better environmental performance—but only if that level of performance can and will be implemented on a widespread basis. In many cases, a lower baseline that leads to greater participation and more practices being installed should produce a better environmental result than a higher baseline where fewer farmers participate and have fewer nutrient load reductions they can make—or at least conventional wisdom indicates it might.

***Require TMDL load allocation reduction first*:** Similar concerns about discouraging early participation and having few qualified sellers surface when establishing a baseline at an aspirational standard far above current environmental practices. The TMDL load allocation may take farmers decades and considerable expense to achieve. Here, the concern is that few farmers are likely to reach the high market entry point at their own initiative and expense, limiting the number of potential sellers and early trades. Furthermore, once they do qualify, most of the environmental improvements that are possible (particularly the high-impact, low-cost opportunities) are likely to have been achieved before the market engages, reducing demand and increasing costs. An analysis of credit supply and demand in the Chesapeake Bay (Selman et al. 2010) predicts that the marginal nutrient reductions that can be achieved by implementing additional BMPs on farms that have already reduced their nutrient loads are small and will likely be more costly per pound of nutrient reduced than those reductions from farms that have not met their baseline. TMLD load allocation reduction baselines likely mean: 1) Fewer farmers, at the outset, will qualify to generate credits because only a few farms will initially meet baseline requirements; and 2) There are fewer possible reductions to be generated beyond the reductions that are already required to meet baseline. To make trading work, the Chesapeake Bay may need to facilitate the financing of

practices that help farmers meet baselines, encourage innovative practices for reducing nutrients, and allow for interstate-interbasin nutrient trading (Selman et al. 2010).

BASELINE OPTIONS THAT MAY STRIKE THE RIGHT BALANCE

Several baseline options seem like they might strike the right balance to harness the power of a market

The challenge in defining baselines is finding the right balance between stimulating lots of credit transactions—a key factor in the extent and pace of water quality improvements in the program area—and maintaining and encouraging a higher level of stewardship overall by harnessing the potential incentive power of markets to facilitate environmental improvements. Theoretically, if farmers can make money by selling credits, participation will not be a problem. We're currently speculating that the following options achieve this balance. We need more research and analysis to confirm their actual impacts. These proposed options listed below are not mutually exclusive:

Option One: Use Phased or Graduated Baselines

A phased or graduated baseline is established at a low to moderate level initially and ramps up over time. This gives farmers and ranchers the immediate opportunity to participate and stimulates a high level of trading activity rapidly, but ensures that the program meets high standards for credit quality over time. Phased eligibility requirements can be defined by the extent of practices implemented, the amount of a specific pollutant reduced, or the extent to which TMDL targets are achieved. The Chesapeake Bay Environmental Markets Team provides an excellent, more in-depth review of this approach, presenting a hypothetical example that demonstrate the potential benefits in overall water quality from earlier adoption of BMPs by farmers using a graduated baseline compared to the "TMDL Load Allocation Baseline" (CBEMT 2012). Phased baseline requirements can be defined by the amount of pollutant reduced or by fixed percentages of TMDL achievement so percent achievement required to participate in the market will increase over time. They can be linked to the milestones set out in the TMDL plan. In the case of Chesapeake Bay, farmers would sell credits during earlier intervals then take those credits off the market and apply them toward TMDL allocations at the beginning of the next compliance interval (CBEMT 2010).

Another type of phasing is offered under Wisconsin's proposed WQT Framework (July 1, 2011). Two types of credits can be generated: interim pollutant reduction credits (to meet baseline) and long-term pollutant reduction credits (after baseline has been met). The baseline (credit threshold) is set at applicable statewide performance standards or at the load allocation calculated in the TMDL. Farmers can generate interim pollutant reduction credits for reductions from practices that help them reach the baseline standard for a maximum of five years. The interim credits help agricultural sources come into compliance with the performance standards (WI DNR 2011; 2013).

This strategy takes advantage of the tendency of markets to evolve towards higher quality credits over time and reinforces it through a phased increase in standards for market entry over time. The principal benefit of this strategy is it initially opens the

market to a wide range of credit producers and sellers, accelerating the pace of environmental improvement. Not only would water quality improve, but the conservation practices installed as a result would generate additional environment benefits for the watershed like carbon sequestration, improvements in air quality and wildlife habitat (Shortle 2010). Gradually, the standards for credit generation would rise, ensuring that credit transactions (consisting of a mix of old and new credits) would exceed the exacting standards of offset markets and trading programs.

Option Two: Allow Credits for a Percentage of NPS Load Reduction

Although this idea was suggested as an approach to encourage early trading in the Chesapeake, it might be compatible with other TMDL implementation plans as well depending on the assumptions it makes. In the Chesapeake Bay TMDL, the state implementation plans make the assumption that most of the BMPs will not applied on 100 percent of available land. If the state assumed a BMP would not be applied on 75 percent of available acres, then it could approve credits for BMPs on 25 percent of available acres, even if the BMPs had not yet been installed on the remaining 75 percent of acres. This approach would be consistent with EPA's goal of using trading to achieve early reductions (Bodine 2013).

Option Three: Use a Community Practice Standard

In this strategy, farmers and ranchers would be required to achieve certain levels of BMP installation or practice use before being eligible to participate in the trading program. This could be based on community norms in the trading area or it could be a fixed standard. To maximize water quality benefits and level the playing field, community standards should apply broadly to all agricultural operations. Programs would need to determine the level at which to set community standards (county, watershed, state, federal) and who would be included in setting those standards. Examples of individual practices that could be part of community-wide standards include vegetative buffers, land application setbacks, winter manure application prohibitions, livestock exclusion requirements and fall fertilizer restrictions (Dexter et al. 2010). For example, in the West Virginia Water Quality Nutrient Trading Program, farmers must meet the *more restrictive of*: a) any existing regulatory requirements or effluent limits related to nutrient management; or b) implementation of a whole farm nutrient management plan and an average per-acre nutrient load on the to-be-credited site based on the 2005 average Edge of Segment nutrient load for the specific agricultural land use (WV DEP 2009). The loading rates are to be modified to reflect the Bay TMDL agricultural nutrient allocations when final. Farmers entering the trading program who have implemented BMPs that exceed the baseline are eligible to receive credits for their prior commitment to land stewardship. This option is likely to provide immediate access to markets for early adopters of BMPs and practices, stimulate trading activity in the area, and ensure that credits are not available to those who are far below the norm in pollution control and treatment. The community norm may change upward as the market or trading program is implemented and peer pressure and outreach efforts increase.

Option Four: Leave Participation Open but Only Purchase Credits that Meet Program Standards

Another option for achieving high rates of program participation and high standards for credits is to establish eligibility at current practice standards but purchase only the credits that meet program standards and expectations. This is essentially the model used in Great Miami program, which has a "current practice" baseline but which uses a reverse auction system to solicit proposals from farmers and ranchers, ranks them by cost and effectiveness, and buys the most cost-effective credits proposed. This has proven to be a very successful approach, with 11 funding rounds to date providing more than $1.8 million to nearly 400 on-farm conservation projects. It is also quite selective, with 35 of 132 proposals funded in the latest round. On the other hand, an auction system may not be the most equitable system for farmers because bidding always drives prices down. In comparing the range of costs covered by EQIP for selected BMPs to the costs covered through the Great Miami program, the WQT program often paid less although the average cost for BMP payments in both programs were generally comparable (Klang and Kieser 2008). Over time, the competitive nature of such a program will require that farmers and ranchers achieve higher standards or lower prices to receive funding. The results are likely to rival programs with high eligibility standards, but levels of community participation are apt to be higher. At the same time, the credits will still meet program standards and expectations.

Option Five: Use Cost-share Incentive Payments in Tandem with WQT

Currently, most programs do not allow farmers to sell credits from practices they've installed with the use of state or federal cost-share funds. Although USDA permits the sale of federally financed credits, most programs chose to avoid the appearance of "double dipping" (Horan et al. 2004). However, double dipping might actually improve the performance of a trading program (Horan et al. 2004). The degree of improved performance achieved by using cost-share incentive payments in tandem with WQT depends on whether the programs are coordinated or not, whether double dipping is allowed and whether the cost-share incentive payments are targeted. If the programs are coordinated, allowing state or federal cost share funds to generate credits increases efficiency because both programs jointly influence farmers' marginal decisions. Without coordination, double dipping may either increase or decrease efficiency, depending on how the cost-share incentive payments are targeted. Finally, double dipping may not solely benefit farmers since it can result in a transfer of the cost-share incentive payment subsidies to point sources.

To avoid double dipping, markets could discount credits that result from federal or state cost-share payments. For example, if the cost-share incentive payment covered half of the cost of installing a grass buffer, the resulting credits would be discounted by 50 percent. In this case, the WQT program is covering the other half of the costs of installing and maintaining the buffer. Another option would to keep a higher baseline but make more farmers eligible to trade by targeting federal and state cost share payments to bring them up to the higher baseline. The state and federal cost share payments could be used to get farmers and ranchers to a level of BMP adoption that would make them eligible for trading programs. Conceivably, a buyer could also help

pay for these practices and negotiate pricing for additional practices that could generate credits. Using public funds in this manner seems to have universal support.

However, linking programs might be challenging to execute, requiring a level of targeting that is unusual in incentive programs. The most likely partnership for WQT programs is with the Environmental Quality Incentives Program (EQIP), a very popular program that is habitually over-subscribed (Breetz and Fisher-Vandem 2006). The challenge is that EQIP is a blunt tool for addressing water quality and with its limited environmental targeting, fuzzier accounting of benefits, weaker focus on cost-effectiveness, lower eligibility requirements and minimal monitoring, it is a poor substitute for WQT's project selection. On the other hand, EQIP and WQT policy are more or less aligned philosophically and some state ranking procedures now favor targeting, benefit calculation and cost-effectiveness. In these cases, the conservation districts could recruit farmers for EQIP and later target the same farmers for WQT once they have met the baseline requirements. To make this happen, WQT programs would have to work directly with the state and county NRCS technical advisory committees—and obtain the blessing of NRCS at the federal level.

In cases where there is a large gap between current practices and market entry thresholds, using conservation incentive programs, most of which are under-funded and allocate funds widely across the landscape, might make this option untenable for any but the smallest initiatives. However, this option is potentially compatible with the current practice of establishing market entry at the TMDL load allocation. There would also need to be thought given to larger and multi-phase projects that might comingle market and incentive payments, whether such behavior is acceptable, and, if so, how credits would be allocated. Finally, the management role in a mixed market/incentive program would be challenging and expensive. Regardless of what programs decide, it makes intuitive sense for WQT to partner with at least some of these over-subscribed public cost-share incentive programs as a way to recruit farmers whose applications addressed water quality issues but were not funded (Breetz and Fisher-Vandem 2006).

CONCLUSIONS

WQT can have a very meaningful impact water quality by focusing a larger share of the public's investment in cleaner water on nonpoint problems

These improvements in water quality may be particularly important when nonpoint contributions are the dominant source for tradable water quality parameters (nutrients, temperature and dissolved oxygen) in a watershed; where these parameters are having a very considerable impact on downstream waters, such as the creation of hypoxic zones; and/or where point source treatment costs are extraordinarily high or nonpoint source treatments are unusually inexpensive.

Baseline determination will have an important impact

The selection of the baseline will impact the costs of the NPS credits in the market and, ultimately, the number of credits that NPS can sell to regulated PS (Ribaudo et al. 2009; Ghosh et al 2009; USDA NRCS 2011c). If the standards are set too loosely for NPS, the credit supply will be plentiful but some of the practices that are implemented may

have been implemented anyway without the market. Conversely, if the standards are set too high, NPS that otherwise could have reduced their loading at a relatively low cost might decline to participate. This could drive up the costs of credits, limit the pool of eligible credit sellers, and reduce the effectiveness of the program. If baselines are established at a low level, these simple and inexpensive actions will produce trading credits, while higher baselines will require upfront investments by farmers to install conservation practices before they can participate in markets. Some of these costs may be offset by cost-share funds or if buyers chose to help. High baselines are apt to increase the costs of nonpoint options, decrease the cost differential and decrease the motivation for point/nonpoint trading.

Baselines play a key role in regulating market activity to accelerate NPS treatment, serving as both the gas pedal and the brake on trading activity

Where the proper circumstances exist—watersheds with a lot of PSs and NPSs, severe downstream impacts, and very low NPS treatment costs—the use of a low baseline can rev up trading activity and investment in nonpoint treatments. In the opposite circumstances, a higher baseline can put the brakes on trading. This seems to provide a good rationale for a baseline that ratchets up over time, initially taking advantage of the highly effective and least expensive improvements with the first treatment actions, then requiring more sophisticated nonpoint treatments as point and nonpoint options reach parity in effectiveness and cost. The potential for lower baselines to stimulate earlier adoption of practices that reduce nutrient loads may mean that a more flexible policy that allows differing baseline levels that are responsive to the unique and evolving needs of each watershed is more desirable than a single national baseline standard.

Substantial differences and issues exist in setting baselines under a TMDL with a NPS load reduction target compared to other regulatory drivers

In most TMDL implementation plans, agriculture is counted on to be part of the solution to achieve water quality goals and is assigned load reductions based on their load allocations, as previously described. As part of the state plans to achieve the TMDL goals, agriculture must meet its share of the reduction. In other words, a TMDL creates a framework by setting the overall cap on a specific pollutant and dividing it amongst the various sources (ID DEQ 2010). However, enforcement that could bring all participants to the table only applies to the point sources for the most part. A growing number of programs are concerned that TMLD load allocation reduction baselines likely mean: 1) Fewer farmers, at the outset, will qualify to generate credits because only a few farms will initially meet baseline requirements; and, 2) There are fewer possible reductions to be generated beyond the reductions that are already required to meet baseline (Selman et al. 2010).

In contrast, in watersheds without TMDLs, nutrient standards are the regulatory driver for water quality and point sources must meet reduction targets in their NPDES permits. NPS, including agriculture, do not have any required reductions. Discussions about baselines for farmers center around existing or current land uses, some documentation of prior land use, the use of reasonable or appropriate BMPs and compliance with local, state and federal regulations—or some combination thereof (coupled with the issues of

methods/techniques). In the case of NPDES, the permit only applies to the PS. Discussions do not have to consider if any of the farmer reductions already are "counted" in the overall plan to reduce nutrients. However, there can be questions about whether existing regulations are specific enough to define clear baseline eligibility and exactly what "complying" with existing regulations means since many "bad actor" laws that authorize enforcement actions against activities that generate NPS pollution are on a reactive complaint-driven basis (US EPA 2011a). How programs resolve these issues affects whether farmers who are poor stewards versus good stewards participate and their competitive advantage in offering the lower cost credits.

Lack of clarity in guidance and consistency among existing programs in setting baselines creates barriers and holds back the implementation and expansion of WQT programs

Although WQT is gaining traction as a tool that can help minimize costs and provide flexibility in meeting water quality goals, there is a lot of disparity in how WQT programs are developed in various states and watersheds. This lack of consistency may put some programs at risk. If some WQT programs are perceived to lack rigor, this may also affect public perception. There are significant differences in the types of baselines being used and the way in which they are chosen, how they are justified, how they are documented and what procedures are followed. In addition, there are differences in the types of tools used to calculate and register credits, how uncertainty in models is addressed, how verification and certification are carried out and how adequate rigor is ensured in registering and tracking credits. As trading programs mature and begin to handle credit transactions, they come under increased public scrutiny. As a result, at least one pending lawsuit challenges the validity of using WQT under the CWA to meet a TMDL obligation (NACWA 2012).

Regardless of the type of baseline, rigorous protocols must verify that the farmer has met the baseline requirement

Programs need some way to measure and verify that: 1) the farm has met the baseline conditions and is eligible to trade; and, 2) that surplus nutrient load reductions beyond those achieved by meeting baselines requirements are creditable. This can involve questioning the farmer and inspecting the farm operation, working with the farmer to assemble and review his or her farm practice records, applying computer models to calculate existing run-off from the operation and collecting spatial data about the operation. Ideally, the trading market can strike a balance between the need to document existing and prior conditions on the farm with the need to simplify paperwork and minimize time requirements. Although this sounds achievable on paper, in practice it can be challenging. Many farms, particularly smaller operations, do not keep detailed records on conservation practices and some annual practices, like cover crops or certain types of tillage, may be difficult to document with remote sensing. If a farmer has participated in State or Federal conservation incentive programs, there may be records available that will document when and where conservation practices have been implemented. However, many farmers voluntarily implement conservation practices without help from government programs.

Depending on where the baseline is set, programs determine which farmers participate and may be accused of either "bailing out the bad actors" or "being unfair to early adopters"

Baselines are designed to improve water quality but can also have indirect policy impacts.

Dealing with critically undertreated acres: Several recent studies have indicated that critically undertreated acres—those where little or nothing has been done to prevent water pollution—can contribute disproportionately to water quality problems (USDA NRCS 2010; USDA NRCS 2011a; USDA NRCS 2011b; USDA NRCS 2011d). In the Pleasant Valley watershed in Wisconsin, eight of the 61 farms occupy only 12 percent of the area but are responsible for 73 percent of the estimated runoff of phosphorus (Nowak 2010a). Because these farms are engaging in inappropriate behaviors in vulnerable times or places, the watershed won't achieve significant water quality improvements until solutions are developed that work for them (Nowak 2010b). Many obstacles may prevent or discourage farmers from implementing practices to reduce nutrient run-off so it may be premature to categorize these farmers as "bad actors" (USDA NRCS 2005). At the same time, there are significant concerns about using funding from WQT—which is often in limited supply—to resolve the worst problems, on the grounds that this money would be "bailing people out" who have neglected their basic responsibility to prevent pollution. This may support a baseline that assumes water quality practices that are slightly below average for the agricultural community as a whole and setting a slightly higher eligibility for the trading program. Farmers who don't meet the baseline could not produce tradable credits and would potentially be subject to state or local regulation. Alternately, a baseline could be phased in, allowing all farmers to participate at first then raising eligibility standards over time.

***Being fair to early adopters*:** Prior adopters of BMPs can apply their experience of installing and maintaining conservation practices to newly installed practices in a WQT market, reducing the risk of practice failure in the market. On the other hand, if they have already significantly reduced nutrient run-off on their farms, additional opportunities to reduce run-off may be limited and more expensive to install and maintain. This can increase the cost of the credit. Limiting participation to early adopters may also affect the supply of credits in a market and that will increase their costs as well. Since these producers have a history of using conservation practices above and beyond what they are legally required to do, how can a market prove that they wouldn't have gone ahead and implemented the credited practice in the absence of the market?

Stakeholders have proposed a number of different approaches to honor early adopters such as paying early adopters to provide credits for the reserve pool; using a starting date for a program (all practices implemented after this date are eligible), assigning a value or multiplier that would be reflective of the credit and providing an opportunity for point sources to give preference to farmers with higher stewardship scores by denoting stewardship status (AFT 2013). It is important to note that the concern about penalizing early adopters was raised independently as an issue by farmers, point sources, State permitting authorities, key agricultural stakeholders and the environmental community

during the development of the Ohio River Basin WQT Plan (AFT 2013). Programs can also consider setting up tiers to provide incentives for good decisions. The first tier (the baseline) might include high residue cover and nutrient management as a prerequisite for a site before a credit can be generated. The program can then adjust trading ratios to encourage progressively higher levels of stewardship: Tier 2: the next BMPs adopted will have a trading ratio of 2.5 to 1; Tier 3: When a farmer has implemented a whole-farm management plan, the trading ratio drops to 2:1.

Markets must strike a balance between ensuring sufficient participation by farmers while maintaining confidence in overall net water quality improvements from the market

Several analyses have shown more stringent baselines eliminate many low cost credits from the market, raising the overall cost of credits and reducing the number of credits trading in the market. More stringent baselines also fail to provide an adequate incentive for poor stewards to adopt BMPs (Ribaudo et al. 2009). This, in turn, may lessen the chances of improving water quality because fewer farmers are trading and the farmers responsible for much of the pollution (critically undertreated acres) are not eligible to trade. A date-based baseline (current practices from a designated point forward) may be the most efficient by providing incentives for poor stewards to adopt BMPs while not pushing good stewards or early adopters entirely out of the market (Ghosh et al. 2011). However, in the end, it might not be possible to define a baseline that is acceptable to all parties. Because of its distributional impacts, choosing the baseline is inherently a political decision (Ghosh et al. 2011).

RECOMMENDATIONS

Baselines should not be set in a vacuum but instead result from a discussion with stakeholders

Input from farmers and from other key stakeholders in a watershed can provide guidance on how to achieve a balance between ensuring sufficient farmer participation while maintaining confidence in overall net water quality improvements from the market. Programs should also reflect state and local watershed policies. For example, some states have agricultural practice standards or are working on certainty agreements that describe standards or baselines that exempt producers from future regulations. These types of standards may help programs decide on baselines. Since all programs will require farmers to comply with local, state and federal regulations, they may need to decide how to handle regulations that consider farmers to be in compliance unless a complaint has been filed. In these cases, farmers may not be fully following regulations but, because they haven't been reported, they are technically considered to be in compliance. Some challenging nuances in regulations may emerge. Also, if NPDES permits are involved, gaining the approval of the State Permitting Authorities is critical if credits are to be used in the permitting process. Also, the option to trade must be incorporated into the permit language. Approaching them early in the process of setting a baseline may influence decisions on baselines.

EPA should relax its policy guidelines regarding baselines set at the level of load allocations in TMDL basins

Current EPA guidelines that state the baseline should be equal to the TMDL load reduction target stifles research and experimentation with alternative approaches that could result in improved results. EPA should modify its guidelines to allow experimentation with setting baselines. This might encourage projects to test graduated baselines in the field. All of these challenges are clearly demonstrated in the case studies evaluated for this project, which indicate that trading programs that require load allocation baselines have virtually no trading activity, while those using more creative approaches are trading actively. By setting the baseline for participation equal to the future target performance level, EPA has foreclosed the potential for faster and more effective trading activity using more attainable standards and farmer-friendly approaches.

WQT could benefit from more experience on the ground with pilot trades to field test approaches

Funding of trading pilots could and should be used to test creative approaches to defining baselines. EPA, USDA and other funders have taken an active interest in stimulating water quality trading through a variety of grant programs, and these early investments have been pivotal in implementing pilots that establish new tools and techniques for environmental markets. We recommend that these agencies target some funding from these discretionary sources to field-test alternative approaches to baselines. The options identified in this paper—phasing, credit for percentage of NPS load reduction, using a community practice standard, high-grading credits in procurement, and combining incentives and trading programs—need further testing and refinement before they are ready for widespread application. The different approaches suggested to honor early adopters should also be tested and refined.

More research and testing would help refine and accelerate the use of WQT

Programs could benefit from more research and analysis that helps us better understand the impact of different approaches to setting baselines on overall water quality, e.g., the impact of a TMDL load allocation baseline on numbers of eligible farmers and the resulting impact on the cost savings assumptions of achieving overall water quality goals with less activity in WQT due to stringency and timing of baselines for farmers. We should also consider research to calculate the potential impact on improving water quality of approaches to baselines and eligibility that result in more farmers taking action sooner. It may be possible to achieve better water quality, sooner, at lower cost with an approach that stimulates earlier action on behalf of farmers. In particular, using graduated baselines that increase over time and allow all farmers to trade but discount their credits by the target load reduction seems promising.

At the same time, we need to identify and document best practices within existing WQT programs

If groups working on WQT can agree on best practices, we can move toward a unified national standard or guidelines for setting baselines (even if allowing for some flexibility for localized conditions). This will help the development and proliferation of markets, which in turn will result in improvements in water quality.

At the moment, one can make a strong case that the proliferation of different baseline models is useful in the evolution of trading programs, allowing a wide range of options to be tested and evaluated in a short period. However, over time this variability is likely to retard the development of trading programs. Agencies developing new trading programs need to evaluate which of many models is likely to work best and pass muster with the federal government. Multi-state trading programs may be hindered or challenged by different standards among participating states, as is currently the case in the Chesapeake Bay (NAS 2011) and, to a much lesser extent, the Ohio River Basin trading programs. In addition, many very promising strategies, such as Wisconsin's very progressive approach, will not get the attention and replication that they may deserve.

We need continued national leadership from USDA and EPA along with better coordination among major WQT programs in addressing these issues to finally unleash the potential of WQT

Water quality trading has been around in various guises since the 1970's but has had very little in the way of concerted federal leadership during this period. The initiative has been stuck in a process of piloting, with nationally recognized best practices and national standards or more specificity in national guidelines slow to develop and often contradictory between the desire to stimulate widespread improvements in water quality but hold to the highest standards for every transaction. Gathering all the program developers and other stakeholders to develop best practices, and move toward a national baseline standard, modeled after several of the more successful and advanced state and regional programs profiled in this report, would be a good place to start. Ultimately, the guidance on baselines must be flexible enough to encourage programs to set baselines that are responsive to the unique and evolving needs of each watershed.

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1150 Connecticut Avenue
Suite 600
Washington, DC 20036
(800) 886-5170