Collaborating for Healthy Watersheds

How the Municipal & Agricultural Sectors are Partnering to Improve Water Quality

A Collaborative White Paper

AGree

National Association of Clean Water Agencies

U.S. Water Alliance

AGree seeks to drive positive change in the food and agriculture system by connecting and challenging leaders from diverse communities to catalyze action and elevate food and agriculture as a national priority. Visit *www.FoodAndAgPolicy.org* to learn more and join our effort to transform food and agriculture policy to meet the challenges of the future.

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The U.S. Water Alliance was formed in 2008 as a 501c3 educational nonprofit whose goal is to unite people and policy for "one water" sustainability. The Alliance awards the *U.S. Water Prize*, organizes the *One Water Leadership Summit* annually, helps staff the *Value of Water Coalition*, and facilitates national dialogues on cutting edge issues. A broad cross-section of interests has come together through the Alliance to advance holistic, watershed-based solutions to water quality and quantity challenges. Learen more about the Alliance at *www.uswateralliance.org*.

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Introduction

Throughout the United States, efforts are underway to restore and maintain healthy watersheds and good water quality in our streams, rivers, lakes and coastal waterways. These efforts are built on a common goal of stewardship for land and water that is shared by Americans living in our cities, on farms and in rural communities. This work is complicated and requires effective collaboration among many parties to forge solutions that are durable and achieve tangible goals and objectives.

The case studies in this paper demonstrate the gains to be realized by both municipalities and agriculture (including producers, landowners, and the supply chain) when they work together to address water quality and productivity concerns. This paper documents examples of successful municipal-agricultural collaborations that have achieved, or are striving to achieve, improved watershed health, with a focus on problem-solving regarding nutrient over-enrichment in our waterways and groundwater. The purpose of the paper is to identify common themes and approaches that have been used in these successful programs and to provide models to encourage others across the United States to engage in similar collaborative efforts. This paper also seeks to promote a partnership model for improving water quality as federal and state policies and programs are further developed.

Federal and State regulatory and incentive programs have been established under the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA) and the Farm Bill in an effort to ensure that water quality and related resources are protected. These programs provide the overarching framework that both constrain and create incentives for collaborative approaches. Wastewater, stormwater and drinking water utilities are subject to regulations that guide many aspects of their operations. CWA requirements include water quality standards that limit the concentration of pollutants that can be discharged into a river, stream or other waterway. Municipalities responsible for wastewater and stormwater discharges have constructed and operate sophisticated collection and treatment systems to address CWA requirements and are being asked to do more. Similarly, under the SDWA, municipalities and public water agencies construct and operate facilities to meet regulatory requirements that are intended to ensure that drinking water is safe for consumption.

The traditional approach of building more advanced treatment facilities can result in an economic burden to many communities. Therefore, both water and wastewater utilities have looked for more cost-effective solutions to create healthy watersheds and good water quality. One of the most promising approaches is to look upstream in the watershed to see if there are ways to prevent nutrients and other pollutants from being released into waterways in collaboration with agricultural and other partners.

Under the 2014 Farm Bill, collaboration between multiple parties is encouraged through the Regional Conservation Partnership Program (RCPP). The purpose of this program is to further the conservation, restoration and sustainable use of soil, water, wildlife and other natural resources on a regional or watershed scale. Approaches that rely on this holistic watershed approach can, in many cases, be more effective, in terms

of both cost and performance, in improving water quality and ensuring watershed health.

A few words about collaboration: it is successful when the parties involved can identify common goals and interests and can trust that their basic needs will be met as they work to achieve joint goals. From the standpoint of municipal and agricultural partners and State and federal regulatory officials, healthy watersheds, good water quality and solutions that make good "business sense" are points of common interest.

For farmers, the activities that make "good business sense" include those that improve their bottom line, improve productivity, and help them to be better farmers. For municipal leaders, actions that are economical, create long-term certainty, and result in dependable environmental benefits are examples that make "good business sense."

As a result, a successful formula for collaboration often includes the attainment of tangible water quality improvements throughout projects and programs that also improve farming operations, create healthy soils, enable sustainable agriculture and create regulatory certainty for municipalities as well as producers. As documented in this paper, building the relationships and trust needed for effective collaboration has often been both challenging and rewarding. Yet the interdependent goals of establishing watershed health and ensuring sustainable agriculture can and do bring people together to achieve them both.

Successful Municipal-Agricultural Collaborations

This paper provides examples throughout the United States of ongoing collaborations between municipalities and agriculture to improve watershed health and enhance agricultural sustainability and productivity (*Figure 1*). These examples include both efforts that have been underway for years and some newly initiated efforts. Descriptions include how different programs came into being, how they operate, and what they have accomplished. Lessons learned and future plans are also highlighted.

The examples include:

- SOURCE WATER PROTECTION: New York City's Watershed Protection Program and Watershed Agricultural Council – The Watershed Agricultural Program (WAP) was initiated in 1994 and has proven to be a long-term, successful partnership between New York City's Department of Environmental Protection and the not-for-profit Watershed Agricultural Council (WAC). WAC works with farm and forest landowners in the New York City Watershed to protect and enhance drinking source water on behalf of nine million New York residents. Through this fully voluntary program, WAC has been able to provide funding and training to farmers to assist them in implementing conservation practices such as planting cover crops, conservation easements, fencing and construction of waste storage and composting facilities. These practices are tailored to each farm and help to protect drinking source water and improve the economic viability of the farms.

- STREAMBANK RESTORATION: Tualatin River Enhanced Conservation Reserve Enhancement Program –The Clean Water Services wastewater agency has worked with the Tualatin Soil and Water Conservation District and other partners since 2004 to reduce water temperature and improve watershed health through planting native trees and shrubs and implementing other conservation practices on farms in the Tualatin River Watershed. The program has resulted in environmental benefits of reduced temperatures and increased flows in the watershed. At the same time, the program has contributed to the economic viability of participating farms.

- WATER QUALITY TRADING: The Great Miami River Watershed Water Quality Credit Trading Program – In 2004, in anticipation of the upcoming nutrient regulations, Miami Conservancy District collaborated with Ohio Environmental Protection Agency (Ohio EPA), Ohio Farm Bureau Federation, local soil and water conservation districts, local wastewater authorizes, and other local partners to implement a market-based trading program targeting nutrient reduction that provides assistance to agriculture and is an alternative to traditional regulatory strategies. The trading program provides farmers with funding to implement conservation practices such as conservation tillage, cover crops or grassed waterways. These practices reduce nutrient runoff and also provide farmers with more sustainable options for their fields.

- ADAPTIVE MANAGEMENT: Yahara Watershed Improvement Network (WINs) – The Madison Metropolitan Sewerage District and Dane County are working with multiple partners, including Yahara Pride Farms, to implement a collaborative adaptive management approach to managing phosphorus in the Yahara River Watershed. Yahara WINs is working with Yahara Pride Farms and others to connect funding sources with farmers and urban entities. Yahara WINs provides funding for farmers to implement conservation practices such as planting cover crops, as well as funding to test improved tillage and fertilizer application technologies. For example, the program has assisted farmers in successfully utilizing cover crop seeding since 2011, with increasing acres of cover crops planted each year.

- REPURPOSING OF AGRICULTURAL WASTE: Fresno-Clovis Regional Water Reclamation Facility (RWRF) Agricultural Partnership – The Fresno-Clovis RWRF has worked cooperatively with local farmers since 1996 to provide recycled water for irrigation and has offered a lend-lease program to encourage farming of a stillage site since 2005. Over the past 10 years, agricultural cropping through the lend-lease program at the site of this former agricultural waste disposal facility has reduced nitrogen loading in the soil. Local farmers benefit financially by being able to use the nutrient rich recycled water at no cost. In particular, drought conditions and reduced surface water allotments make the nutrient-rich effluent a sustainable source of water and farmers gain a sizeable return on investment because it cuts down fertilizer input costs while also boosting feed sales at a high market value.

- DATA COLLECTION: Lake Springfield Nitrogen Management Program – 'Keep it for the Crop by 2025' is an agreement between the Illinois Council of Best Management Practices and Illinois EPA that fosters the involvement of the agricultural sector in the development of nutrient management strategies. Through this program, which was initiated in 2013, the City of Springfield Water Light and Power is coordinating with agricultural producers to develop and implement the Lake Springfield Nutrient Management Program. An initial goal of the program is to provide training and assistance to farmers regarding the use of cover crops as an approach to reducing nutrient loadings to waterways. As public utilities and agriculture groups in Illinois work together, it is hoped that public perceptions will become more positive.

- SUSTAINABLE RESOURCE PLANNING: Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) - Initiated in 2006, CV-SALTS is a collaborative stakeholder driven and managed program to develop a long-term, sustainable salinity and nitrate management plan and regulatory framework for the Central Valley Region of California. Initiated in 2006, key participants include several municipalities working with Regional Water Board, State Water Board, irrigated agriculture, food processing industries, dairies, and environmental justice groups. Unlike many other regions of the US, runoff from agriculture is subject to regulation in California through the Irrigated Lands Program and waste discharge requirements, a developing program which requires surface and groundwater monitoring and nutrient management practices. Through the CV-SALTS collaboration, approaches are being identified to improve drinking water supplies to small communities with high nitrates in existing wells and sustain the agricultural economy of the Central Valley.

- PAYMENT FOR ENVIRONMENTAL SERVICES: Northern Everglades - The Northern Everglades – Payment for Environmental Services (NE-PES) program is a partnership between South Florida Water Management District (SFWMD) water managers and cattle ranchers to achieve water storage, water quality and habitat improvement benefits in the Northern Everglades. Since 2011, eligible ranchers can apply to enter a 10-year contract with the SFWMD to provide two water management services in exchange for payment: water retention or nutrient load reduction. This project has proven beneficial to both ranchers and SFWMD. Ranchers are guaranteed an income source independent of marketplace fluctuations for cattle, and the SFWMD is able to increase water retention and reduce nutrient loads.

- COMPREHENSIVE WATERSHED PLANNING: Arroyo Colorado Watershed Protection Plan – Formed in 2006, the Arroyo Colorado Watershed Partnership (ACWP) represents a collaboration of federal, state, and private organizations which strive to improve watershed health, integrate watershed management, and make better use of watershed project funding. Agricultural producers have received significant guidance and support from Texas A&M AgriLife Extension Service, Texas State Soil and Water Conservation Board, U.S. Department of Agriculture-Natural Resources Conservation Service and the local Soil and Water Conservation Districts in the form of education, cost-share, and technical assistance to install Best Management Practices (BMPs).

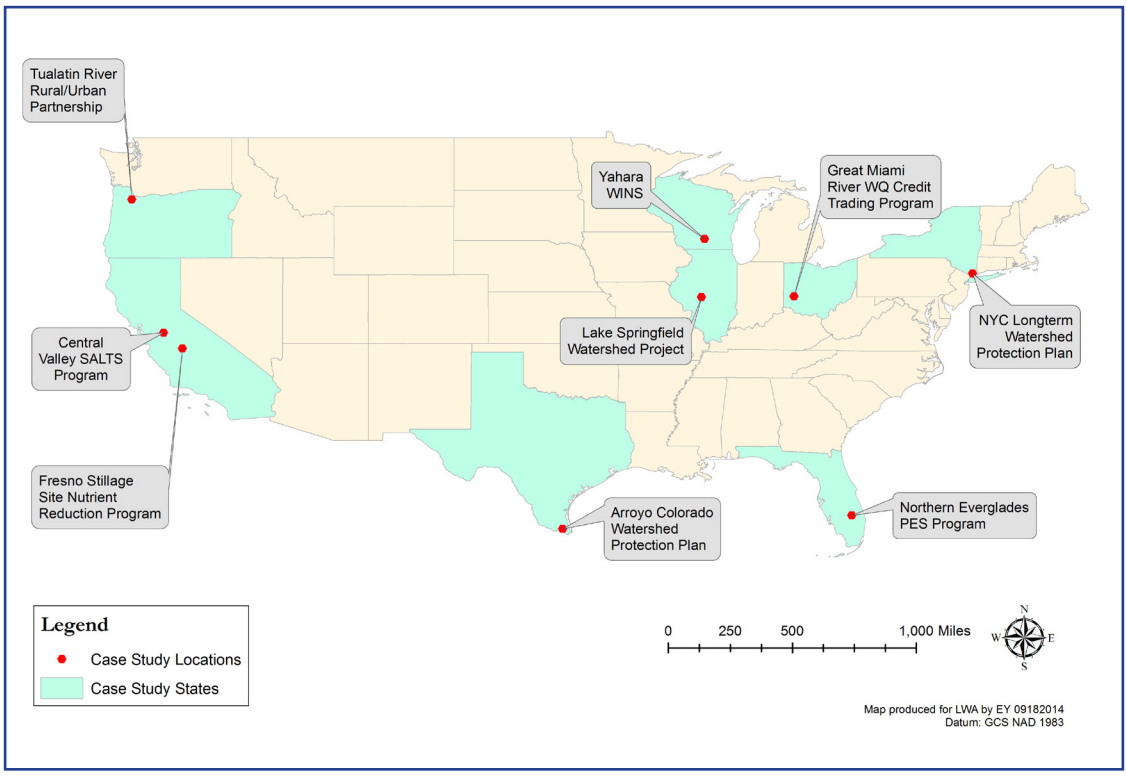

Figure 1. Case Studies of Successful Municipal Agricultural Collaborations

NEW YORK CITY'S WATERSHED PROTECTION PROGRAM AND WATERSHED AGRICULTURAL COUNCIL[1]

Key Collaborators	New York City Department of Environmental Protection (DEP), Watershed Agricultural Council, United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), County Soil and Water Conservation Districts, Cornell Cooperative Extension
Program Initiated	1993

New York City's drinking water supply system consists of nineteen reservoirs and three lakes within a 1,972 square mile watershed stretching north and west of the City. The watershed has two subregions: The Croton watershed east of the Hudson River, providing about 10% of the City's water; and, the Catskill/Delaware watershed to the west, supplying the remainder.

In 1989, the U.S. Environmental Protection Agency (EPA) promulgated the Surface Water Treatment Rule under the SDWA, which requires all public water systems to either provide filtration or meet specified criteria to avoid filtration, including establishment of an effective watershed control program.

Since the early 1990s, DEP has operated the Catskill/Delaware system under a Filtration Avoidance Determination (FAD) in accordance with the Surface Water Treatment Rule. The FAD allows for watershed protection and pollution prevention approaches, like the Watershed Agricultural Program (WAP) instead of requiring mechanical filtration of the water supply at a drinking water utility. DEP is constructing a filtration plant to treat Croton system water, but is continuing to implement similar watershed protection efforts in the Croton watershed.

When it first sought filtration avoidance for the Catskill/Delaware water supply systems, the City proposed extensive regulation of farms within the watershed. The farming community expressed concern that further regulation would drive farms out of business, leaving farmlands vacant and available for development. Recognizing the benefits of a healthy, environmentally conscious farming community, NYC teamed with upstate partners (i.e., the not-for-profit Watershed Agricultural Council or WAC) to develop the voluntary WAP. Working through the WAC, NYC funds development of farm plans and implementation of BMPs such as fencing to keep livestock away from waterways and covered barnyard areas.

In addition to the WAP, elements of DEP's watershed protection program include: land acquisition; land

1 www.nycwatershed.org

management; waterfowl management program; wastewater treatment plant upgrades; stream management; and wastewater infrastructure programs.

The WAC uses Whole Farm Plans (WFP), Forest Management Plans (FMP), and conservation easements to help farmers, forest professionals and private landholders reduce runoff of nutrients and other pollutants while supporting the economic viability of agriculture and forestry in the watershed. WFP and FMP incorporate water-quality improvements, mitigation approaches and BMPs. BMPs include planting cover crops, conservation easements, fencing, and construction of waste storage and composting facilities. These BMPs, along with land conservation techniques and team planning, are tailored to each property. WAC partners with local, regional, state and federal agencies and nonprofits including local Cornell Cooperative Extension, County Soil & Water Conservation Districts, and the USDA NRCS.

Accomplishments

The net effect of the collaborative effort is that DEP can comply with SDWA regulations and provide safe drinking water to its residents without installing and operating a costly filtration system. A recent estimate of the cost to build filtration to replace the Catskill/Delaware watershed program was more than $10 billion with annual operating costs of $100 million. In comparison, since 1997, DEP has committed approximately $1.7 billion in capital funds with annual program costs of approximately $40 million. DEP also set a goal for participation in the WAP of 90%. To date, more than 92% of watershed farms have signed up to participate in the program.

To date, the WAP has implemented 274 BMPs on 128 farms costing approximately $3 million. Farmers have implemented 335 WFP and 267 Nutrient Management Plans (NMPs) in the Catskill/Delaware Watersheds and 74 WFPs and 44 NMPs in the Croton Watershed. Funding provided by DEP, the USDA and other sources helped the WAP realize its goals.

The City has augmented the WAP by adding a City/Federal cost-sharing effort known as the Conservation Reserve Enhancement Program (CREP) a program available through the U.S. Department of Agriculture. Under this program, 47.4 acres in riparian forest buffers were enrolled in 2013. The WAP continues to partner with Cornell Cooperative Extension to provide educational programs to area farmers regarding effective implementation and maintenance of BMPS and information on new conservation options. In 2013, over 700 farmers and farm advisors attended 26 educational programs. Another funding source, the 2010 Agriculture Water Enhancement Program (AWEP) grant, resulted in Nutrient Management contracts for 33 AWEP participants receiving $285,555.

Lessons Learned

The most central lesson learned from this program is that a voluntary, farmer-driven program (i.e., the WAP), has been at least as effective and much better received than the regulatory program initially proposed by DEP would have been.

Building relationships between WAC staff and the farm community has been essential to the program's success. WAC staff works with farmers to provide training and follow-up site visits to ensure the BMPs are properly

maintained. Another key to success is the ability of WAC to fully fund projects with City funds, without requiring any match from farmers. In return, farmers are required to sign an agreement to maintain the BMP and to revise operations as needed to properly implement the BMP.

As participation has grown, it is a challenge for staff resources to meet demand. WAC planners work with a farm to develop a WFP and identify BMPs that meet priorities established in consultation with DEP to protect drinking water. The WFP is first reviewed by agency representatives and then approved by the WAC Agriculture Committee which is made up of other farmers. Projects are implemented in order of priority based on the target constituents (e.g., nutrients, manure, and pathogens are higher priority than sediments or fuel storage and clean-up projects). The WAP has developed a significant back-log of projects and farmers may have to wait up to 5 years for their project to be installed.

Another challenge is ensuring that farmers meet their commitments under the agreement. WAC relies on annual communications, ongoing education, and a comprehensive inspection every third year for each farm. There is an option to terminate the agreement and require the farmer to pay for some portion of the cost of their projects. While farmers are aware of this possibility, it has not been triggered.

Plans for the Future

The current FAD is effective through 2017 and the current permit authorizing acquisition of conservation easements is effective through 2025. The WAP includes goals for additional BMPs at both large and small farms in the watershed. WAC staff and farmers are surveyed in an effort to re-evaluate the prioritization strategy used to determine which projects get implemented each year. The strategy was established by DEP in the 1990s and revised in 2011.

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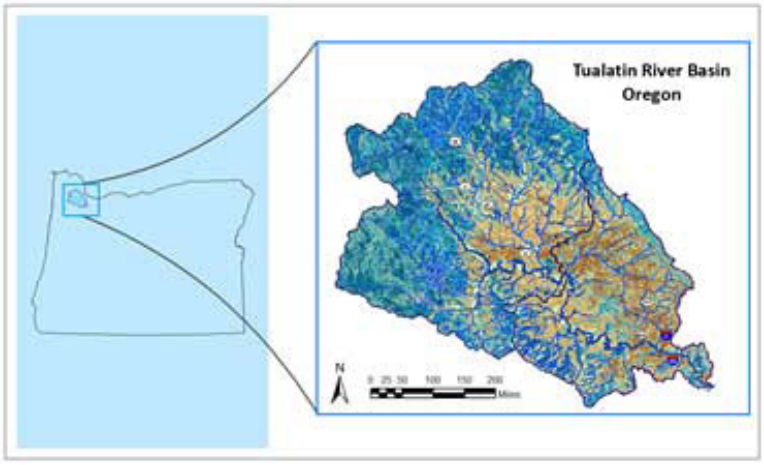
TUALATIN RIVER ENHANCED CONSERVATION RESERVE ENHANCEMENT PROGRAM[2]

Key Collaborators	Tualatin Soil and Water Conservation District, Clean Water Services, Farm Services Agency, The Freshwater Trust, Natural Resources Conservation Service, Oregon Department of Forestry, Oregon Watershed Enhancement Board, Oregon Water Resources Department, West Multnomah Soil and Water Conservation District
Program Initiated	2004

Oregon's Tualatin River watershed is 710 square miles encompassing most of Washington County in northwest Oregon. The watershed is divided between forested and agricultural areas in the western third, densely urbanized areas in the eastern third, and rapidly urbanizing areas in between. The urban area is served by four wastewater treatment plants, all of which are operated by Clean Water Services (CWS). These plants have been identified as a source of nutrients and increased temperatures in the main stem of the Tualatin River. However, agriculture is also a significant land use with approximately one-fourth of the watershed's land base used for production agriculture.



High temperature in the Tualatin River was identified as an environmental concern and, in 2001, temperature reduction requirements were established for CWS' treatment plants. The traditional solution would have been to install refrigeration units at the treatment plant discharge points or redirect the discharge to other, larger rivers. Instead, CWS partnered with federal, state and local agencies to offer incentives to landowners to increase shade and flow along the Tualatin River. This approach has successfully met the temperature reduction goals at a much lower cost than the $100 million that would have been required to install chillers at the treatment plant. In addition to cost savings, it has provided other critical environmental benefits along the River, including increasing wildlife habitat, improved aquatic habitat and recreational opportunities.

Oregon operates a number of programs that are funded through state and federal resources, such as the Oregon Conservation Reserve Enhancement Program (CREP). Oregon's CREP is a cooperative program between the State of Oregon and the USDA Farm Service Agency (FSA), and is further supported by local soil and water conservation districts. Landowners enrolled in the CREP receive annual rental payments, incentive payments, and cost share payments to install conservation measures such as planting trees and shrubs, installing fencing, livestock watering facilities, and other approved conservation measures. While the CREP was originally established in 1999, no landowners in the Tualatin Basin had enrolled in it by 2004 when CWS began exploring opportunities to collaborate with them to undertake its riparian shading program to lower the River's temperature.

Revisions were made to the CREP after obtaining input from local farmers and evaluating how other states had

2 www.cleanwaterservices.org

revised it to make it more effective. The Enhanced CREP in Oregon that was developed based on these revisions has been very successful. The Enhanced CREP projects in the Tualatin Watershed receive significant financial assistance from CWS for installing conservation practices. CWS also provides funding for activities related to land acquisition, maintenance, program outreach, and technical assistance. Oregon's Enhanced CREP also provides a cumulative impact incentive payment to landowners who enroll more than two miles of a stream segment. Similarly, landowners who provide water for in-stream purposes on acreage enrolled in CREP are paid higher rates. CWS also serves as a general contractor and manages contracts between the Farm Service Agency, the farmer, and subcontractors.

Accomplishments

CWS' Temperature Management Program resulted in 30 miles of riparian planting during its first five years and, along with release of stored water in July and August, has offset the temperature load of its treatment plants allowing CWS to avoid installing cooling systems. The program provides other environmental benefits such as stream bank stabilization, increased habitat, filtration of stormwater runoff and improved water quality.
A related effort led by CWS, "Tree-for-all", is a community partnership of cities, farmers, non-profits and other volunteers who are working together to ensure the health of the Tualatin River and its tributaries, while taking into account community values and regional economic needs. "Tree-for-all" has planted four million trees in the Tualatin watershed in ten years. In agricultural areas, more than 1.2 million native trees and shrubs were planted in riparian corridors. To date, approximately 8,000 acres of agricultural lands adjacent to the project areas benefit from restoration efforts and 897 acres are under active management through a joint CWS-USDA program.

Lessons Learned

The primary critiques, based on input from local farmers, of the original CREP were that the payments were too low, there were insufficient resources for outreach and technical assistance, there were no payments for permanent conservation, and there was time and risk associated with riparian buffer conversion and maintenance. CWS addressed the lack of financial resources by collaborating with the agricultural community and providing financial assistance to install conservation practices. Not only did this address stakeholders concerns and achieve the desired environmental benefits, but this approach was more cost effective than building the cooling facilities that would be needed for treatment plant effluent to achieve the temperature goals in the Tualatin River. While temperature concerns were the initial impetus, working with farmers has enabled CWS to work more broadly to restore and maintain a healthy watershed.

Despite the fact that the program was developed based on input from the agricultural community, gaining acceptance was slow. In 2005, one farmer signed up - by 2008, 27 farmers had enrolled. Today, there are 70 to 80 landowners participating and there is a waiting list with projects prioritized based on their potential impact on waterways.

The farm community has embraced the enhanced CREP as it has enabled them to keep land in the family, earn a decent living from farming, and be good stewards of the land. Today, a farmer who participates in the program receives assistance and information that allows them to develop a comprehensive water quality management

plan that, in addition to tree planting, addresses irrigation efficiency, wetlands enhancements, and other farm practices.

CWS has learned fundamental aspects of what works best to achieve effective temperature control through riparian planting such as the types of plants and number of 'stems' needed. More importantly, CWS has learned how to work effectively with the farm community by engaging farmers and the Tualatin Soil and Water Conservation District to assist with communications and outreach. To ensure that community and watershed goals are met, the program is reevaluated annually to determine what modifications or enhancements are needed.

Plans for the Future

Despite fifteen years of outreach and education, many landowners are not aware of the program, or, if they are aware of it, have not enrolled. CWS believes this is primarily due to the fact that it is difficult to reach some landowners through traditional outreach methods. CWS is planning to work with its partners to increase training of technical assistance providers, foresters, and other staff to expand outreach efforts.

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GREAT MIAMI RIVER WATERSHED WATER QUALITY CREDIT TRADING PROGRAM[3]

Key Collaborators	Miami Conservancy District; Cities of Dayton, Englewood, and Union; Butler County Water and Sewer Department; Tri-Cities North Regional Wastewater Authority; County Soil and Water Conservation Districts; Ohio Farm Bureau Federation, Inc.; Ohio Environmental Protection Agency, Division of Surface Water; Ohio Department of Natural Resources (Ohio DNR), Division of Soil and Water Conservation; U.S. Department of Agriculture, Natural Resources Conservation Service; United States Environmental Protection Agency (EPA)
Program Initiated	2004

Stakeholders in the Great Miami River Watershed (GMRW), located in southwest Ohio, have been working to reduce nutrient loads and improve surface water quality over the last four decades. However, about 40 percent of the watershed's rivers and streams do not meet state guidelines for fishing and swimming and other uses due to nutrient-related impacts. Excess nutrients have also been determined to contribute to adverse impacts downstream of the watershed up to and including the Gulf of Mexico. As a result, Ohio EPA is developing nutrient regulations for this region.

More than 70% of the land in the Great Miami River Watershed is used for agriculture and approximately 85% of the nutrient load to the watershed is contributed by non-point sources including agricultural lands. However, limited financial assistance is available for farmers to implement nutrient management practices. At the same time, municipal wastewater treatment utilities in the watershed, a source of approximately 15% of nutrients to the watershed, are faced with the prospect of installing expensive treatment upgrades to comply with anticipated nutrient regulations.

In anticipation of the upcoming statewide nutrient regulations and to provide funding for agricultural nutrient management practices, Miami Conservancy District (the flood protection agency for the watershed) collaborated with EPA, Ohio EPA, and numerous local partners (i.e., wastewater and sewer authorities, soil and water conservation districts) to design and implement a market-based, water quality credit trading program that targets the most significant sources and reduces nutrients in streams and rivers as an alternative to traditional regulatory strategies. Water quality credit trading allows municipalities to invest dollars in voluntary agricultural practices, which are often more cost-effective and provide broader environmental benefits, than technology upgrades at wastewater treatment plants.

In 2004, the Great Miami River Watershed Water Quality Credit Trading Program (Trading Program) began as a pilot to evaluate its viability as an approach to nutrient reduction. The pilot established a new sustainable local

3 www.miamiconservancy.org/water/quality_credit.asp

source of revenue for agricultural producers to implement conservation practices in cooperation with wastewater treatment plants.

An economic and market analysis estimated that wastewater treatment plant upgrades with biological nutrient removal technologies would cost $422.5 million. The cost for implementation of agricultural conservation practices to achieve similar levels of nutrient reduction was projected at $37.8 million. It was estimated that, on average, point sources would pay $23.37 to reduce one pound of phosphorus with biological nutrient removal compared to $1.08 for agriculture with conservation practices. For nitrogen, point source unit costs were $4.72/pound compared to $0.45/pound for agriculture.

The trading process that has been developed is completely voluntary and generally works as follows:

- Soil and Water Conservation District (SWCD) staff members suggest practices such as conservation tillage, cover crops, or grassed waterways to local farmers upstream of participating wastewater treatment plants.
- These farmers agree to voluntarily change their farming practices or implement projects that reduce phosphorus and nitrogen runoff.
- SWCDs submit project applications that describe the scope of the new practice and estimate the amount of phosphorus and nitrogen the practice will keep out of local waterways.
- Farmers provide a bid for each project that states the amount of money they are willing to accept to install the practice.

- Projects are then reviewed and selected for funding by an advisory committee with members representing wastewater treatment plants, agricultural producers, Ohio Farm Bureau Federation, Ohio Water Environment Association, community-based watershed organizations, county soil and water conservation districts, Ohio DNR and the USDA. The projects generate credits that wastewater treatment plants can use to meet regulatory requirements. Projects are selected based on the lowest cost per pound of nutrients prevented from entering the river or stream.

Accomplishments

As of May 2014, 397 agricultural projects have been contracted generating more than 1.14 million credits over the life of the projects, resulting in an estimated 572 ton reduction in nutrient loads in the watershed. More than $1.6 million will be paid to producers for these credits. Interest among agriculture producers continues to grow with far more applications submitted each year than available funds can support.

Lessons Learned

In the initial phases of developing the Trading Program, gaining support and building trust with the stakeholder community was critical. This was accomplished through initial discussions with wastewater treatment plant representatives and regulators along with a dozen town hall meetings over a six month period. From 2003-2005, over 100 meetings were conducted with individual farmers, county soil and water conservation district staff and their elected board of supervisors, county farm bureau offices, certified crop advisors, and community-based watershed organizations. Some of the specific concerns among the agricultural community ranged from the time of year funding announcements are issued and ensuring user-friendly forms to revising monitoring

requirements for evaluating management practices.

While initially models were used to predict the impacts of nutrient loadings on water quality, several years of actual water quality data have been collected and are now being used to refine the models to enable them to better predict future conditions.

More recent challenges have been associated with how the Trading Program will be incorporated into the statewide nutrient regulations. The coalitions and relationships that have formed through the 10-year pilot trading process are being used to work through this set of issues. Resolution of this issue is critical to the long term success of the program.

Plans for the Future

Once the nutrient regulations are finalized, the plan is to expand the Trading Program to provide a framework and funding for substantially more projects throughout the watershed. In the near term, stakeholders will continue working with EPA to effectively incorporate the Trading Program into the regulations.

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YAHARA WINS (WATERSHED IMPROVEMENT NETWORK)[4]

Key Collaborators	Madison Metropolitan Sewerage District (MMSD), Dane County, the Clean Lakes Alliance, and the Yahara Pride group are among the 30 partners in an initial pilot project. Other partners include towns, villages, cities, environmental groups, Wisconsin Department of Natural Resources (DNR), United States Geological Service (USGS), EPA, and the University of Wisconsin.
Program Initiated	2012

In 2010, to address concerns with excess phosphorus from treatment plants, agriculture and urban runoff, the Wisconsin Department of Natural Resources (DNR) adopted the 'phosphorus rule'. This rule established statewide water quality objectives for total phosphorus and a method for calculating effluent limits for phosphorus applicable to municipalities. During the rule making process, municipal stakeholders expressed concern regarding the cost to add new treatment facilities for wastewater and stormwater to meet the new objectives. Stakeholders proposed an approach to achieving water quality objectives through watershed-based solutions, such as allowing Publicly Owned Treatment Works (POTWs) to invest in phosphorus reducing practices targeting other sources (e.g., agricultural or urban runoff.) Achieving improved water quality through Adaptive Management was incorporated into Wisconsin Administrative Code (NR 217, Subchapter III).

Also, in 2010, Clean Water Act (CWA) requirements limiting total maximum daily loads for phosphorus and sediment were adopted for the Rock River Basin, which covers approximately 3750 square miles in South Central Wisconsin. To achieve these targets, Madison Metropolitan Sewerage District (MMSD) took the lead in developing an adaptive management program in the Yahara Watershed, which is located in the lower Rock River Basin. The first step in the process was contacting and gaining support from other entities discharging phosphorus to the watershed including POTWs, Municipal Separate Storm Sewer System (MS4s) and farmers. MMSD began working with multiple partners (Dane County, villages, towns, cities, DNR, environmental organizations and farmers) to implement an adaptive management pilot project in the Yahara Watershed. The pilot project is being conducted in the Sixmile Creek Subwatershed, which is located northwest of Lake Mendota.

A key partner in the collaborative effort is the Yahara Pride Farms, which was founded in 2011 'by an enthusiastic and progressive band of area producers, agronomists, and businessmen to develop a self-regulated, self-recognized, and self-incentivized organization to improve and protect the land and waterways in Dane County' (www.yaharapridefarms.org).

During 2013, the first complete year of the pilot project known as the Yahara Watershed Improvement Network or Yahara WINs, approximately $500,000 in funding was provided for research, water quality monitoring, phosphorus reducing practices, baseline inventories of agricultural land, and other initiatives. Yahara WINs is

4 www.madsewer.org/programs-Initiatives/Yahara-WINs

working with Yahara Pride Farms and other stakeholders to connect funding sources with farmers and urban entities. Yahara WINs provides funding to implement conservation practices including planting cover crops, providing tillage technology and vertical manure injection trials.

The pilot project is to be completed by 2015 and will provide information needed to help Yahara WINs participants expand implementation of a full scale adaptive management program throughout the Yahara watershed to meet the Rock River regulatory requirements.

Accomplishments

In the initial year of the project, Yahara WINs achieved the following successes:

- Phosphorus reductions were quantified for the period from 2008 through 2012 to be credited against required reductions (about 42% of the reduction goal for the pilot project.)
- Phosphorus loads were calculated for all four major tributaries to Lake Mendota.
- Yahara Pride Farms helped farmers test phosphorus load reduction practices on almost 3,000 acres of land.
- Dane County awarded $1.5 million in Urban Water Quality Grants.
- The Rock River Coalition's Citizen Water Quality Monitoring program began volunteer monitoring at sites throughout the watershed.
- With funding from Yahara WINS, the University of Wisconsin Water Resources Management Practicum identified pilot mitigation project area priorities.

With funding support from Yahara WINs, Yahara Pride Farms has worked with farmers to successfully utilize cover crop seeding since 2011, increasing the number of cover crop acres planted each year. In the summer of 2013, Yahara Pride Farms implemented a Farm Certification Program certifying that a farmer or dairy operation successfully completed all aspects of the water quality program including a facility, crop and soil assessment, a complete farm walkover, and a one-on-one meeting with a conservation resource manager. The Certified Yahara Pride Farms members make a commitment to implement recommended conservation practices to ensure protection of soil and water resources in the watershed.

Lessons Learned

Developing a framework for successful collaboration between a diverse set of stakeholders was a challenge for MMSD. A key to overcoming this challenge was MMSD learning the 'language' to support effective communication and to bridge differences and find similarities among the different interests. For wastewater, stormwater and agricultural interests, each state and federal program they traditionally access has a different regulatory structure, nomenclature, and time frames within which to meet various program requirements. In addition, each city, town and village has its own unique government structure and political interests. During a year-long process, representatives from MMSD met with public works directors, city councils, agricultural groups and others to achieve acceptance and support for the program. MMSD was critically aided in its efforts by the Yahara Pride Farms Group which helped facilitate dialogue with dairy operators and other agricultural

producers. An additional challenge was changing stakeholders attitudes from an 'us vs them' mentality to a 'we' mentality. Yahara WINs has worked to change thinking of phosphorus discharges as someone else's concern to thinking of it as all the stakeholders' responsibility (i.e. a collaborative watershed issue.)

Plans for the Future

For 2014, a new Memorandum of Understanding is being developed by MMSD with Wisconsin DNR to help guide development of a full-scale adaptive management project. Yahara WINs will continue to fund phosphorus reducing practices and will pilot test different funding delivery mechanisms. Yahara Pride Farms will also work with farmers to continue testing phosphorus reduction practices with the goal of increasing the number of acres in the program by 50% relative to 2013. Water quality monitoring efforts will be expanded working both with USGS and the Rock River Coalition's Citizen Monitoring program. Dane County Land Conservation Department will complete inventories of remaining farmland in the pilot project area and work with landowners to install harvestable buffers along stream corridors. Cost projections for a full-scale adaptive management project will be refined using information generated through the pilot project.

The time line for the overall adaptive management process includes development of a full-scale adaptive management plan no later than 2018 and reissuance of MMSD's National Pollutant Discharge Elimination System (NPDES) permit in 2015, 2020, 2025 and 2030.

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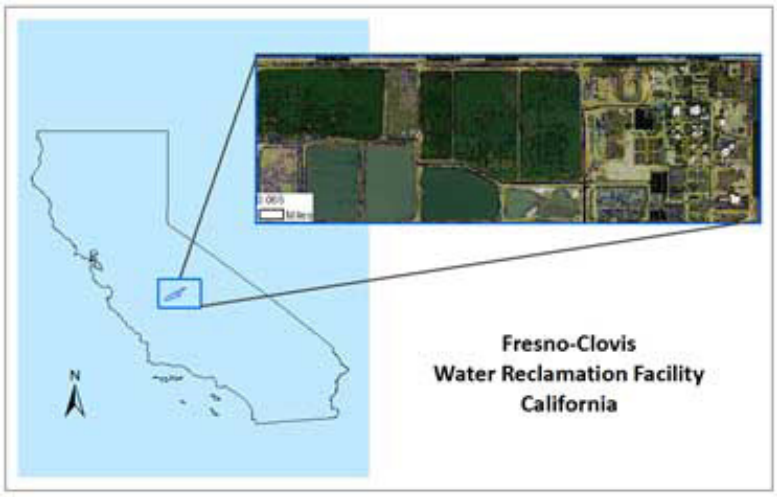
FRESNO-CLOVIS WATER RECLAMATION FACILITY AGRICULTURAL PARTNERSHIP[5]

Key Collaborators	Fresno/Clovis Regional Wastewater Reclamation Facility (RWRF), Local agriculture community
Program Initiated	1996

The Fresno Clovis Regional Wastewater Reclamation Facility (RWRF) treats 60 million gallons of wastewater per day, serving approximately 750,000 residents in the cities of Fresno, Clovis and surrounding areas in the Central Valley of California. The main method of disposing of its effluent is by discharging to 1750 acres of on-site percolation ponds. To promote direct agricultural reuse, 8.3 million gallons per day of effluent is used for irrigating non-food crops such as Alfalfa, Corn Silage, Wheat, Sorghum Sudan and Cotton. Most of the effluent however, percolates into the soil and later pumped out by a network of reclamation wells that provides up to 30,000 acre-feet a year of well water to a local irrigation district for unrestricted agricultural reuse.



The RWRF site includes approximately 600 acres of farmland, as well as 145-acres that were used as a wine stillage disposal site from 1974 to 2003. Stillage waste is generated from the distillation of wine for the production of distilled spirits. Stillage waste was conveyed year-round to the stillage site by a dedicated pipeline and contributed to elevated nitrogen loading to the groundwater. In 2003, the Central Valley Regional Water Quality Control Board required that discharge of stillage to the site cease permanently. To reduce the nitrogen loadings, the City of Fresno was required to implement nitrogen control measures by: 1) planting and harvesting crops that reduce nitrogen content in soils, and 2) conducting vadose zone monitoring for waste constituents and their decomposition by-products.

Farming of the stillage site commenced in June 2005 with the planting of silage corn and continues through a land lease agreement between the City of Fresno and a local farmer. The City leases the former stillage site to a farmer specifically for growing non-food crops. Other farmers who directly reuse treated effluent also have similar land lease contracts, typically leasing City-owned land for 5 years with the option of a 2 year extension. Participants in the program agree to several use terms, including that no fertilizer addition is permitted at the former stillage site. The RWRF performs extensive monitoring including stillage site soil, tissue and vadose zone sampling and monitors nitrogen crop efficiency rates. The monitoring data is reported to the Water Board on an annual basis.

Accomplishments

Over the past decade of stillage site farming, a number of crops have been planted: corn silage, winter forage, sorghum Sudan, wheat, triticale, and alfalfa (which has been demonstrated to be particularly effective in reducing the nitrogen content in the soils). Since the RWRF provides nutrient-rich effluent and water-balance monitoring, alfalfa cropping has proven to have a sizeable economic return for 160 acres of cropland and remains an increasingly popular program for the City of Fresno. The amount of total nitrogen in soil has been

5 www.fresno.gov/Government/DepartmentDirectory/PublicUtilities/Wastewater/Recycled+Water/default.htm

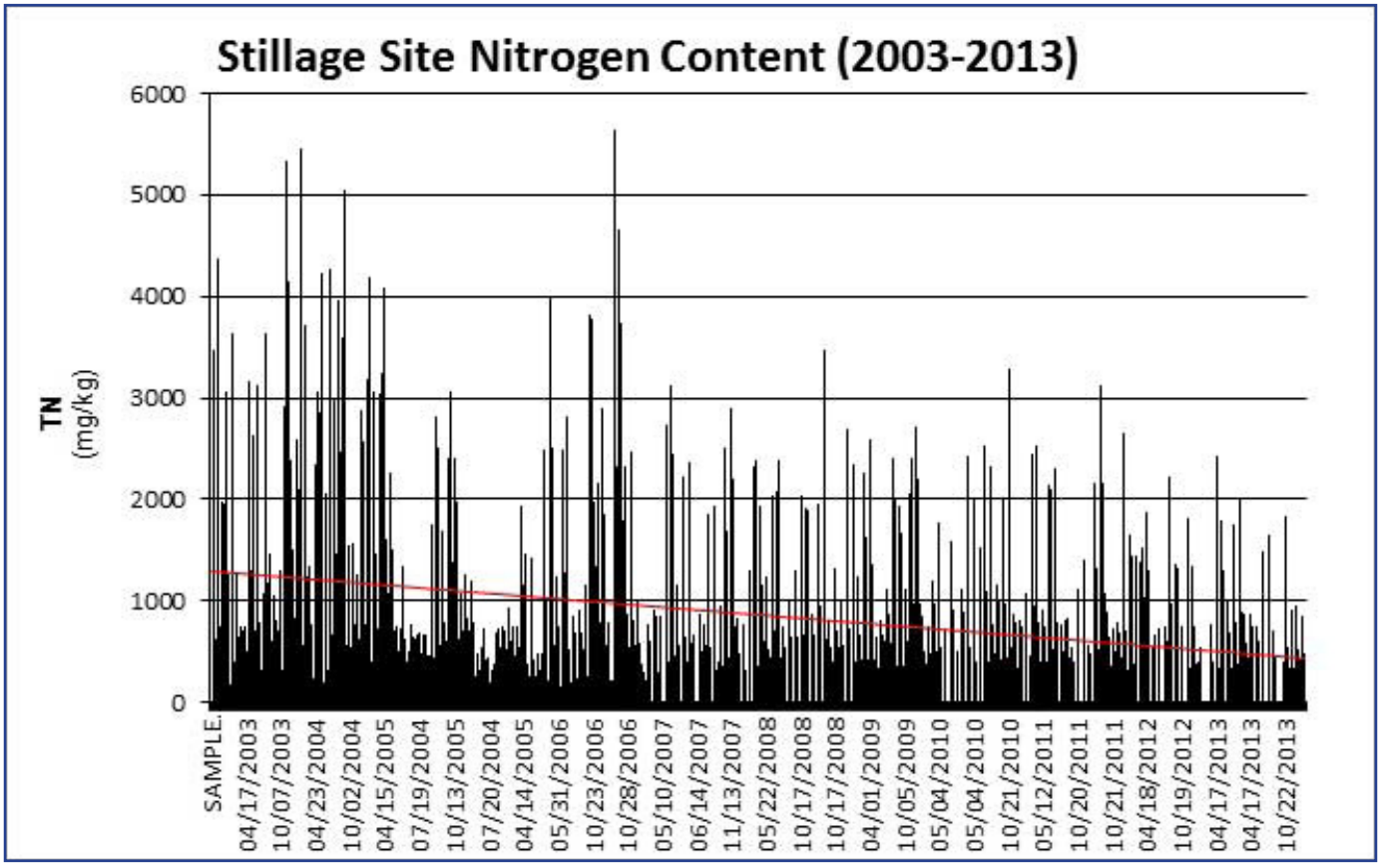
reduced during the last several years and is consistent with crop utilization estimates.

Lessons Learned

The recycled water direct reuse program in addition to the farming activities on the repurposed stillage site have received immensely positive reactions from the community at large. To rehabilitate the stillage site, a public listing for lease participants has been met with consistently high demand. Many farmers who have lived in the area for generations are accustomed to using treated wastewater effluent for farming nonfood crops. Some farmers have irrigated their crops with treated effluent from the RWRF at no cost for over 50 years. Drought conditions and reduced surface water allotments make the nutrient-rich effluent a sustainable source of water, and farmers gain a sizeable return on investment because it cuts down fertilizer input costs while also boosting feed sales at a high market value.

Plans for the Future

The RWRF will continue to lease the former stillage site to farmers who are interested in growing crops that are effective in nitrogen control. In the near future, the RWRF is planning to expand to include distribution and delivery of tertiary disinfected recycled water for unrestricted agricultural use, commercial, industrial reuse and landscape irrigation of freeway medians, golf courses, cemeteries, green belts and parks.



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LAKE SPRINGFIELD NITROGEN MANAGEMENT PROGRAM[6]

Key Collaborators	Illinois Council on Best Management Practices (CBMP), City of Springfield Water Lights and Power (CWLP), Sangamon County Soil & Water Conservation District, Lincoln Land Community College, National Fish and Wildlife Foundation (NFWF), CBMP Council Members: Illinois Corn Growers Association, Illinois Pork Producers, Illinois Fertilizer & Chemical Association, Illinois Soybean Association, Syngenta Crop Protection, Monsanto, Illinois Farm Bureau, and GROWMARK, Inc.
Program Initiated	2013

The State of Illinois and EPA have become increasingly interested in establishing low, numeric nutrient standards throughout Illinois' waters, as these waters represent one of the largest contributors of nutrients to the Mississippi River and the Gulf of Mexico.[7] Illinois point and non-point sources contribute nearly 20% of the total nitrogen and 13% of total phosphorus loading to the Gulf of Mexico.[8] As such, the Gulf Hypoxia Task Force has recommended that Mississippi River Basin States, including Illinois, reduce nitrogen and phosphorus loading by 45% to prevent hypoxia in the Gulf. The difficulty of achieving stringent new standards has prompted innovative collaborations between agriculture, industry, regulatory agencies, and environmentalists.

In 2011, the Illinois Council of Best Management Practices (CBMP)—a coalition of agribusinesses and agricultural organizations which includes the Illinois Farm Bureau and the Illinois Fertilizer & Chemical Association—and the Illinois EPA (IEPA) agreed to allow voluntary, collaborative compliance with water quality regulations to continue until 2025. However, the agreement requires the CBMP to develop a program to educate the agricultural sector on nutrient management techniques, and to focus these efforts within six priority watersheds. In exchange, IEPA has delayed setting stringent numeric nutrient criteria.

The educational program is titled Keep it for the Crop by 2025. In the Lake Springfield watershed located in central Illinois, a unique relationship has emerged between CBMP and the local municipal water utility as a result of these efforts.

In the fall of 2012, a severe drought caused crops to fail throughout the state, leaving a significant amount of nitrogen remaining in the soil. CBMP tried to encourage farmers to plant cover crops with the goal of reducing nitrogen loading in the water. However, farmers were unaccustomed to this practice and were not prepared to undertake the effort that year. The following spring was extremely wet resulting in large amounts of rainfall moving excess nitrogen through the system and into the Lake Springfield watershed.

Realizing that nitrogen levels could rise to concerning levels, CBMP and the City of Springfield Water Light and

6 www.illinoiscbmp.org

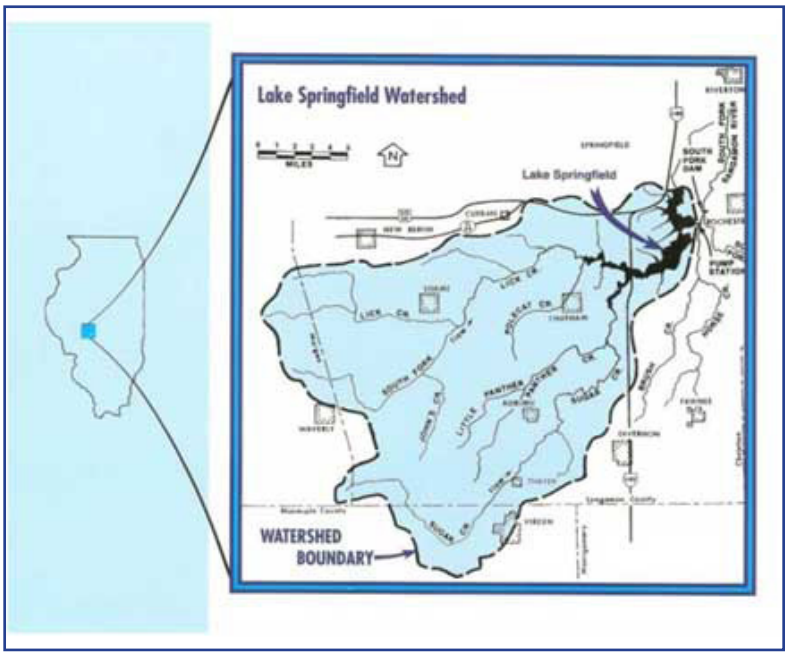
7 Illinois Environmental Protection Agency (2014). Nutrient Reduction Strategy Update [PowerPoint slides]. Retrieved from http://www.epa.state.il.us/water/nutrient/index.html.

8 Ibid.

Power (CWLP) recognized an opportunity to not only work together, but also to educate the agricultural community regarding nutrient impacts to the watershed. CWLP and CBMP partnered to develop the Lake Springfield Nutrient Management Program to achieve a sustained reduction in nitrate loading to Lake Springfield. CBMP received grant funding from the National Fish and Wildlife Foundation, as well as support and matched funds from CWLP.

Accomplishments

- CBMP raised $168,000 per year in grants from NFWF and the CWLP for the three year program.
- A total of 12 farmers have enrolled in the Crop Cover Program, with a combined total of 504 acres of cover crops. The acreage is expected to increase to 1000 by the winter 2014-15, all of which contributes to minimizing sediment and nutrient loading of surface water.



- N-watch sites have been established to monitor crop nitrogen uptake and inventory, track, and verify plant-available nitrogen throughout the year. Currently, 24 N-Watch sites have been established on the cover crop acres, and a total of 59 N-Watch sites have been established throughout the watershed.
- 15 water quality sampling sites were established along the tributaries to Lake Springfield. These sites will be monitored by ambient grab samples twice a week for nitrate nitrogen. The monitoring of these tributaries will help target producers in areas with particularly high water nitrate levels for outreach and education regarding available nutrient management programs. Many producers have expressed an interest in increasing their participation.

Lessons Learned

Though the program is in its infancy, the collaborative relationship between the agricultural participants and the local utilities has been praised by the community. Recently, CWLP received an award from the American Water Works Association for their proactive work and involvement in the Lake Springfield Watershed project. Several utilities have reached out to CBMP and expressed interest in starting programs to reduce nutrient loadings and to support outreach and education in the surrounding agriculture communities.

However, a challenge facing CBMP is its ability to expand this program given the lack of field assistance and staff resources. With respect to the cover crop program, in 2013, many producers waited too long to seed their cover crops, resulting in many cover crop fields that failed to grow due winter frosts.

Additional education will detail the impacts of crop growth on nutrient loading and should help correct these mistakes prior to the next fertilizer and seed application period, beginning November 2014.

CBMP has learned that public utilities and the communities they serve are willing and interested in committing time, energy, and resources into collaborative efforts to improve water quality. Though Illinois agriculture groups have previously faced criticism from the public, the Lake Springfield Nutrient Management Program has

demonstrated that the public is supportive of agriculture-driven projects to reduce nutrient loading.

Plans for the Future

The acreage enrolled in the cover crop program is expected to approximately double in 2014. Several outreach and education sessions have been planned. A 2014 spring producer outreach meeting attracted 115 participants, including 65 farmers from the area. CBMP will continue to hold meetings in the fall of 2014, and is interested in installing a demonstration site at Lincoln Land Community College to educate the public on their efforts to reduce excess nutrients in the watershed. With increased outreach, educational meetings, and on-farm demonstrations, CBMP hopes to raise awareness and increase participation in the Lake Springfield Nutrient Management Program.

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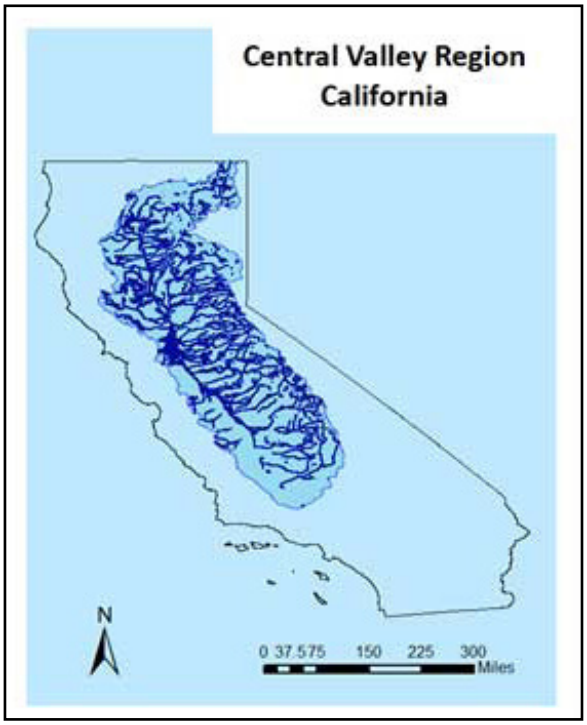
CENTRAL VALLEY SALINITY ALTERNATIVES FOR LONG TERM SUSTAINABILITY (CV-SALTS)[9]

Key Collaborators	East San Joaquin Water Quality Coalition, San Joaquin River Group Authority, San Joaquin Valley Drainage Authority, California Rice Commission, Stockton East Water District, Central Valley Regional Water Quality Control Board, State Water Resources Control Board, Central Valley Clean Water Agencies, Sacramento Regional County Sanitation District, Alta Irrigation District, Tulare Lake Drainage District, City of Tracy, City of Fresno, Dairy Cares, Community Water Center
Program Initiated	2006

Increasing salt and nitrate levels in groundwater in the Central Valley of California pose a long term threat to agriculture and drinking water supplies. The Central Valley is a large area with diverse geography — the salinity and nitrate problem is highly complex and varies regionally. Stakeholders from municipalities, agriculture, industry, regulatory agencies and non-governmental organizations have come together to develop a comprehensive salinity and nitrate management plan and re-vamped regulatory approach.



The Central Valley Salinity Alternatives for Long-Term Sustainability initiative (CV-SALTS) is a collaborative effort initiated by the Central Valley Regional Water Board and key stakeholders in 2006 to develop a sustainable salinity and nitrate management plan for the region. CV-SALTS is working to develop scientific information and revised regulatory policies to enable improved and sustainable management of salinity and nutrients in the Central Valley.

Additionally, CV-SALTS is enabling and funding collaborations between municipalities and agriculture, including a pilot project to examine an innovative nitrate management zone concept at the water district scale.

Accomplishments

Accomplishments with respect to organization, funding, policy and technical work include:

- Initiating a pilot program of municipal/agricultural collaboration to restore impaired water supplies and assure the sustainability of agriculture and community development.
- CV-SALTS has established a common vision, goal and objective and a set of stakeholders that are focused on valley-wide salinity and nutrient solutions and a sustainable agricultural economy.
- CV-SALTS has secured $5 million in funding from the State of California and an additional $4 million to date from major stakeholders to directly support its work. Additionally, the work of the group is supported through in-kind services provided by the participating stakeholders.
- Policy development is occurring through regular facilitated meetings of agricultural, municipal, and other

9 www.cvsalinity.org

interests. CV-SALTS is working to craft practical policy solutions (e.g. new and improved approaches to establishing water quality objectives, beneficial use designations, alternative compliance strategies, variances) within a stakeholder framework.

- Major technical projects that will inform a salt and nitrate management plan for the Valley have already been completed including an initial conceptual model evaluating salt and nitrate trends in groundwater and GIS mapping of existing crops, irrigation systems, soils, well locations and groundwater quality data.

Lessons Learned

A challenge for this project has been to create a positive collaboration between a diverse set of stakeholders with varying interests in an area as large as the Central Valley. The groups represented (agricultural, municipal wastewater and stormwater, regulatory agencies, industry, environmental justice) have their own interests and views due to regional differences.

Keys to the successful collaboration effort to date have included:

- Articulation of a shared vision and purpose
- Strong commitment to the process by all parties who see this effort as an opportunity to "do it right" in setting the stage for a long term plan
- Development of a coalition of stakeholders to provide a portion of the funding
- Adequate funding for organization, facilitation, and technical support to the group
- Use of test cases to explore policy and technical concepts for application on a broad scale

Plans for the Future

The CV-SALTS nitrate management zone pilot project will be completed in 2015. A Central Valley-wide Draft Salt and Nitrate Management Plan (SNMP) will be prepared by summer 2016, with formal adoption in 2018.

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NORTHERN EVERGLADES – PAYMENT FOR ENVIRONMENTAL SERVICES[10]

Key Collaborators	South Florida Water Management District (SFWMD), Florida Department of Agriculture and Consumer Services (FDACS), US Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) , local ranchers
Program Initiated	2011

Florida's Everglades have experienced significant change over the past century. Urban and agricultural development have led to distinct changes in its hydrology. Drainage, irrigation, flood-control, and other water-control projects have transformed southern Florida, leading to degradation of water quality, alteration of the flow regime, and loss of wildlife habitat. Managing the Lake Okeechobee Watershed has presented unique problems to water management districts in the Everglades.

Historically, Lake Okeechobee experienced flooding events that would transport water throughout the Everglades. However, due to urban and agricultural development, the water reaching the lake carries nitrogen and phosphorus loads that are detrimental to the health of the Lake and its surrounding communities. Lake Okeechobee has been subject to limitations for phosphorus since 2011, which requires the reduction of phosphorus loading by 140 metric tons. In addition, large flooding events overflow the Lake's boundaries, causing the release of degraded waters to the delicate estuaries in the Caloosahatchee River and St. Lucie River watersheds, and potentially damaging to the Everglades National Park.

To meet the established target for nutrients and to mitigate detrimental flooding events, the South Florida Water Management District (SFWD) has developed several projects to increase water storage across Southern Florida. One such project, the Northern Everglades – Payment for Environmental Services (NE-PES) program, is a partnership between SFWMD water managers and cattle ranchers to achieve water storage, water quality and habitat improvement benefits in the Northern Everglades. By increasing water storage north of Lake Okeechobee, water managers can reduce the amount of water delivered into Lake Okeechobee during the wet season. Water storage provides other benefits, such as the natural sequestration of nutrients, rehydration of drained systems, and enhanced plant and wildlife habitat. By collaborating with ranchers to store water on rangelands, SFWMD is able to utilize existing infrastructure and minimize costs otherwise associated with similar land-acquisition projects.

To participate in the program, eligible ranchers bid to enter a 10-year contract with the SFWMD to provide water retention or nutrient load reduction services in exchange for payment (i.e., Water Management Alternatives or WMAs). Water Retention WMAs retain on-ranch stormwater to reduce the volume and rate of water flow to Lake Okeechobee and estuaries during periods of high water levels. In addition to retaining water, these WMAs also retain nutrients. Nutrient Removal WMAs divert off-site water and return water with reduced

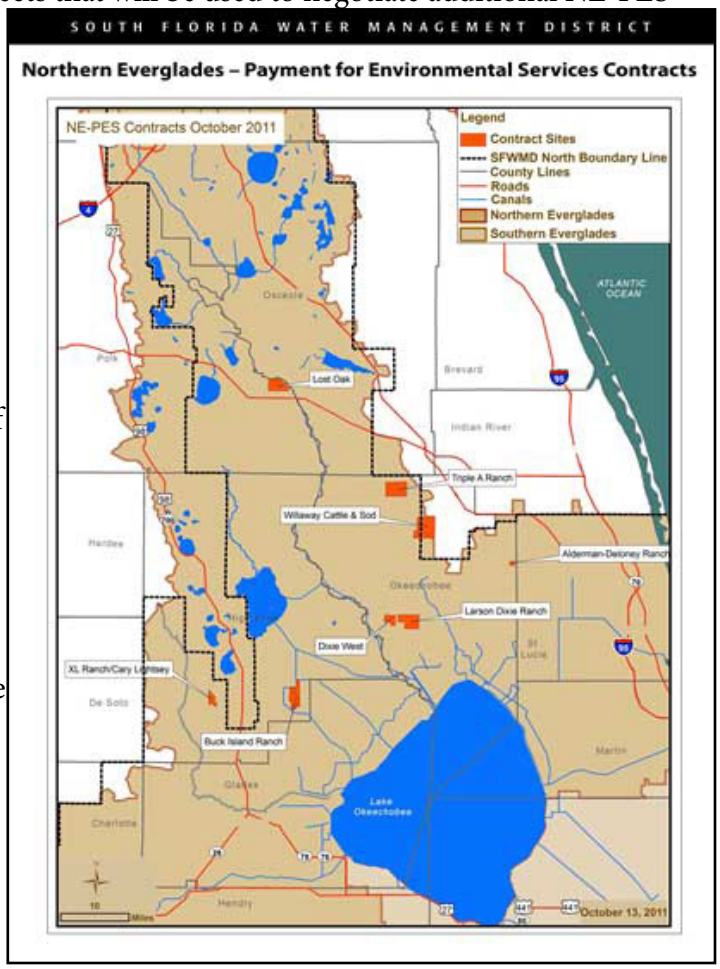
10 http://www.sfwmd.gov/northerneverglades

nutrients to the regional system. Nutrients are removed through natural processes such as sequestration and volatilization. Nutrient Removal WMAs also reduce the volume and slow the movement of water under high water conditions.

Accomplishments

In 2011, the first eight NE-PES projects were approved by the SFWMD Governing Board with two additional water storage projects approved in 2013. Collectively, these projects provide approximately 8,600 acre-feet of water retention on local ranches in the Northern Everglades.

The Florida legislature recently appropriated $5 million in one-time funding and another $5 million in recurring funding for additional dispersed water management projects that will be used to negotiate additional NE-PES contracts.



Lessons Learned

The NE-PES program grew out of the Florida Ranchlands Environmental Services Project (FRESP), a pilot program developed as a proof-of-concept for a payment of environmental services program. During the 6-year pilot program, a number of potential barriers and opportunities to expanding on-ranch water management were identified and incorporated into the NE-PES program: establishing a baseline for payments of environmental services, providing regulatory certainty, and minimizing program application costs.

Throughout the pilot program, both buyers and sellers of the water management services expressed interest in a constant annual payment independent of fluctuations in rainfall. Ranchers would be guaranteed an income source independent of marketplace fluctuations for cattle, and the SFWMD would be able to allot a budget for water retention. However, a constant annual payment required the level of services for the NE-PES contract and the payment to be defined before the implementation of any WMA. The ranches submit with their proposal application, a payment request for 1) the estimated costs of WMA design, permitting, and construction, and 2) a lump sum annual service payment. A model developed during the pilot stage predicts the site-specific average annual water retention over the course of 10-years allowing ranchers to identify the necessary water retention facilities.

The pilot program also brought to light concerns over the regulatory process. Since the NE-PES program requires a 10-year contract, landowners requested assurances that they would be safe from any unanticipated, future, regulatory requirements. In addition, the permitting process during the pilot program was long and arduous. A streamlined process was developed to assist landowners through the regulatory process. Three tools were designed for the NE-PES program: an Endangered Species Act Consultation Guidance Matrix (CGM) issued by NRCS and the U.S. Fish and Wildlife Service for federally listed species whose habitat is in the NE-PES program area that receive assistance from NRCS; 2) a regional general permit from the Army Corps of Engineers; and 3) the development of state and federal government agency memorandums of understanding

(MOUs) and related guidance that identifies roles and responsibilities in implementing and permitting the NE-PES Program.[11]

Nutrient reduction WMAs, though available to interested ranchers, are not currently active. This is because the features required for a nutrient reduction WMA (e.g., the capacity to pump public water through a pasture or marsh, and discharge back into the public canal) are rarer than those of water retention. Given that cattle ranchers comprise the most extensive land use and the largest total source of phosphorus throughout the watershed,[12] future NE-PES contracts should focus on nutrient reduction strategies.

Plans for the Future

While this program has been popular with ranchers, it is still functioning at a small scale with respect to the water retention needed to see measurable environmental benefits. With the additional $5 million in funding obtained in 2014, SFWMD will be able to negotiate and fund new proposals in NE-PES, thereby expanding water storage projects throughout the Northern Everglades.

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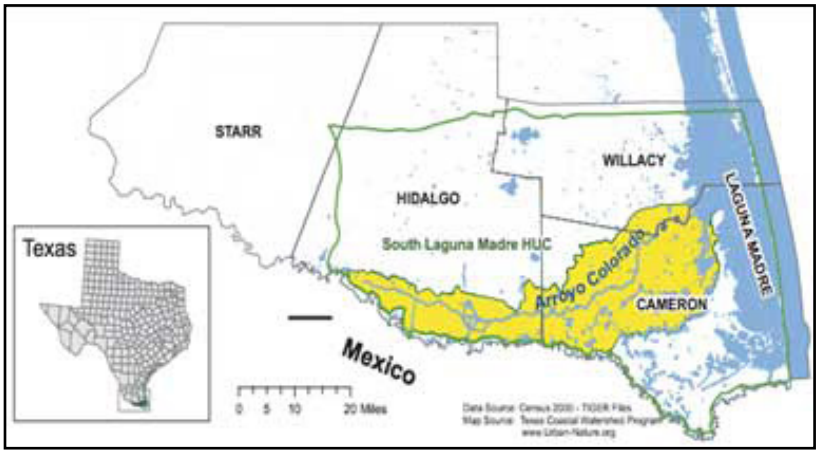
11 Lynch, S. and L. Shabman. (2011). Regulatory Challenges to Implementing a Payment for Environmental Services Program. National Wetlands Newsletter. November-December 2011: 18-21.

12 Ibid.

ARROYO COLORADO WATERSHED PROTECTION PLAN[13]

Key Collaborators	Arroyo Colorado Watershed Partnership, Texas Water Resources Institute, Texas Commission on Environmental Quality (TCEQ), Texas State Soil and Water Conservation Board (TSSWCB), local soil and water conservation districts (SWCD)
Program Initiated	2007

The Arroyo Colorado flows through Hidalgo, Cameron and Willacy Counties in the Lower Rio Grande Valley of Texas into the Laguna Madre and drains a 2,344 square mile watershed, the Main Floodway and the North Floodway. The Arroyo Colorado waters are sustained by natural base flow, urban runoff, agriculture irrigation return flows, and wastewater discharge from twelve cities. The Arroyo is the major source of fresh water to the lower Laguna Madre, an economically and ecologically important region.



Approximately 300,000 acres of irrigated cropland can be found within the Arroyo Colorado watershed.[14] The market value of crops sold in Cameron County is over $62 million and over $182 million in Hidalgo County. And agriculture in the Valley is important to the Texas economy as, combined, Cameron and Hidalgo Counties account for nearly 28% of Texas' state market value of vegetables sold and over 49% of Texas' fruit market value.[15] However, agricultural runoff has contributed to degradation of the Arroyo. Nearly 87% of the suspended sediment, 41% of the biological oxygen demand (BOD), 68% of the nitrate, 64% of the ammonia, and 49% of the phosphate loads can be attributed to agricultural runoff.[16]

Since 1986, as a result of BOD and ammonia loadings, the tidal segment of the Arroyo Colorado does not meet aquatic life standards for dissolved oxygen. The Texas Commission of Environmental Quality (TCEQ) estimates a 90% reduction in nitrogen, phosphorus, and oxygen demanding substances is necessary to meet these standards.

In 2005, in response to this challenge, the Arroyo Colorado Watershed Partnership (ACWP) was formed. Administered by the Texas Water Resources Institute, a unit of Texas A&M AgriLife, in cooperation with the TCEQ and the Texas State Soil and Water Conservation Board (TSSWCB), the ACWP represents a collaboration of federal, state, and private organizations whose goal is to improve watershed health through integrated watershed management and better use of watershed project funding.

To address the known problems associated with agricultural runoff, the AGWP has formed an Agriculture Issues Work Group, whose goal is to achieve the voluntary adoption of BMPs on 50% of the irrigated cropland by 2015.

13 arroyocolorado.org/watershed-protection-plan/

14 2006. *Arroyo Colorado Watershed Protection Plan: Components Addressing Agricultural Nonpoint Source Pollution*. Prepared by the Agricultural Issues Work Group of the Arroyo Colorado Watershed Partnership.

15 Ibid.

16 2006. *Arroyo Colorado Watershed Protection Plan: Components Addressing Agricultural Nonpoint Source Pollution*. Prepared by the Agricultural Issues Work Group of the Arroyo Colorado Watershed Partnership.

To achieve this goal, the group is offering four types of assistance to local farmers and landowners: technical assistance, cost share assistance, education and training, and monitoring and assessment.

Accomplishments

Agricultural producers have received significant guidance and support from Texas A&M AgriLife Extension Service, TSSWCB, USDA-NRCS and the local Soil and Water Conservation Districts (SWCDs) in the form of education, cost-share and technical assistance to install BMPs. Nearly $2 million in grants have been allocated towards the four goals of the Agriculture Issues Work Group (AIWG). More than 3,500 producers have been part of the program's education and outreach efforts. In 2011, nearly 16% of agricultural cropland (over 100,000 acres) across three counties had implemented Water Quality Management Plans (WQMPs). The ACWP has also conducted agriculture runoff assessments and BMP nutrient reduction modeling. The assessments help identify the true extent of nutrient loading to the river, determine the optimal location to implement BMPs, and demonstrate their effectiveness.

Lessons Learned

Results from BMP demonstrations and runoff assessments have shown producers how to minimize impacts to water quality, while still maintaining crop yields. Additionally, drainage ditch monitoring has demonstrated the potential for ditches to remove nutrients before entering the water body. After developing models for BMP performance, AgriLife Research at Temple of Texas A&M University has developed a suite of recommended BMPs that will help decision makers implement practices that will optimize nutrient removal with the least investment.

Plans for the Future

Though the program has been successful in educating the community about the impacts of agriculture runoff and has successfully implemented over 1000 WQMPs, the goal of the Arroyo Colorado Watershed Protection Plan is to reduce nutrient loading by over 1300 tons per year. To determine the effects BMPs and WQMPs have on reducing the nutrient loading, the ACWP will continue to conduct detailed runoff assessments, modeling, and long-term water quality monitoring.

The AIWG hopes to implement WQMPs on 150,000 acres of land by 2015, and to develop new milestones for nutrient loadings by 2020. In addition, ACWP plans to continue the education, outreach, and cost-sharing programs to provide landowners with the necessary tools to address nutrient loading and pollution in the Arroyo Colorado.

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Federal Efforts to Promote Collaboration

Some of the collaborative case studies described in this report have taken advantage of Federal policy and funding initiatives. EPA's Water Quality Trading Policy has provided a framework for successful municipal-agriculture collaborations as described for the Great Miami River Watershed. In addition, the Regional Conservation Partnership Program (RCPP) and the Conservation Reserve Enhancement Program (CREP) which are included in the 2014 Farm Bill, are intended to foster more collaborative efforts across the country by coordinating USDA funding initiatives. The CREP provided the basis for the Enhanced CREP described for the Tualatin River Watershed and is one of the resources used by the New York City Watershed Protection Program.

EPA'S 2003 WATER QUALITY TRADING POLICY[17]

Water quality trading provides an opportunity for sources with high unit costs of pollutant reduction to purchase and use towards compliance less expensive and environmentally-equivalent pollution reductions from other sources. While NPDES Permits and TMDLs adopted under the CWA drive most of the current activity in water quality trading, it is also possible to have trading driven by local water quality needs or non-regulatory drivers.

The CWA was written before water quality trading was in use. To provide greater context and detail around this growing approach, EPA released a Water Quality Trading Policy in 2003. The trading policy was developed based on the premise that trading has the potential to achieve water quality and environmental benefits that are greater than would be achieved through traditional approaches. The policy supports trading programs that occur within a single watershed and are consistent with CWA requirements, and encourages this approach for nutrients in particular. The policy sets guidelines for setting baselines and describing when trading can occur (e.g., to meet water quality standards, a TMDL, etc.). Common elements of a credible trading program include adequate legal authority; clearly defined units of trade, credits and duration of credits; compliance provisions; public participation; and program evaluation.

In addition to the national policy, nine states have established statewide regulatory authority for trading via statute, regulation, policy, or guidance: Colorado, Idaho, Michigan, Minnesota, Ohio, Oregon, Washington, Wisconsin, and West Virginia. Four additional states have issued policy, guidance, or rules for nutrient trading in particular watersheds: Pennsylvania, Virginia, North Carolina, and Florida.

Water quality trading policies allow municipalities to invest in voluntary agricultural practices, which are more cost-effective and provide broader environmental benefits, than technology upgrades at wastewater treatment plants. In addition to the water quality trading program described for the Great Miami River Watershed, water quality trading principles have contributed to the success of the programs described for the New York City Watershed and the Tualatin River Watershed.

17 EPA, Office of Water. Water Quality Trading Policy. January 13, 2003.

NRCS PROGRAMS RELATED TO WATER QUALITY

USDA operates many programs dedicated to soil and water conservation, ecosystem services, and sustainable agriculture. Under USDA, NRCS is the agency most focused on improving water quality. NRCS works with farmers, ranchers, and private forest landowners nationwide to identify and address natural resource objectives and implement conservation practices to deliver environmental benefits at the local, regional, and national level. NRCS accomplishes this task by administering programs that fund adoption and implementation of conservation practice standards by farmers, ranchers, and landowners, and provide associated technical assistance to farmers. Many of the conservation practices supported by USDA can also generate non-point source credits under water quality trading programs.

USDA conservation activities and programs have a long history. The initial focus of these efforts was to reduce soil erosion and improve soil health. The 1985 Farm Bill authorized the Conservation Reserve Program (CRP) which pays farmers for conserving sensitive cropland by taking it out of production. The 1990 Farm Bill created the Wetlands Reserve Program, and the Water Quality Incentives Program, which was the first time the Farm Bill linked conservation programs to water quality. The 1996 Farm Bill created the Environmental Quality Incentives Program (EQIP), which provides cost sharing adoption of specific conservation practices on working lands. The 2002 Farm Bill greatly expanded funding for all of the above programs and created some additional subprograms. Most relevant to water quality, the 2002 bill established the Conservation Security Program (CSP) and the Conservation Innovation Grants (CIG) program under EQIP. The CIG program provides grant funding to state and local governments and non-governmental organizations (NGOs) for demonstrating and testing innovative approaches to conservation and stewardship. CSP provided incremental financial incentives to farmers for long-term land stewardship. However, in 2008 the CSP program was dissolved and replaced by the Conservation Stewardship Program, which provides an annual land-use payment in exchange for environmental benefits they produce. The key to the new program is that participants are paid for conservation performance.

After several decades of Farm Bill initiatives, over 20 distinct conservation programs provided annual funding greater than $5 billion for conservation activities on the farm. The differences and number of these programs created confusion about the purpose, participation, and policies of the programs. Discussion about simplifying or consolidating conservation programs to reduce overlap and duplication, and to generate savings, has continued for a number of years. The 2014 Farm Bill, enacted on February 7, 2014, aims to streamline many of these existing conservation programs into several different categories: working lands conservation programs, land retirement and easement programs, other conservation programs, and compliance programs. Several programs were consolidated into a newly established program known as the Regional Conservation Partnership Program (RCPP). RCPP combines the authorities of four former conservation programs – the Agricultural Water Enhancement Program, the Chesapeake Bay Watershed Program, the Cooperative Conservation Partnership Initiative and the Great Lakes Basin Program.

The RCPP is designed to enhance regional cooperation to more effectively implement and maintain conservation activities, and to deliver conservation assistance to producers and landowners. NRCS provides assistance to producers through partnership agreements and through program contracts or easement agreements with entities including municipal wastewater and drinking water utilities. Assistance is delivered in accordance with the rules of EQIP, CSP, the Agricultural Conservation Easement Program (ACEP), and Healthy Forests Reserve Program (HFRP); and in certain areas the Watershed Operations and Flood Prevention Program. RCPP encourages collaborative projects between partners and producers to increase the restoration and sustainable use of soil, water, wildlife and related natural resources on regional or local watershed scales.

In Fiscal Year 2014-2015, the RCPP provides nearly $400 million in funding to apply to new, collaborative projects. Funding for RCPP is allocated to projects in three different categories: Critical Conservation Areas,

National, and State. Critical Conservation Areas (CCAs) consist of eight geographic areas chosen by the Secretary of Agriculture. Seven of the CCAs list water quality degradation and nutrients as primary resource concerns.

For more than twenty years, conservation programs through the NRCS have aided farmers and producers in conserving land and improving the quality of water, air, and soil resources. Over the years, natural resources management techniques have changed, with collaborations between different stakeholders becoming more common. The new RCPP seeks to address and facilitate the rise of collaborative conservation projects throughout the nation, by providing financial assistance and guidance for developing effective and healthy conservation oriented partnerships.

FOSTERING COLLABORATION

Flexibility exists for program designers to innovate and customize programs to their watershed's unique needs. For programs involving agricultural sources, field-level organizations with established connections to the agricultural community play a critical role. These organizations not only have the trust of farmers, but can supply vital technical expertise in planning and implementing BMPs. Conservation districts can be involved in different ways, such as preparing BMP proposals for farmers, estimating pollutant reductions, and monitoring the implementation and maintenance of the BMPs. Conservation districts can also play an important planning role in helping locate and aggregate trades among the agricultural community. Soil and Water Conservation Districts are key partners in the New York City Source Water Protection Program, the Great Miami River Watershed Trading Program, and the Tualatin River Watershed Programs.

Water quality trading, Farm Bill programs, technical assistance from conservation districts, and drinking source water protection programs have all contributed in different ways to the collaborations described in this report. In many of the examples, innovative opportunities have been identified that link economic development with conservation improvements. Also, trading programs have fostered new relationships between farmers, ranchers, forest landowners and municipalities.

Conclusions

Watershed-based solutions to improving water quality are not new. Land management practices that can both reduce nutrients being released to waterways and improve the productivity and sustainability of a farm have been recognized for decades. For example, many farms began experimenting with 'no-till' practices in the 1980's that resulted in improving the permeability of the soil and retention of water which, in turn, improved the productivity of the land. By increasing the water retention on site, runoff and nutrient pollution were significantly reduced benefiting both the aquatic ecosystem and the farm. In fact, during drought years, long-term continuous no-till land often has higher yields than farms with traditional tillage practices. This is due to greater water harvesting and holding capacity based on increased organic matter and much improved tilth in the soil.[18] In one example, in 2012, no-till corn fields in Indiana averaged 220 bushels per acre (bpa) while conventionally tilled fields in the area typically yielded 50 bpa less on similar soil types.[19]

The case studies described in this paper clearly demonstrate the potential that exists for successful collaborative efforts between municipal entities, farmers and other stakeholders. In examples from around the United States, collaboration has been a key to opening the door to more effective management decisions and multiple benefits in addressing issues of watershed health and water quality improvement.

Some common themes that emerge from these examples of successful collaboration are:

- Building trust between municipalities and agriculture is critical and is typically accomplished through multiple meetings and interactions
- Effective communication uses common language and relies on partnerships with trusted intermediaries to the municipal and agricultural communities
- Demonstrating positive results through pilot studies or early projects helps to build participation
- Approaches and solutions should make good business sense and be beneficial to both agricultural and municipal participants
- Regulatory frameworks should be developed as needed to provide clarity and support a "common sense" approach
- Adequate financial incentives, training, and technical resources can lead to a commitment to participate and even competition to participate
- Voluntary approachs can be effective at providing benefits to all participants especially when based on mutual trust and commitment

18 Triplett, G. B. Jr. and W. A. Dick. 2008. No-Tillage Crop Production: A Revolution in Agriculture! Agronomy Journal 100: S-153–S-165.

19 J. Moseley, August 2014. Personal communication.

An observation regarding future collaborations: While successes at multiple levels have been documented in the examples described herein, resolution of water quality impairments and attainment of water body concentration targets are not commonly cited. To enhance the mutual understanding of the needs and interests of both agricultural and municipal partners, and to create even more potential for the long term success of collaborative efforts, greater emphasis needs to be placed on the attainment of specific water quality goals. The development of predictive tools to link management actions (such as nutrient load reductions) to the creation of benefits to uses (i.e. aquatic life/ecosystem uses, municipal water supply, recreational uses) is essential. While a common approach has been to presume such benefits, it is becoming increasingly important, and technically feasible, to measure the tangible watershed and water quality benefits achieved.

The case studies described in this paper clearly demonstrate the viability and power of collaboration as a problem solving framework. Collaborations between agricultural, municipal and other interests that have focused on healthy watersheds, sustainable agriculture, and smart business decisions are cost effective for all parties. The lessons learned from these case studies provide information that can help light the way for similar efforts. It is hoped that the RCPP provisions of the new Farm Bill and other initiatives will provide incentives for future collaborative efforts and help build momentum for outcomes that are mutually beneficial to municipalities and the agricultural community.

Acronyms

ACEP	Agricultural Conservation Easement Program
ACW	Arroyo Colorado Watershed
ACWP	Arroyo Colorado Watershed Partnership
AWEP	Agriculture Water Enhancement Program
BMPs	Best Management Practices
BOD	Biological Oxygen Demand
bpa	Bushels Per Acre
CBMP	Council on Best Management Practices
CCAs	Critical Conservation Areas
CIG	Conservation Innovation Grants
CREP	Conservation Reserve Enhancement Program
CSP	Conservation Security Program
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CWA	Clean Water Act
CWLP	City of Springfield Water Light and Power
CWS	Clean Water Services
DEP	Department of Environmental Protection
DNR	Department of Natural Resources
EQIP	Environmental Quality Incentives Program
EPA	Environmental Protection Agency
FAD	Filtration Avoidance Determination
FDACS	Florida Department of Agriculture and Consumer Services
FRESP	Florida Ranchlands Environmental Services Project
FSA	Farm Service Agency
GMRW	Great Miami River Watershed
HFRP	Healthy Forests Reserve Program
IEPA	Illinois EPA

MMSD	Madison Metropolitan Sewerage District
MOUs	Memorandums of Understanding
MS4s	Municipal Separate Storm Sewer System
NFWF	National Fish and Wildlife Foundation
NE-PES	Northern Everglades – Payment for Environmental Services
NGOs	Non-Governmental Organizations
NMPs	Nutrient Management Plans
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
POTWs	Publicly Owned Treatment Works
RCPP	Regional Conservation Partnership Program
RWRF	Regional Water Reclamation Facility
SDWA	Safe Drinking Water Act
SFWMD	South Florida Water Management District
SNMP	Salt and Nitrate Management Plan
SWCD	Soil and Water Conservation District
TCEQ	Texas Commission on Environmental Quality
TSSWCB	Texas State Soil and Water Conservation Board
USDA	United States Department of Agriculture
EPA	United States Environmental Protection Agency
USGS	United States Geological Service
WAC	Watershed Agricultural Council
WAP	Watershed Agricultural Program
WFPs	Whole Farm Plans
WINs	Yahara Watershed Improvement Network
WMA	Water Management Alternatives
WQMPS	Water Quality Management Plans