



SUMMARY OF INTERVIEWS WITH SELECTED  
TRADING PROGRAMS AND INDIVIDUALS



Prepared for NEIW PCC by rbouvier consulting

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# 1. Introduction

This report summarizes several interviews conducted by rbouvier consulting between December of 2020 and March of 2021. Interviews were conducted with managers of five programs, a noted agricultural economist, a senior analyst at the USDA, and two managers of the EPA Chesapeake Bay Program Office.

## 2. Methodology

As the purpose of this task was to interview managers of successful programs, an initial survey was taken of the active water quality trading programs in coastal areas. Pilot programs were not included. Programs were then screened for signs of current trading activity (through active websites and availability of other information). Characteristics of nine trading programs were summarized in an Excel spreadsheet. Five programs were selected for interviews. From January to March 2020, interviews were conducted over Zoom. Details of each of the programs follow the section on lessons learned.

## 3. Lessons Learned

### 3.1 Definition of “success”

We originally set out to interview managers of successful trading programs. However, the definition of “successful” is rather different from what we expected going into the interviews. Although we selected five programs based on the appearance of an active trading program, none of the programs could truly be called robust. In fact, in interviews with five program managers, none of the trading programs could be called “robust.” Although mechanisms exist by which point-nonpoint trades could take place, very few point-nonpoint trades have actually occurred in the programs considered, with the exception of Virginia. In that case, developers have purchased credits generated by permanently retiring land from agriculture. However, as this is a permanent,

rather than on-going, nutrient reduction activity, it is not a “trade” in the conventional sense of the word.

In fact, one of the lessons learned throughout the process was that the terms “credit,” “trade,” and “offset” were used interchangeably, and sometimes meant different things in different states. In Pennsylvania, for example, credits were generated and certified for certain best management practices at farms and poultry litter facilities, but the generation of credits could not be called “trades” as they were never “purchased” on the market. In fact, about half of the credits generated were never actually traded in Pennsylvania in 2020, leading to a surplus of credits.<sup>1</sup> Moreover, several program managers mentioned that, in municipalities that had an MS4 program and a WWTP, it was not uncommon to see a “trade” occur “from one side of DPW to the other,” which, they felt, was not in the spirit of the trading program.

If we measure success by the number of trades that occurred from non-point sources to point sources, none of the programs could be considered successful. Likewise, if we define success as bringing in private money to incentivize conservation, or to give agricultural producers an (additional) incentive to engage in best management practices, very few of the programs here could be considered successful. In fact, Mindy Selman, who was a Senior Associate at the World Resources Institute until 2014 and is now Senior Analyst in the Office of Environmental Market at USDA, told us that people were initially excited about the idea of trading because they thought it would get private money involved and bring farmers in. Unfortunately, she says, it hasn't happened that way, and NRCS (Natural Resources Conservation Services) has quietly stopped funding trading programs (Mindy Selman, personal communication, December 12, 2020). Josh Duke, an agricultural economist at Auburn University, concurs, saying that, “The reason the planners love it and the policy makers love it is because it’s free,” but that trading is not

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<sup>1</sup> This is one of the points made in the 2017 discussion paper, “Considerations for Interstate Trading and Offsets in the Chesapeake Bay Watershed” (which will be discussed in more detail in an upcoming report). The discussion paper pointed out that “public uncertainty over basic definitions, no matter how seemingly subtle the uncertainty may be, could lead to material misunderstanding of the actual policy or applicability...” (U.S. EPA Region 3 Water Protection Division, 2017).

ecologically viable for a variety of reasons, including credit stacking, high monitoring costs, and incentives to “game the system” (J. M. Duke, personal communication, December 4, 2020).

We could also define success as improving water quality. However, even that goal met with skepticism from our interviewees. Water quality has improved in many of the states that have water quality trading programs. But that does not imply that the trading program itself contributed to the improvement. Rather, the decline in nutrient loads in most cases has been attributable to the fact that the WWTPs installed pollution control technology in lieu of trading.<sup>2</sup> Jim Hawhee, Natural Resources Policy Analyst at the North Carolina Department of Environmental Quality, says that a combination of over-valued credits, low to minimal uncertainty ratios and transport factors that are vast underestimates of how much pollution is actually getting to the Bay mean that trading is unlikely to improve water quality. He maintains that the program was set up to provide a cost-effective means to meet regulatory requirements, but not to improve water quality.

However, there is one area in which trading has the potential to be successful: giving municipalities and states a “relief valve” for growth in the future. As municipalities grow and development expands, so too will the pressure exerted by the cap on wasteload. Trading, even if not robust now, may become so in the future as municipalities see increased development and WWTPs reach the point where further nutrient reduction is prohibitively expensive. On the other hand, it is also quite likely that wastewater treatment technology will continue to improve, continuing to be a damper on demand.

### 3.2 Demand matters

Demand for credits essentially arises from two sources: a regulatory cap and a gap between what is necessary to achieve compliance and what can be achieved without trade. Over and over, the individuals we interviewed pointed to the same thing: the lack of demand. In Florida, for

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<sup>2</sup> North Carolina has a very successful agricultural program, where each watershed basin has to reduce its nutrient loading compared to the 1991-1995 baseline. But that is not a trading program (Neuse Basin Oversight Committee, 2018).

example, wastewater treatment facilities are more likely to install pollution control technology than to engage in a “risky” trade, according to Kevin Coyne, Program Administrator at the Florida Department of Environmental Protection (K. Coyne, personal communication, January 12, 2021). In Maryland, there was a funding stream dedicated to improving pollution control at WWTPs, which effectively “swept the legs out from under” the market. In fact, discharges have become so low that WWTPs have become a source of supply, rather than of demand (N. Christ & G. Sandi, personal communication, December 9, 2020). That is also the case in Virginia, where a combination of tight regulations on sediment generation and a dedicated fund for WWTF upgrades lead to decreased demand for credits (Stephenson & Shabman, 2017). However, they have seen an uptick in demand for credits from developers (M. Davenport, personal communication, January 21, 2021).

The following sections summarize the characteristics of the trading programs that were profiled.

## 4. Individual Program Summaries

### 4.1 Florida

Florida Nutrient Trading Program – Selected Characteristics and Observations
<p><b>Status:</b></p> <ul style="list-style-type: none"> <li>Nutrient trading occurs through Florida’s Basin Management Action Plan (BMAPs). Florida has nearly 30 active Basin Management Action Plans and several that are proposed. They have seen limited point – nonpoint source trading in some of their counties, but it has been a while since that has happened. Most if not all of the trading has been point to point (K. Coyne, personal communication, January 12, 2021).</li> </ul>
<p><b>Description of market:</b></p> <ul style="list-style-type: none"> <li>Point or non-point sources can generate credits if they meet their baseline (see below). Once the Florida Department of Environmental Protection verifies the credits, they are posted on their website. Transactions take place between the parties – Florida DEP is not involved other than to verify the transactions.</li> </ul>
<p><b>Baseline:</b></p> <ul style="list-style-type: none"> <li>The baseline for a point source is the entity’s annual wasteload allocation under the BMAP or RAP, or a water quality-based effluent limitation established in a permit, whichever is more stringent.</li> <li>The baseline for a non-agricultural nonpoint source is the entity’s individual annual load allocation or the applicable categorical load allocation under the BMAP or RAP.</li> <li>The baseline for an agricultural nonpoint source is the entity’s annual load allocation or applicable categorical load allocation, if specified in the BMAP or RAP, or the nutrient load expected following the entity’s implementation of applicable Department of Agriculture and Consumer Services (DACS) adopted BMPs (Water Quality Credit Trade Tracking, n.d.).</li> </ul>
<p><b>Geographic limitations:</b></p> <ul style="list-style-type: none"> <li>Trades must take place within the same basin.</li> </ul>
<p><b>Intermediaries such as clearinghouses, etc.:</b></p> <p>None.</p>
<p><b>Trading and attenuation ratios:</b></p> <ul style="list-style-type: none"> <li>2:1 for urban stormwater, and 3:1 for agricultural runoff, unless the Department determines otherwise (Water Quality Credit Trade Tracking, n.d.)</li> </ul>
<p><b>Overall impression of program and additional notes:</b></p> <ul style="list-style-type: none"> <li>Demand is the limiting factor.</li> <li>WWTFs are meeting their obligations – the technology and treatment levels are getting better. As the technology improves, the demand declines.</li> </ul>
<p><b>Further information</b></p> <ul style="list-style-type: none"> <li>Kevin Coyne, Program Administrator, Basin Management Action Plan Program, Tallahassee, FL</li> <li><a href="https://floridadep.gov/dear/water-quality-restoration/content/basin-management-action-plans-bmaps">https://floridadep.gov/dear/water-quality-restoration/content/basin-management-action-plans-bmaps</a></li> </ul>

## 4.2 Maryland

Maryland Nutrient Trading Program – Selected Characteristics and Observations
<b>Status:</b>
<ul style="list-style-type: none"><li>• The trading program launched in 2018 after having discussed it for over a decade.</li><li>• There were about three or four trades in 2020 and about 5 trades in 2019.</li><li>• Demand is not really materializing. In the past 10 years, they've had a funding stream dedicated to updating the WWTFs "to the tune of \$50 million a year," which swept the legs out from under the market.</li><li>• They have not had any agricultural trades as of yet.</li></ul>
<b>Description of market:</b>
<ul style="list-style-type: none"><li>• Credits generated by wastewater, stormwater, and aquaculture are posted on the State marketplace after they are certified. Credits generated by agricultural sources are certified by the Maryland Department of Agriculture.</li></ul>
<b>Baseline:</b>
<ul style="list-style-type: none"><li>• The baseline is calculated using the Chesapeake Bay Nutrient Trading Tool ("which is miserable – no farmer's going to want to do that" – from the interview)</li><li>• The baseline for a stormwater point source is the "restoration requirement of the stormwater points source's current NPDES permit" (<a href="https://mde.maryland.gov/programs/Water/WQT/Documents/WQT_regulations.pdf">https://mde.maryland.gov/programs/Water/WQT/Documents/WQT_regulations.pdf</a>)</li></ul>
<b>Geographic limitations:</b>
<ul style="list-style-type: none"><li>• Trade cannot occur between impaired and non-impaired basins. Credits used within any impaired waters must be generated within such impaired waters or upstream of the credit user's discharge.</li></ul>
<b>Intermediaries such as clearinghouses, etc.:</b>
<ul style="list-style-type: none"><li>• The state is not involved in the trades.</li><li>• They feel that an aggregator would be necessary to get more involvement from agriculture.</li></ul>
<b>Trading and attenuation ratios:</b>
<ul style="list-style-type: none"><li>• All credits require Edge of Tide adjustments</li><li>• An uncertainty ratio of 2:1 shall be applied to trades involving credits generated by nonpoint sources and acquired by wastewater point sources, unless the generator, seller, or buyer of the credit is able to demonstrate to the Department that a lower ratio is justified and protective of water quality standards.</li></ul>
<b>Other characteristics:</b>
<ul style="list-style-type: none"><li>• Maryland has a reserve ratio of 5%; the agricultural reserve ratio is 10%</li><li>• "The Agricultural Trading Program is not intended to accelerate the loss of productive farmland. Therefore, credits will not be generated under this policy for the purchase and idling of whole or substantial portions of farms to provide nutrient credits."</li></ul>



<https://extension.umd.edu/sites/extension.umd.edu/files/images/programs/anmp/Nut%20Trading.pdf>

**Overall impression of program and additional notes:**

- Trying to integrate agriculture and aquaculture.
- Quote of note from the interview: “A well-designed market is designed to kill itself.”
- Same comment that I’ve heard from other programs that involve stormwater: if MS4 communities also own WWTFs, then you see a transfer of permits “from one side of DPW to the other.”

**For further information:**

- Nicole Christ and Greg Sandi, Maryland Department of the Environment, Baltimore, MD
- [https://mda.maryland.gov/resource\\_conservation/Pages/nutrient\\_management.aspx](https://mda.maryland.gov/resource_conservation/Pages/nutrient_management.aspx)

### 4.3 North Carolina

#### North Carolina Nutrient Trading Program – Selected Characteristics and Observations

##### **Status:**

- To date, most of the trades that have taken place have been either point to point or nonpoint to nonpoint (stormwater, for example), but not from nonpoint to point (Jim Hawhee, personal communication, December 11, 2020). Within the stormwater program, the predominant nutrient reduction practice is the restoration and enhancement of riparian forested buffers on agricultural lands (North Carolina Department of Environmental Quality, n.d.).

##### **Description of market:**

- There are two types of transactions that take place between point to point sources: formal allocation trades, with new allocation limits reflected in the facilities’ permits; and more informal “leases” that occur through a watershed-specific compliance association (North Carolina Division of Water Resources, Nonpoint Source Planning Branch, 2017). The most recent formal allocation trade took place in 2012.

- In 2017, North Carolina proposed a new nutrient exchange credit, which is a new time-limited credit type. “These credits would be most appropriate for nutrient reduction projects where significant maintenance obligations are required to sustain the project’s nutrient reductions” (North Carolina Division of Water Resources, Nonpoint Source Planning Branch, 2017).

- New development regulations authorize the purchase of off-site nutrient offset credits after meeting certain criteria (North Carolina Division of Water Resources, Nonpoint Source Planning Branch, 2017).

##### **Baseline:**

- In three of the four watersheds, new and expanding WWTFs must first “evaluate all practical alternatives to a surface water discharge and make reasonable efforts to obtain allocation from existing dischargers before seeking nutrient offset credits generated from nonpoint sources” (North Carolina Division of Water Resources, Nonpoint Source Planning Branch, 2017). There does not seem to be a baseline that point sources must meet before “trading” within their bubble.

- For agricultural sources, the baseline varies by watershed. In the Neuse and Tar-Pamlico basins, agricultural producers may generate credits if they meet the requirements of the offset rule. In the Jordan watershed, producers may generate credits only if their sub-watershed meets their nitrogen reduction goal. In both the Falls and the Jordan watershed, the Watershed Oversight Committee must perform several duties before trading is allowed (including “quantification of nitrogen and phosphorus credits for nutrient reduction practices, establishment of a process for trading credits to other regulated parties, and approval of trades” (North Carolina Division of Water Resources, Nonpoint Source Planning Branch, 2017) and those discussions have not taken place as of 2017.

##### **Geographic limitations:**

- Trading must take place within one of their four watersheds (North Carolina Department of Environmental Quality, n.d.).

**Intermediaries such as clearinghouses, etc.:**

- North Carolina does allow nutrient banks. They need to meet certain fiscal requirements.
- Wastewater treatment facilities may form watershed specific compliance organizations. (North Carolina Division of Water Resources, Nonpoint Source Planning Branch, 2017).

**Trading ratio:**

- “For offset credits used to meet NPDES wastewater discharge requirements, the applicant shall provide 50 percent additional credits to address the uncertainty factor for using unmonitored nonpoint source reductions to meet point source discharge limits” (Nutrient Offset Credit Trading, 2020). There are exceptions for certain watersheds, where the point to nonpoint trading ratio is proposed to be 1.1:1 for unmonitored transactions, and 1:1 for monitored transactions.
- For buffer mitigation, the mitigation ratio is based on zones, ranging from a 3:1 ratio to a 1.5:1 ratio (Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers, n.d.).

**Other characteristics:**

- North Carolina approves the following practices for nutrient reduction crediting: “agricultural buffer restoration, cattle exclusion, discharging sand filters, reducing illicit discharges to surface waters or stormwater systems, soil improvements, storm drain cleaning, and street sweeping” (North Carolina Department of Environmental Quality, n.d.). However, as noted, the primary method for nutrient reduction has been buffer restoration.
- In most cases, no credit will be given to processes that were already implemented to “satisfy other requirements from the same nutrient strategy, other local, State or federal requirements; or those resulting from State or federal compensatory mitigation requirements” (Nutrient Offset Credit Trading, 2020).
- North Carolina has agricultural nutrient rules, whereby the entire sector seeks to reduce its baseline nutrient loading estimates by a given percentage. For example, all agricultural operations within the Neuse estuary are collectively subject to a 30 percent reduction rule for nutrient loading from a 1991-1995 baseline. The strategy seems to be effective – farmers in the Neuse basin have consistently exceeded its 30 percent reduction goal since 2001. The Neuse Basin Oversight Committee noted that “the main reason for the greater nitrogen reduction in these counties is cropping shifts to crops with lower nitrogen demands and application rates” (Neuse Basin Oversight Committee, 2018). Other factors they noted as contributing to reduced nitrogen application rates include: economic decisions, increased education and outreach on nutrient management, mandatory animal waste management plans, and the federal government tobacco buyout (Neuse Basin Oversight Committee, 2018).
- New developers (rules vary depending on the watershed) may seek nutrient offset credits if they are unable or unwilling to meet the onsite nutrient loading targets. If credits are available

from private providers, negotiation takes place between those providers; if no credits are available, the developers may seek to pay an in-lieu fee to the Department of Mitigation Services.

- Allocation trades “will be reviewed by DWR staff to ensure they do not create an undue risk for localized water quality impacts in the affected streams or downstream waters. Impoundments between a point source discharge location and a water body with a nutrient-related impairment, TMDL or TMDL alternatives may be particularly susceptible to the formation of nutrient hotspots” (North Carolina Division of Water Resources, Nonpoint Source Planning Branch, 2017).

**Overall impression of program and additional notes:**

- According to a draft discussion document, “These active markets provide important flexibility and economically efficient compliance options for regulated parties. Yet while new opportunities for trading have been authorized in successive strategies, trades have not always materialized. Rule implementation delays in the Falls and Jordan strategies are a significant factor because the demand for credits has not yet materialized. Another major consideration is the relative cost of these options in relation to alternate compliance options” (North Carolina Division of Water Resources, Nonpoint Source Planning Branch, 2017).

- In an interview with Jim Hawhee, he expressed the opinion that credits for riparian buffer enhancement have been overvalued by a factor of four, but that right now the program is so entrenched that it will be impossible to get rid of it. A whole industry has sprung up around it, according to Mr. Hawhee (Jim Hawhee, personal communication, December 11, 2020).

- A combination of over-valued credits, low to minimal uncertainty ratios and transport factors that are vast underestimates of how much pollution is actually getting to the Bay mean that trading is unlikely to improve water quality. The program was set up to provide a cost-effective means to meet regulatory requirements, but not to improve water quality (Jim Hawhee, personal communication, December 11, 2020).

**For further information:**

- Jim Hawhee, Division of Water Resources, Department of Environmental Quality, North Carolina
- <https://deq.nc.gov/about/divisions/water-resources/planning/nonpoint-source-management/nutrient-offset-information>

## 4.4 Virginia

### Virginia Nutrient Trading Program – Selected Characteristics and Observations

#### Status:

- In 2005, the Virginia General Assembly adopted the Chesapeake Bay Watershed Nutrient Credit Exchange Program. This program established a system to limit and reduce the total amount of nitrogen and phosphorus that can be discharged into the Chesapeake Bay by industrial and municipal wastewater treatment control facilities. Theoretically, Virginia landowners can generate credits by permanently converting cropland to forest, hay, pasture, or open land. However, as of the writing of this report, there have been no point to nonpoint source trades for a variety of reasons. Since the program’s inception, point sources have consistently reduced nutrient discharge well below their allowable limit, generating surplus credits every year.

#### Description of market:

- Virginia has several environmental trading programs: a wetland and stream permit program, where developers could offset any disturbances to wetlands; a stormwater management program, where a developer may buy permanent phosphorus credits; the Chesapeake Bay Point Source Nutrient Trading Program; and an MS4 trading program, where municipal governments in the Chesapeake Bay Watershed can buy nitrogen or phosphorus credits.

#### Stormwater program:

- In 2014, Virginia implemented requirements whereby urban land developers must implement a site-specific stormwater management plan. Developed under a Virginia Stormwater Management permit, the plan details actions that the developer must take to reduce the amount of runoff from the site after construction. Dischargers can meet up to 25% of their water quality requirements through purchasing phosphorus credits from third-party credit providers. These phosphorus credit providers must provide long term (i.e., permanent, not annual) reductions in phosphorus load.

- Virginia allows MS4s to purchase nutrient credits from a variety of sources, including point sources and nonpoint sources. Virginia defines nonpoint source credits broadly; they can include certifying credits from nutrient reductions from “agricultural and urban stormwater best management practices, use or management of manures, managed turf, land use conversion, stream or wetlands projects, shellfish aquaculture, algal harvesting, and other established or innovative methods of nutrient control or removal, as appropriate.”

- If a development disturbs five acres or more, the developer must achieve at least 75 percent of the required amount of phosphorus control on site, as opposed to through offsets. If a development disturbs fewer than five acres, all phosphorus loads can be offset off-site. As many communities are both operating under an MS4 permit and have a wastewater treatment facility, many “trades” occur within their own “bubble.”

#### Agricultural baseline:

<ul style="list-style-type: none"> <li>• Agricultural producers must meet baseline in order to generate credits. You are assumed to meet baseline if you have implemented ALL of the following: Soil Conservation, Nutrient Management, Cover Cropping, Livestock Stream Exclusion, Riparian buffer Installation.</li> </ul>
<ul style="list-style-type: none"> <li>• Does not apply to land conversions.</li> </ul>
<p><b>Geographic and other limitations:</b></p>
<ul style="list-style-type: none"> <li>• Same calendar year</li> </ul>
<ul style="list-style-type: none"> <li>• Same tributary</li> </ul>
<p><b>Intermediaries such as clearinghouses, etc.:</b></p>
<ul style="list-style-type: none"> <li>• The law requires that point sources acquire offsets through a public, or private entity acting on behalf of a landowner.</li> </ul>
<ul style="list-style-type: none"> <li>• The Virginia Nutrient Credit Exchange Association is a voluntary association of 73 owners of 105 treatment facilities cleaning wastewater in the Chesapeake Bay watershed. The Nutrient Exchange was established in 2005 to coordinate and facilitate nutrient credit trading among its members.</li> </ul>
<p><b>Trading ratio:</b></p>
<ul style="list-style-type: none"> <li>• 2:1 (non-point to point)</li> </ul>
<p><b>Other characteristics:</b></p>
<ul style="list-style-type: none"> <li>• Agricultural sources also have to consider efficiency rates and attenuation rates, and appropriate offset delivery factors “as established by DEQ.”</li> </ul>
<ul style="list-style-type: none"> <li>• Any BMP enhancement (e.g., early cover crop, continuous no-till) for which agricultural producers received state or federal cost-share payments is not eligible to generate offsets.</li> </ul>
<p><b>Overall impression of program and additional notes:</b></p>
<ul style="list-style-type: none"> <li>• The hoops that an agricultural producer would have to jump through in order to generate credits is pretty onerous.</li> </ul>
<ul style="list-style-type: none"> <li>• Virginia has a substantial capital grant subsidy program to help fund nutrient removal technology upgrades at municipal wastewater treatment facilities, reducing the demand for offsets.</li> </ul>
<ul style="list-style-type: none"> <li>• According to economists Kurt Stevenson and Leonard Shabman, “Regulated dischargers face a suite of regulatory obligations, and compliance with some of these obligations reduces the need for incremental nutrient controls” (Stephenson &amp; Shabman, 2017).</li> </ul>
<ul style="list-style-type: none"> <li>• Much of the farmland in the state is rented, so farm operators may not directly benefit from nutrient credit sales.</li> </ul>
<p><b>For further information:</b></p>
<ul style="list-style-type: none"> <li>• Melania Davenport, Water Permitting Division, Virginia Department of Environmental Quality</li> </ul>
<ul style="list-style-type: none"> <li>• <a href="https://www.deq.virginia.gov/">https://www.deq.virginia.gov/</a></li> </ul>

## 4.5 Pennsylvania

<b>Pennsylvania Nutrient Credit Trading Program</b>
<b>Status (as of September 2020):</b>
<ul style="list-style-type: none"><li>• Nutrient reductions equivalent to over 581,000 nitrogen and 48,000 phosphorus credits were generated during the 2020 compliance year, more than 90 percent of them from WWTPs (Pennsylvania Department of Environmental Protection, 2021). The remaining ten percent were generated from agricultural best management practices and export of poultry litter. Notice that credits generated does not mean credits traded (see bullet below).</li><li>• Slightly less than half of the credits generated were actually traded to help 49 WWTPs meet their compliance loads (Pennsylvania Department of Environmental Protection, 2021). It was unclear whether any of the trades that took place included nonpoint sources.</li></ul>
<b>Description of market:</b>
<ul style="list-style-type: none"><li>• Potential seller will generate nutrient reduction and apply to PADEP to verify the reduction. Once verified, PADEP posts the credits on their website, and then it is up to the individual facilities to conduct the trade.</li></ul>
<b>Baseline:</b>
<ul style="list-style-type: none"><li>• Point sources must demonstrate that total nitrogen is below 6mg/L and total phosphorus is below 0.8mg/L (Pennsylvania Department of Environmental Protection, 2016).</li><li>• Nonpoint sources must implement BMPs, convert or destroy manure, or export manure outside of the Bay Watershed.</li><li>• When the program was first implemented, PADEP had a practice baseline, rather than a performance baseline. EPA expressed concern, leading to a higher than usual baseline ratio (3:1). PA is now moving towards using something similar to the Chesapeake Bay Nutrient Trading tool (Pennsylvania Department of Environmental Protection, 2019).</li></ul>
<b>Geographic limitations:</b>
<ul style="list-style-type: none"><li>• Trading may only occur in a PADEP defined watershed (Pennsylvania Department of Environmental Protection, 2016).</li></ul>
<b>Intermediaries such as clearinghouses, etc.:</b>
<ul style="list-style-type: none"><li>• From 2010 to 2018, PENNVEST assisted DEP's WQT program by hosting credit auctions. Currently, all trades must be coordinated between buyers and sellers though DEP maintains a regularly updated website with information on how to both buy and sell credits. (insert citation - website).</li><li>• Trades have decreased to the point that traders realized that they could conduct their transaction more simply (Joint Legislative Air and Water Pollution Control and Conservation Committee, 2018).</li></ul>
<b>Delivery ratio:</b>

- Segments close to the Bay have delivery ratios close to 1, while those further from the Bay have lower values (Pennsylvania Department of Environmental Protection, n.d.). Delivery ratios can be found on their website.

**Trading ratio:**

- 3:1 for now, until they can use the Nutrient Trading Tool (T. Hofstetter, personal communication, January 13, 2021)

**Other characteristics:**

- No credit stacking or banking allowed.
- A 10 percent retirement ratio is required (Joint Legislative Air and Water Pollution Control and Conservation Committee, 2018).

**Overall impression of program and additional notes:**

- Historically, trading was limited. When the trading program was rolled out, it was almost concurrent with a number of treatment facilities being required for the first time to reduce nitrogen, phosphorus and sediment in their permits. A lot of POTWs were very hesitant to trade at the time. Most of the demand went into purchasing and building additional treatment.
- Officials addressed a “cultural disconnect” – that many POTWs don’t feel that they should have to pay for agricultural improvements (Joint Legislative Air and Water Pollution Control and Conservation Committee, 2018).
- Despite limited success, there is a feeling that the program is needed to provide a “relief valve” for future growth, and an optimism that there will be further trades down the road (Joint Legislative Air and Water Pollution Control and Conservation Committee, 2018).
- Some of the PA state legislators reflected skepticism about the “science” behind the Nutrient Trading Tool (Joint Legislative Air and Water Pollution Control and Conservation Committee, 2018).
- There has been some disappointment among poultry farmers specifically who were hoping that they could make money off of selling credits, but that generally has not been the case (T. Hofstetter, personal communication, January 13, 2021).
- They would like to get the MS4s involved, but MS4s don’t have a capload. They are mostly focused on reducing sediment, and there’s an assumption that addressing sediment issues will also reduce nitrogen and phosphorus (T. Hofstetter, personal communication, January 13, 2021).

**For further information:**

- Theia Hofstetter, Bureau of Clean Water, Department of Environmental Protection
- <https://www.dep.pa.gov/Business/Water/CleanWater/NutrientTrading/Pages/default.aspx>



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