ESMC
Ecosystem Services Market Consortium

Mississippi River Basin State Policies Relevant to Environmental Market Development

A Rapid Assessment

Ecosystem Services Market Consortium, February 2021

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Executive Summary

This rapid assessment summarizes conditions in specific Mississippi River Basin (MRB) states that may support or inhibit the trading of **soil carbon**, **net greenhouse gas (GHG)**, **water quality and/or water quantity** assets (voluntary) or credits (compliance) generated from the agricultural sector as developed through robust ecosystem markets revolving around the advancement of agricultural outcomes. The authors (the Sand County Foundation and the Environmental Policy Innovation Center) have developed this rapid assessment on behalf of the Ecosystem Services Market Consortium (ESMC) to inform their market development activity in the region. The authors have categorized relevant conditions as **people**; **policies and programs**; and **payments**. The geographic scope of the assessment is limited to the agricultural working lands of the lower 48 states, with a primary focus on states along the main stem of the Mississippi River, and more specifically where ESMC has pilot projects. Accordingly, the states covered in this report are **Iowa, Illinois, Kansas, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin.** It is important to note that this rapid assessment is not comprehensive, but rather serves as an initial approximation of potential opportunities or hinderances present in the states for the environmental outcome trading types considered.

The states included in the rapid assessment present different opportunities depending on the impact of the dynamic mix of people, policies and programs, and payments within each state for soil carbon, GHG, and/or water quality/quantity. Soil carbon and net GHG opportunities from agricultural land appear promising in states that are focusing on soil health, and this focus brings water quality into the outcomes produced as well. However, programmatic infrastructure, rules and regulations surrounding soil health are limited; therefore, developing and locating avenues through which to connect with and engage producers will be critical. Many states are developing water quality trading programs for compliance-grade credits and some have regulatory drivers in the form of numeric nutrient criteria, but complicated rules and requirements combined with a smaller geography of potential trading for compliance purposes may serve as a barrier to rapid trading program deployment or will at the least require engagement from ESMC with state water quality regulators to determine how the ESMC market may operate.

Based on their initial and rapid assessment, the authors have identified several states where conditions align in favor of a successful environmental market for one or more of the environmental outcomes considered. High-level recommendations and potential next steps for each of the states are presented in table 1. The highlighted states are worth prioritizing.

Table 1: High Level Recommendations and Next Steps		
State	**Recommendations**	**Potential Next Steps**
Iowa	**Prioritize**/engage for compliance-grade water quality credit generation	Engage with Iowa DNR
Illinois	Wait and watch; additional research required	Monitor evolving legal situation; conduct additional interviews/desk research on potential for environmental markets
Kansas	Engage for compliance-grade water quality credit and Scope 3 soil carbon/GHG asset generation	Engage with Kansas Department of Health and Environment; potential pilot project of Inverse Nutrient Trading concept
Minnesota	Engage for compliance-grade water quality credit and Scope 1/3 soil carbon/GHG asset generation	Engage with Minnesota Pollution Control Agency
Missouri	**Prioritize** for compliance-grade water quality credit and Scope 3 soil carbon/GHG asset generation	Engage with Missouri DNR's Nutrient Trading Workgroup
Nebraska	**Prioritize**/engage for soil carbon, net GHG and Scope 3 water quantity asset generation	Engage with Nebraska's Healthy Soils Task Force; potential pilot project
Ohio	Wait and watch; additional research required	Conduct additional interviews/desk research on potential for environmental markets
Wisconsin	Engage for compliance-grade water quality credit generation and for Scope 3 soil carbon and net GHG asset generation	Engage with Wisconsin DNR (water quality) and with the Governor's Task Force on Climate Change (soil carbon/net GHG)

Iowa

The authors did not locate clear obstacles to trading in Iowa. Rather, the authors found that an enabling environment for water quality trading has developed in the state. The state is motivated to increase adoption of conservation practices on agricultural lands that can generate positive environmental benefits, in particular for water quality and flood risk. Particular attention is given to increasing acreage under cover crops. The state is pursuing a flexible trading policy to reach water quality goals rather than implementing stringent numeric regulatory criteria. A water quality trading platform (Nutrient Reduction Exchange, or NRE) and framework is already in place, buoyed by champions both at the regulatory agency as well as through multiple watershed-scale stakeholder forums. The platform and framework are flexible and have been designed to accommodate other types of environmental outcome credits. An innovative Memorandum of Understanding (MOU) has been developed and approved for connecting point and nonpoint sources in water trading arrangements through the state's NRE. The size of the water quality compliance trading market will, however, always be limited because of the disproportionate ratio between urbanized areas and agricultural ones.

Illinois

While Illinois was the site of the Chicago Climate Exchange and has had water quality-related activity, the state currently lacks a coordinated state-level effort around water quality trading or soil health planning and the research did not identify any particular champions for water quality or soil health. The state

appears to be focused on watershed planning through developing Nutrient Assessment Reduction Plans, though these plans do permit water quality trading. Interviews suggest that addressing five of the nine major point source facilities in the state would provide a large reduction in phosphorus load, albeit at a higher cost at the facility-level. Further, ongoing litigation from environmental groups has created an environment of uncertainty; uncertainty surrounding the performance of best management practices (BMPs), necessary trade ratios, and in long-term farmer participation are also impeding the development of viable point/nonpoint source trading programs in the state. At the same time, over half of Illinois' land (60%) is in row crop agriculture, where 80% of the nitrogen pollution load and 48% of the phosphorus pollution load originates, underscoring the need for effective conservation practice implementation on Illinois' farms.

While the authors did not locate a coordinated effort at the state level that could support the development of environmental markets, the state does not have a policy that would prevent trading. And, the state currently has a Democratic governor (J.B. Pritzker), a super majority in the legislature, and is a US Climate Alliance state. Interviews suggest that the landscape has changed since the time of the Chicago Climate Exchange, and conservation practices on farms are now a normal element of farm life.

Kansas

Similar to other states in the Mississippi River Basin, the rural make-up of Kansas leads to a high proportion of overall nutrient load delivered from nonpoint sources. However, Kansas does not have numeric nutrient criteria (NNC) or a formal nutrient reduction strategy as the state considers itself fringe in the Gulf Hypoxia work. Kansas also does not provide extensive funding for nonpoint sources and does not have a dedicated tax-based source of revenue for conservation practices. For these reasons, Kansas is actively working on a water quality trading framework and has active champions in state agencies promoting a flexible approach termed "Inverse Nutrient Trading" to achieve water quality goals. While this framework is still in concept stage, the research indicates that the state is likely to move ahead with a pilot program in 2021. Kansas is also taking action on soil health: soil health was a major driving factor in the state's participation in an ESMC pilot within the state. The state has completed background watershed planning work to inform water quality and soil health work in a collaborative, stakeholder-driven framework; this process has also provided necessary capacity building for a trading program.

Minnesota

The authors did not find evidence of specific policies in Minnesota that would explicitly impede development of environmental markets. Rather, the authors found that the state is actively engaged in developing policies and programs around water quality, soil health, and climate change. The authors found evidence of champions for water quality trading, climate change action, and soil health. As a result, the state does have numerous current regulations, programs and policies the requirements of which would need to be considered for market credit generation and development, including its own water quality trading framework under development. Unlike the more flexible approaches taken by some states in the Mississippi River Basin, Minnesota has a strong regulatory approach for water quality, soil health, and climate change/GHG emissions reductions. For example, Minnesota has established phosphorus numeric nutrient criteria for both lakes and rivers. The state has a strong water quality monitoring program at the watershed level, made possible by dedicated tax-based funding through the 2008 Clean Water Land & Legacy Amendment to the state's Constitution. This funding source also spurred

development of a Clean Water Plan for the state, with specific goals for water quality and quantity, and is supporting programs to diversify economic opportunities for farmers in Minnesota, including for carbon and soil health. The state has active soil health programs in collaboration with the academic sector, and an active statewide climate change planning process with GHG emissions reductions goals underway that is looking at environmental markets and emissions reductions possibilities on agricultural lands.

Missouri

The research suggests that Missouri does not have specific policies that would impede development of an environmental market or generation of environmental credits from agricultural lands. Missouri is actively creating a centralized trading infrastructure to lower barriers and costs for trading, but potential trading programs in the state, while required to follow certain aspects of their trading program, are not required to use the centralized infrastructure. A part of the trading infrastructure includes development of a Water Quality/Nutrient Credit Clearinghouse that would leverage the state's Soil and Water Conservation Program (state cost-share), which stands as a stable pool of money that could support practices and trading moving forward. The Program also has the trust of and existing agreements with farmers. The authors also found champions for water quality trading and soil health/agricultural conservation practices. Missouri combines this somewhat flexible approach with regulatory drivers. Missouri has developed NNC for nitrogen and phosphorus for lakes; these are currently being challenged legally but interviews suggest that the standards would only become more stringent (EPA's NNC proposal included impairment designations for more lakes and impacted a greater number of wastewater facilities than Missouri's rule). While research focused on water quality, soil carbon and GHG emissions credit generation, one industry interviewee noted that Missouri would also be very interested in habitat/biodiversity credit generation as well.

Nebraska

The research suggests that Nebraska does not have specific policies that would impede development of an environmental market and generation of environmental credits from agricultural lands. In contrast to other states included in this assessment, where water quality and phosphorus were areas of focus, Nebraska is focused on soil health and nitrogen in groundwater supplies. Given that 85% of the state relies on groundwater for drinking water (from the Ogallala Aquifer), and the high nitrate levels in the state's groundwater, nitrogen and water quantity are more apparent areas of potential for environmental market development and credit generation. The state is actively pursuing development of a state Soil Health Hub that would serve in part to facilitate investment in agricultural conservation practices. Interviews indicated that NRCS funding is largely delivered to irrigation improvement projects because Nebraska has the highest percentage of irrigated cropland in the country, leaving a small percentage for other practices such as cover crops. One interviewee associated with the state's soil health initiative noted that only 8% of cover crops in Nebraska were installed through Federal cost-share. With limited state cost-share, a large investment potential in agricultural conservation practices remains. Further, a focus on soil health can produce water quality, soil carbon, and GHG emissions reductions benefits, potentially generating credits for multiple ecosystem services markets.

Ohio

The research did not find elements that would preclude environmental market development in Ohio. While the state has established water trading rules, the limited number of water quality trading programs currently operational suggest that enabling elements are missing in the state despite a formal trading framework. For example, Ohio does not have NNC. The authors also did not locate a water quality trading or soil health champion but recognize a number of initiatives ongoing in the state that are focused on soil health and stewardship on agricultural lands, including the Ohio Agriculture Conservation Initiative and the Soil Health Symposium. Earlier programs to achieve trading have stumbled after years of development because regulation-driven demand for phosphorus reduction has not materialized; market opportunities would probably grow if those conditions changed. The authors conclude that additional research is necessary to determine the potential for market development and environmental credit generation in Ohio.

Wisconsin

The research did not find elements that would preclude environmental market development in Wisconsin. The research indicates that Wisconsin approaches water quality from a regulatory perspective: the state has numeric nutrient criteria for phosphorus and a water quality trading/adaptive management program in place that is being used by a number of regulated facilities. Wisconsin's very low nutrient limits have led the state to encourage watershed-based work given the difficulty facilities have in meeting the limits. Phosphorus and sediment are the primary focus in the state. The high level of development in Wisconsin's water quality trading framework means that ESMC will have to conduct additional research through engagement with the state's Department of Natural Resources (DNR) to determine how the ESMC platform might fit within the state, and where barriers are or adjustments may be required. While this research did not identify any specific state-level soil health programs, recent climate change related work on strategies to reduce emissions by the Governor's Task Force on Climate Change has specifically called out carbon farming and supporting farmer-led groups to increase carbon sequestration on agricultural lands. Engaging with the Governor's Task Force may therefore be a logical entry for soil carbon market discussions for ESMC.

Introduction

The Mississippi River Basin (MRB) is the third largest river basin in the world; only the Amazon and Congo Basins are larger. The MRB occupies 41% of the contiguous United States and drains water from all or part of 31 states, representing a drainage basin of over 1.2 million square miles. The MRB is also the site of heavily concentrated industrial agriculture, largely rainfed to the east of the River and irrigated to the West. Roughly 65% of harvested cropland in the U.S. is grown within the Basin, and more than 100,000 tons of pesticide and 6.5 million tons of commercial nitrogen fertilizers are applied each year to this cropland.[1] Runoff from agricultural land, influenced by these and other farming practices, has led to high levels of nutrients, sediment, and other pollutants discharged to the Mississippi River, which empties into the Gulf of Mexico and creates the large hypoxic "dead zone". In 2020, the dead zone measured 2,116 square miles.[2]

Given its size and impact, the agricultural sector in the MRB presents an important opportunity to address water quality issues at the Basin scale. State-level action around water quality in the Mississippi River Basin is driven in part by participation of many of the states covered in this policy assessment in the Mississippi River/Gulf of Mexico Hypoxia Task Force. Under the Task Force, 12 states have developed final or draft nutrient reduction strategies to reduce nitrate and phosphorus flowing to the Gulf by 45%.[3] At the same time, the agricultural sector is increasingly seen as an opportunity to generate many other beneficial environmental outcomes that can also be win-win situations to agricultural producers. Improving soil health, for example, has the potential to simultaneously improve soil carbon content and water quality while increasing soil productivity and therefore potential profitability.

Scope

Through this rapid assessment, the authors summarize conditions in specific MRB states that may support or inhibit the trading of **soil carbon**, **net GHG**, **water quality and/or water quantity** assets (voluntary) or credits (compliance) generated from the agricultural sector as developed through robust ecosystem markets revolving around the advancement of agricultural outcomes. As discussed in the methods section below, the authors have categorized relevant conditions as **people**, **policies and programs**, and **payments**. The geographic scope of the assessment is limited to the agricultural working lands of the lower 48 states, with primary focus on states along the main stem of the Mississippi River, and more specifically where ESMC has pilots. Accordingly, the states covered in this report are **Iowa, Illinois, Kansas, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin.** The authors' policy assessment is summarized in table form as a matrix with these states on one axis, environmental outcomes on the second axis, and relevant people, policies and programs and payment sources listed within the cells. Following the matrix, the authors present summaries for each state in which the authors discuss key elements of the matrix that may impact environmental market development and environmental credit generation.

[1] https://www.sciencedirect.com/science/article/abs/pii/S0048969799005306?via%3Dihub
[2] https://www.epa.gov/ms-htf/northern-gulf-mexico-hypoxic-zone
[3] State members of the Gulf Hypoxia Task Force are Iowa, Arkansas, Illinois, Indiana, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Ohio, Tennessee, and Wisconsin.

It is important to note that given the scope of work, this policy assessment does not serve as a comprehensive summary. Rather, the policy assessment reflects a targeted review of those policies and programs that would most likely provide enabling or disabling conditions for the development of environmental markets and trading in these ecosystem services. State summaries are provided after the matrix that draw out key policies and programs in the states and offer qualitative assessment of whether the policies and programs may facilitate or hinder market development. The policy assessment also does not include a comprehensive examination of tax policy as related to environmental credit generation from the agricultural sector but does document instances of tax policies that may help or hinder environmental markets as these examples arose over the course of the research.

Through this rapid assessment, the authors provide an overview of what specific states in the Mississippi Basin are currently doing to improve water quality, soil carbon, and net GHG emissions outcomes from the agricultural sector. Actual changes to agricultural practices for better environmental outcomes in the Basin will be determined by social, environmental, regulatory, and economic drivers for water quality, soil carbon, GHG emissions reductions and other environmental outcomes that are beyond the scope of this rapid assessment. The authors do note that important drivers for water quality exist in the region, such the goals and plans developed through the Mississippi River/Gulf of Mexico Hypoxia Task Force; as do important drivers for soil carbon and GHG sequestration in agricultural soils, notably corporate sustainability goals and shareholder requirements in an area that includes many source producers for large agribusiness companies. The authors also note that state activities must be placed in context of a fairly politically conservative region where regulating agriculture is complex, especially given the lack of Clean Water Act regulatory authority over nonpoint sources of pollution. The authors also note the high degree of non-operating landowners in the region as a potential barrier to increasing agricultural conservation practices to improve environmental outcomes.[4] While beyond the scope of this assessment, targeting non-operating landowners will be an important step toward improving conservation outcomes.

Methods

The authors developed the matrix and associated recommendations based on interviews and desk research. The authors first reached out and spoke to ESMC program staff and members to solicit feedback and mine the internal knowledge on what is already known or who within each state should be contacted. The authors then conducted phone interviews with key contacts identified in each of the states. Examples of the kinds of key contacts the authors contacted and interviewed include: state agency directors of water quality programs and water quality trading programs, where applicable; state agency leads on climate change and soil health; industry groups engaged with agricultural producers; and nonprofit and private organizations with experience in and knowledge of environmental regulation and environmental market conditions in the MRB.

The desk review focused on key water quality, soil health and GHG/climate change mitigation conditions for each state as represented in reports and websites from relevant state agencies, nonprofit organizations, and other research sources.

[4] https://www.sciencedirect.com/science/article/abs/pii/S0264837718302722?via%3Dihub

Results

Following the scope and methods above, the authors summarize the rapid policy assessment in table form as a matrix with states on one axis, environmental outcomes on the second axis, and relevant people, policies and programs, and payment sources listed within the cells. Following the matrix, the authors present summaries for each state in which the authors discuss key elements of the matrix that may impact environmental market development and environmental credit generation.

The authors have categorized key enabling or disabling conditions for environmental markets into **people; policies or programs; and payments**. It is important to note that it is difficult to assess whether individual components within these categories are enabling or disabling on their own, both because the scope of this rapid assessment precluded a detailed legal and policy examination of each component, and also because these components come together in differential ways within the states to support or hinder environmental markets and trading. The existence of champions for water quality trading or soil health programs, for instance, are enabling and their absence would be a disabling factor. Other components, such as the existence of a water quality trading framework or platform within a state, may be enabling or disabling to the introduction of another trading entity depending on a complex number of factors. In these cases, the authors have suggested that additional research or engagement with the existing trading programs will be necessary to determine whether the program could enable additional market development or may hinder it.

- The **people** dimension includes individuals in decision-making positions in the state government and the relationships between them and other leaders. The authors looked for individual champions/leaders who support market-based solutions/trading even where guidelines or regulations are not in place. The authors also looked for stakeholder forums where people from different sectors (e.g., regulators, regulated entities, and agricultural producers) are able to communicate, plan, and/or prioritize in a facilitated manner because these forums can be important sources of social capital and understanding between groups that can lower barriers to working together in cross-sectoral, multi-stakeholder environmental market arrangements. The authors note that while the existence of champions and stakeholder forums are likely to be enabling conditions for market development and credit generation, turnover of key staff and individuals is a potentially important consideration.
- **Policies and programs** include legislation, regulations, established or developing programs and programmatic guidance that establish compliance requirements (e.g., water quality criteria) or voluntary standards (e.g., soil health standards) for environmental variables and set the rules and currency of market-based solutions/trading, potential arrangements, and allowed flexibility. The authors looked for policies and programs that they determined were most relevant to environmental market development and credit generation. Policies and programs can have differential impacts on environmental market development and credit generation depending on the rules and working relationships they establish. For example, certain policies/programs may allow for scaling-up of environmental market-based approaches where they provide an established interface with agricultural producers. Regulatory drivers, such as numeric nutrient criteria, may be important demand drivers for trading if the costs of compliance (e.g., technology upgrades) with lower nutrient limits are prohibitively expensive at the facility level. Alternatively,

high degrees of regulation in small geographies, such as can occur with water quality trading where numeric criteria are present in both rivers and lakes, may increase the costs of matching producers with credit buyers. Specifically, the authors looked for the following:

- **For water quality asset/credit generation:**
  - Water quality standards for components (nitrogen, phosphorus, sediment) that could be included in trading programs, including nutrient reduction strategies and numeric nutrient criteria (NNC). This assessment specifically considers numeric nutrient standards. EPA has listed a number of benefits to states of developing NNCs: faster development of total maximum daily loads (TMDLs) and National Pollutant Discharge Elimination System (NPDES) permits; quantitative targets to support trading programs; measurable standards from which to gauge needs and progress.[5]
  - Standards, requirements, and/or programs for water quality that impact agriculture (e.g., buffer laws, agriculture water quality programs). These requirements can generate important baseline information about practices on farms and suggest there is engagement with agriculture that can increase the willingness and ability to implement conservation practices on the part of producers for water quality and other environmental outcomes.
  - Water quality trading guidelines/rules, programs in place. These programs can provide an established framework for trading credits and facilitate connections with producers but may have their own specific rules and requirements that ESMC would have to adjust to.
  - For water quality trading, the authors have included information on the model types used by states and trade ratios where available; these concepts have been treated in more detail in a Technical Brief that preceded the development of ESMC's protocol and were not included in the scope of this policy assessment.
- **For soil carbon/GHG asset/credit generation:**
  - Specific soil health policies and/or programs (includes soil carbon and water quality).
  - State or local climate change planning initiatives and/or goals if recent and active.
  - Emissions reporting requirements. While EPA's GHG Reporting Program covers roughly 8,000 large facilities that are required to report emissions, a federally mandated GHG reporting requirement for U.S. states does not exist. In its absence, states have independently enacted mandatory or voluntary GHG emissions reporting programs. The authors include the existence of mandatory or voluntary reporting as evidence of a state's engagement with GHG emissions data and trends. Many states with mandatory or voluntary reporting requirements are members of The Climate Registry.

[5] https://www.epa.gov/sites/production/files/2014-08/documents/nutrient-memo-may252007.pdf

- **Payments** include the financial mechanisms available for incentivizing producers to engage in market-based solutions/trading and to assist in the installation of practices. Payments for conservation practices on agricultural lands originate from Federal cost-share programs, state cost-share and other funding programs, and from the private sector. The authors limit research to unique, state cost-share programs and any consistent, dedicated funding sources (e.g., tax-based funding) in the states that support agricultural conservation practices.

Flowing across and between all of these categories is **information**: information on current landscape conditions and environmental variables. Market-based solutions critically rely on information linking practices on the land to environmental outcomes, and on agreed-upon values associated with these outcomes. In the state summaries, the authors have noted some information sources the states are developing that may aid in environmental market development.

Within the categories above, there were certain elements the authors **did not consider** because they categorize them as common elements across states, irrespective of the extent to which they are actually being implemented in the individual states. The categories the authors do not consider in this assessment include:

- USDA Federal conservation programs (e.g., EQIP, CSP, CRP).
- Funding, planning (Nonpoint Source Management Plans), and activity associated with CWA Section 319 funding unless the state is applying the 319 funding in an innovative way that would impact on market development and credit generation.
- Impaired and TMDL designations or threat of TMDLs (relative level of water impairment or number of TMDLs in a state) which are assumed to be present or could be present in all states.

There are also broader policy movements and regional initiatives that given the scope of this rapid assessment the authors do not cover in detail. These are potentially important factors in the future success of environmental markets and credit generation in the region that may be worth a closer examination. These include:

- Potential future Federal action from EPA or other government agencies.
- Regional soil health and agricultural stewardship programs, such as the 4R Nutrient Stewardship Certification Program (implemented in MN, MO, OH and IN); the Midwest Row Crop Collaborative (implemented throughout the Midwest, with a focus of projects in IA, IL, and NE); and the Soil Health Partnership (implemented in many of the states included in this rapid assessment).
- Other carbon and environmental outcome initiatives that are developing in the region, such as Nori, Indigo, Field to Market, and closed supply chain trading arrangements.

State Matrix

The matrix below summarizes the research results. The State Summaries section that follows details key elements of the matrix that may enable or disable ESMC's market development.

State	Iowa	Illinois	Kansas	Minnesota	Missouri	Nebraska	Ohio	Wisconsin
General								
Water Quality (WQ) Focus N = nitrogen P = phosphorus	N and P; Flexible	Regulatory	P; Flexible	P; Regulatory	Flexible	N and water quantity; Flexible	Regulatory	P; Regulatory
WQ Nutrient Assessment Tools	NTT & validation by Iowa State	STEPL	SWAT	PTMApp	NTT	Not located	SNAP	SnapPlus
Stormwater Utilities (# identified in 2018)	106	28	37	198	5	0	109	126
People								
Lead Surface WQ State Regulatory Agency	Iowa DNR	Illinois EPA	Kansas DHE	Minnesota PCA	Missouri DNR	Nebraska DEQ	Ohio EPA	Wisconsin DNR
Key Stakeholder Groups	Watershed Management Authorities Iowa Watershed Approach Practical Farmers of Iowa	Agriculture Water Quality Partnership Forum	State Association of Kansas Watersheds	Ag-Urban Partnership Forum Minnesota Agricultural Water Resource Center Minnesota Association of Watershed Districts Minnesota Association of Soil and Water Conservation Districts			Division of Soil & Water Conservation Ohio Lake Erie Commission Ohio Federation of Soil and Water Conservation Districts	WI Initiative on Climate Change Impacts DATCP Producer Led Groups Wisconsin Land + Water

State	Iowa	Illinois	Kansas	Minnesota	Missouri	Nebraska	Ohio	Wisconsin
Policies and Programs								
Watershed Planning	Iowa Watershed Approach Watershed community-based planning Watershed Management Authorities Conservation Infrastructure Initiative Iowa BMP Mapping Project	Illinois Watershed Based Planning	Kansas WRAPS Program	One Watershed, One Plan Clean Water Roadmap Minnesota WRAPS	Our Missouri Waters 2011	Natural Resource Districts (NRDs) Nebraska Integrated Water Management Planning Process	H2Ohio	Nine Key Element Watershed Plans
Water Quality Policies	No numeric N/P criteria Iowa Nutrient Reduction Strategy	P criteria for Lakes/Reservoirs Proposed numeric nutrient criteria Illinois Nutrient Loss Reduction Strategy Nutrient Assessment Reduction Plans	No numeric N/P criteria	P criteria for Lakes/Reservoirs; Rivers/Streams MN Nutrient Reduction Strategy MN Buffer Law MN Groundwater Protection Rule (nitrates)	N/P criteria for Lakes/Reservoirs MO Nutrient Reduction Strategy	N/P criteria for Lakes/Reservoirs Focus is on N/groundwater	No numeric N/P criteria Ohio Nutrient Reduction Strategy 2013	P criteria for Lakes/Reservoirs; Rivers/Streams WI Nutrient Reduction Strategy NR151: Land spreading of manure
Water Quality Programs	Clean Water Iowa	Precision Conservation	City of Wichita Off-Site Implementation	Pre-TMDL P Trading	Nutrient Monitoring		Ohio Water Quality Trading Rules	WI Water Quality Trading Program

State	Iowa	Illinois	Kansas	Minnesota	Missouri	Nebraska	Ohio	Wisconsin
	Iowa Water Quality Initiative Iowa Nutrient Reduction Exchange		KS Inverse Trading Concept	WQ Trading Guidelines under development Agricultural Water Quality Certification Program	Program under dev Water Quality Trading Framework Nutrient Trading Workgroup MO Nutrient Credit Clearinghouse Agricultural Water Quality Monitoring Program			Adaptive Management Multi-Discharger Variance for Phosphorus Water Quality Trading Clearinghouse
WQ Trading Ratios	State: 1:1		In Wichita: 2:1 for sediment (nonpoint source/point source)				State: Min requirements: 1:1 (point source/point source); 2:1 (nonpoint source/point source without TMDL); 3:1 (nonpoint source/point source with TMDL) EPRI Ohio River Basin: location specific based on formula:	State: Trade Ratio = Delivery + Downstream + Equivalency + Uncertainty):1

State	Iowa	Illinois	Kansas	Minnesota	Missouri	Nebraska	Ohio	Wisconsin
							Trading Ratio = (Ffield x Friver x Finstream x Fequivalence x Fsafety) Great Miami: Investor: 1:1 with no impaired water; 2:1 with impaired. Contributor: 2:1 with no impaired water; 3:1 with impaired.	
Soil Health	HF102 (proposed) To establish a statewide soil health monitoring system.	HB.2737/SB 1980 Includes soil health in purpose of SWCDs HB2819 (proposed): Requires soil health practices on land leased for agricultural purposes (Dept. of Natural Resources Act) Precision Conservation	KS Corn Soil Health Partnership K State Soil Health Initiative	MN Soil Health Coalition Minnesota Office for Soil Health	Statewide soil moisture network	LB243: Creates Healthy Soils Task Force Healthy Soils Task Force Healthy Soils Task Force Draft Report		

State	Iowa	Illinois	Kansas	Minnesota	Missouri	Nebraska	Ohio	Wisconsin
Climate Action	Iowa City Climate	IL US Climate Alliance Goals City of Chicago Climate Action Plan City of Evanston Climate Action Plan	Kansas City Climate Action Plan	MN State Climate Action Plan 2020 (proposed) Our Minnesota Climate City of St Paul Climate Action & Resilience Plan Minneapolis Climate Action Plan	Kansas City Climate Goals City of St Louis Climate Adaptation Plan	LB283 (introduced) Proposes a climate change adaptation and mitigation study for NE.	City of Cleveland Climate Action Plan 2018	Governor's Task Force on Climate Change City of Madison Goals City of Milwaukee Goals
Emissions Reporting Requirements	Mandatory (Iowa Code 455B.104)			Voluntary GHG reporting		No mandatory or voluntary reporting		Mandatory (Wisconsin Administrative Code Chapter NR438) WI Voluntary Emission Reduction Registry
Payments								
State Cost Share and Incentive Programs	IDALS WQ Cost-Share IDALS cover crop crop insurance HB78 (proposed) To establish property tax exemption for	IL DoA Cover Crops Premium Discount Program	Water Resources Cost-Share Sediment and Nutrient Reduction Initiative Non-Point Source Pollution	Soil and Water Conservation District Grants	Soil and Water Conservation Program	Soil and Water Conservation Fund	SWCD Watershed Program Grants	Department of Agriculture, Trade and Consumer Protection Producer-Led Watershed Protection Grants

State	Iowa	Illinois	Kansas	Minnesota	Missouri	Nebraska	Ohio	Wisconsin
	land with cover crops.		Control Program Water Quality Buffer Initiative					
Tax-Based Financing	Natural Resources & Outdoor Recreation Trust Fund (unfunded) 2018 Water Excise Tax			Clean Water, Land and Legacy Amendment Environment and Natural Resources Trust Fund	Parks, Soils and Water sales tax			
CWA 319 Non-Point Source Program	Watershed Improvement in Iowa	IEPA 319 Nonpoint Source and IEPA Illinois Clean Lakes Program (ICLP)	Kansas Watershed Management Section	Minnesota Nonpoint Source Issues	Missouri's Section 319 Nonpoint Source Program	Nonpoint Source Pollution Management Program	Ohio Nonpoint Source Pollution Control Program	Wisconsin's Nonpoint Source Pollution Program

State Summaries

Iowa

The authors did not locate clear obstacles to trading in Iowa. Rather, they found that an enabling environment for water quality trading has developed in the state. The state is motivated to increase adoption of conservation practices on agricultural lands that can generate positive environmental benefits, in particular for water quality and flood risk. Particular attention is given to increasing acreage under cover crops. The state is pursuing a flexible trading policy to reach water quality goals rather than implementing stringent numeric regulatory criteria. A water quality trading platform (Nutrient Reduction Exchange, or NRE) and framework is already in place, buoyed by champions both at the regulatory agency as well as through multiple watershed-scale stakeholder forums. The platform and framework are flexible and have been designed to accommodate other types of environmental outcome credits. An innovate Memorandum of Understanding (MOU) has been developed and approved for connecting point and nonpoint sources in water trading arrangements through the state's NRE. The size of the water quality compliance trading market will, however, always be limited because of the disproportionate ratio between urbanized areas and agricultural ones.

People

People are critical to trading successes in Iowa so far. Water quality trading has a champion in the state's Department of Natural Resources (DNR), and numerous watershed-scale stakeholder forums help to build the social capital necessary to enable innovative trading programs and connect agriculture with other sectors.

Iowa has great partnerships and momentum for watershed-scale collaborative work that could potentially support environmental credit generation from the agricultural sector, with particularly strong evidence for water quality credit generation. Iowa's stakeholder forums relevant to watershed-scale planning include Watershed Management Authorities (WMAs) that bring together cities, counties, Soil and Water Conservation Districts (SWCDs) and other stakeholders to conduct watershed-scale planning around water quality and flood risk. WMAs were created in 2010 by state legislation and must be located in an 8-digit HUC. WMAs can be multi-jurisdictional and can leverage funding and technical assistance. Iowa's Nonpoint Source Management Plan 2018 encourages rural/urban cooperation on water quality through WMAs. For these reasons, the multi-stakeholder WMA forums are likely important for ESMC to engage with in order to reach Iowa's producers and share knowledge about environmental market potential in the agricultural sector. Other relevant programs include the Iowa Watershed Approach, currently targeted at watersheds impacted by 2011-2013 floods in Iowa, which is a voluntary program to engage stakeholders in Iowa's watersheds to reduce flood risk and improve water quality, among other goals. Community-based watershed planning, led by DNR, is voluntary for communities to develop watershed plans, and include watershed advisory councils of 5 to 12 members from different stakeholder groups to lead the local watershed planning process. A technical advisory team works with the advisory council to aid in assessing and developing potential watershed solutions. The Conservation Infrastructure Initiative is comprised of 100 partner organizations focused on market-based solutions for water quality improvement through conservation practice implementation. Importantly, the Iowa BMP Mapping

Project has provided a complete baseline of BMPs (e.g., terraces, water and sediment control basins, buffer strips) implemented in the state from 2007-2010. These forums and initiatives suggest a vibrant dialogue around water quality and other environmental outcomes (e.g., flood risk reduction) that ESMC could enter into.

Policies & Programs

Water Quality

Iowa is a sparsely populated state with a high proportion of agriculture and a lower number of point source facilities**.** Agriculture is a key contributor to water pollution in the state's waterways. A recent University of Iowa study showed that Iowa contributes disproportionately to nitrate pollution in the Gulf;[6] a recent lawsuit brought by Des Moines Water Works to 13 drainage districts in the state demonstrated the difficulty in addressing nonpoint source contributions to pollutant loads in the state, which are significant but unregulated, and serves as a potential motivating factor for other creative approaches to reduce nonpoint source pollution in the state. Flooding is also a driver for water quality action in the state.

Iowa does not currently have regulatory drivers for water quality trading, such as NNC for phosphorus and/or nitrogen. Iowa has implemented stringent ammonia limits and disinfection requirements at very high costs for regulated facilities; additional water quality criteria, such as through NNCs, would impose an even higher burden. Interviews also suggest that regulatory criteria, such as TMDLs and NNC, are not seen as a balanced way to approach water quality goals in Iowa due to their stringency and the difficulty in achieving low limits. However, the state has indicated that it is seeing increasing pressure from EPA to develop these criteria.

In the absence of state-level regulatory water quality criteria for nitrogen or phosphorus, water quality-related activity in Iowa is particularly driven by goals developed through the Gulf Hypoxia Task Force requirements in the Iowa Nutrient Reduction Strategy (NRS), which calls for an overall 45% reduction in nutrients flowing from Iowa to the Gulf: a 45% reduction from agriculture for both total nitrogen and total phosphorus, and for point source, a 66% reduction in total nitrogen and 75% reduction in total phosphorus. Major facilities comprise the bulk of the nutrient problem in Iowa (~100 out of 900 facilities; ~85% of all wastewater treatment in Iowa); interviews suggest that the remaining 800 facilities will be focused on optimization of nutrient reduction systems and creating voluntary partnerships, and that required actions under the NRS will not apply to them.

Interviews suggest that the NRS provides the state with a flexible approach given its agricultural and regulatory culture. When writing the strategy, there was a push to include trading at the outset, but it was determined that it would likely be more affordable to have some plants upgrade, so trading was included as a future strategy DNR would pursue. The state has developed the Iowa Water Quality Initiative as the action plan for the NRS (also called Clean Water Iowa). While water quality trading may not be required to meet reduction goals, investments from the state revolving fund into the nonpoint source sector by point sources has motived establishing the ability for benefits generated to be registered as credits for future use by regulated facilities.

Iowa's existing water quality trading framework is evidence of the flexible approach to meeting water quality goals in the state. Iowa has a 1 microgram phosphorus/liter mandate at the plant level that is not

[6] https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0195930

prohibitively expensive to achieve using biological upgrades at permitted facilities, but that at a larger scale provides the state with flexibility in working with facilities to achieve the limit. Under Iowa's disadvantaged community rules, facilities are also required to complete a feasibility study to determine if nutrient reduction technologies are feasible (technically possible to remove to meet the limits for nitrogen/phosphorus) and reasonable (a pure affordability analysis on whether the community can afford it now or in the future).[7] Part of the feasibility analysis requires the facility to consider alternatives and solutions in the watershed as well, which opens a door to water quality trading as a potential solution.

Iowa's current water quality trading framework consists of an innovative MOU letter developed to incentivize trading agreements and the Iowa Nutrient Reduction Exchange, a system built on the US Army Corps of Engineers' Regulatory In-lieu fee and Bank Information Tracking System (RIBITS) database and EPA's Nutrient Tracking Tool to track nutrient reductions generated in Iowa from installation of BMPs for NRS goals. The MOUs have a 1:1 trading ratio and use the NTT tool and validation by Iowa State University. The MOU tool is flexible, scalable, and is facilitated by the NRE**.** The Sand County Foundation facilitated negotiations among the Iowa DNR, the City of Dubuque, and numerous non-governmental organization (NGO) stakeholders to create the first MOU enabling use of watershed offsets for NPDES permit compliance. This agreement is also the first use of the state's NRE. The agreement allows municipal wastewater treatment plants to partner with landowners and farmers to reduce nutrient runoff from the land, and for the city to claim those reductions as offsets against their permit requirements. Two of these agreements are signed and work has begun on watershed efforts; two additional agreements are in the final stages of negotiation. Unlike some states that provide blanket certainty, the MOU is an individual agreement between the regulator and the regulated entity, and as such provides for customization while still meeting NRE requirements. Once credits are approved by the DNR, they are registered on the NRE platform. Importantly, while the DNR is concerned about water quality requirements under NPDES permits, the NRE platform is flexible and could allow for trading of other environmental credits in addition to nutrient credits. Flexibility is also evident in the DNR's concept of additionality—the DNR accepts additionality of practices as long as documentation that the practice is new and in addition to existing practices is provided—and in DNR's allowance that cities can trade before installing Biological Nutrient Removal (BNR) technology if required to meet limits.

Iowa DNR is an important agency for ESMC to engage with. The agency is a champion for a more flexible approach; trading infrastructure has been developed and utilized through the MOU agreement and is versatile in terms of the types of environmental outcomes that can be registered; and rules and requirements are not too mature as of yet to make ESMC market development within the state a potentially lengthy process.

Soil Health

Iowa does not have a state soil health program. However, there is evidence at both the farm and state level that attention to and interest in soil health is present. The 2015 Iowa Farm and Rural Life Poll indicated that 75% of farmers in Iowa are working on improving soil health on their farms but showed a gap between the percentage of farmers who understand soil health concepts (70%) vs. landlords (22%).

[7] Iowa's disadvantaged community rules establishes criteria for Iowa DNR to determine if ratepayers or communities are able to afford required upgrades; in the event it is determined that it is not feasible, DNR cannot require them to implement the upgrade.

Improving soil health in Iowa will therefore have to contend with the large proportion of Iowa's rented farmland.

Recently proposed legislation in Iowa is evidence of interest in soil health at the state level. Specifically, HB78 (proposed 2019) would establish a property tax exemption for land with cover crops, and HF102 (proposed 2019) would require the Department of Agriculture and Iowa State University to conduct statewide soil health monitoring.

Climate Action

Iowa's focus on GHG reduction efforts has been variable, but some enabling work has been implemented. State level programs require annual GHG inventories (Iowa Code 455B.104) which states that "by December 31, of each year, the department shall submit a report to the governor and the general assembly regarding the GHG emissions in the state during the previous calendar year and forecasting trends in such emissions...." The most recent GHG report focuses on calendar year 2018 GHG emissions. Iowa Code 455B.131, as amended by Senate File 485 in 2007, requires the Iowa DNR to include estimates of emissions of some GHGs in its construction permitting and emissions inventory programs and to create a voluntary GHG registry for purposes of tracking and crediting companies in Iowa that reduce their emissions of GHGs or that provide increased energy efficiency.

State-level GHG emissions reductions goals were recommended in the early 2000s but were not adopted, and the effort appears defunct. In 2007 and 2008 the Iowa legislature enacted laws creating the Iowa Climate Change Advisory Council (ICCAC) tasking it with developing scenarios "to reduce statewide greenhouse gas emissions by 50% and 90% by 2050." In 2009, Iowa Code section 473.7 established the Iowa Climate Change Impacts Committee, which completed the Iowa Climate Change Impacts Committee's Report to the Governor and the Iowa General Assembly that highlighted certain effects. The Committee is no longer active. At the local level, in 2016 Iowa City formalized GHG reduction goals to reduce 2005-level GHG emissions by 26 to 28 percent by 2025, and 80 percent by 2050.

Payments

Iowa has state-level funding sources that can support conservation practices on farms and environmental credit trading. The state's Natural Resources and Outdoor Recreation Trust Fund 2010 will be funded by the first 3/8% of any increase in the sales tax for water quality projects. Sales tax has not been increased since this was adopted so the fund has not filled yet. The Iowa Water Excise Tax 2018 directs $280M of water utility tax payments for water quality initiatives to water improvement funds, local governments, industries and agencies for point and nonpoint source projects. In 2018, the Iowa legislature passed SF 512, creating a Water Service Excise Tax (WET), a portion of which will be distributed to two funds – a water quality infrastructure fund and a water quality assistance fund – and used through the Department of Agriculture and Land Stewardship (IDALS) and the Iowa Finance Authority for water quality improvement projects. IDALS has a state cost-share program through the Soil and Water Conservation Districts. In 2020, the Iowa Secretary of Agriculture announced that farmers could receive cost-share through the Iowa Water Quality Initiative; to be eligible, farmers must follow crop insurance and NRCS guidelines for cover crop management. Iowa also has a cover crop – crop insurance premium reduction program, which provides a crop insurance discount of $5/acre for cover crop planting. Iowa is currently in the 4th year of implementing this program.

The Clean Water State Revolving Fund (CWSRF) program is a federal-state partnership operated by the EPA with each of the 50 states and Puerto Rico, that provides communities low-cost financing for a wide range of water quality infrastructure projects. For example, Iowa's Clean Water State Revolving Fund finances wastewater treatment, sewer and stormwater projects, and nonpoint source projects. The DNR allows SRF interest payments to be used for community water quality projects, including those that reduce nutrients. In this case, the credits generated can either be used by the party registering the nutrient reductions or traded to another point source discharger in the watershed.

Illinois

While Illinois was the site of the Chicago Climate Exchange and has had water quality-related activity (see Policies & Programs section below), the state currently lacks a coordinated state-level effort around water quality trading or soil health planning and research did not identify any particular champions for water quality or soil health. The state appears to be focused on watershed planning through developing Nutrient Assessment Reduction Plans (NARPs), though these plans do permit water quality trading. Interviews suggest that addressing five of the nine major point source facilities in the state would provide a large reduction in phosphorus load, albeit at a higher cost at the facility-level. Further, ongoing litigation from environmental groups has created an environment of uncertainty; and uncertainty surrounding the performance of BMPs, necessary trade ratios, and in long-term farmer participation are impeding the development of viable point/nonpoint source trading programs in the state. At the same time, over half of Illinois' land (60%) is in row crop agriculture, where 80% of the nitrogen pollution load and 48% of the phosphorus pollution load originates, underscoring the need for effective conservation practice implementation on Illinois' farms.

While the authors did not locate a coordinated effort at the state level that could support the development of environmental markets, the state does not have policy that would prevent trading. And, the state currently has a Democratic governor (J.B. Pritzker), a super majority in the legislature, and is a US Climate Alliance state. Interviews suggest that the landscape has changed since the time of the Chicago Climate Exchange, and conservation practices on farms are now a normal element of farm life.

People

The authors did not identify any particular state-level champions for water quality or soil health, but did identify the Agricultural Water Quality Partnership Forum, a stakeholder group that includes representatives from agencies and non-governmental organizations such as Illinois Department of Agriculture, United States Department of Agriculture, Illinois EPA, Illinois Department of Natural Resources, Soil and Water Conservation Districts, agriculture industry organizations, and environmental and conservation groups. This forum is focused on outreach and education around nutrient loss reduction and agriculture conservation practices and could be an important forum for ESMC to engage with.

Interviews noted that Illinois has limited funding and outreach and education to landowners. A data platform called Precision Conservation has been developed by the Illinois Corn Growers Association to identify the economics of conservation in the state; this platform has also been leveraged to access the high number of non-operating landowners in the state, which complicates agricultural conservation programs because landowners may not be engaged with conservation decisions. To bridge this gap, the

Precision Conservation Management Program is collaborating with the American Farmland Trust and PepsiCo in a "Learning Circle" to increase cover crop implementation on rented agricultural land.

Policies & Programs

Water Quality

Illinois conducts state watershed planning through Illinois EPA, the delegated CWA regulatory agency in the state, using EPA's 9 minimum elements of watershed-based plans. STEPL and the EPA Region 5 model are used for nutrient and sediment load reduction in the watershed planning work of Illinois.

Illinois has a Nutrient Loss Reduction Strategy (NLRS)that indicates priority watersheds for nutrient reduction-related activities. As part of the Illinois NLRS, the Nutrient Science Advisory Committee (NSAC) was established to make recommendations to Illinois EPA regarding numeric nutrient water quality standards for Illinois' rivers and streams. NSAC recommendations were proposed in 2018.

Water quality-related work in Illinois is currently focused on Nutrient Assessment Reduction Plans (NARPs), watershed-based plans involving multiple stakeholders that determine how phosphorus is reduced on a watershed basis from both point and nonpoint sources. NARP requirements will be included in major publicly-owned treatment works (POTWs) NPDES permits by Illinois EPA as a method to implement water quality-based requirements. NARPs are currently in the watershed assessment phase but do provide for water quality trading as long as trading does not violate water quality standards. Interviews indicate that laws that created POTWs should not serve as a barrier to water quality trading but do not expressly permit water quality trading either. Illinois passed an amendment to the Metropolitan Water Reclamation Act that allowed the state's largest facility, the Chicago MWRD, to engage in water quality trading and fund activities external to its jurisdiction. It is possible that additional clarity on the ability of POTWs to engage in funding activities within the broader watershed may be necessary.

A notable water quality program in the state is the Piasa Creek Watershed Project to reduce sediment flowing into the Mississippi River through water quality offsets. Partners in this public-private partnership included the Illinois-American Water Company, the Illinois EPA, the Illinois Pollution Control Board, the Great Rivers Land Trust, and local stakeholder groups. Notably, the Illinois Pollution Control Board has allowed adjusted standards to point source dischargers that have incorporated agricultural environmental projects such as these.

Notable watershed groups include the DuPage River Salt Creek Workgroup (DRSCW), which has included a Basin-wide Nutrient Trading Program that solicited qualifications from firms to develop a phosphorus and nitrogen waste water treatment trading plan for a select number of watersheds. The DRSCW was formed in response to potential TMDLs being set for the East and West Branches of the DuPage River and Salt Creek. Another group is the Fox River Study Group for reducing dissolved oxygen and algae in the Fox River.

The research has identified the Illinois Nutrient Trading Initiative as an area for further research discovered later in the research period; the authors were not able to conduct interviews of multiple stakeholders in this group as of yet.

Soil Health

While Illinois does not have a state soil health program, recent soil health-related legislation demonstrates state attention to the issue. HB.2737/SB. 2980, passed in 2019, amended the Soil and Water Conservation Districts Act to add soil health, water quality, and climate resilience to the purposes of soil and water conservation districts. The amendment defines "soil health" and allows SWCDs to conduct activities to improve soil health. HB.2819, proposed in 2019, would amend the Department of Natural Resources Act to allow the DNR to require the establishment of soil health practices on leased agricultural land.

Climate Action

Illinois is currently a US Climate Alliance state with GHG reduction goals. From 2003 to 2010, the state housed the now-defunct Chicago Climate Exchange, a cap-and-trade program with an offsets component.

Payments

The Partners for Conservation Program (PFCP) is a state program extended to 2021 by Public Act 95-0139 for natural resources protection and outdoor recreation in Illinois. The Illinois Department of Agriculture manages the fund's agricultural component, distributing cost-share funding to Illinois' SWCDs, which prioritize and select projects. The PFCP also includes a sustainable agriculture grant program, a stream bank stabilization and restoration program, and the SWCD grants program. Popular cost-share practices under the cost-share component include cover crops, conservation tillage, field buffers, and streambank stabilization structures. Illinois has also modeled a cover crop insurance reduction program after Iowa's – the Cover Crops Premium Discount Program, run through the Illinois Department of Agriculture - which is in its second year of funding. Acres enrolled in this program must be unencumbered in order to receive the discount.

Kansas

Similar to other states in the Mississippi River Basin, the rural make-up of Kansas leads to a high proportion of overall nutrient load delivered from nonpoint source. However, Kansas does not have NNC or a formal nutrient reduction strategy as the state considers itself fringe in the Gulf Hypoxia work. Kansas also does not provide extensive funding for nonpoint source and does not have a dedicated tax-based source of revenue for conservation practices. For these reasons, Kansas is actively working on a water quality trading framework and has active champions in state agencies promoting a flexible approach termed "Inverse Nutrient Trading" to achieve water quality goals. While this framework is still in concept stage, the research indicates that the state is likely to move ahead with a pilot program in 2021. Kansas is also moving towards soil health: soil health was a major driving factor in the state's participation in an ESMC pilot within the state. The state has completed background watershed planning work to inform water quality and soil health work in a collaborative, stakeholder-driven framework; this process has also provided necessary capacity building for a trading program.

People

Kansas has champions for water quality trading and soil health within the Kansas Department of Health and the Environment (KDHE). Interviews suggest that there is motivation to develop a flexible trading program (detailed in the water quality section below) by individuals appropriately placed within KDHE.

Interviews also indicate that the watershed planning program in Kansas is uniquely positioned to serve as a champion for the watershed itself – delivering water quality priorities and the producers who can help to meet them to any future water quality and/or soil health-related trading effort. KDHE is therefore an important state agency for ESMC to engage with for both water quality and soil carbon environmental market development.

Watershed planning in Kansas is encapsulated in the Kansas Watershed Restoration and Protection Strategy (WRAPS) Program. The WRAPS program is a framework that engages stakeholder groups at the watershed level to work collaboratively to identify watershed restoration and protection needs and priorities; establish goals at the watershed level; and create and implement action plans. The program is funded through EPA Section 319 and the Kansas State Water Plan. WRAPS plans have thus far been developed and are being implemented for 36 large watersheds in the state. Half of these watersheds are engaged with traditional USDA watershed/conservation programs, while half have a dedicated water quality coordinator and active local leadership teams. The latter are driven by state priorities, TMDLs, and nutrient management. The WRAPS program provides a stakeholder-driven framework through which citizens and stakeholder groups, including local, state and Federal agency resources and support, have a voice and the ability to plan and prioritize for watershed goals. Importantly, the WRAPS program provides a watershed "champion"—the WRAPS groups that can prioritize watershed goals and efforts, and foster relationships with landowners.

Policies & Programs

Water Quality

The WRAPS program was instrumental in an early effort by KDHE to venture into the concept of trading through allowing NPDES permits held by MS4 (urban stormwater) communities to include "off-site implementation". The City of Wichita's off-site implementation program allows developers to deposit a fee in-lieu of implementing on-site stormwater mitigation measures; the MS4 permit holder (the City) then uses the fees to finance implementation of practices in the rural areas of the watershed that generate at least as much stormwater reduction as the practice would if implemented on-site in the urban area. A 2:1 ratio was required of the off-site sediment practice to account for uncertainty in actual sediment delivery reductions from the off-site practices. The rural implementation of practices is managed by the Little Arkansas WRAPS group; WRAPS was also the watershed champion and instrumental in handling the rural landowner relationships. Practices are required to be maintained for 10 years.

Through the Cheney Lake Watershed program, the City of Wichita also has experience in paying farmers for conservation practices upstream in order to reduce water treatment costs and extend the life of its reservoir due to reduced sediment delivery from upstream areas. While this is more of a payment for ecosystem services arrangement, it nevertheless shows the capacity of the City to work with surrounding landowners, and to arrange for funding practices in the broader watershed.

Not all states have stormwater utilities; included in the matrix is a row of data from the 2018 Western Kentucky University Stormwater Utility Survey summarizing the number of identified stormwater utilities by state. These utilities have the independent authority to set fees and are the basis of trading funding in several states; therefore, their abundance represents an enabling condition for ESMC. For example, Kansas has 32 stormwater utilities. As flood risks intensify, mitigating stormwater risks will be a greater

priority. The adoption of agricultural conservation practices that promote soil health and water quality can be effective at improving drainage and reducing surface runoff, thereby reducing flood impact.

KDHE is now spearheading an innovative, flexible approach to water quality trading termed "Inverse Nutrient Trading" where "credit" will be used as a verb instead of a noun. The approach is still in draft concept form and is aimed to inform development of a nutrient trading framework in the state. In terms of point source pollution reduction, the focus in Kansas has been on BNR technology at wastewater treatment plants in order to address a phosphorus TMDL on the receiving water. KDHE noted that wastewater plants with BNR technology were sometimes achieving nutrient levels in effluents closer to Enhanced Nutrient Removal (ENR) output (with lower phosphorus and nitrogen levels) through optimizing their nutrient removal techniques and processes and without regulatory action on the part of KDHE, and that many wastewater plants have already upgraded their nutrient reduction technology. KDHE also noted that due to the scale of watersheds in Kansas, funding limitations, and the willingness of agricultural producers to implement practices to reduce loads, nonpoint sources were not meeting their load allocations under the TMDLs and would not be able to generate credits under typical water quality credit generation rules. KDHE is looking at leveraging the work the wastewater plants have done and are doing to reduce phosphorus levels beyond requirements in order to address the load reduction problem from nonpoint sources. "Inverse Nutrient Trading" would involve the following general steps:[8]

- A wastewater plant upgrades its treatment technology to meet BNR levels of output;
- The wastewater plant optimizes plant operation in order to reduce nutrient discharges below their permit limit, and at the level of ENR or greater;
- The point source generates credits by operating below their permit limit that is equal to the difference between actual and permitted discharges;
- The wastewater utility, in lieu of investing in ENR or other technology to meet increasing phosphorus reductions, could invest instead in the watershed to enable nonpoint source practice implementation;
- Under MS4 NPDES permits, the utility can invest in off-site implementation;
- Cities could combine their watershed investments with source water for drinking water compliance requirements, saving additional money that would otherwise be required for water treatment;
- This investment could be used to leverage other watershed dollars, such as Section 319 nonpoint source grants and private environmental outcome investment programs;
- WRAPS or KDHE could act as the broker of these arrangements; and
- KDHE "credits" the utility in future permitting decisions.

KDHE is currently working on developing a pilot for Inverse Nutrient Trading that will require coordination across TMDL, NPDES, and 319 programs in KDHE, the city's utility, and perhaps private sector actors.

[8] Information on the Inverse Nutrient Trading concept received from personal communication with KDHE.

Soil Health

Research identified two relevant programs in Kansas related to soil health, the KS Corn Soil Health Partnership and the Kansas State Dryland Soil Health Network. The KS Corn Soil Health Partnership, an initiative of the National Corn Growers Association, is an "…innovative long-term research effort that aims to show U.S. farmers how sustainability through soil health can also lead to increased profitability. Kansas Corn farmers support SHP with their checkoff dollars through the Kansas Corn Commission and with their support of NCGA." Kansas State has recently initiated a Dryland Soil Health Network that aims to "…advance soil management strategies and prioritize conservation, cover crops, and no-tillage systems to improve soil health and productivity of dryland cropping systems through participatory research and learning."

Climate Action

Climate Action is not evident at the state level; however, Kansas City has a Kansas City Climate Action Plan for GHG emissions reductions. The final plan will be released in 2021.

Payments

The Kansas Watershed Restoration and Protection Strategy (WRAPS) Program discussed above as a stakeholder-driven, watershed-scale watershed management framework, also functions as a cost-share program focused on restoring and protecting watersheds.

Through the Kansas Sediment and Nutrient Reduction Initiative, the 2018 Kansas Legislative Session allocated roughly $280,000 to the Division of Conservation to help promote the reduction of nutrients and sediment through the CRP program, a Federal conservation program through the U.S. Department of Agriculture. Watersheds targeted for sediment and nutrient impairment are eligible to participate. Incentive payments are based on the level of impairment specified by KDHE.

Minnesota

The authors did not find evidence of specific policies in Minnesota that would explicitly impede development of environmental markets. Rather, the authors found that the state is actively engaged in developing policies and programs around water quality, soil health, and climate change. The authors found evidence of champions for both water quality trading, climate change action, and soil health. As a result, the state does have numerous current regulations, programs and policies the requirements of which would need to be considered for market credit generation and development, including its own water quality trading framework under development. Unlike the more flexible approaches taken by some states in the Mississippi River Basin, Minnesota has a strong regulatory approach for water quality, soil health, and climate change/GHG emissions reductions. For example, Minnesota has established phosphorus NNC for both lakes and rivers. The state has a strong water quality monitoring program at the watershed level, made possible by dedicated tax-based funding through the 2008 Clean Water Land & Legacy Amendment to the state's Constitution. This funding source also spurred development of a Clean Water Plan for the state, with specific goals for water quality and quantity, and is supporting programs to diversify economic opportunities for farmers in Minnesota, including for carbon and soil health. The state has active soil health programs in collaboration with the academic sector, and an active statewide climate

change planning process with GHG emissions reductions goals underway that is looking at environmental markets and emissions reductions possibilities on agricultural lands.

People

Minnesota has a champion for water quality trading within the state's CWA delegated regulatory agency, the Minnesota Pollution Control Agency (MCPA). The state also has a champion for climate change activity and GHG emissions reductions programs in the newly established Climate Director position at the state level, also within the MPCA. Finally, the state has a champion for conservation practices on agricultural lands in the Board of Water and Soil Resources (BWSR) who oversees the state's nonpoint restoration and protection efforts by working in partnership with more than 240 local units of government and private landowners and in the Minnesota Department of Agriculture, who is also participating in the state's water quality trading framework development with the MPCA.

Within the Minnesota River Basin, the MCPA has stated that "[d]eveloping partnerships between agriculture and municipalities in the Minnesota River Basin may be the next step in restoring the state's namesake river." Accordingly, in 2019 the City of Mankato, the Water Resources Center at Minnesota State University-Mankato, the MPCA, and the Minnesota Department of Agriculture convened the Ag-Urban Partnership Forum to bring leaders from cities in the state together to discuss "multi-benefit water quality projects". The goals of the forum are to understand challenges, learn about potential solutions, and develop collaborative pilot projects to reduce pollution discharged into the Mississippi River.

Policies & Programs

Water Quality

Minnesota has strong statewide watershed planning and monitoring infrastructure, and regulatory drivers for water quality activity, including phosphorus NNC for both lakes and rivers. As with most of the states in this study, Minnesota, a headwater state for the Gulf, has developed a Nutrient Reduction Strategy pursuant to the Gulf Hypoxia Task Force. However, the state's extensive regulatory and programmatic framework around water quality appears to be the larger driving factor. Development of watershed data and plans occurs through the state's One Watershed, One Plan program, which leads to development of Comprehensive Water Management Plans and was enacted by Minnesota Statute 103B.801. The Comprehensive Water Management Plans bring together local governments at the watershed level to plan, prioritize and achieve watershed goals; One Watershed, One Plan planning grants are made available to support plan development. The One Watershed, One Plan Transition Plan notes that the goal of One Watershed, One Plan is to "…align local water planning on major watershed boundaries with state strategies towards prioritized, targeted and measurable implementation plans – the next logical step in the evolution of water planning in Minnesota." The goal for statewide transition to Comprehensive Water Management Plans is 2025.

Minnesota's statewide watershed planning and monitoring work is possible due to consistent tax-based funding into the Clean Water Fund through the Clean Water, Land and Legacy Amendment to the Minnesota Constitution in 2008, described in more detail in the Payments section below. Interviews noted that given the timeframe of the Clean Water Fund (2009-2034), the state will have resources to continue executing their watershed monitoring approach of chemical and biological monitoring at the HUC 8 and smaller watershed level for at least another 15 years. The state developed the Clean Water Roadmap, a

25-year plan for prioritization and implementation of Clean Water Funds. This roadmap includes the following specific statewide goals for 2034:

- **Lake water quality**: Increase the percentage of Minnesota lakes with good water quality, as measured by acceptable Trophic State Index, from 62% to 70%.
- **River and stream water quality**: Increase the percentage of Minnesota's rivers and streams with healthy fish communities, as measured by the Index of Biotic Integrity, from 60% to 67%.
- **Groundwater quality**: Reduce the percentage of new wells exceeding the drinking water standard for arsenic by 50%; reduce nitrate levels in groundwater by 20%, which will decrease the percentage of wells exceeding the drinking water standard by 50% (in two vulnerable areas of the state).
- **Groundwater quantity**: Ninety percent of groundwater monitoring sites affected by groundwater pumping will have either a steady or increasing water level trend.

Minnesota has implemented a statewide Buffer Law, which requires "…perennial vegetative buffers of up to 50 feet along lakes, rivers, and streams and buffers of 16.5 feet along ditches. These buffers help filter out phosphorus, nitrogen and sediment." The states note that as of July 2019, 98% of parcels adjacent to Minnesota waters are in compliance with this law.

Minnesota has also implemented a statewide Groundwater Protection Rule to reduce nitrate pollution. The rule "…minimizes potential sources of nitrate pollution to the state's groundwater and protects our drinking water. The rule restricts the application of nitrogen fertilizer in the fall and on frozen soils in areas vulnerable to contamination, and it outlines steps to reduce the severity of the problem in areas where nitrate in public water supply wells is already elevated." The Groundwater Protection Rule came into effect in September 2020.

Water quality trading guidelines are currently under development by the MPCA and should be available in 2021; the MPCA currently states that "The MPCA is interested in exploring the trading potential for various pollutants, particularly nutrients, sediment, and temperature, and cross-pollutant trading opportunities (for example, watershed-based phosphorus reductions to address in-stream dissolved oxygen deficiency by reducing the algal loads in the watershed.) Other areas of interest include reducing excess flows, which can contribute to stream bank erosion, and options for other tradable pollutants. Any sectors whose activities influence Minnesota's surface water quality and quantity may participate in trading. These include individuals, companies, public advocacy groups and governmental entities whose interests involve point source discharges, urban, construction, industrial and agricultural stormwater sources, agricultural drainage management, and others." The MPCA provides some detail on trading on its website, including that trades are enforced through NPDES permits and for trade boundaries "[c]redit generation and use must be upstream of the targeted body of water and in most situations, trades may not occur where a waterbody that does not meet water quality standards for the pollutant of concern is located between an upstream credit user (buyer) and a downstream credit generator (seller). As a result, in most cases, all participating sources must be upstream of the closest downstream impaired waterbody." Differences in trade ratios are noted, suggesting that trade ratios will vary with certainty and watershed dynamics. The trading guidelines under development will provide more certainty around

trading in MN; so far, the state has had a few point source to nonpoint source trades (e.g., Rahr Malting facility; Southern Minnesota Beet Sugar Cooperative), but nothing on a large-scale.

Interviews have noted that permit holders that discharge into areas upstream of lakes have to meet criteria for both the river and lake, so trading is limited to areas for which a facility can receive credits needed; in this case the permit holder would not be able to trade with the lake for credit.

The MPCA currently allows for Pre-TMDL P Trading (PTPT). This program allows "…new and expanding wastewater treatment facilities to receive a discharge permit prior to completion of an applicable phosphorus-related TMDL. Through PTPT, a new or expanding facility may increase its phosphorus discharge by purchasing a phosphorus reduction from another source. The MPCA documents the transfer of nutrient load, or trade, through the NPDES permitting process."

The Minnesota Agricultural Water Quality Certification Program (MAWQCP) is a unique, statewide effort initiated by the Minnesota Department of Agriculture to provide regulatory certainty to the agricultural community in exchange for implementing a suite of conservation practices on the entire farm for a period of 10 years. Roughly 2% of the state's agricultural land (975 producers and 685,000 acres) has been certified so far. Through the certification process, a comprehensive audit and scoring of practices in the field is assessed using computer models, including physical characteristics, nutrient management, tillage management, pesticide management, irrigation management, drainage management, and conservation practices. All fields/crops must score higher than 8.5 to receive certification (the scoring occurring from 1 to 10 with a higher score equivalent to a lower risk to water quality), and each farm is verified by a licensed certifier for the final step of the certification process. All acres of the farm are assessed and certified, providing a detailed baseline of conservation practices at the field-level. The state is currently assessing whether MAWQCP-certified acres can be banked as credits for future trading. In exchange for using conservation practices for 10 years on certified acres, certified producers receive a number of benefits. According to the Minnesota Department of Agriculture, MAWQCP certified producers receive:

- **Regulatory certainty**: certified producers are deemed to be in compliance with any new water quality rules or laws during the period of certification.
- **Recognition**: certified producers may use their status to promote their business as protective of water quality.
- **Priority for technical assistance**: producers seeking certification can obtain specially designated technical and financial assistance to implement practices that promote water quality.

Given the active role that both MPCA and the MAWQCP are currently playing in the development of water quality trading and water quality certification on farms, these are two state agencies that will be important for ESMC to engage with.

Soil Health

Monitoring, evaluation and verification data on soil carbon was noted in interviews as a limiting factor in the development of environmental markets. Minnesota is taking steps to fill this gap through statewide initiatives. The Minnesota Soil Health Coalition is "…a farmer led and driven organization dedicated to provide education, farmer to farmer mentoring, networking and plain language technical information." Goals of the Coalition include mentoring for farmers and soil health testing to provide data on soil health variables. The Minnesota Office for Soil Health is a collaboration started in 2017 between the Minnesota

Board of Water and Soil Resources and the University of Minnesota Water Resources Center to "…work toward healthy farms and ecosystems by delivering soil education, promoting grower networks, and researching best practices." Minnesota is the first state to have a dedicated Soil Health Specialist to provide expertise on soil health issues and promote an understanding of the economic impacts of soil and water management practices for agricultural and conservation professionals across the state.

Climate Action

Minnesota is taking an active role in addressing climate change, summarized in the state's website Our Minnesota Climate, a "multi-agency initiative focused on putting Minnesota back on track to reduce GHG emissions by 80% by 2050". In 2019, Governor Tim Walz signed Climate Change Executive Order (19-37), underscoring the importance of addressing climate change and establishing the Climate Change Subcabinet and the Governor's Advisory Council on Climate Change. Minnesota's Climate Change Subcabinet is comprised of multiple workgroups, including a natural and working lands team led by the Department of Agriculture and the Minnesota DNR, which will develop strategies for soil health and emissions reductions on croplands. The State's proposed 2020 Climate Action Plan has a primary goal of a 45% reduction in GHG emissions by 2030 and 80% by 2050. The lands section of the plan notes strategies to achieve this goal, including improving soil health through agricultural practices, enhancing local food systems, and increasing natural carbon sequestration on public lands.

As noted previously, the state has established a Climate Director position within the MPCA. Interviews with this office indicate they are interested in the use of market-based systems across sectors—particularly in agriculture—and in leveraging regulatory programs to achieve soil carbon and GHG reductions/carbon storage benefits, with a specific goal of delivering market signals and compensation to the land providers. The state will be learning from the ESMC pilot, which will inform policy development in Minnesota. The state is trying to increase cross-agency coordination (e.g., MPCA, DNR, Department of Agriculture) around agricultural conservation practices and the interface with climate change emissions reductions goals. The Comet-farm tool has been utilized to assess emissions reductions from agricultural practices in the state. Discussion is happening through various forums, including the Great Plains Institute and the Governor's Biofuels Council. Interviews with this office also indicate that the state needs to resolve requirements for monitoring, verification, and evaluation; whether and how producers can separate water quality and carbon outcomes from the same practices; and how to evaluate carbon benefits over different time periods.

The climate change work in MN interfaces with the state's water quality work on agricultural lands through the MAWQCP, which together with the MPCA estimates GHG emissions reductions associated with 21 agricultural practices. The state notes that "Between 50-60% of the new water quality practices implemented by certified growers are climate practices identified by MPCA. For applicable practices implemented through MAWQCP-certification, the average emission reduction is 37 tons per practice per year. All combined these achieve the equivalent of removing 8,000 passenger vehicles from Minnesota's roads each year."

Interviews also suggested that an enabling condition in the state is the experience around renewable energy credits from the M-RETS, the Renewable Energy Tracking System in Minnesota.

In addition to climate change action at the state level, and as in other cities in the Midwest, cities in Minnesota are also taking the lead on developing and implementing climate change-related programs.

The City of St Paul Climate Action & Resilience Plan, adopted by the City Council in 2019, focuses on achieving carbon neutrality in city operations by 2030 and across the city by 2050. The Minneapolis Climate Action Plan set a target for the city to reduce GHG emissions by 15% by 2015 and 30% by 2025 using 2006 as a baseline.

Payments

The unique Clean Water Land & Legacy Amendment passed in 2008 by voters as an Amendment to the MN Constitution, supports a great deal of the conservation work in the state, including the MAWQCP and some of the university-led initiatives and funded positions such as the Forever Green Initiative and the Soil Health Specialist at the University of Minnesota. The Amendment allocates 33% of sales tax revenue to the Clean Water Fund, the funds of which "…may only be spent to protect, enhance, and restore water quality in lakes, rivers, and streams and to protect groundwater from degradation. At least five percent of the clean water fund must be spent to protect drinking water sources." The Clean Water Fund brings together 7 state agencies to collectively partner on Clean Water Fund management and activities. The FY 2020-21 budget for the CWF has allocated 55% of funding to nonpoint source implementation.

Minnesota's Board of Water and Soil Resources (BWSR) has significant funding to protect water quality through land management practices. BWSR also provides grant funding and works closely with local units of government and with Soil and Water Conservation Districts to facilitate installation of BMPs that protect water quality and mitigate climate.

Missouri

The research suggests that Missouri does not have specific policies that would impede development of an environmental market or generation of environmental credits from agricultural lands. Missouri is actively creating a centralized trading infrastructure to lower barriers and costs for trading, but potential trading programs in the state, while required to follow certain aspects of their trading program, are not required to use the centralized infrastructure. A part of the trading infrastructure includes development of a Water Quality/Nutrient Credit Clearinghouse that would leverage the state's Soil and Water Conservation Program (state cost-share), which stands as a stable pool of money to keep the practices and trading moving. The Program also has the trust of farmers and has existing agreements with farmers. The authors also found champions for water quality trading and soil health/agricultural conservation practices. Missouri combines this somewhat flexible approach with regulatory drivers. Missouri has developed NNC for nitrogen and phosphorus for lakes; these are currently being challenged legally but interviews suggest that the standards would only become more stringent (EPA's NNC proposal included impairment designations for far more lakes and impacted a greater number of wastewater facilities than Missouri's rule). While research focused on water quality, soil carbon and GHG emissions credit generation, one industry interviewee noted that Missouri would also be very interested in habitat/biodiversity credit generation as well.

People

Interviews and research suggest that Missouri has individuals within the DNR and the state's Soil and Water Conservation cost-share program who are champions for water quality trading and are also engaged in soil health efforts in the state.

Policies & Programs

Water Quality

Our Missouri Waters is Missouri's state stakeholder-driven, watershed-based clean water initiative, run by the Missouri DNR and established in 2012, with the stated goal to "to build partnerships that include the people who live and work in the watershed to plan together and work together to benefit the watershed". After reviewing 66 watersheds in the state, the DNR selected three (Spring River, Big River and the Lower Grand River watersheds) for the first phase of the initiative and has been adding additional watersheds to the initiative since that time.

Supporting the potential for environmental markets, the MO Nutrient Reduction Strategy 2014 includes trading as a goal to meet a 40% reduction in nitrogen and phosphorus discharge from the state over roughly the next 20 years. The MO DNR Nutrient Reduction Strategy (2020 update) outlines priorities and future plans around water quality in the state. Priority actions underway include nutrient monitoring program development and implementation; upcoming actions include implementing the NNC for lakes; 4R Nutrient Stewardship; and enhancing the statewide soil moisture network.

Missouri has developed NNC for nitrogen and phosphorus for lakes in the state; Missouri's rule is less stringent than EPA's, and interviews have indicated that the result of the court's decision will only make the final rule more stringent. EPA's proposal would result in an impairment designation for 113 lakes in Missouri and would impact an estimated 739 wastewater facilities. Missouri's rule, by contrast, designates only 34 lakes as impaired and impacts only 30 wastewater facilities. Based on current data, the impairment designations under EPA's proposal are estimated to cost $1.7 billion to impacted wastewater facilities, compared to $83.1 million attributed to Missouri's rule. State agency officials noted roughly 2,500 point sources in the state would be subject to the criteria for lakes, out of a total of 12,000 NPDES-permitted facilities. The state agency officials also noted that while a large preponderance of nutrient flow comes from major facilities, the majority of those facilities are located in areas of the state that are not subject to the lake NNC. For this reason, the state wants to provide flexibility to the regulated point sources under the NNC in whether they choose infrastructural upgrades or credits from nonpoint sources within the watershed in order to comply.

Missouri has developed a 2018 Nutrient Criteria Implementation Plan; Table 6 outlines Regulatory Flexibilities for Trading that could allow permittees to meet new requirements. Water quality trading is included as a component and refers to the 2016 Missouri Water Quality Trading Framework. Flexible solutions are needed in part due to Missouri's Affordability Statute, through which DNR must consider affordability in permit writing. Schedules for permits are based on affordability of requirements for new criteria and limits; longer schedules are provided where affordability is an issue. Affordability is calculated off of the grey infrastructure solution.

Facilitating the potential for environmental markets, Missouri DNR has a Nutrient Trading Workgroup to explore potential water quality trading arrangements the state could implement in response to the state's Nutrient Reduction Strategy. In 2013, DNR commissioned a study, Nutrient Trading in Missouri, that explored potential trading arrangements and modeled potential arrangements in two Missouri watersheds. Interviews indicated that Phase I of DNR's water quality trading activity included the development and adoption of the 2016 Water Quality Trading Framework. This framework includes the elements that an entity seeking to create a trading program would need to provide to the DNR. Phase II

is underway and is focused on research into the effectiveness of agricultural BMP's in nutrient reduction, with the overall goal of determining trade ratios, models to be used, and the price of nutrient credits in a potential future market.

The 2016 Water Quality Trading Framework notes the DNR's goal to provide common infrastructure to facilitate point source to nonpoint source trades. The Framework states that "[p]oint source to nonpoint source trading requires additional capabilities not needed for point source to point source trading. The department has committed to develop a common infrastructure to support communities wishing to engage both types of trading. The department will make available to trading programs a suite of systems or capabilities that enable the greatest breadth of water quality trading in Missouri in return for payment for the services rendered assuming no other funding source is developed. While no trading program is required to use these systems or capabilities, each provides a set of functions that can reduce the amount of locally-supported infrastructure required for trading, particularly if point source to nonpoint source trading is anticipated." The elements of Missouri's centralized trading infrastructure will include:

- Established modeling systems, such as the Missouri Soil and Water Information Management System (MoSWIMS) and the Nutrient Tracking Tool (NTT);
- A Water Quality Trading Clearinghouse to facilitate, register and track trades.

Recognizing the potential to generate multiple environmental credits from certain practices, the Framework also states that "[n]othing in this framework prevents projects involved in trading from earning credits under other programs, except that no project may claim credits within two different parts of the Clean Water Act. For example, a project could not be awarded water quality credits for a project under Section 404 for stream or wetland mitigation and also be awarded the water quality credits within a trading program. Should an entity want to assign the ecological value of a mitigation project for the purposes of Section 404 of the Clean Water Act and the water quality benefits to a water quality trading program, the clear distinction between those two sets of credits would have to be submitted to and approved by both the department and the designated U.S. Army Corps of Engineers office before use."

The Water Quality/Nutrient Credit Clearinghouse would leverage the Soil and Water Conservation Program, which stands as a stable pool of money to keep the practices and trading moving. State agency officials indicated that the Soil and Water Conservation Program spends roughly. $40 million annually on BMPs, many of which have a nutrient benefit. The Program also has the trust of and agreements with farmers. Interviewees noted that the Clearinghouse would be at the HUC12 level, and that the state would keep 75% of credits generated based on the cost-share and would bank these for sale to point sources. Revenue would be reinvested in the watershed for additional conservation practices that are not well-represented, becoming similar to a revolving fund for regulatory credits. State agency officials from DNR indicated that the Clearinghouse could help move the needle on practices already occurring in the Soil and Water Conservation Program to achieve additional benefit. Interviewees noted that the state is not considering carbon credit generation along with water quality credits, but that they do not see a problem with generating a carbon credit as long as a water quality credit is also generated. An interviewee from an industry group suggested that skepticism of a market solution exists among farmers based on their knowledge of the Chicago Climate Exchange, and that early adopters of conservation practices are concerned that they will not be rewarded for good stewardship.

The research indicates that Missouri DNR is an important agency for ESMC to engage with. State agency officials from DNR appear interested in having outside entities advance more cost-effective water quality trading for the environmental quality benefits it could bring. The agency officials noted that under the current trading framework in the state, the DNR can already facilitate trades, but it is a cumbersome process in which a point source would have to locate nonpoint sources on their own, arrange all elements of the trade, and then include the trade in their NPDES permit request to DNR. DNR has not yet had a trade due to a lack of demand drivers – the NNC will be a driver but it is new (2018). Interviews suggest that DNR is highly motivated to determine how to accelerate demand for trading and make trading easier and more cost-effective under the new NNC.

The Agricultural Water Quality Monitoring Program, a collaborative effort between the Missouri Corn Merchandising Council and the Missouri Soybean Merchandising Council in partnership with the Missouri Department of Natural Resources and the USDA Natural Resources Conservation Service, conducts edge of field water quality monitoring to verify and improve on water quality impacts of conservation practices. This program could be explored as a means to quantify water quality credits.

Soil Health

While Missouri does not have a statewide soil health program, the state is making strides towards collecting data on soil health that could inform future programmatic activities. Missouri's Cover Crop cost-share program implemented in 2015 by the Missouri DNR and the Soil and Water Conservation Districts through the DNR's Soil and Water Conservation Program (detailed in Payments below) required participating farmers to take and submit soil samples for enrolled fields to the University of Missouri Soil Health Assessment Center (SHAC). The SHAC assessed the samples for carbon content, nitrogen, phosphorus and other soil variables. A recent poster related to this initiative noted that it has provided a baseline of soil health for Missouri's Major Land Resource Areas (76 of 114 Missouri counties have samples) and for the Midwest generally. Missouri DNR is also expanding its statewide soil moisture network for flood and drought monitoring.

Climate Action

Similar to other Midwest states, climate action is more evident at the local (city) level than at the state level. Missouri does not currently have climate change related emissions reductions goals or a climate action plan, but individual cities have developed climate plans and strategies. For example, the City of St Louis Climate Adaptation Plan, released by the City's Sustainability Office, includes strategies to meet the city's goal of an 80% reduction in citywide GHG emissions by 2050, and Kansas City also has goals, including reducing GHG emissions from city municipal operations by 70% of 2005 levels by 2025 and being climate neutral by 2030.

Payments

The Soil and Water Conservation Program is a unique, statewide cost-share program for conservation practices in Missouri, providing up to 75% of the cost of soil and water practice installation for controlling erosion and water quality improvement. This program represents the highest level of cost-share funding in the country and has dedicated tax funding through the state's Parks, Soils and Water sales tax, a one-tenth-of-one-percent parks, soils and water sales passed by Missouri voters in 1984 to fund state parks and soil and water conservation efforts. The tax generates roughly $90 million a year, half of which goes

to parks and half to the Soil and Water Conservation Program. The funding supports a Soil and Water Conservation District in each of the 114 MO counties – these districts have boards that set priorities for practices to implement and provide technology support for the design, implementation and maintenance of practices.

Nebraska

The research suggests that Nebraska does not have specific policies that would impede development of an environmental market and generation of environmental credits from agricultural lands. In contrast to other states included in this assessment, where water quality and phosphorus were areas of focus, Nebraska is focused on soil health and nitrogen in groundwater supplies. Given that 85% of the state relies on groundwater for drinking water (from the Ogallala Aquifer), and the high nitrate levels in the state's groundwater, nitrogen and water quantity are more apparent areas of potential for environmental market development and credit generation. The state is actively pursuing development of a state Soil Health Hub that would serve in part to facilitate investment in agricultural conservation practices. Interviews indicated that NRCS funding is largely delivered to irrigation improvement projects because Nebraska has the highest percentage of irrigated cropland in the country, leaving a small percentage for other practices such as cover crops. One interviewee associated with the state's soil health initiative noted that only 8% of cover crops in Nebraska were installed through Federal cost-share. With limited state cost-share, a large investment potential in agricultural conservation practices remains. Further, a focus on soil health can produce water quality, soil carbon, and GHG emissions reductions benefits, potentially generating credits for multiple ecosystem services markets.

People

The authors identified the state's Healthy Soils Task Force as a champion for soil health in the state; given the scope of the developing state Soil Health Hub it is likely that other such champions also exist or will become more apparent within the next year.

Policies & Programs

Water Quality

Natural resource management at the watershed scale is built into Nebraska's watershed management framework. The Nebraska Groundwater Management and Protection Act (adopted in 1975) created Natural Resources Districts (NRDs) to regulate and manage groundwater in the state. Over time, NRDs have been given increasing authority to protect groundwater quantity and quality, as well as surface water that is hydrologically connected to groundwater sources (Nebraska DNR has statewide authority over surface water). Unlike the county-based districts established in all other states for natural resources management, Nebraska's conservation-related activities are implemented through 23 watershed-delineated Natural Resource Districts (NRDs). NRD districts are governed by a locally elected board of directors and are autonomous in terms of planning, prioritization and funding programs: NRDs have taxing authority and programs are funded through roughly 1-2% of property taxes collected in the district. NRDs have 12 responsibilities under state law, including management, use and conservation of ground and surface water; soil conservation; erosion and flood prevention and control; and pollution control. For example, NRDs have legal authority to require erosion control solutions under the state's Erosion and Sediment Control Act. NRDs are also required to develop Groundwater Management Plans, which are

approved by the Nebraska DNR. Under these plans, the NRDs regulate groundwater use, quantity and quality in the state. Some NRDs have their independent programs where they conduct funding for water quality related work, such as in areas with heavy nitrate concentrations, but this is rare.

While NRD programs have been focused on water, there is an increasing interest in soil health. NRDs often partner with other public and private organizations at the local, state and federal level, including NRCS for many of their technical projects and the Nebraska DNR for soil and water conservation projects.

Nebraska also conducts an Integrated Water Management Planning Process through which state and local agencies and water users develop planning documents called integrated management plans (IMPs) to plan and address unique water challenges in specific areas. The integrated management planning process requires collaboration between the DNR, NRDs, and other water users and stakeholders.

Nebraska has developed nitrogen and phosphorus NNC for lakes and rivers; research could not identify policies, programs or pilots related to point source/nonpoint source trading under NPDES permits.

Soil Health

In 2019, the Nebraska legislature passed LB 243 to establish the Healthy Soils Task Force. In December 2020, the Task Force released the Healthy Soils Task Force Draft Report & Recommendations (Nebraska Department of Agriculture). The Healthy Soils Task Force aimed to improve communication and coordination around soil-health related work in the state and has recommended the development of a state Soil Health Hub. The Task Force took a comprehensive look at soil health work in Nebraska, including drinking water source protection and nutrient and sediment reduction for multiple environmental quality purposes. The report features a case study of the water quality benefits of soil health management. Shell Creek was designated impaired by EPA in 2006 due to a high concentration of Atrazine. In 2018, the watershed was the first stream to be delisted from EPA's Impaired Waters list as a result of a comprehensive watershed management plan that included soil health management practices. The watershed-level planning and implementation required was a collaboration between more than 240 local producers who installed over 340 conservation practices on the land, the NRD and academic and Federal agencies.

The state is looking at the soil health initiative as a driver for environmental markets in Nebraska. One interviewee noted that one of the goals of the initiative is to serve as an economic development corporation to recruit money for soil health in the state; the state is actively working to become an attractive state for corporate investment due to sustainability and other goals. The Soil Health Hub is one part of a "Soil Health for Nebraska Wealth" Action Plan. The Action Plan details the following five goals of the Healthy Soils Task Force:

- **Goal 1: Establish the Nebraska State Soil Hub with Regional Proving Grounds.** The report notes that "By working collectively, the resources of NRDs, UNL, NRCS, and other stakeholders in soil health would be better utilized… The HSTF recommends formation of a formal "Nebraska Soil Hub" (The Hub) within the overall Initiative. The Hub creates a centralized means to facilitate enhanced coordination, collaboration and communication among these entities in partnership with producers and non-operating landowners to carry out the goals of the comprehensive Initiative."
- **Goal 2: Form a Nebraska Producer Learning Community (PLC)**

- **Goal 3: Develop the Next Generation of Soil Health Practitioners**
- **Goal 4: Recruit $50,000,000 in Additional Soil Health Funding and Incentives** (over the next 10 years). For this goal, the rationale provided in the report is "[t]he HSTF believes it is far better to incentivize farmers and ranchers to adopt healthy soil management practices rather than to regulate them into it. Incentives can be an effective way to encourage producers to try new things, but wide spread incentive programs require large scale funding. NRCS programs like EQIP and CSP are effective, but limited with less than 8% of all cover crop plantings in Nebraska being program funded. Additional incentives beyond these existing programs are needed to advance soil health in Nebraska. One of the priorities of the new established Soil Hub will be to research and recruit additional incentive funding sources for producers."
- **Goal 5: Establish Nebraska Soil Health Measurements and Benchmarks.**

In 2019, LB729, the Soil Health and Productivity Incentive Act, was introduced in the Nebraska Legislature. The purposes of the Act are to: (1) improve soil health and productivity throughout the state through the planting of diverse cover crops, (2) incentivize farmers to plant cover crops, (3) increase farmer yields and profitability through improved soil health farming practices, and (4) improve degraded waterways to protect the public's health through increased water filtration with the application of cover crops. Incentives would be provided under the Act to encourage farmers to plant cover crops.

Climate Action

State level climate action in Nebraska was proposed in 2019 through LB283, A Bill for an Act Relating to Climate. This Act would direct the University of Nebraska to "…develop an evidence- based, data-driven, strategic action plan to provide methods for adapting to and mitigating the impacts of climate change". This Bill has stalled for years in the legislature, and there has been a recent push to help it pass.

Until the Bill passes, climate action in Nebraska is limited to the local level. The City of Lincoln, through its Resilient Lincoln Initiative, has developed a Draft Climate Action Plan to reduce GHG emissions by 80% by 2050.

Payments

Nebraska's Soil and Water Conservation Fund, established in 1977, is the state's cost-share for conservation practices. The Fund provides state financial assistance to Nebraska landowners installing approved soil and water conservation measures. Since 1977, the State of Nebraska has provided more than $96 million in state cost-share assistance to Nebraska landowners. The fund is administered at the state level by the Nebraska Department of Natural Resources and is coordinated by the state's NRDs; NRCS provides technical assistance.

Ohio

The authors' research did not find elements that would preclude environmental market development in Ohio. While the state has established water trading rules, the limited number of water quality trading programs currently operational suggest that enabling elements are missing in the state despite a formal trading framework. For example, Ohio does not have NNC. The authors also did not locate a water quality trading or soil health champion but recognize a number of initiatives ongoing in the state that are focused

on soil health and stewardship on agricultural lands, including the Ohio Agriculture Conservation Initiative and the Soil Health Symposium. Earlier programs to achieve trading have stumbled after years of development because regulation-driven demand for phosphorus reduction has not materialized; market opportunities would probably grow if those conditions changed. The authors conclude that additional research is necessary to determine the potential for market development and environmental credit generation in Ohio.

People

The authors did not locate state level water quality or soil health champions in the course of their research but recognize that the state has water quality guidelines and programs, and new initiatives that suggest champions are likely present. For example, the Ohio AgriBusiness Association has been actively engaged in the 4R Nutrient Stewardship Certification Program since 2014, working on specifications for best practices for nutrient management for agricultural nutrient service providers with the goal of long-term improvement of Ohio's water quality (and more specifically, Lake Erie).

Policies & Programs

Water Quality

In 2013, Ohio's EPA led the development of the state's Nutrient Reduction Strategy (NRS); upland management strategies include development of nutrient management plans for farms; reducing soil erosion through conservation practices on farms; and development of a statewide soil testing program. However, Ohio's NRS does not include specific nutrient reduction goals. In addition, Ohio does not have NNC for either phosphorus or nitrogen.

Ohio has statewide Water Quality Trading Rules that have been written in Chapter 3745-5 of the Ohio Administrative Code. These rules require that water quality trading must occur under a plan approved by the Ohio EPA Director. The rules outline requirements for trading plans and provide detail on prohibitions and restrictions on trading; the calculation of water quality credits; rules on settling baselines and trading ratios; incorporating trades into NPDES permits; and limits on trades in order to avoid adverse impacts. Despite clear rules at the state level, there appears to be limited water quality trading in Ohio, though the state is home to the only multi-state water quality trading program, the EPRI-led Ohio River Basin Trading project, approved in 2012 and amended twice. The project was initially driven by the expectation of more stringent regulatory water quality requirements (NNC, particularly for nitrogen) but these have not materialized for either nitrogen or phosphorus, and interviews suggest that the cost of technology to reduce phosphorus is decreasing. This project is still active with farmers; however, credit sales have been low. The EPRI trading ratio, provided in the matrix above, are location specific; the program does not have a basin wide trading ratio. Another trading program in Ohio was the Great Miami River Trading Program. This trading program was developed prior to and informed the development of the Ohio guidelines. Trading in this program is not active, largely due to a TMDL study Ohio completed that determined that trading would not address the problem of high phosphorus in low flow periods in impounded areas. It appears that the lack of regulatory drivers is limiting demand in Ohio's water quality trading space. Understanding other factors that may be limiting conditions when clear trading program rules exist is an important area of further research and could be an opportunity for ESMC to explore how to increase interest.

A number of initiatives in Ohio focus on conservation and water quality improvement from the agricultural sector. The Ohio Agriculture Conservation Initiative is a "…partnership between agriculture, conservation, environmental and research communities to recognize farmers for their dedication to advancing methods that improve water quality in Ohio and increasing the number of best management practices being implemented on farms… OACI offers resources and education that farmers need to proactively employ modern, science-based practices on their farms and better demonstrate how those efforts are improving water quality over time." OACI was formed to accomplish two primary goals:

- To create a "universally recognized" voluntary farmer certification program. OACI had planned a pilot program for 2020 in order to increase BMP adoption and recognize farmer actions. According to OACI's website, farmers must enroll in the program by March 31, 2021. Farms that decide to participate will be assessed and scored in a number of categories by self-reporting on a mobile app, including soil testing, nutrient application and placement and on-field management. The total score will determine the certification level. The certification program will be administered by the Ohio Federation of Soil and Water Conservation Districts. Because the program is not a government program, it will be funded by the member organizations; financing to pay for the practices will come from the H2Ohio program.
- Create a "confidential farm practices assessment" to benchmark best BMP adoption and track progress towards goals.

OACI also supported the creation of the H2Ohio Fund.

Another effort the authors located during desk research was the Ag Nutrient Alliance. The OACI website notes that this Alliance "… facilitates the implementation of effective agriculture best management practices through integration of current research and data, stakeholder education, identification of research gaps and recommendations for funding priorities that can measurably improve the water quality of Ohio's lakes, rivers and streams."

Ohio has developed a Nine Element Nonpoint Source Implementation Strategic Plan for watershed planning at the HUC12 level for areas with defined impairments. Ohio's goal is to have a Nine Element nonpoint source plan for every HUC12 in Ohio. However, one interviewee noted that there is no regulatory hammer associated with these plans, and that most HUC12s do not have a municipality incorporated into the planning effort.

Soil Health

Research did not find evidence of soil health programs at the state level outside of the NRCS soil health program in the state, and soil health research conducted at academic institutions. However, there is interest amongst farmers, agricultural advisors, and industry to explore how the field of soil health leads to a healthier Ohio. The Ohio Soil Health Symposium was launched in 2017 and coordinated by Seneca Conservation District, and has become an annual opportunity for soil scientists in the field to engage in conversation and learn together. This provides an example of how active county conservation districts can be critical players for the successful implementation of environmental market programs. Using these existing stakeholder discussion platforms as a way to introduce the economic benefits that trading programs can provide could be an effective way for ESMC to introduce the opportunities for environmental markets into a new state.

Climate Action

Research did not find evidence of state climate action planning in Ohio; however, the City of Cleveland Climate Action Plan 2018 establishes an overarching GHG reduction goal of 80% below 2010 emissions by 2050, with interim goals of a 16% reduction by 2020 and a 40% reduction by 2030. Columbus, Ohio also has a Climate Action Plan released in 2018.

Payments

H2Ohio is a statewide program allocated for at least two years at roughly $20 to $25 million per year of funding. The program has identified ten practices for phosphorus reduction according to cost-benefit analysis that it is willing to fund; funds will be delivered across the Ohio EPA, Ohio DNR and the Ohio Department of Agriculture. Farmers that receive Federal conservation funding for certain practices are ineligible for H2Ohio funds for those practices. An important area for future clarification is whether farmers receiving H2Ohio funding for phosphorus reduction would be able to generate credits for sale in environmental markets.

Wisconsin

The research did not find elements that would preclude environmental market development in Wisconsin. The research indicates that Wisconsin approaches water quality from a regulatory perspective: the state has NNC for phosphorus and a water quality trading/adaptive management program in place that is being used by a number of regulated facilities. Wisconsin's very low nutrient limits have led the state to encourage watershed-based work given the difficulty facilities have in meeting the limits. Phosphorus and sediment are the primary focus in the state. The high level of development in Wisconsin's water quality trading framework means that ESMC will have to conduct additional research through engagement with the state's DNR to determine how the ESMC platform might fit within the state, and where barriers are or adjustments may be required. While the research did not identify any specific state-level soil health programs, recent climate change related work on strategies to reduce emissions by the Governor's Task Force on Climate Change has specifically called out carbon farming and supporting farmer-led groups to increase carbon sequestration on agricultural lands. Engaging with the Governor's Task Force may therefore be a logical entry for soil carbon market discussions for ESMC.

People

Wisconsin has champions for water quality with the state's DNR; these individuals manage a fairly comprehensive water quality trading program that combines trading, adaptive management, and other evolving measures as described in the water quality section below.

Wisconsin policies also support farmer-led groups. For example, the Department of Agriculture, Trade & Consumer Protection (DATCP) provides funding to producer-led groups that focus on nonpoint source pollution mitigation projects through the Producer-Led Watershed Protection Grant Program (PLWPG). Projects led by these groups often target practices that incorporate soil health principles and reduce nutrient runoff loss across watersheds and therefore could support watershed-based trading programs.

Policies & Programs

Water Quality

Watershed planning in Wisconsin links the County Land and Water Resource Management (LWRM) Plans, required for each county in Wisconsin, and Nine Key Element Watershed Plans. A Nine Key Element Watershed Plan is required in order to be eligible for state funding of BMP implementation.

In 1997, Wisconsin adopted a statewide 1 mg/L Technology Based Effluent Limitation (TBEL) for phosphorus in statute; three water quality trading pilots were created by statute (Red Cedar River Watershed; Fox & Wolf River Basins; Upper & Lower Rock River Basins). While treatment upgrades at facilities were used to comply, one trade in the Red Cedar River Watershed occurred and the pilots helped develop quantification methods and informed the state's current Water Quality Trading (WQT) framework. Wisconsin moved from the technology based effluent limit to a water quality-based limit with the finalization of a statewide NNC for phosphorus for lakes/reservoirs and rivers/streams. The very low phosphorus limit usually requires filtration systems for effluents at a $4M median cost for facilities to install, and up to $100M; many small communities cannot afford these costs. This serves as an important driver for water quality trading in the state.

Wisconsin has developed a number of ways in which regulated facilities can meet permit requirements. The state has rolled out the phosphorus criteria slowly, and interviews indicate that facilities can have up to 9 years to plan to meet the limit. Facilities can choose between water quality trading and adaptive management but cannot do both. The state does give flexibility for a permittee working on adaptive management to fold their practices into a trade if it is quantifiable. Wisconsin also has a multi-discharger variance component.

As of late 2019, 44 facilities were engaged in water quality trading under the WI Water Quality Trading Program. The average number of credits required was 430; the average project size was 785 lbs/year and the average trade ratio was 1.8:1. Key features of this program include:

- The majority of credits are generated from nonpoint sources; the most common practices are taking land out of production and reverting it to perennial vegetation/prairie, or no longer tilling or fertilizing the land.
- The permitted facility/discharger has to enter into the agreement with the person reducing the pollution (usually a farmer but not always). Agreement has to be directly between the credit user and generator. The state is flexible on who puts the credit user in contact with the credit generator.
- Facilities have to purchase credits from within their own watershed. The permittee obtains credits from upstream. The state does provide some flexibility for downstream credits but not too far downstream.
- The Trade Ratio = (Delivery + Downstream + Equivalency + Uncertainty):1
    - Minimum trade ratio set at 1.1:1 for point source-point source and 1.2:1 for nonpoint source–point source
- Delivery is calculated using USGS model SPARROW or outlined in TMDL.

- SnapPlus is used as the primary model for agricultural-based trades.
- Downstream credits (credits generated downstream of credit user's point of standards application) are based on a ratio of point source to nonpoint source load. This allows for limited downstream trading but requires a greater off-set.

Wisconsin's Adaptive management program is "…a compliance option that allows owners of point and nonpoint sources of phosphorus to work together to improve water quality and to meet water quality standards. Adaptive management recognizes that excess phosphorus in lakes and rivers is the result of a variety of activities and sources; both point and nonpoint source reductions are often needed to achieve water quality standards." Wisconsin's adaptive management approach is meant to combine regulation of point sources and nonpoint sources for the least-cost option; its actual cost-effectiveness should and most likely will be assessed in the next few years. Adaptive management is even more flexible than water quality trading: water quality trading has to be done up front – practices have to be installed, quantified, verified, and credits are numbers that are written into a permit for the discharger to demonstrate compliance. Adaptive management, on the other hand, doesn't require practices up front or practice-specific quantification; rather dischargers commit to a plan that will bring their receiving water back to criteria. This program has been likened in an interview to an "adopt a watershed" program or similar to the Nine Key Element Watershed Plans through Section 319 of the Clean Water Act. An interviewee noted that adaptive management is more effective when a discharger is in the headwaters or discharging to a small water body and can work locally to clean it up. In adaptive management, the facility is subject to an interim level achievable with current technology and then can continue with the interim level as long as the receiving water meets the phosphorus criteria, and they have 20 years to do it. As of late 2019, 21 facilities were engaged in adaptive management. The benefits of adaptive management as listed on the state's website include:

- Permit compliance through adaptive management may be economically preferable to other compliance options.
- Point sources and partner nonpoint sources demonstrate commitment to their community and the environment by restoring local water resources.
- Dischargers receive less restrictive interim phosphorus limits while they work with partners to improve water quality. These less restrictive phosphorus limits may become permanent if adaptive management is successful and phosphorus water quality standards are restored.
- Adaptive management provides flexibility for permittees and partners to learn from each other and adapt with experience. The adaptive management option can extend over a 20-year timeframe (up to four five-year permit terms). This time is provided so the permittee can install phosphorus reduction practices, create new partnerships and measure success.
- Adaptive management may also address total suspended solids (TSS) wasteload allocations in watersheds with a Federally approved TMDL for TSS.

Wisconsin also has a statewide phosphorus multi-discharger variance (MDV) option, where "…point sources commit to step-wise reductions of phosphorus within their effluent as well as helping to address nonpoint sources of phosphorus from farm fields, cities or natural areas to implement projects designed to improve water quality. The MDV is similar to an individual variance. However, multiple point sources

can be covered under the MDV, whereas an individual variance only applies to a single facility. This provides for administrative streamlining and maximizes the potential benefits watershed projects may have through the variance program." In exchange, the facility receives an extended timeframe in which they are required to comply with lower phosphorus limits. Facilities must demonstrate economic hardship in order to be eligible for MDV. As of late 2019, 118 facilities were using the MDV. The MDV is not directly related to adaptive management but is rather a streamlined variance to the phosphorus water quality standard and is a common approach in other states. Wisconsin's MDV is somewhat innovative when compared to other variance approaches due to the county payment option for MDV whereby the facility can make a payment to a county Land and Water Conservation Department as one way of implementing a watershed project. Ultimately, the MDV can be used by facilities to gain additional time to find a compliance solution (a variance is not a final solution).

In 2020, Act 151 of the Wisconsin legislature passed a requirement that its DNR develop a nutrient credit clearinghouse to track the availability and sale of place-based nutrient credits. The law requires the Department of Administration (DOA) to partner with DNR to solicit a third party to operate a single statewide clearinghouse. Requirements for registries are a natural outgrowth of any successful market-based approach because the potential number of transactions begins to exceed regulator's ability to keep track of them through informal means. The unit or 'currency' that Wisconsin credits are quantified through is the SnapPlus model. Regardless of the speed of the clearinghouse's development, it likely creates the need for ESMC's systems of tracking and transacting credits to be able to communicate and integrate with the state clearinghouse, through an API software interface or manual sharing of data on supply, demand, and transactions. The authors are not aware of any distinctions in the legislative language or early development of the tool that make Wisconsin's clearinghouse distinct from Iowa's nutrient exchange or any other form of registry that exists for ecosystem service credits. Interviews have noted that the clearinghouse creates another option for how trading transactions can occur but does not change the existing trading framework in Wisconsin. The clearinghouse may, however, capture more trades if it is successful at reducing transaction costs. The Request for Information (RFI) for the clearinghouse closed in September 2020; the next step is a draft RFP for public notice but this has not been posed publicly yet.

Soil Health

Research did not find evidence of soil health programs at the state level outside of the NRCS soil health program in the state, and soil health research conducted at academic institutions.

Climate Action

Wisconsin has significant state-level activity on climate change planning. For example, the WI Initiative on Climate Change Impacts is "…a statewide collaboration of scientists and stakeholders formed as a partnership between UW-Madison's Nelson Institute for Environmental Studies and the Wisconsin Department of Natural Resources. WICCI's goals are to evaluate climate change impacts on Wisconsin and foster solutions."

In 2019, Governor Tony Evers signed Executive Order #52, establishing the Governor's Task Force on Climate Change to develop strategies to adapt to and mitigate climate change. The Task Force's Final Report was released on December 9, 2020. The report includes 46 recommendations across nine sectors: climate justice and equity; energy; transportation; agriculture; resilient systems; clean economy;

education; food systems; and forestry. Policy pathways include Executive/Agency Action; 2021-2021 State Budget; and Legislation. The report recognizes agriculture as a net source of emissions, and also as an important piece of climate mitigation through increased soil carbon sequestration (from increases in conservation practices) and reduced GHG emissions (from changes in on-farm management). Recommendations specific to agriculture in the Final Report are as follows:

- **Support farmer-led watershed groups**.
    - Establish a soil carbon and climate pilot program with producer-led watershed groups to assess the extent and value of climate mitigation practices to generate carbon credits based on verified protocols and models used in existing carbon markets. Identify barriers to participation by agricultural producers and opportunities and solutions to overcome those challenges.
- **Pay farmers to increase soil carbon storage in agricultural and working lands**.
    - Establish a "carbon farmers" program at DATCP to develop methods for measuring how much carbon is stored through agricultural management practices and provide tax incentives or subsidies.
    - The creation of a "carbon farmers" pilot program that pays farmers for carbon sequestration and GHG offsets would allow farmers to learn how to participate in markets that reward sustainable management practices. This pilot program would enable DATCP and agricultural operators to gain a thorough understanding of various carbon credit protocols and the degree of carbon credits that various practices can generate, and therefore the amount of carbon tax credits a farm could receive if a true carbon market is established in the Midwest. A working group would be formed to perform iterative evaluations of the pilot program in the context of current federal legislation and regional carbon markets. This ongoing evaluation of the pilot program will determine the feasibility for a state carbon market for agriculture, taking into account how it could function, how Wisconsin farmers would participate, the interest of companies in participating and purchasing credits, and the appropriateness of these carbon markets for Wisconsin farmers.
    - Create and fund a pilot program through the Soil and Water Resource Management grant to help inform the feasibility of a state-based agricultural policy that pays farmers for carbon sequestration.
    - Work with partners to understand carbon market options for Wisconsin that would be consistent with, and complementary to, other efforts in the Midwest and federal legislation to increase access to carbon markets for the state's agriculture and forestry industries.
- **Increase incentives for cover crops, reduced tillage, and crop rotation adjustments to increase soil carbon storage.**
    - Establish a cost-share program to provide annual incentive payments to farmers who sign agreements for long-term best management practices (BMPs) that mitigate the impacts of and agriculture's contribution to climate change, increase soil health, reduce erosion and over-application of nutrients, and increase soil carbon storage.

- Establish a Climate Leader Award for a farm each year to highlight and educate about climate-smart farming operations.
- Increase funding and technical support for carbon storage programs and practices.

- **Avoid conversion of natural working lands.**
- **Make managed grazing livestock production systems an agricultural priority.**

The WI Voluntary Emission Reduction Registry from WI Section NR 437.01 "…applies to any person who wants to register emission reductions or avoided emissions of GHGs or air contaminants, or carbon sequestration, if the emission reduction, emission avoidance or carbon sequestration occurs before it is required by law or results in emissions which are lower than those allowed by law." The text notes that emission reductions "…may be used to comply with existing regulations if they meet the provisions specified in the applicable regulation".

At the local level, both the City of Madison and the City of Milwaukee have climate change goals. City of Madison Goals include a "100% Renewable Madison" where the City has set the ambitious goal of reaching 100% renewable energy and zero net carbon emissions by 2030. The City of Milwaukee Goals include a 25% renewable energy goal by 2025.

Payments

As noted above, DATCP currently provides funding to producer-led groups that focus on nonpoint source pollution abatement activities through the Producer-Led Watershed Protection Grant Program (PLWPG). The program's goal is "[t]o improve Wisconsin's soil and water quality by supporting and advancing producer-led conservation solutions by increasing on the ground practices and farmer participation in these efforts." Since its inception in 2016, the program has increased from 14 to 31 groups funded to date. The PLWPG has increased farmer engagement in nonpoint source pollution mitigation and has allowed farmers to share knowledge and learn from others. The most recent round of Producer-Led Watershed Protection Grants has been awarded to 27 groups of farmers.

NR 151, State run-off rules for farms was signed into law in March 2020 and requires farmers to comply if they are to receive cost-share. This program is also overseen by DATCP.

Conclusions and Recommendations

The potential for generating positive environmental outcomes from the agricultural sector in the Mississippi River Basin is extensive but varied. The scope of the current rapid assessment includes an overview of people, policies/programs, and payment sources relevant to water quality, soil carbon, and net GHG credit generation from agricultural lands in this region, with additional detail on key unique elements for each of the states. The potential for market-based solutions such as environmental markets and trading to generate positive environmental outcomes and catalyze change at the watershed, state or basin level is in part a function of the states' approach to environmental regulation. A particular state's approach to environmental regulation and its willingness to innovate and experiment with new approaches is determined by a variety of factors, including the severity of the environmental challenge; the social and political culture of the state; the costs of compliance with traditional/grey solutions; the willingness of people in decision-making positions to assume some additional risk; and the existence and functioning of partnerships that can serve as generators of social capital that make the kind of cross-sector, multi-stakeholder arrangements common to environmental markets possible.

The states included in the rapid assessment present different opportunities depending on the impact of the dynamic mix of people, policies and programs, and payments within each state for soil carbon, net GHG, and/or water quality/quantity. Soil carbon and net GHG opportunities from agricultural land appear promising in states that are focusing on soil health, and this focus brings water quality into the outcomes produced as well. However, programmatic infrastructure, rules and regulations surrounding soil health are limited and developing and locating avenues through which to connect with and engage producers will be critical. Many states are developing water quality trading programs for compliance-grade credits and some have regulatory drivers in the form of NNC, but complicated rules and requirements combined with a smaller geography of potential trading for compliance purposes may serve as a barrier to rapid trading program deployment.

Based on the initial and rapid assessment, the authors identified several states in which the components they identified appear to be aligning in favor of a successful environmental market for one or more of the environmental outcomes considered. Their high-level recommendations and potential next steps for each of the states are presented in table 2 below. They have highlighted those states where ESMC could prioritize engaging with to start. The states the authors have recommended prioritizing are those that are both flexible (as evidenced by policies and programs in place) and motivated (as evidenced by champions and partnerships in decision-making positions and in frameworks/programs that are developed or under development within the states).

Table 2: High Level Recommendations and Next Steps		
State	**Recommendations**	**Potential Next Steps**
Iowa	**Prioritize**/engage for compliance-grade water quality credit generation	Engage with Iowa DNR
Illinois	Wait and watch; additional research required	Monitor evolving legal situation; conduct additional interviews/desk research on potential for environmental markets
Kansas	Engage for compliance-grade water quality credit and Scope 3 soil carbon/GHG asset generation	Engage with Kansas Department of Health and Environment; potential pilot project of Inverse Nutrient Trading concept
Minnesota	Engage for compliance-grade water quality credit and Scope 1/3 soil carbon/GHG asset generation	Engage with Minnesota Pollution Control Agency
Missouri	**Prioritize** for compliance-grade water quality credit and Scope 3 soil carbon/GHG asset generation	Engage with Missouri DNR's Nutrient Trading Workgroup
Nebraska	**Prioritize**/engage for soil carbon, net GHG and Scope 3 water quantity asset generation	Engage with Nebraska's Healthy Soils Task Force; potential pilot project
Ohio	Wait and watch; additional research required	Conduct additional interviews/desk research on potential for environmental markets
Wisconsin	Engage for compliance-grade water quality credit generation and for Scope 3 soil carbon and net GHG asset generation	Engage with Wisconsin DNR (water quality) and with the Governor's Task Force on Climate Change (soil carbon/net GHG)

The authors also note the following **potential areas of additional work**:

- A focused case-study assessment into one or more of the environmental outcomes for which ESMC seeks to generate credits (e.g., water quality, soil carbon, net GHG reductions, habitat, and/or biodiversity) and/or into a particular policy/program type in one or more of the states.
- A focused case-study assessment into one or more pilot projects completed or underway in one or more of the states considered in the rapid assessment in order to extract lessons learned/best practices.
- An exploration and longer-term analysis of what it might mean for another market to enter a state such as Wisconsin, which already has a highly regulatory water quality trading framework, and how ESMC might enter the market without serving as a competitor. Will the existing framework positively influence the frequency distribution of adoption[9] compared to a state without a current framework?
- An exploration of what it might mean for ESMC to enter a state such as Missouri, which has a developing but flexible and motivated trading atmosphere.

[9] https://teddykw2.files.wordpress.com/2012/07/everett-m-rogers-diffusion-of-innovations.pdf