CURRENT AND POTENTIAL ROLES FOR GOVERNMENT IN FACILITATING WATER QUALITY MARKETS

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I. INTRODUCTION

Water quality trading (WQT) markets have been operating since the 1980s with now more than 51 programs in the United States.[1] These programs have all evolved differently and respond to different drivers. Consequently, the roles that government agencies play vary by program. The success of water quality trading programs has also varied with limited market activity to date despite sometimes heavy involvement by federal and state government agencies.[2] This paper examines the roles that government currently plays in many water quality trading programs. This paper also examines how government might take on new or expanded roles in these markets to help overcome market barriers and facilitate the scaling up of these programs. In particular, we explore the potential for expanded roles of government in facilitating markets through credit banking and reducing uncertainty through various credit guarantee and agricultural certainty programs.

II. GOVERNMENT'S CURRENT ROLE

Currently, federal and state agencies fill many roles across water quality trading programs which can be categorized as: regulatory and legislative; technical and financial support provision; program administration; market facilitation; and risk mitigation. We explore these roles in depth below.

A. REGULATORY AND LEGISLATIVE

One of the primary roles that government plays in regulatory markets is of the regulator. Regulations are critical for establishing the demand drivers that underpin water quality trading markets. The primary legislative driver is the Clean Water Act (CWA). Water quality trading programs in the United States are generally established as a result of a Total Maximum Daily Load (TMDL) established for a water body under the authority of the CWA. A TMDL creates a pollution budget for the watershed. Pollution reduction targets are allocated among sources, and in the case of point sources, these waste load allocations (WLAs) are written into the National Pollution Discharge Elimination System (NPDES) permits. Water quality trading programs are often established to help point sources meet NPDES pollution reduction targets in a manner that is more cost-effective. TMDLs may also result in state-

level regulatory actions that serve as drivers for water quality trading. For example, in Maryland the TMDL for the Chesapeake Bay has led Maryland Department of Environment to begin crafting a policy that will require all new development to offset their nutrient loads.[3]

Water quality trading programs themselves, as a means of achieving pollution reduction targets more cost-effectively, have gained traction as a result of federal and state policy and regulations. The legal authority for water quality trading programs is established through the CWA under 33 U.S.C. Section 1251 and its implementing regulations.[4] In 2003, EPA issued its policy on water quality trading which was intended to encourage voluntary trading programs and identify conditions and constraints under which trading can occur. At the state level, nine states have added statewide regulatory authority for trading through statute, regulation, policy, or guidance.[5] Many states, like Pennsylvania and Maryland, have sought to take initial regulations and turn them into legislation. Other states, like Virginia, have begun with legislation and then developed the regulations. There are a few water quality trading programs that exist without regulatory authority. These are mainly pilot projects where NGOs or other third parties often lead the development of guidance documents. These programs frequently do not advance beyond the pilot stage unless there is buy-in from the regulatory programs.[6,7]

B. TECHNICAL AND FINANCIAL SUPPORT

Providing technical and financial support has been one of government's largest roles in the establishment and operation of water quality trading markets. Federal and state agencies provide technical and financial assistance namely through grant programs, cost-share programs, water quality trading guidance, and landowner outreach and education efforts. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA) have grant funding available through Section 319 of the CWA, and through programs like the Targeted Watershed Grant Program and Conservation Innovation Grants (CIGs). In 2012, for example, USDA provided $10 million in CIGs to support water quality trading programs, with half of that dedicated to supporting trading in the Chesapeake Bay.[8] For Maryland's trading program, a Natural Resource Conservation Service (NRCS) CIG grant covered most costs associated with program and tool development, stakeholder outreach, and administration.[9] The USDA, U.S. Geological Service (USGS), National Oceanic Atmospheric Administration (NOAA), and the U.S. Forest Service also provide decision support tools that can be used in water quality trading programs. One notable tool whose development has been supported by USDA for purposes of water quality trading is the Nutrient Tracking Tool (NTT). NTT is a farm-scale model that can estimate nutrient and sediment fluxes from farms based on soil characteristics, local climate, and on-farm management practices. This tool has been adopted and implemented in several water quality trading programs including Maryland and Oregon.

Through the Farm Bill, several soil and water conservation programs are available through USDA's (NRCS) that provides financial and technical assistance and landowner outreach and education to support nutrient and sediment reduction on farms, grasslands, and ranchlands. In general, these programs are administered through local soil and water conservation districts (SWCDs) by NRCS and state agents. SWCD staff often provides the primary means of communicating with landowners about the water quality trading program and explaining how landowners might participate. [10]

EPA and USDA have also developed and provided training and guidance materials, workshops, and conferences to assist states with water quality trading markets. In 2004, EPA released the Water Quality Trading Assessment Handbook.[11] In 2006, USDA issued a departmental regulation, "USDA Roles in Market-Based Environmental Stewardship." USDA established that it will be a policy of USDA to facilitate and promote environmental markets through technical and financial assistance, outreach, education, and partnership building activities.[12]

State agencies also provide financial and technical assistance for trading programs. For example, Connecticut's Clean Water Fund is devoted to municipal treatment plant upgrades and has been helpful in the Long Island Sound.[13] Many states, including Maryland, Virginia, and West Virginia, provide guidance documents as well.[14]

C. PROGRAM ADMINISTRATION

Program administrators are responsible for the overall coordination of water quality trading programs, including monitoring and enforcement of rules and regulations, review and approval of projects and trades, and certifying, verifying and tracking credits, e.g., through registries. Examples of government actors filling this role are numerous. In the Chesapeake Bay, Maryland, Pennsylvania and Virginia all use government agencies as program administrators. In Maryland's trading program, administrative oversight is shared between the Maryland Department of the Environment and the Maryland Department of Agriculture; in Virginia, the Department of Environmental Quality is now taking on all administrative tasks; and in Pennsylvania, the Department of Environmental Protection administers the program and certifies credits. Government agencies can also administer credit registries which track and monitor trading efforts. For example, the Maryland program has adopted a version of NutrientNet, created by the World Resources Institute, but administered by the Maryland Department of Agriculture, to serve as its registry.

Third parties have also filled administrative roles. In the case of the Tualatin Sub-basin Trading Program in Oregon, the Oregon Department of Environmental Quality (DEQ) administers trade but as the market grows, the Willamette Partnership, a non-profit organization, has taken on administrative responsibilities. Additionally, as the DEQ does not require credit registration, the Willamette Partnership has partnered with a private company, Markit Environmental Registry, to create a web-based registry.[15] Likewise in the Ohio River Basin trading pilot, the Electric Power Research Institute (EPRI) has assumed the primary administrative role. In some cases, administrative tasks like credit verification are completed initially by government actors and subsequently completed by third parties. In Maryland and Virginia, the initial validation step is completed by state administrative bodies. After that, annual verification is conducted by third parties with intermittent state audits.[16]

D. MARKET FACILITATION

Market facilitators are actors that help connect buyers and sellers and facilitate transactions by aggregating and validating credits, operating a centralized marketplace, and brokering trades. Who plays these roles varies by project. Federal and state government agencies have acted in each role but market facilitation has been the most active space for private third parties and SWCDs. The level of government participation is often determined based on the state's capacity to undertake this service. Credit banks are one type of entity that has emerged in several markets to facilitate market transactions. Credit banks can take many forms, but in general these banks generate a central pool of credits from multiple sources, offered up for sale to buyers at a single market-clearing price. We explore several credit bank models in Section III. In the Great Miami program, the role of credit bank has been assumed by the SWCD; in Pennsylvania, the Pennsylvania Infrastructure Investment Authority (PENNVEST) has assumed the role; and in Virginia as well as in the Ohio River Basin program, a third-party, has assumed the role of credit bank administrator.

E. RISK MITIGATION

Recognizing that risk and uncertainty are major market barriers, government has stepped in in several circumstances to mitigate risk. To address seller uncertainty on private lands, some states, along with EPA and

USDA are discussing the use of state-administered programs called agricultural "certainty," "assurance," or "certification" programs to facilitate the adoption of voluntary conservation measures on private lands to improve water quality. The basic premise is that in exchange for undertaking voluntary conservation measures, the state provides landowners with assurances (e.g., a written agreement) that it will not impose any additional environmental regulations over the length of the agreement. Additionally, to address uncertainty associated with how weather events impact nonpoint source credits, some state governments have intervened as insurance providers. Some programs are designed to have an insurance fund with a reserve of credits. In Pennsylvania, for example, the state's trading program employs a trading ratio through which the state aggregates 10 percent of all credits generated into a centralized insurance fund. This fund is available for regulated buyers to use in the event that the credits they purchased to meet a permit obligation become invalid as a result of unforeseen weather events. Section IV explores additional ways that government might act to mitigate risk.

III. POTENTIAL FOR NEW OR SCALED-UP ROLES FOR GOVERNMENT IN WATER QUALITY TRADING

Government already plays several critical roles in water quality markets. However, there may be opportunities for government to play a more consistent role in market facilitation and risk mitigation which might help facilitate and scale water quality markets moving forward. The sections below presents some possible activities that government, in particular, USDA, might be able to play, as well as challenges that USDA might face should it decide to adopt these roles.

A. MARKET FACILITATION

Environmental markets, especially those in the early or start-up phase, can experience high transaction costs as a result of imperfect information about buyers and sellers, thin markets, lack of infrastructure for producing and selling credits, and lack of private capital. In addition, new and emerging markets often face a problem where credit supply, credit demand, or both are lacking. In order to more actively facilitate markets, government, especially USDA, might consider adopting the role of a credit bank or clearinghouse.

Credit clearinghouses and credit banks, are financial institutions that manage buying and selling of credits within the WQT program. O'Hara et al. state a credit bank or clearinghouse in WQT typically "describe programs in which point sources make payments into a fund at a predetermined per-unit fee, and a state agency uses these funds to finance pollution mitigation projects[…] These agencies typically assume responsibility for contracting and enforcement of credit generation from funded projects, and may adopt indemnification clauses that absolve point sources of regulatory liability after the appropriate fee is paid."[17] Several existing water quality trading programs include a clearinghouse or credit bank model, and many of these are financed and/or operated by federal, state, and local government entities. We have classified three types of credit bank models commonly used in water quality trading program, these include the revolving credit bank, in-lieu fees, and financial clearinghouse.

REVOLVING CREDIT BANK

An initial capital investment is used to fund project implementation and credit generation. These credits are then offered for sale to buyers, and proceeds from the sale are recycled into the bank to fund generation of additional credits. In Ohio, the Miami Conservancy District acts as a revolving credit bank. The credit bank was first capitalized using a combination of private investment from the regulated community and federal grant money. The Miami Conservancy District issued a request for proposals to generate agricultural credits. SWCDs then held a reverse

auction to select and fund applications that optimized phosphorus reductions at the lowest cost. Credits were then allocated to investors based on their initial investment amount.[18] In the Ohio River Basin trading pilot project, private match dollars for a federal grant are being used to capitalize a revolving credit bank that is administered by EPRI and operates through local SWCD offices to put conservation measures on the ground and generate credits. Those credits will then be sold to buyers in the watershed, and the proceeds used to fund additional offset projects.

IN-LIEU FEE:

An in-lieu fee program is one where a developer or permitted entity can pay a pre-determined fee into a centralized fund in order to offset their obligation. The fund manager is then responsible for implementing and maintaining mitigation projects that offset the nutrient obligation. The in-lieu fee model typically involves a regulatory state or federal agency and mitigation activities generally happen after permitted impacts have occurred. The in-lieu fee model has been used extensively in the wetland mitigation banking context. In North Carolina, in-lieu fees are also established to mitigate nutrient impacts. Developers that need to offset nutrients can offset their obligation through private nutrient banks or a government in-lieu fee program, the Ecosystem Enhancement Program (EEP). When EEP receives an in-lieu fee payment from a developer, they are responsible for developing and maintaining a nutrient offset project to compensate for the developers' nutrient offset obligation. Another example includes Virginia, which established the Water Quality Improvement Fund (WQIF) as part of its water quality trading program. In effect this fund was to be used as a last resort for permitted entities that could not otherwise locate nonpoint source offsets. The permitted entity could pay money into the WQIF, which in turn would implement offset projects in order to offset the permit obligation.

FINANCIAL CLEARINGHOUSE:

A central financial clearinghouse is an entity that collects credits from various sellers and brokers trades to multiple buyers. In some cases, the clearinghouse may accept some liability for the credits it is brokering. In Pennsylvania, PENNVEST is currently acting as a clearinghouse for auction transactions. PENNVEST is a state financing authority for municipal water projects. Due to limited trading activity in the early phase of Pennsylvania's trading program, PENNVEST designed a nutrient credit clearinghouse where credit buyers and sellers can contract with PENNVEST to exchange credits through periodic auctions and bilateral agreements. PENNVEST aims to reduce risks and transaction costs associated with meeting permit obligations and trading rules and regulations by selling certified credits at known prices over multiple years. PENNVEST also assumes default risk and enforcement responsibility by acting as the buyer and seller of credits. PENNVEST aims to keep credit prices low by establishing a market clearance price and quantity. The final price is a weighted average of the last bid to buy and the offer to sell. PENNVEST works with both the Pennsylvania Department of Environment and the third party actor, Markit Environmental Registry, for supportive services like registry and certification.[19] Third parties also play the role of auction service providers.[20]

IS THERE A LARGER ROLE FOR USDA IN CREDIT BANKING?

Of the three credit bank models, USDA is likely best suited to the revolving credit bank model. To date, the in-lieu fee models typically involve federal or state regulatory agencies, and the financial clearinghouse is likely best suited to state or private financial organizations. In this section, we consider the benefits of a larger role for USDA in the revolving credit bank model as well as challenges that USDA might face in expanding its role to credit bank.

The revolving credit bank model provides the greatest opportunity for USDA in particular to leverage its existing funding and network including the Farm Service Agency (FSA), NRCS, and SWCDs. These entities currently administer and provide technical guidance on implementation of conservation practices and contracts to landowners. USDA's network provides multiple funding opportunities including financial assistance through cost-share and easement programs, as well as Conservation Innovation Grants.

POSSIBLE STRUCTURE OF A REVOLVING CREDIT BANK

Revolving credit banks exist in a handful of water quality trading markets today—however these have operated through third-party administrators (e.g. the Ohio River Basin pilot credit bank which is administered through EPRI, and the Great Miami pilot credit bank which is administered through the Great Miami Conservancy). If USDA were to administer or directly facilitate a revolving credit bank through its agencies, we should ask ourselves how it might operate. For the purposes of comparison, we outline two distinct models: full integration with cost-share programs and parallel administration vis-à-vis cost-share programs.

In the first hypothetical model, USDA would fully integrate the credit bank model with the federal cost-share programs. For instance, one might imagine that a farmer signing up for cost-share programs or land retirement programs might also sign an agreement to place any of the resulting credits from these implemented conservation practices into the credit bank. The credit bank would then be able to sell the credits and pay the producer a dividend based on the amount of credits he contributed to the credit bank and the revenue from credit sales.

A second potential USDA revolving credit-bank model is one that assumes the cost-share programs and the revolving credit bank operate as two separate and distinct programs, but capitalize on the same infrastructure (e.g. staff and producer networks). In this scenario, the producer might choose to apply for federal cost-share funding, or might decide to generate credits in the water quality market. These would operate as distinct programs, but administered by the same entity. On the part of the producer, the water quality market might appear to be yet another cost-share program. For example, in the case of the Ohio River Basin pilot project, EPRI administers a revolving credit bank model through the local soil and water conservation districts in a model that is similar to the parallel model described here. Producers wishing to participate in the water quality trading program are given 75% cost-share for practices, but money used to fund the practices comes from private capital, not federal cost-share. In the parallel bank model, USDA would need to capitalize its credit bank through either an initial influx of federal funds, private capital, or a combination of the two. These funds would then be used to pay farmers to implement conservation practices under the water quality trading program.

Both models described above are likely to rely heavily on existing USDA partnerships with local SWCD offices. SWCD agents have longstanding relationships with local producers and can help inform producers about the WQT program and opportunities, help determine farmer eligibility, provide expertise on practices that are most profitable in the program, and aid in contract monitoring and verification activities within the WQT program.

BENEFITS TO USDA IN ROLE OF CREDIT BANK

There are many benefits to USDA taking on a larger role in the establishment and operation of revolving credit banks. Benefits apply to both models described above as both leverage USDA's existing infrastructure. First, as USDA would broker transactions between buyers and sellers, transaction costs would be reduced for both landowners and point sources as it reduces the number of actors with which they need to work. Transaction costs

include time spent searching and bargaining for credits and time spent organizing contractual agreements between buyers and sellers.[21]

Second, the revolving credit bank model acts to leverage USDA's existing infrastructure of staff, office buildings, vehicles, etc. Most credit banks in existence today heavily leverage SWCDs as the primary contact with the producer. By working with local SWCDs and other USDA agencies (e.g., FSA, NRCS) the credit bank can benefit from existing administrative staff, activities and costs and thus reduce transaction costs. For example, in the Great Miami Watershed Trading Program, The Miami Conservancy District acted as the clearinghouse but was able to leverage local SWCD offices to promote the program, and assist farmers with applications and fund disbursement.[22] USDA can specifically leverage SWCD staff to conduct verification and monitoring of cost-share best management practices (BMPs) to also verify and monitor BMPs that generate credits for trading.

Third, the revolving credit bank model also leverages USDA's relationships with landowners which can help to kick-start nascent water quality trading programs and build confidence in a market approach. In a model where water quality trading is integrated with cost-share programs, USDA can combine incentives to encourage additional landowners to participate in conservation activities and encourage landowners already participating in cost-share and easement programs to adopt additional practices. Where trading and cost-share programs are not integrated, USDA can still conduct outreach with landowners enrolled or requesting funding from cost-share programs to encourage trading participation, especially for landowners that applied but were denied cost-share funding.

CHALLENGES AND CONSIDERATIONS FOR A USDA CREDIT BANK MODEL

There are multiple considerations and possible challenges that USDA should consider were it to play a central role in a revolving credit bank model. For example, policymakers would need to consider additionality, apportionment of risk and liability, strategies for scaling up, strategies for avoiding redundancies with existing market actors, credit pricing, and agency resources. We consider these issues below.

- *Additionality:* One of the biggest concerns with structuring a credit bank that seeks to capitalize on existing cost-share programs is additionality—that is, ensuring that the credits generated and sold through the credit bank do not represent environmental benefits that would have happened "anyway." This challenge is especially marked in the "full integration" credit bank scenario described above. If the conservation practices used to generate the credits in the bank are funded through cost-share it would be hard to prove that these projects are financially additional. In addition, there may be concerns that these credits are also being double counted as many conceive that the environmental benefits from cost-share funded practices accrue to society.[23] In fact, most water quality trading programs have some provisions against the use of cost-share to generate credits in a water quality trading market. For example, in Oregon and Ohio, cost-shared projects are prorated and may only generate credits in proportion to the amount of private capital that was used to implement the practice. Some states, like Maryland and Virginia, do not allow any cost-shared practices to generate credits. The provisions for cost-share established in a given water quality trading program will help dictate the type of credit bank model that is feasible. For example, in programs where federal cost-share monies are not allowed to generate credit, the "integrated" bank model would not be feasible. The "parallel" credit bank model, because it operates as two distinct programs and does not necessarily stack federal and market payments, would likely not raise similar additionality concerns and could potentially be adaptable to any program regardless of existing cost-share provisions. However, if the credit bank were capitalized with federal funding (and not private capital), there may be similar issues raised. For more details on how cost-

share programs and water quality markets might be integrated see, "*How can payments for practices through conservation programs effectively interact with environmental market credit-based systems?"*[24]

- *Risk and Liability*: If USDA were to administer and operate a credit bank, they would need to consider exposure to risk and liability. The extent to which the agency is exposed to risk and liability will vary depending on the bank structure. For instance, USDA might choose to operate the bank as a broker—meaning that the bank centralizes the credits and matches buyers and sellers, but trade contracts are executed between the buyers and sellers themselves. In this way USDA would be removed from any contractual liability. However, this bank model may not be attractive to buyers who are likely seeking to reduce their own risk by executing a trade contract through a single entity, preferably one that is bonded and insured and willing to provide contractual assurances.

  A second option for a USDA credit bank would be to serve as a contracted party to the trade. This might operate similar to the financial clearinghouse model, where the credit bank would hold contracts with individual landowners as well as with credit buyers. For example, the bank would hold contracts with individual landowners or project developers which stipulate obligations and expectations for project maintenance over the life of the project and in some cases will hold permanent easements. These contracts would be similar to those it already holds with farmers participating in cost-share programs. On the buyer side, the bank would be a party to the trade contract with the buyer and be subject to those provisions as well. Under this model, USDA, as the bank operator, would take on liability for ensuring activities that generate credits are undertaken and that water quality improvements are achieved. While this option is more attractive to the regulated community, it potentially presents new challenges for USDA as it would now be liable for any failures on the part of the landowners to deliver on promised credits. This would represent a departure for USDA; while USDA has always held contracts with farmers under its Farm Bill programs, risk of noncompliance on the part of the producer does not currently result in any legal ramifications for the agency.

- *Scaling up and addressing potential redundancies:* If USDA were to take on a role of a credit bank, one advantage could be the ability to scale up nationally. By having a national credit bank model, there would be consistency among programs, start-up costs for water quality markets could be reduced, and some of the uncertainties around credit supply could be minimized. However, in areas with existing water quality trading programs it is possible that a national credit bank model represents a redundant market solution. Although in some cases a revolving credit bank administered by a federal agency or its representative may represent a more optimal solution to what is currently in place. USDA is likely best able to add value to water quality trading markets in new and emerging programs as it can help kick-start market development, reduce transaction costs, and build credit supply. For instance a USDA credit bank, especially a "fully integrated" model might generate a supply of agricultural credits even in the absence of demand. These credits might eventually be traded, but may also be retired towards net water quality improvements. Such an exercise would, at the least, demonstrate market concepts and landowner willingness to participate in environmental markets which will be valuable as programs move to maturity.

  USDA should consider that by taking on a role of a credit bank it runs the risk of reducing private sector activity and ingenuity that can spur market development and provide additional employment opportunities. To avoid interfering with potential for third party involvement USDA could choose to include a phase-out option with its credit bank model such that it can eventually hand this role over to a third party or state government agency at a later date if warranted. USDA should also consider that, due to the variation in water

quality trading program design and implementation, it may be that a "national" revolving bank model would not suit for all programs. Thus, a credit bank administered by USDA should be flexible and adaptable to local market rules and infrastructure.

- *Credit pricing*: Credit banks operate by aggregating credits from multiple sources and selling at a single price. However, getting the price right can be hard, especially in new and emerging markets. If USDA were to adopt a bank model that is fully integrated with cost-share programs, this could potentially keep market prices artificially low, as it reduces the market's ability to leverage market forces given cost-share rates are already pre-set. Low market prices will also discourage the implementation of some of the higher-value projects (in terms of permanence and co-benefits) like riparian buffers or land retirement. It is uncertain as to whether these types of high value projects and market-clearing prices would be as easily arrived at using a credit bank model. The potential for credit banks to keep prices low has been seen in both the PENNVEST clearinghouse and EPRI's credit bank in the Ohio River Basin. PENNVEST, which uses auctions to derive the credit-clearing price, has been criticized for having credit prices which are too low and thus discourage the participation of many private aggregators[25] and the EPRI-administered bank caps project payments at 75 percent of project costs, which means that credit prices will not reflect full cost of the project. Higher credit prices and longer term credits have been seen generally in markets with private aggregators and strong demand drivers (e.g. Virginia, North Carolina, and Oregon).

- *Financial and human capacity needs*: Finally, interviewees expressed concern that USDA lacks the staff and financial capacity to take on additional roles in water quality markets and that this role might be better suited for private third party actors who can afford to be more mission oriented and thus make better use of their staff and funding. By leveraging its current roles working with producers, programs and infrastructure, USDA would likely be able to achieve greater economies of scale and reduce transaction costs associated with a credit bank. But while USDA would not start from scratch, it is almost certain that taking on the role of a credit bank in one or multiple water quality trading programs would result in the need for additional resources. If budgets were to stay the same, this may require a reallocation of resources away from existing priorities. It is also a possibility that a credit bank model administered by USDA could include a fee-based structure that helped fund additional resources.

Clearly there are significant synergies with existing roles that USDA could leverage should it take on a role of credit bank. How the bank is structured, how it can ensure additionality, how it assumes (or does not assume) liability through trade contracts, how it sets prices, and its strategy for scaling up will need to be carefully thought through at the outset. USDA should be especially mindful of the types of market actors and mechanisms that have already emerged in many markets. A USDA credit bank model can be very valuable in new and emerging water quality markets, but may interfere with roles of third party actors in markets that are better established. With this in mind, USDA should consider which criteria it would use to establish banks and how it might phase-out its role as markets mature.

B. POTENTIAL GOVERNMENT ROLES TO MITIGATE RISK IN WATER QUALITY MARKETS

Uncertainty and risk are intrinsic to water quality trading markets. These risks and uncertainties include things like: uncertainty in credit calculation methods for nonpoint sources, permanence of credits as a function of weather related risk, uncertainty around availability of supply or certainty of demand, and uncertainty around future regulations or market rules.

There are several roles that government has adopted or could adopt that can mitigate some of these risks and uncertainties. In this section, we discuss the benefits and challenges of government acting to endorse credit calculation methods or tools, create an insurance program for weather-related risks, create a credit guarantee program, and establish certainty programs.

ENDORSEMENT OF METHODS AND TOOLS FOR CALCULATING NONPOINT SOURCE CREDITS

Water quality trading markets currently use a variety of tools and methods for calculating nonpoint source credits. These tools and methods attempt to estimate how a change in agricultural land use management or implementation of structural best management practices impact runoff of nutrients and pollutants into water bodies. Generally, tools and methods are built based on both biophysical data taken from soil and water sampling and assumptions about relationships between land use, management practices and nutrient fluxes. As a result, there is a certain level of uncertainty associated with all modeling efforts. Both nonpoint and point sources might be hesitant to participate in a water quality trading market if there is uncertainty regarding meeting permit obligations and receiving payments.

Federal government can encourage participation by endorsing credit calculation tools and/or endorsing best practices for quantification. For example, the Ohio EPA endorsed the Great Miami program's spreadsheet tool for N and P reductions. Interviews conducted with Great Miami market participants in the report by Industrial Economics (2008) found that the market's success was influenced by the spreadsheet tool and that EPA endorsement has the potential to promote trading. Federal government endorsement effectively sends a message to market participates about what level of uncertainty in calculations is acceptable while also providing a greater level of surety about credits. As a result, tool and method endorsement has the potential to increase confidence in the markets and thereby encourage greater activity. The Willamette Partnership et al.[26] has specifically recommended that USDA and/or EPA expand the Nutrient Tracking Tool (NTT) to be a national model to quantify nonpoint source reductions in nutrients and sediment. NTT is currently being used in Maryland, Ohio, and Oregon and has the capacity to be integrated into local software and trading tools (e.g., WRI has incorporated NTT into its tool, NutrientNet). Specifically, the report states that USDA NRCS could encourage adoption of the tool in other trading programs, parameterizing the model to various regions, maintaining the model code, updating data sources, and providing web support. Willamette Partnership makes several recommendations for expanding the tool to a national level including:

- Maintain clear version control;
- Establish protocols so that updates to the tool are transparent and timely ;
- Calibrate and validate NTT regularly to ensure model certainty; and
- Enable the incorporation of NTT into water quality trading program-specific contexts.

It is important that government not dictate which tools to use, but instead provide recommendations on which tools pass standards in terms of scientific rigor. Dictating tools could provide an unfair advantage to some and reduce the incentive for creativity and scientific advancement in the marketplace.

INSURANCE PROGRAM FOR WEATHER-RELATED UNCERTAINTY

One source of uncertainty for water quality trading markets is related to weather events (floods, droughts, storms) or other "acts of God" (e.g. disease) and how they may impact the functioning of agricultural projects that generate credits. For example, if a flood event were to occur and wipe out a newly established riparian buffer, what would happen to the buyer who had purchased credits generated from that project? There is also uncertainty in how climate change will impact the frequency and severity of weather events in the future. State government has taken on this role in a handful of water quality trading programs, mostly through the application of a reserve ratio on generated credits. The credits in the reserve pool made available for regulated buyers to use in cases where credits they have purchased are no longer valid as a result of weather-related events or other unforeseen circumstances. For example, in Pennsylvania (PA), the state has also played the role of insurer. PA has a state insurance fund which is capitalized through a trading "tax" on all certified projects where 10% of all generated credits are placed into a centralized insurance fund and are available for any purchaser of credits who needs to replace credits.

Federal government could also have a role in creating an insurance program where they insure buyers and sellers against this kind of risk. USDA, for example, could capitalize an insurance fund with credits that would be available to regulated entities under certain circumstances. Credits used to capitalize this fund could come from existing cost-share projects, or might be funded through additional appropriated federal funds. Alternately, state/private investors purchase an insurance policy. These funds are then used to implement projects whose credits are available to the investors holding the insurance policies. The benefit of a federal government agency taking on this role is that it might provide buyers with a greater sense of certainty and encourage greater participation. In addition, until WQT markets begin to gain liquidity, private insurance providers may be unwilling to provide these types of services.

A challenge in taking on the insurance role is that private aggregators have also self-insured against these types of risk by holding credits in reserve to mitigate against the potential for project failure. USDA would need to ensure that a federally operated insurance fund did not duplicate current efforts within state programs or among aggregators to insure against similar events.

CREDIT GUARANTEE PROGRAM

Attracting private capital into environmental markets has been problematic in many programs, especially in the start-up phase when demand and supply are uncertain. A government funded credit guarantee program could insure early-actors against failed investments by guaranteeing a credit price on any unsold credits. One possibility is for USDA or EPA to take on the role as a guaranteed buyer of credits. This type of program was once proposed as part of the Cardin Bill,[27] which stated that government should appropriate $20 million dollars that would sit in a fund. If a seller was unable to sell their credits, government would buy them back at 80 cents on the dollar, minimizing risk of capital loss. The fund could last for a limited time (e.g., five years or less) to give the market time to mature and build demand and supply. Additionally, government would need to specify whether it is purchasing credits or the contracts for BMPs that underlie credits. Credits are generated annually whereas BMP contracts might last from five to twenty years. For water quality trading markets that have watersheds with new TMDLs, government acting as a guaranteed buyer could help to meet nonpoint source load allocations.

As another option, USDA could provide loan guarantees to finance initial credit generation, whereby USDA assumes the debt obligation of the credit generator or borrower in case of default.[28] USDA could leverage one of

its existing programs (e.g., the USDA's Rural Development office business loan guarantee program or USDA Farm Service Agency's conservation loan guarantee program) to finance credit development in markets where access to capital is a barrier for market development.

The advantage of a credit guarantee program is that it establishes a known cost for risk mitigation. However, such a program has the potential to be abused and may encourage projects to move forward that are not, in essence, good investments. To avoid abuse for a program where government acts as a guaranteed buyer of credits, government would need to set clear expectations on timeframe, conditions, and prices for purchasing of credits to ensure that momentum will continue to build in the marketplace. For guaranteed loans, USDA can structure programs to avoid abuse. For example, USDA can choose to guarantee only a portion of a loan, develop eligibility criteria to filter out undesirable candidates (e.g., applicants must have a good credit score), and/or strengthen oversight of loans.

CERTAINTY PROGRAM

Recently, states, EPA, and USDA have been discussing the use of state-administered programs called agricultural "certainty", "assurance", or "certification" programs to facilitate the adoption of voluntary conservation measures on private lands to improve water quality. The basic premise is that in exchange for undertaking voluntary conservation measures, the state provides landowners with assurances (e.g., a written agreement) that it will not impose any additional environmental regulations over the length of the agreement. To encourage participation, states can design these programs to provide landowners with priority for NRCS conservation program funding, public recognition, priority for technical assistance from state and federal agencies, and elevated cost-share rates for conservation practices. Additionally, as certainty programs promote conservation measures, many are designed with requirements for verification and certification to provide buyers with assurance that farmers are actually contributing to water quality improvements.[29] For example, the 2013 Maryland General Assembly recently passed SB 1029, the "Maryland Agricultural Certainty Program," which assures farmers that meet 2025 water quality goals now that they will have flexibility in meeting any potential new laws and regulations. The legislation requires annual reporting for agricultural operations, as well as three-year on-site inspections and verification.[30]

Certainty programs are being regarded as one way in which WQT programs can be facilitated. For example, certainty programs might be designed in a way in which the voluntary level of effort required for entering the certainty program is on par with any baseline requirements in the WQT program. Thus, the certainty program could provide a stepping-stone to landowner participation in WQT programs.

Certainty programs can be designed to leverage USDA's network of SWCDs and make credit generation more cost-effective. For example, SWCDs can act to administer local programs and verify projects. Through these programs, SWCDs can also target landowners that might not be eligible for conservation incentive programs. There are many benefits associated with certainty programs that apply to water quality trading. By enhancing landowner confidence, certainty programs could potentially increase the potential supply of credits by ensuring that more landowners qualify for trading. Additionally, certainty programs build buyer confidence by assuring greater accountability on farmers through strict verification and monitoring procedures.

IV. CONCLUSION

Currently, federal and state agencies fill many roles across water quality trading programs which can be categorized as: regulatory and legislative; technical and financial support provision; program administration; market facilitation; and risk mitigation. Many market barriers exist that government might be able to address by better facilitating and scaling water quality markets moving forward. In particular we identified additional roles that USDA might assume in water quality trading programs in order to help markets scale-up and mitigate risk related to nonpoint sources.

Uncertain supply and demand in new and emerging water quality trading markets is often a hurdle. We explore how a USDA-operated credit bank could help facilitate these markets by serving as a credit bank which funds landowners to generate credits, aggregates the resulting credits, and resells these to interested buyers. Because of its existing relationships with landowners through its conservation and technical assistance programs, USDA, as a credit bank administrator, could help reduce transaction costs, facilitate landowner participation and credit supply, create national consistency in the market, and help reduce uncertainty. If USDA decides to consider such a role, there are many several issues that should be considered including how the bank is integrated with cost-share programs, how additionality is addressed, USDA's exposure to risk and liability, how a bank might be scaled nationally and under what conditions, and what types of financial and staff capacity would be required to operate a bank. Another critical consideration for USDA is how it would impact the role of existing third-party actors that may be willing to operate these markets.

In addition to a facilitation markets, USDA is also well-positioned to help mitigate risk and uncertainty in water quality trading markets as it pertains to nonpoint sources. Possible roles or actions that USDA could take to mitigate risk include: creating a standard for credit calculation methods from nonpoint sources, developing an insurance fund to insure against weather-related risk, creating a credit guarantee program that would reduce risk to early actors which undertake credit-generating activities, and linking certainty programs to water quality trading baseline when possible.

Part of the clear niche for USDA in the credit bank model is its direct links and existing relationships with farmers. One role that USDA does not assume, however, is that of project developer. In many WQT markets today the role of aggregator has emerged as crucial to the market. Aggregators often not only aggregate credits from multiple landowners, they are also project developers. An aggregator might pay landowners for the right to develop projects on their land. This model has been successful because it reduces the perceived behavioral risk that landowners may not honor agreed upon operation and maintenance schedules for credit-generating projects. When a buyer is able to purchase credits from a single project developer (even though that developer may have many projects), behavioral risk is reduced. However, aggregators/project developers are generally active in markets that are more mature and which have clear signals for demand. Thus, it is unlikely that USDA would compete with a potential role for these types of aggregators if it is careful to operate as a credit bank only in areas where these markets are nascent and where generation of credit supply is unlikely to happen unless the role is undertaken by an entity such as USDA.

V. REFERENCES

[1] Selman, M., Greenhalgh, S., Branosky, E., Jones, C., Guiling, J., 2009. Water quality trading programs: An international overview. World Resources Institute Issue Brief: Water Quality Trading No. 1.

[2] Newburn and Woodward. 2012. "An Ex Post Evaluation of the Great Miami Water Quality Trading Program." *Journal of the American Water Resources Association.*

[3] Maryland Department of Environment, 2013. Maryland Accounting for Growth (AfG) Guiding Principles. Retrieved from http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/AccountforGrowth/Meeting_Materials/AFG_Guiding_Principles_Final2.pdf on May 15, 2013.

[4] Willamette Partnership, Pinchot Institute for Conservation, and World Resources Institute, 2012a. In it together: A how-to reference for building point-nonpoint water quality trading programs. Overview (part 1 of 3). Willamette Partnership. Hillsboro, OR.

[5] Willamette Partnership, Pinchot Institute for Conservation, and World Resources Institute, 2012a. In it together: A how-to reference for building point-nonpoint water quality trading programs. Overview (part 1 of 3). Willamette Partnership. Hillsboro, OR.

[6] Selman, M., Greenhalgh, S., Branosky, E., Jones, C., Guiling, J., 2009. Water quality trading programs: An international overview. World Resources Institute Issue Brief: Water Quality Trading No. 1.

[7] Steinzor, R., Vidargas, N., Jones, S., Huang, Y., 2012. Water quality trading in the Chesapeake Bay. Briefing paper no. 1205. Center for Progressive Reform.

[8] USDA, 2012. USDA Announces Funding for Water Quality Markets, Seeks Proposals for Projects. Available at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/newsroom/releases/?cid=STELPRDB1046367.

[9] Willamette Partnership, Pinchot Institute for Conservation, and World Resources Institute, 2012b. In it together: A how-to reference for building point-nonpoint water quality trading programs. Designing and operating a trading program. (Part 2 of 3). Willamette Partnership. Hillsboro, OR.

[10] Willamette Partnership, Pinchot Institute for Conservation, and World Resources Institute, 2012b. In it together: A how-to reference for building point-nonpoint water quality trading programs. Designing and operating a trading program. (Part 2 of 3). Willamette Partnership. Hillsboro, OR.

[11] U.S. EPA, 2004. Water quality trading assessment handbook: can water quality trading advance your watershed's goals? U.S. Environmental Protection Agency Office of Water. EPA 841-B-04-001.

[12] USDA, 2006. USDA Roles in Market-Based Environmental Stewardship. USDA Departmental Regulation 5600—003.

[13] Industrial Economics, 2008. EPA water quality trading evaluation: final report. Prepared for the U.S. Environmental Protection Agency Office of Policy, Economics, and Innovation.

[14] Branosky, E., Jones, C., Selman, M., 2011. Comparison tables of state nutrient trading programs in the Chesapeake Bay Watershed. World Resources Institute. Version 1.

[15] Willamette Partnership, Pinchot Institute for Conservation, and World Resources Institute, 2012b. In it together: A how-to reference for building point-nonpoint water quality trading programs. Designing and operating a trading program. (Part 2 of 3). Willamette Partnership. Hillsboro, OR.

[16] Branosky, E., Jones, C., Selman, M., 2011. Comparison tables of state nutrient trading programs in the Chesapeake Bay Watershed. World Resources Institute. Version 1.

[17] O'Hara, J.K., M.J. Walsh, and P.K. Marchetti (2012), "Establishing a Clearing House to Reduce Impediments to Water Quality Trading." *Journal of Regional Policy and Analysis* 42:139-150.

[18] Selman, M., Greenhalgh, S., Branosky, E., Jones, C., Guiling, J., 2009. Water quality trading programs: An international overview. World Resources Institute Issue Brief: Water Quality Trading No. 1.

[19] PennVest, 2011. Overview of purchasing/selling nutrient credits in PENNVEST's Nutrient Credit Clearinghouse. Available at: http://www.pennvest.state.pa.us/portal/server.pt/community/nutrient_credit_trading/19518/nct_documents/1075305.

[20] O'Hara, J.K., M.J. Walsh, and P.K. Marchetti (2012), "Establishing a Clearing House to Reduce Impediments to Water Quality Trading." *Journal of Regional Policy and Analysis* 42:139-150.

[21] Newburn and Woodward. 2012. "An Ex Post Evaluation of the Great Miami Water Quality Trading Program." *Journal of the American Water Resources Association.*

[22] Newburn and Woodward. 2012. "An Ex Post Evaluation of the Great Miami Water Quality Trading Program." *Journal of the American Water Resources Association.*

[23] Greenhalgh, S., Selman, M., Taylor, M., 2006. Conservation best management practices, cost-share, and water quality trading programs. WRI Policy Note. Environmental markets: Water quality trading. No. 2.

[24] Gasper, Rebecca and Mindy Selman. 2013. "*How can payments for practices through conservation programs effectively interact with environmental market credit-based systems?"* Prepared for the USDA Office of Environmental Markets.

[25] Personal communication with George Kelly of Environmental Banc & Exchange, March 2013

[26] Willamette Partnership, Pinchot Institute for Conservation, and World Resources Institute, 2012c. Opportunities for action: Recommendations supporting the next iteration of point-nonpoint water quality trading programs. (Part 3 of 3) Willamette Partnership. Hillsboro, OR.

[27] Chesapeake Clean Water and Ecosystem Restoration Act, S. 1816, 111th Cong., 2d Sess. (2010).

[28] Willamette Partnership, Pinchot Institute for Conservation, and World Resources Institute, 2012c. Opportunities for action: Recommendations supporting the next iteration of point-nonpoint water quality trading programs. (Part 3 of 3) Willamette Partnership. Hillsboro, OR.

[29] National Association of Conservation Districts, 2012. Certainty programs for landowners and producers: An NACD review of four State Programs. Available at http://www.nacdnet.org/resources/reports/Certainty_Programs.pdf

[30] Chesapeake Bay Foundation, 2013. Senate Bill 1029 – The Maryland Agricultural Certainty Program – Passes. Available at http://www.cbf.org/about-cbf/offices-operations/annapolis-md/the-issues/sb-1029-agricultural-certainty-30/15/13

Other Sources

Bay Bank, 2013. About the Bay Bank. Available at http://www.thebaybank.org/about.

Bennett, K., Todd, A., 2011. A registry for environmental credits: Chesapeake Bay Environmental Markets Team White Paper. USDA Office of Environmental Markets.

Boisvert, R.N., Poe, G. L., Sado, Y. Selected economic aspects of water quality trading: A primer and interpretive literature review. Cornell University Department of Applied Economics and Management. Available at http://www.water.rutgers.edu/Projects/trading/Economic%20Aspect_of_Water_Quality_Trading_final_EPA.pdf

Fox, Jessica. 2011. Barriers and Solutions for Farmer Participation in the Ohio River Basin Water Quality Trading Program. EPRI Technial Update 1023642.

Maroon, J.H., 2011. Emerging issues in nutrient credit trading in the Chesapeake Bay Watershed. Maroon Consulting. Prepared for the Keith Campbell Foundation.

Mid-Atlantic Regional Water Program. A primer on water quality credit trading in the Mid-Atlantic Region. Available at http://www.mawaterquality.org/publications/pubs/wq_trading_primer.pdf

Moody, L., 2011. Is an agricultural certainty program a useful tool? The Fertilizer Institute. Available at http://www.tfi.org/voice/agricultural-certainty-program-useful-tool

Morgan, C., Wolverton, A., 2008. Water quality trading in the United States: trading programs and one-time offset agreements. Water Policy. Vol. 10: 73—93.

National Association of Conservation Districts. Water quality trading nonpoint credit bank model. Available at http://www.eli.org/pdf/wqtforum/TradingBankModelPaper.pdf

Pennsylvania Department of Environmental Protection, 2013. Verification Information. Available at http://www.dep.state.pa.us/river/nutrienttrading/verification/index.htm

State of Oregon Department of Environmental Quality, 2007. Water quality credit trading in Oregon: Case study report. Available at http://www.deq.state.or.us/wq/trading/docs/wqtradingcasestudy.pdf.

USDA NRCS and Vermont Agency of Agriculture, Foods, and Markets, 2012. State water quality certainty programs. Available at http://www.emcenter.org/wp-content/uploads/2012/11/Certainty-Publication.pdf

U.S. EPA, 2013. How does it work? Ensuring results. Available at http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/EnsuringResults.html?tab2=7

Wakild, C., 2013. North Carolina Department of Environment and Natural Resources comments on the draft Nonpoint Source Program and Grants Guidelines for States and Territories. NC DENR. Received from Rich Gannon on February 7, 2013.