ENVIRONMENTAL INTEGRITY PROJECT

1 Thomas Circle NW, Suite 900
Washington, DC 20005
main: 202-296-8800
fax: 202-296-8822
www.environmentalintegrity.org

August 31, 2012

Nick DiPasquale, Director
Darrell Brown
USEPA Region 3 - Chesapeake Bay Program
Annapolis City Marina
410 Severn Avenue Suite 109
Mail Code: 3CB00
Annapolis, MD 21403
dipasquale.nicholas@epa.gov
brown.darrell@epa.gov

Re: Technical memorandum on uncertainty ratios in nutrient trading

Dear Mr. DiPasquale and Mr. Brown:

We understand that your office is preparing a technical memorandum on uncertainty ratios for use by the Chesapeake Bay states as they develop their trading and offset programs. For reasons discussed below, we are convinced that a trading program must include an uncertainty ratio of at least 2:1 for nonpoint-point trades in order to ensure that net nutrient loads do not increase. We ask that EPA consider these comments as you draft your technical memorandum on this important subject.

Uncertainty ratios in nutrient trading programs.

As you know, simple pound-for-pound pollution trading schemes are unusual. Most trading schemes apply one or more trading ratios or retirement provisions to alter the balance of credits on either side of a sale. A 2:1 trading ratio, for example, requires a credit buyer to purchase two pounds worth of credits for every pound that he or she intends to discharge. Trading ratios and credit retirement provisions are used to achieve a range of policy goals including water quality improvement, the creation of an insurance or reserve pool of credits, and adjustment for pollution attenuation between an upstream location and a downstream location.[1]

One of the most important policy goals served by trading ratios is accounting for the uncertainty inherent in a trade—specifically, in the case of nutrient trading, the uncertainty in the generation of nonpoint nutrient load reductions, often through the implementation of agricultural Best Management Practices (BMPs). This uncertainty is typically addressed with an explicit "uncertainty ratio." Uncertainty ratios provide a margin of safety against model efficiency overestimates and help to account for variations in the performance of credited practices, especially important for trades or offsets involving nonpoint sources such as agricultural BMPs. In the context of the Bay TMDL, uncertainty ratios are important means of reaching reasonable assurance.

As explained below, research indicates that regulators routinely overestimate BMP efficiencies; the present degree of uncertainty supports an uncertainty ratio of at least 2:1. This is in line with the uncertainty ratios applied in other nonpoint-point nutrient trading programs, which are almost universally 2:1 or higher. Finally, uncertainty ratios serve a critical goal and should not be conflated with other trading adjustments.

1. Regulators routinely overestimate BMP efficiencies.

Unlike discharges through monitored point source outfalls, the nutrient load reductions from agricultural BMPs are very difficult to measure. Instead, BMPs are assigned estimated pollution reduction values, or "efficiencies." A fundamental element of uncertainty enters the trading equation with the assignment of BMP efficiencies. The National Research Council (NRC) observed that

> BMP efficiencies are often derived from limited research or small-scale, intensive, field-monitoring studies in which they may perform better than they would in aggregate in larger applications . . . Thus, estimates of load reduction efficiencies are subject to a high degree of uncertainty.[2]

Note that the NRC authors are suggesting that the uncertainty is largely in one direction—BMP efficiencies are likely to overestimate actual nutrient removals. Indeed, the authors go on to say that "[p]ast experience . . . has shown that credited BMP efficiencies have more commonly been decreased rather than increased in the light of new field information."[3] A study of BMP

---

[1] *See, e.g.*, Cynthia Morgan and Ann Wolverton, Water Quality Trading in the United States, Working Paper # 05-07 for the National Center for Environmental Economics, U.S. EPA, at 15 – 16 (June, 2005); World Resources Institute (WRI), Water Quality Trading Programs: An International Overview, at 9 – 11 (March 2009).

[2] National Research Council (NRC), Achieving Nutrient and Sediment Reduction Goals in the Chesapeake Bay 73 (2011).

[3] *Id.* at 76.

implementation at a small farm in Michigan presents one example.[4] Researchers estimated phosphorus removal efficiencies before, and measured after, the implementation of BMPs including animal exclusion from a stream area, the planting of grass filter strips, and manure management. The projected BMP efficiency, 87% phosphorus removal, overestimated the actual efficiency of 23.4% by a factor of more than 3:1.

In addition to problems with forecasting the efficiencies of well-implemented BMPs, there is the additional possibility that BMPs may not be fully implemented and maintained by the farmers selling the nutrient credits. In addition, severe weather events (which cannot be adequately reflected in the Bay Model efficiencies) can dramatically reduce actual BMP effectiveness. And if BMPs fail to reduce nutrient loads, the failure is unlikely to be noticed—state agencies will not be able to monitor water quality in every stream, and will not be able to verify BMP implementation at more than a small subset of farms. As the NRC noted, "[f]ield monitoring of BMPs on a comprehensive basis is neither practical nor affordable."[5] On a related point, this calls for strict guidelines regarding verification of any trade or offset involving nonpoint sources and a permitted activity.

Research to date suggests that an uncertainty ratio of at least 2:1 is needed to account for the high degree of uncertainty associated with nonpoint BMPs.

2. Trading ratios less than 2:1 are outside the norm.

Uncertainty ratios of 2:1 are the standard, with lower ratios falling well outside the norm. In general, reviews of pollutant trading and uncertainty ratios have confirmed that uncertainty ratios are usually 2:1. A 2005 EPA review, for example, stated that:

> Trading ratios often are used as a mechanism to manage uncertainty associated with the effectiveness of non-point source controls. All programs use trading ratios, but these ratios vary considerably from program to program. . . [T]he most common trading ratio for programs that are trading nutrients between point and non-point sources is 2 to 1.[6]

[4] Kieser & Associates, Post-BMP Implementation Monitoring Results for the Cooper Township Agricultural Site #2 Area A, Project 97-IRM-5C (Dec. 31, 2001).
[5] NRC, *supra* note 2, at 73.
[6] Morgan and Wolverton, *supra* note 1, at 15; *see also* Organization for Economic Co-operation and Development, Water Quality Trading in Agriculture 36 (2012) (citing Morgan and Wolverton as evidence that "ratios of 2:1 or higher are common in U.S. programs.").

Trading programs have been reviewed many times, and this conclusion about uncertainty ratios is consistent.[7]

Several reviews of trading ratios have blurred the distinction between ratios used to address uncertainty and ratios used for other purposes (e.g., net reduction in load), and have also considered various ratios used in point-to-point, nonpoint-to-point, or cross-pollutant trading. We have read several reviews and looked into individual trading programs in order to make a rough inventory of specifically uncertainty ratios used in nonpoint-to-point trading of nutrients. This is attached as Table 1 below. As that table shows, uncertainty ratios are almost uniformly 2:1.

3. The Bay states must not conflate uncertainty ratios with water quality improvement policies.

Uncertainty ratios are intended to prevent nutrient loads from increasing. They do this by creating a margin of safety in case any nutrient reduction practices fail to live up to expectations. The expected outcome in a typical trading situation is that some BMPs will fall short—if there is no accounting for uncertainty, this will result in a net increase in nutrient loads and could jeopardize the permitted activity which retains liability for the reductions. If, on the other hand, there is a built-in uncertainty ratio, the net change to nutrient loads should be closer to zero. Accounting for uncertainty is a fundamentally different policy goal than attempting to guarantee water quality improvements, yet many trading policies conflate the two.

Consider Maryland's proposed growth offset trading policy: A "key principle" of Maryland's trading and offsets policy is that "[t]rades must result in a net decrease in loads."[8] Maryland's chosen mechanism for achieving this goal has been a requirement that each trade include the retirement of 5% or 10% of the purchased credits (for point and nonpoint credits, respectively).[9] It is important to note, as EPA observed earlier this year, that "the reserve is not insurance for failed offsets"[10] It is therefore very troubling to see Maryland describing the credit retirement provisions as a "margin of safety" in their latest growth offset policy statements.[11] It should be clear that retiring 10% of nonpoint credits, which is quantitatively the same as applying a trading

---

[7] *See, e.g.*, WRI, *supra* note 1, at 10 ("Uncertainty ratios are often set at 2:1"); M.O. Ribaudo and J. Gottlieb, Point-Nonpoint Trading—Can it Work?, 47 J Am. Water Resources Assn. 5, 9 (Feb. 2011) ("Uncertainty ratios in water quality trading programs generally range from 2:1 to 5:1.").

[8] *See, e.g.*, Maryland Policy for Nutrient Cap Management and Trading in Maryland's Chesapeake Bay Watershed Phase II-A: Guidelines for the Generation of Agricultural Nonpoint Nutrient Credits, 7 (Apr. 2008).

[9] *Id.*; U.S. EPA, Maryland's Trading and Offset Programs Review Observations, Final Report 8 (Feb. 17, 2012) ("Maryland uses a 5% retirement ratio for point source trades and a 10% retirement ratio for nonpoint source trades to provide a water quality benefit.") (emphasis added).

[10] U.S. EPA, *supra* note 9, at 12 (emphasis added).

[11] Maryland Departments of Agriculture and the Environment, Accounting for Growth: Discussion Draft, at 3 (July 17, 2012).

ratio of 1.1:1, cannot accomplish both goals now being attributed to the credit retirement provision. This leaves almost no margin of safety in practice (consider, as noted above, that most uncertainty ratios are 2:1), and can easily erase any desired improvements in water quality. Specifically, if BMP efficiency estimates are off by more than 10%, which, as discussed above, is very likely, then there will be a net increase in nutrient loads.

In Maryland and elsewhere, trading policies must include a distinct trading ratio to account for uncertainty. If a state chooses to pursue a policy of improving water quality through trading, then it should implement a separate trading ratio or retirement provision for that purpose. At the very least, states must quantitatively parse trading ratios to account for distinct policy goals in a transparent way and prevent double-counting of the benefits of a specific ratio. The Southern Minnesota Beet Sugar Cooperative Trading Program, for example, which involved point-nonpoint phosphorus trades, applied a trading ratio of 2.6:1, apportioning the 2.6 side of the ratio into an offset (1), uncertainty (0.6), and environmental improvement (1).[12]

In conclusion, we are concerned that nutrient trading schemes that fail to account for the uncertainty in nonpoint nutrient load reductions with an uncertainty ratio of at least 2:1 will not have an adequate margin of safety, will not reach TMDL or reasonable assurance goals, and could jeopardize a permitted facility or activity's legal obligation to meet load reductions. Without an adequate margin of safety, nutrient trading will likely cause a net increase in nutrient loads to the Chesapeake Bay, counteracting the significant progress that is being made by the Bay states on other fronts. We hope that you will be able to take our concerns into account as you prepare the Technical Memorandum, and we are of course available to talk more about this issue at your convenience.

Sincerely,

Abel Russ
Attorney
Environmental Integrity Project
One Thomas Circle, Suite 900
Washington, DC 20005
aruss@environmentalintegrity.org
(202) 263-4453

[12] Environomics, A Summary of U.S. Effluent Trading and Offsets Projects, prepared for Dr. Mahesh Podar, U.S. EPA, at 23 (Nov. 1999).

Table 1: Uncertainty ratios used in point-nonpoint nutrient trading programs.

Trading Program	Pollutant	Trading ratio	Basis for ratio	Reference
Colorado; Bear Creek Total Phosphorus Trade Program	Phosphorus	2:1	Unknown	Bear Creek Watershed Association[13]
Colorado; Chatfield Reservoir	Phosphorus	2:1[14]	Uncertainty (implied by basis for possible exemption[14])	Chatfield Water Authority[15]
Colorado; Cherry Creek Basin Trading Program	Phosphorus	2:1 to 3:1	Uncertainty	U.S. EPA [16]
Colorado; Lake Dillon	Phosphorus	2:1	Unknown	U.S. EPA[17]
Delaware; Pinnacle (Vlassic Foods)	Nutrients	2:1	Margin of safety and location	UVA[18]
Delaware; Inland Bays	Nutrients	2:1	Unknown	UVA[19]
Florida; Lower St. Johns River	Nutrients	2:1 and 3:1, depending on source of credits	Uncertainty	Florida DEP[20]

[13] Bear Creek Watershed Association, Total Phosphorus Trade Program and Nonpoint Source Trading Guidelines, available at http://www.cdphe.state.co.us/op/wqcc/Reports/WatershedAR/BCtrading.pdf (Feb. 8, 2006).

[14] "[T]he Trade Ratio will be 2:1 for all Trade Projects unless the applicant requests an exemption of the 2:1 trade ratio based on adequate water quality data collected on a project-specific basis." Chatfield Water Authority, Water Quality Trading Guidelines 10, available at http://www.chatfieldwatershedauthority.org/docs/Chatfield%20%20Trading%20Guidelines%20Final%20April%2025,%202007.pdf. (Apr. 25, 2007).

[15] *Id.*

[16] Morgan and Wolverton, *supra* note 1, at 17.

[17] *Id.*

[18] Jennifer Vogel, A Survey of Trading Ratios Used for Generation of Credits in Water Quality Trading Programs, 6 (UVA Environmental Law Clinic, July 20, 2012).

[19] *Id.* at 6.

[20] Florida DEP, The Pilot Water Quality Credit Trading Program for the Lower St. Johns River: A Report to the Governor and Legislature, at 12–13 (Oct. 2010), available at http://www.dep.state.fl.us/water/wqssp/docs/WaterQualityCreditReport-101410.pdf.

Trading Program	Pollutant	Trading ratio	Basis for ratio	Reference
Massachusetts; Wayland Business Center Treatment Plant Permit	Phosphorus	3:1	Unknown	Environomics[21]
Michigan; Kalamazoo River Water Quality Trading Demonstration Project	Phosphorus	2:1 or 4:1, depending on the nature of baseline practices	Uncertainty	Environomics[22]; U.S. EPA [23]
Michigan; Water Quality Trading	Nutrients and other pollutants	2:1[24]	Uncertainty and environmental benefit	Michigan Administrative Code[24] above
Minnesota; Southern Minnesota Beet Sugar Cooperative Trading Program	Phosphorus	1.6:1[25]	Uncertainty	Environomics and EcoAgriculture Partners[25]
Minnesota; Draft Statewide Water Quality Trading Rules	Phosphorus	2.5:1	Uncertainty, risk, and location	UVA[26]
Montana; state policy for nutrient trading	Nutrients	"greater than 1:1"	Uncertainty	Montana DEQ[27]
New York; New York City Watershed Phosphorus Offset Pilot Program	Phosphorus	3:1	Unknown	Environomics; U.S. EPA [28]

[21] Environomics, *supra* note 12, at 17.
[22] Environomics, *supra* note 12, at 19.
[23] Morgan and Wolverton, *supra* note 1, at 17.
[24] Michigan regulations require retirement of 50% of nonpoint source credits "to address uncertainty and to provide a net water quality benefit." This would be, in ratio terms, a 2:1 ratio. Mich. Admin. Code r. 323.3016.
[25] The trading ratio is divided into three components: 1.0 to provide an offset, 1.0 to provide an environmental benefit, and 0.6 to account for uncertainty. Environomics, *supra* note 12, at 23; *see also* EcoAgriculture Partners, The Watson Partners and the Southern Minnesota Sugar Beet Cooperative, 18 (May, 2011) (confirming that "the required number of phosphorus reduction trading credits remains 2.6 times the annual phosphorus mass discharge limit for the WWTF.").
[26] Vogel, *supra* note 18, at 10.
[27] Montana DEQ, Montana's Policy for Nutrient Trading (draft, Aug. 2, 2010), available at http://deq.mt.gov/wqinfo/nutrientworkgroup/nutrienttradingpolicy.mcpx.

Trading Program	Pollutant	Trading ratio	Basis for ratio	Reference
New York; Croton Watershed	Phosphorus	2:1 to 3:1	Unknown	UVA[29]
North Carolina; Neuse River Nutrient Sensitive Water Management Strategy	Nutrients	2:1 (implied by payment price)[30]	Unknown	Environomics[30]; U.S. EPA [31]
North Carolina; Tar-Pamlico Nutrient Reduction Trading Program	Nutrients	2:1 or 3:1, depending on source of credits	Uncertainty	UVA[32]
Ohio; sugar Creek Watershed—Alpine Cheese Co.	Phosphorus	3:1	Uncertainty and Margin of Safety	UVA[33]
Ontario South Nation River Total Phosphorus Management Program	Phosphorus	4:1	Uncertainty	OECD[34]
Virginia trading policy	Nutrients	2:1	Uncertainty	U.S. EPA[35]
Wisconsin; Red Cedar River Pilot Trading Program	Phosphorus	2:1	Unknown	Environomics[36]

[28] Environomics, *supra* note 12 at 29; Morgan and Wolverton, *supra* note 1, at 17.
[29] Vogel, *supra* note 18, at 12.
[30] *See* Environomics, *supra* note 12, at 25.
[31] Morgan and Wolverton, *supra* note 1, at 17.
[32] Vogel, *supra* note 18, at 12.
[33] *Id*. at 14.
[34] Organization for Economic Co-operation and Development, Water Quality Trading in Agriculture 23 (2012)
[35] U.S. EPA, Virginia's Trading and Offset Programs Review Observations, Final Report (Feb. 17, 2012).
[36] Environomics, *supra* note 12, at 36.