IOWA SOYBEAN Association

RESEARCH CENTER FOR FARMING INNOVATION

2021 Water Monitoring Report

Having water monitoring capabilities creates opportunities to validate actual changes in water quality derived from performance of using management techniques, products and practices.

Insight and Engagement Opportunities

Insight and engagement opportunities within the Iowa Soybean Association Research Center for Farming Innovation – **WATER MONITORING REPORT 2021.**

Iowa farmers value data and science to solve problems. Farmers are inherent problem solvers and understanding the current conditions of our natural resources has been a critical driver for the work and services we provide at the Iowa Soybean Association's Research Center for Farming Innovation (RCFI). This report provides insights into our work to support water monitoring and research across Iowa. Conducting data analysis and exploring how the data changes over time given wet and dry cycles help develop an understanding of where to focus resources for the future.

When it comes to water and land management, farmers are curious like so many people. Is the water quality good or poor and why is it that way? What are the concerns and what are the variables affecting those concerns? What can be done to protect or improve water quality? Farmers need to know if the management practices they are implementing are positively impacting water quality, and those results and efforts need to be reported to the general public. Working with the farmer by answering and providing insights and credible data is where RCFI can assist the farmer – working with farmers, for farmers.

RCFI works in concert with many others as we position water monitoring, evaluation, research projects and programming. Some of our current partnerships are with our local government agencies like the Iowa Department of Agriculture and Land Stewardship, USDA Natural Resources Conservation Service, and the Soil and Water Conservation

Districts. We also work with cities, counties, university researchers and local ag retailers who provide services and products supporting production agriculture.

If you are a farmer and want to explore water monitoring, learn about research products and opportunities, or management practices on your farm, RCFI stands ready to engage with you. And likewise, if you are a potential partner, give us a call, and we can explore opportunities to engage.

We look forward to working with you.

Roger Wolf, Director Iowa Soybean Association, Research Center for Farming Innovation

TO LEARN MORE ABOUT THE OPPORTUNITIES BY ENGAGING WITH RCFI, PLEASE VISIT *www.iasoybeans.com* OR CONTACT KRISTEN DEARDEN AT KDEARDEN@IASOYBEANS.COM.

Testing the Waters

ISA lab provides data to help improve water quality

The Iowa Soybean Association's (ISA) water lab will soon complete its 11th year of water monitoring.

ISA's water laboratory is a unique asset, connecting directly with the work of the Research Center for Farming Innovation (RCFI).

"We are in the business of helping our farmers be productive, profitable and sustainable," says Roger Wolf, RCFI director. "We work to bring data and research results to the table, and this information gives a certain amount of credibility to our work."

Located on-site at ISA, staff at the water lab first began testing water samples in 2011. Previously, water sample analysis was done in partnership with the Des Moines Water Works lab. During that time, monitoring was done on stream samples, and tile sampling started once ISA had its own lab.

"The water lab gives us the capacity to commit to water monitoring by having it on-site compared to having to work with a private lab or a third party," says Tony Seeman, senior field services lab and data manager at ISA. "We work with projects to help farmers use data to know where to target resources to treat the highest levels."

Water testing

The ISA water lab will test thousands of samples each year. The accredited lab is certified by the U.S. Environmental Protection Agency (EPA) through the Iowa Department of Natural Resources to analyze E. coli bacteria, nitrates, nitrites and fluoride under the Safe Drinking Water Act.

The method, ion chromatography, is used to test common nutrients, including nitrates, nitrites and phosphate as well as fluoride, chloride and sulfate.

Other tests conducted in the lab include turbidity (a measure of water clarity), total phosphorus, alkalinity and hardness and ammonia nitrogen.

In 2021, the ISA water lab analyzed more than 4,100 individual samples as part of 20 different projects. Dry weather conditions prevented the collection and analysis of another 1,300 scheduled samples.

Dave Graham, ISA Water Quality Technician

Projects ranged from the traditional Agriculture's Clean Water Alliance (ACWA) tributary sampling of the Raccoon and Boone Rivers to supporting multiple Iowa Department of Agriculture and Land Stewardship (IDALS) Water Quality Initiative demonstration projects, to specific research with the University of Iowa on restored oxbows and Practical Farmers of Iowa cover crop work.

New projects for 2021 included a series of sampling events throughout Lyon County with the local Soil and Water Conservation District and providing sample analysis to support the Soil and Water Outcomes Fund verification efforts.

The data has been compiled, and reports will be generated for the projects. Individual reports will be sent to more than 150 participating farmers, detailing the data and comparing results to other sites statewide.

Craig Fleishman, an ISA farmer-member from Minburn, has been participating in water monitoring for several years and is grateful ISA has taken the initiative to be proactive about water quality.

"As a farmer, I am interested in seeing what the tile lines are carrying and where it ends up," Fleishman says.

Fleishman says results from his water samples reinforce the conservation systems he has on his farm. He gathers samples from tile lines, creeks and rivers every two weeks and encourages others to do the same.

"If anyone is interested, they should try it. Even if farmers are just doing it for their knowledge," he says. "Every producer has some creek or tile line to test. It's not hard to do."

Water monitoring can potentially play a significant role in helping achieve goals set by the Iowa Nutrient Reduction Strategy.

"We need a 45% reduction of nitrates from every acre in Iowa," Seeman says. "You need to know where you are at to gauge your next steps in achieving the 45% reduction per acre."

Results of water monitoring

Water monitoring allows farmers to better understand the conditions in streams and water leaving the farm property, whether via surface flow or tile water, which often leads to more questions about what can be done to protect or improve water quality.

"Being able to monitor several locations over many years enables RCFI to focus programs and topics specific to issues that are present," says Wolf. "For example, many watershed projects receive additional funding support to address specific concerns local farmers are trying to remedy. Having monitoring capabilities creates opportunities to validate actual changes in water quality derived from the performance of using management techniques, products and practices."

Looking ahead

Like soil testing, farmers value having water quality data, and ISA intends to keep supplying the information.

"Our long-term vision for the laboratory is to continue embedding monitoring as part of our comprehensive research at RCFI," Wolf says. "Monitoring helps farmers and partners focus programming and validate the performance of in-field and edge-of-field strategies. It gives farmers confidence their practices are performing, which drives continuous improvement for the sustainable production of soybeans."

Wolf says increased demand for these services could lead to an expansion of the ISA water lab.

"Over the next 10 years, we hope to find ways to lower the cost and speed up access to actionable information to help farmers make informed decisions accurately and faster," Wolf says. "New sensors, expanded analytics and data decision tools are likely"

Craig Fleishman, ISA farmer-member from Minburn

"We are in the business of helping our farmers be productive, profitable and sustainable," says Roger Wolf, RCFI director. "We work to bring data and research results to the table, and this information gives a certain amount of credibility to our work."

Agriculture's Clean Water Alliance

Our mission is identifying and advancing solutions that reduce nutrient loss, build healthier soils and improve Iowa's waters.

Since the earliest days of the Iowa Soybean Association's (ISA) Environmental Programs and Services, through the present-day Research Center for Farming Innovation (RCFI), the backbone of ISA water monitoring efforts has been the Agriculture's Clean Water Alliance (ACWA) stream monitoring program.

Harry Ahrenholtz, chairman of the ACWA, says water quality monitoring has been an integral part of the organization's annual work plan since the organization was established in 1999.

"The monitoring program has been instrumental in identifying the priority geography and then targeting the specific placement of in-field mitigation projects," says Ahrenholtz. "Once those projects are in place, water monitoring becomes the report card for the effectiveness of those mitigation efforts by measuring water quality in and comparing with water quality out. Water quality monitoring is the foundation of the building blocks we are using to improve Iowa's water."

"This continued commitment to understanding nutrient issues in the river demonstrates agriculture's recognition of its role in generating solutions while providing the data to give a real-world assessment of those efforts in the reality of a dynamic system," says Tony Seeman, senior field services lab and data manager at the Iowa Soybean Association.

Over time, the model of scaling down to individual streams within a larger river system to look for similarities and differences has been expanded by ACWA, for example, in the Boone and Des Moines Rivers and replicated by others like ISA's partnership with the City of Cedar Rapids in the Middle Cedar Basin.

The data collected in the Raccoon has been leveraged to further watershed projects and planning efforts beginning with West Buttrick Creek in 2003 and continuing today with the Farm to River project and support for the North Raccoon Headwaters Water Quality Initiative.

ACWA was an early supporter of edge-of-field practices, funding installation and monitoring research on the earliest field-scale bioreactors in Iowa that helped usher in the practice standard that the Natural Resource Conservation Service uses to implement the practices across Iowa.

Over the years, weather, changing land uses, and management practices have contributed to water quality dynamics in tile water, stream and mainstem rivers.

The data and information that has been gleaned through monitoring is helping stakeholders, including farmers, ag retail and agencies, better understand complexities, giving context to the issues and illustrating the scope and scale of water quality challenges.

Over the years, there have been numerous examples of farmers and groups of farmers taking actionable steps to work on addressing these challenges by targeting the use of practices and systems to improve water quality.

2021

The main story for 2021 was the ongoing drought conditions over much of Iowa. Pairing data from ACWA stream sites located at United States Geological Service stream gage stations gives an estimate of nitrogen loads and yields from larger watershed areas to

compare to each other over time. The data for 2021 ranked lowest for nitrate concentrations and loads since 2007, except for the upper reach of the Boone River, which ranked second lowest.

Drought

The lingering effects of a drought can impact the following year's nitrogen loss. A warm, dry summer and fall can be prime conditions for an elevated level of soil mineralization.

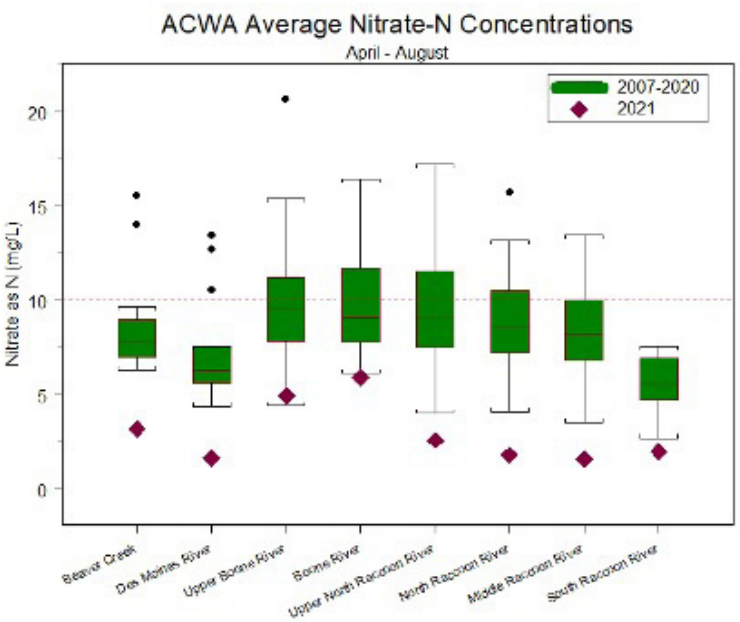
Without adequate moisture, the nitrate-nitrogen can't migrate into the crop or down to the groundwater and accumulates in the soil profile, leaving it vulnerable to being lost later.

Seeman says looking at the long-term record from the Raccoon River can give us some insight into what to expect in the coming year.

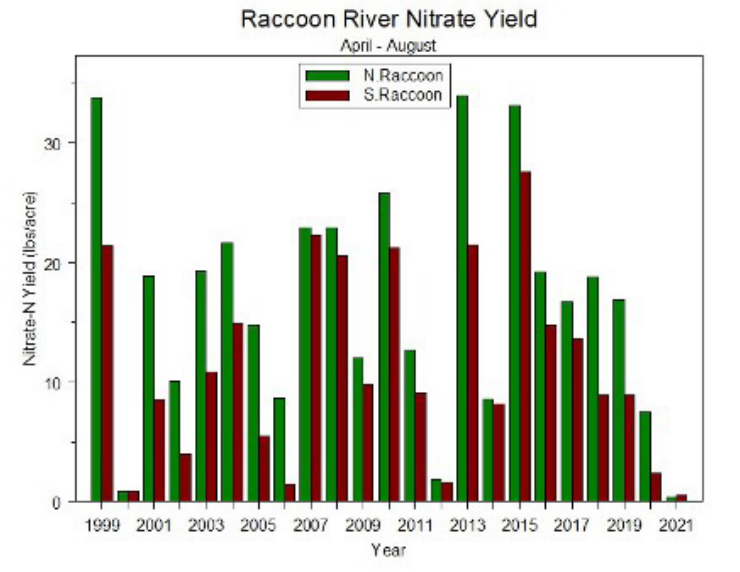
Data following the droughts of 2000 and 2011-2012 show different patterns.

Loads from the North Raccoon bounced back to around average (19 lbs./acre) in 2001, whereas in 2013, the loads measured were the highest in the ACWA data record at 34 lbs./acre.

"The higher loads in 2013 were most likely due to the spring being extremely cold and wet, which delayed planting and allowed a lot of water to move through the soil, leaching the accumulated nitrate before the crops could uptake it," says Seeman.



Average nitrate-N concentrations for major basins in the Raccoon and Des Moines River watersheds for 2007-2020 (range shown with boxplots) and 2021 (dots).



April-August nitrate-N yields for two main branches of Raccoon River in pounds/acre.

Tile Monitoring

Nitrogen loss through subsurface (tile) drainage is an inevitable byproduct of row crop production and improved drainage.

Although it is not the only nitrogen source in surface water, subsurface drainage is a primary source of nitrogen delivery to surface water because the tile drains provide a convenient pathway for water and nitrogen that leach below the root zone to move to surface water. Because it readily moves with water, nitrate is the primary form of nitrogen lost through subsurface drainage.

The amount of nitrate loss depends on many factors. Some factors, such as fertilizer, crop and soil management, are controllable. Other factors are outside the farmer's control, including geologic setting, precipitation timing and amounts, nitrogen mineralization from soil organic matter and other environmental factors.

"The RCFI tile monitoring program seeks to document and understand nitrogen loss at the field scale and how best to manage for maximum nitrogen efficiency," says Tony Seeman, senior field services lab and data manager at the Iowa Soybean Association.

Soils matter

Looking across contrasting landforms in Iowa that have been formed by different geologic, glacial, wind and water histories, we know that soil properties such as infiltration and amount of organic matter vary a lot.

These properties impact the groundwater quality and the type of farming system used. For example, the Des Moines Lobe is flat with very rich soils that require significant tile drainage systems and occasional tillage to maximize production. Because of this, it usually contains the highest nitrate concentrations and loads.

The Southern Iowa Drift Plain, by contrast, has older, more erosion-depleted soils and steeper slopes promoting surface drainage. In this case, water runs off before being able to infiltrate the soil, requiring a need for tile.

Seeman says another finding that may surprise some farmers is nitrate concentrations do not vary much between the soybean and corn years in a rotation.

"This is counterintuitive since before or during corn growth, significant amounts of nitrogen fertilizer are applied to the soil, while soybeans generally don't receive added nitrogen fertilization," says Seeman.

The nitrate concentration is similar to corn and soybean ground because of the inherently leaky nature of the nitrate part of the nitrogen cycle.

Water-soluble nitrate leaches from fertilizer and natural soil sources. It is driven by the increased speed the water moves through the soil profile bypassing natural processes that could reduce the amount of nitrate delivered to the stream.

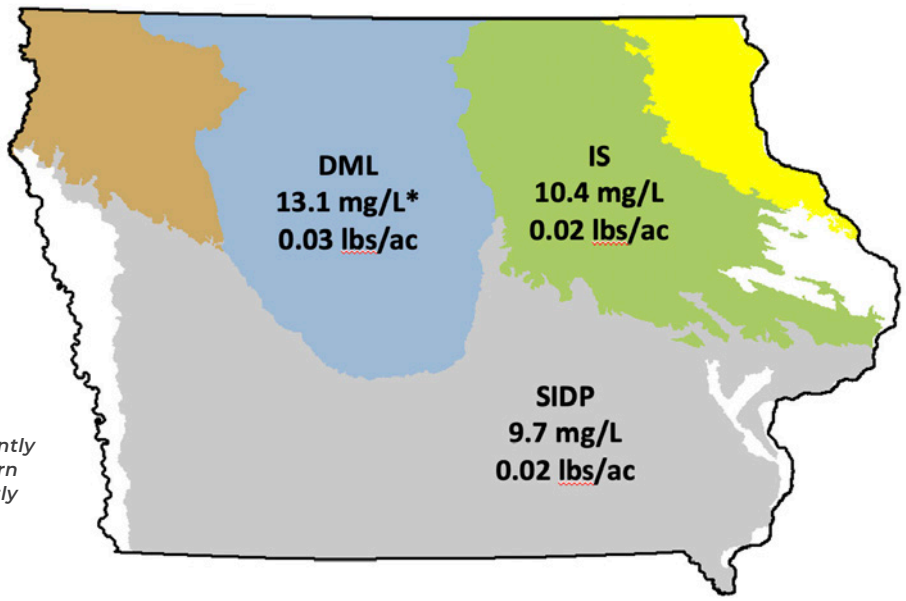
This is a primary challenge for managing nitrate and balancing it with crop production.

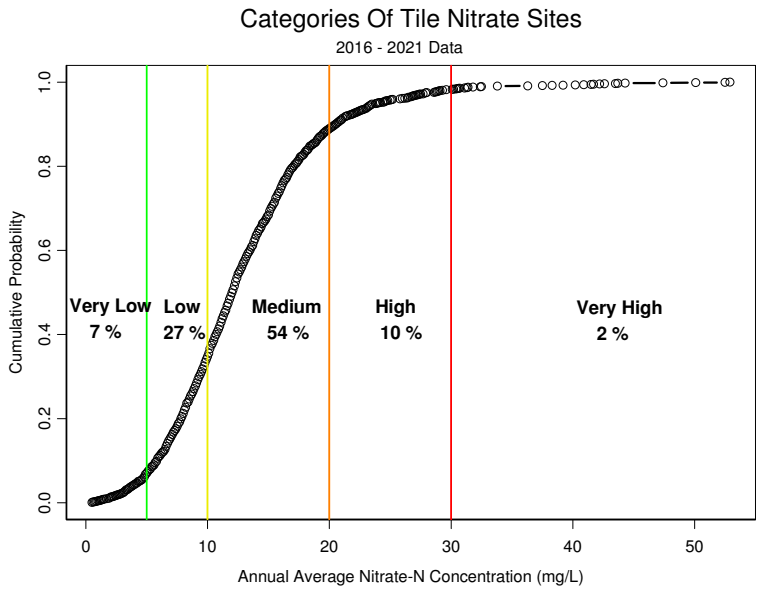
"New products and technologies are emerging to improve in this space, such as enhanced efficiency fertilizers," says Seeman. "We may see more projects in the future to look for cost-effective and performing solutions."

ISA categorizes results and provides recommendations for water quality improvement based on nitrate concentration and yield results.

2021 Tile Monitoring Average Nitrate-N by Landforms in Iowa

Average Tile Nitrate-N concentrations and yields by landform region for 2021. The Des Moines Lobe concentrations were significantly higher than the Iowan Surface and Southern Iowa Drift Plain. Yields were not significantly different between the 3.





This figure shows the cumulative distribution for average nitrate concentration from 1800 site/years data since 2016 with these categories marked. Over half of all sites fall into the medium category, signifying adequate nutrient management but a need to further reduce loss by implementing conservation and treatment practices. Only 12% of sites showed a strong need for changing current nutrient management practices.

If you are interested in sampling your tile, please contact Anthony Seeman by calling 515-334- 1042 or email: aseeman@iasoybeans.com.

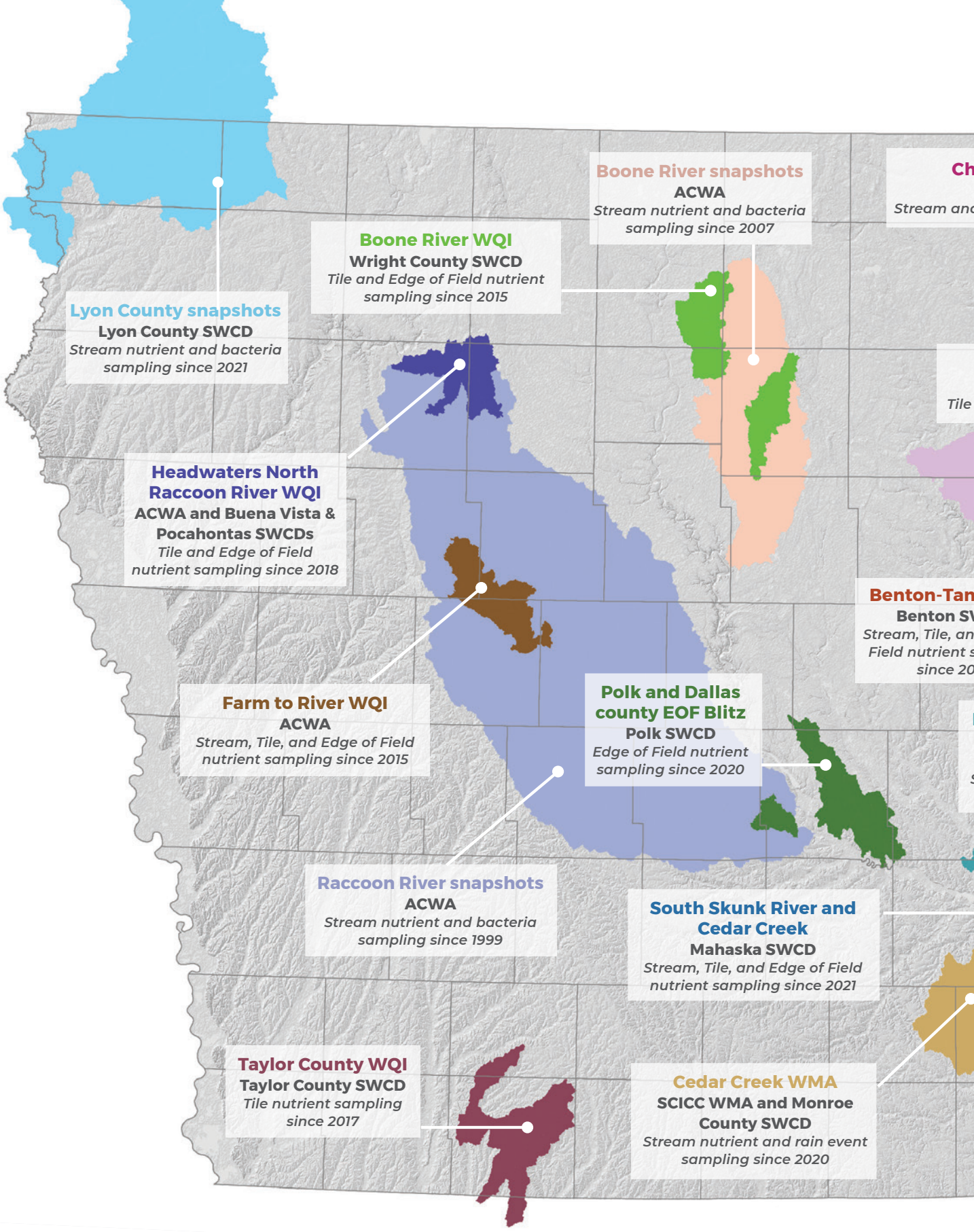
Leading in the Understanding of Tile Nitrate

• Low to Very Low Concentration or Yield: Nitrate concentrations and nitrate yields in the low or very low categories suggest that current nutrient and cropping management practices are working well for limiting nitrogen losses. If you are satisfied with current management strategies, continuing with them should contribute to better-than-average water quality results. Additional refinements can always be made, and cover crops can contribute to further nutrient reductions and soil health goals if not already in use. However, edge-of-field practices (saturated buffers or woodchip bioreactors) are less likely to be cost-effective at these sites.

• Medium Concentration or Yield: The medium category concentrations and nitrate yields are where the most significant numbers of sites fall. Nitrate concentrations in this range are what ISA and others in the Midwest typically observe for corn and soybean or continuous corn rotations using standard practices. However, additional nutrient reduction practices at these sites are needed to meet state nutrient reduction goals. Cover crops or edge-of-field practices (saturated buffers or woodchip bioreactors) would provide additional nutrient reductions for water leaving the field(s). Changes to nitrogen management practices (rate, timing, form and placement) are unlikely to yield significant nitrogen loss reductions on their own, for sites in the medium category should be considered as part of an overall strategy.

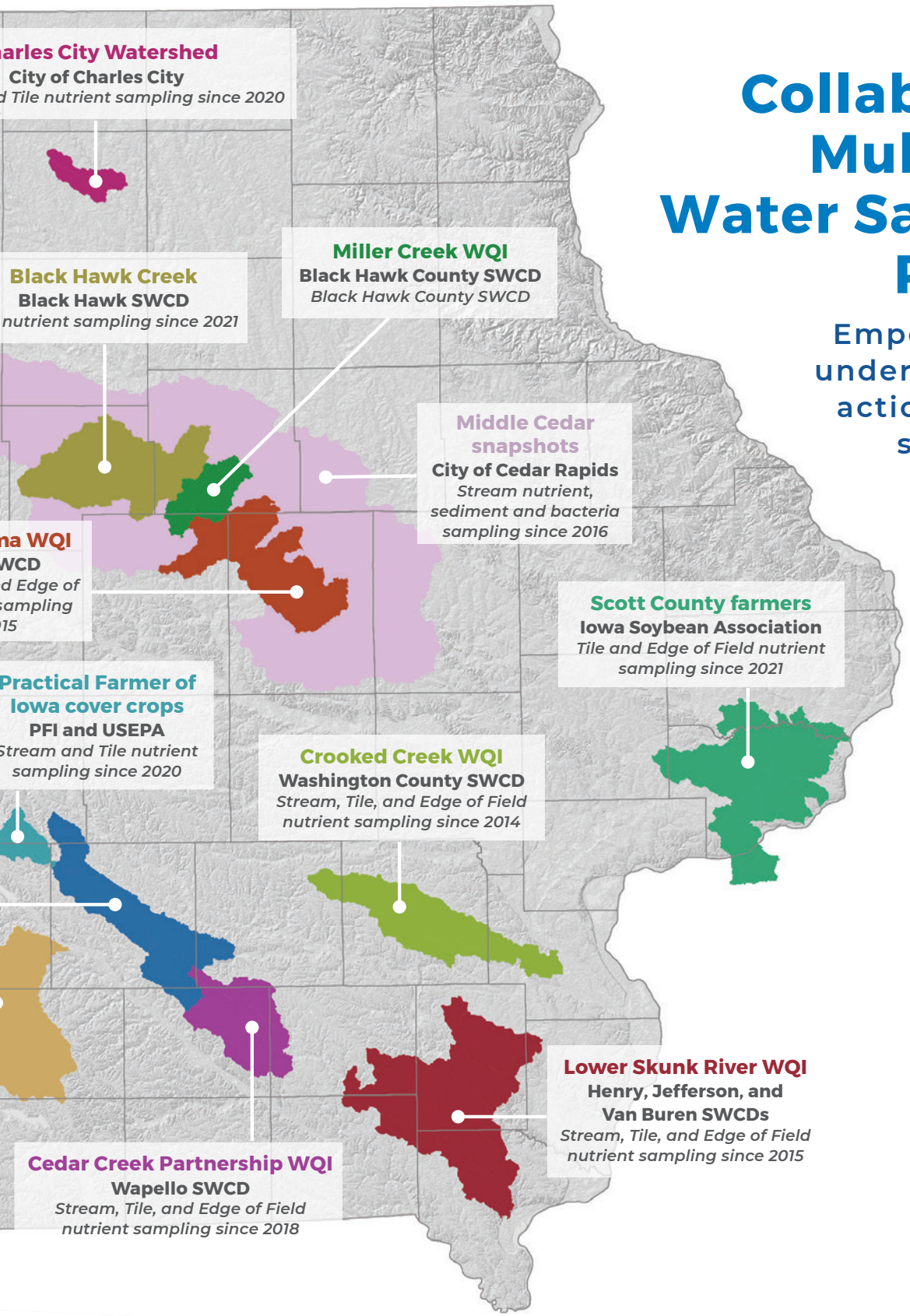
• High to Very High Concentration or Yield: Nitrate concentrations and nitrate yields in the high or very high categories indicate that additional nutrient reduction practices would greatly benefit these sites. Reviewing nitrogen management practices (rate, timing, form and placement) for these sites is an excellent first step, and adjustments to these practices may provide noticeable water quality and economic benefits. Cover crops or edge-of-field practices (saturated buffers or woodchip bioreactors) should also be considered to reduce nitrogen losses from these sites further.

> “New products and technologies are emerging to improve in this space, such as enhanced efficiency fertilizers.”
>
> *— Tony Seeman, senior field services lab and data manager at the Iowa Soybean Association*


Lyon County snapshots
Lyon County SWCD
Stream nutrient and bacteria sampling since 2021
Boone River snapshots
ACWA
Stream nutrient and bacteria sampling since 2007
Boone River WQI
Wright County SWCD
Tile and Edge of Field nutrient sampling since 2015
Headwaters North Raccoon River WQI
ACWA and Buena Vista & Pocahontas SWCDs
Tile and Edge of Field nutrient sampling since 2018
Farm to River WQI
ACWA
Stream, Tile, and Edge of Field nutrient sampling since 2015
Polk and Dallas county EOF Blitz
Polk SWCD
Edge of Field nutrient sampling since 2020
Raccoon River snapshots
ACWA
Stream nutrient and bacteria sampling since 1999
South Skunk River and Cedar Creek
Mahaska SWCD
Stream, Tile, and Edge of Field nutrient sampling since 2021
Taylor County WQI
Taylor County SWCD
Tile nutrient sampling since 2017
Cedar Creek WMA
SCICC WMA and Monroe County SWCD
Stream nutrient and rain event sampling since 2020

Collaborative Multi-scale Water Sampling Projects

Empowering local understanding and action to improve soil and water resources.



Accelerating Water Quality Efforts Through WQIs

In 2013, the state adopted the Iowa Nutrient Reduction Strategy. It accelerated efforts to reduce the amount of nitrogen and phosphorus leaving the state through our waterways, which included the adoption of the Water Quality Initiative (WQI).

One part of the WQI is establishing watershed improvement projects to incentivize and demonstrate the widespread adoption of conservation practices to reduce nutrient loss.

The Iowa Soybean Association's (ISA) Research Center for Farming Innovation (RCFI) has worked on several projects going back to 2014, including watershed planning and water monitoring.

Anthony Seeman, senior field services lab and data manager, says there are multiple reasons for including water monitoring as part of these demonstration projects.

Water monitoring includes baseline and ongoing stream nutrient concentrations and allows for general education and engagement of local producers.

"It provides the data from their fields; targeting practices to sites with substantial loss and guiding management and evaluating the effectiveness of specific edge-of-field practices like bioreactors and saturated buffers," says Seeman.

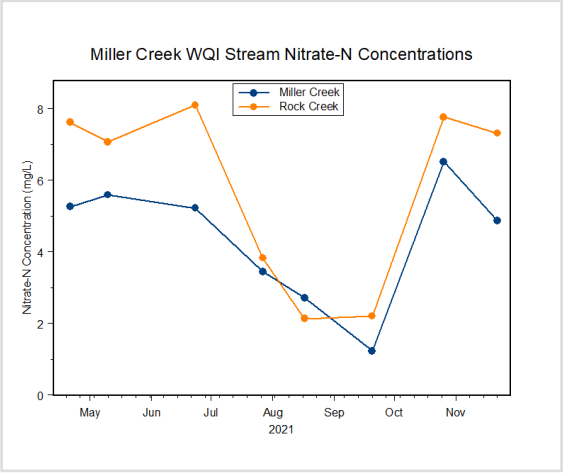
Each project is unique and locally led, but as a group, they are pushing forward and providing a blueprint for watershed improvement for all parts of the state.

These projects have a dedicated coordinator working with farmers and landowners in the area, helping promote practices and navigate the various cost-share and incentive programs to get conservation on the ground. As some of the projects have matured, the areas have been expanded to include more acres and participants, building on their success.

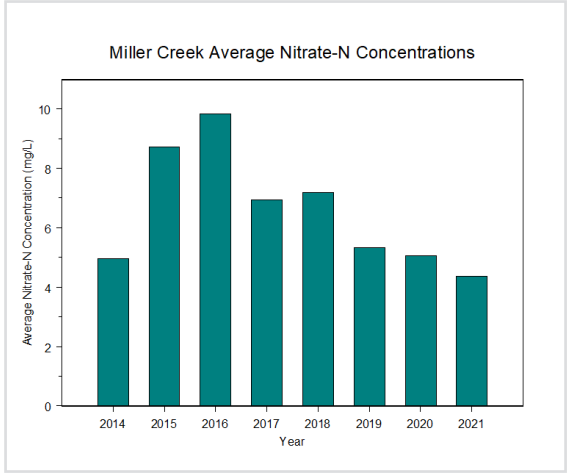
While considerable progress will take time to show up in the water sampling data, there are some positive signs.

Miller Creek WQI

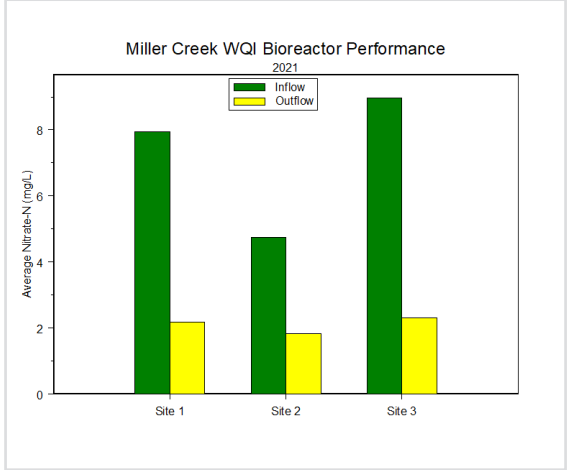
One example is the Miller Creek WQI project that has been on-going since 2014.



In 2020, the Miller Creek WQI project expanded to include nearby Rock Creek. Since Rock Creek didn't have the benefit of six years of dedicated staff and funding, it is encouraging to see that Miller Creek is significantly lower showing the effects that the Miller Creek WQI project had.



Average Nitrate-N concentrations in Mill Creek show a general decline but also a significant variability over the course of the project.



Bioreactors installed as part of the Miller Creek project showed between 60-75% reductions in average nitrate-N concentrations in 2021.

Middle Cedar Basin

The city of Cedar Rapids and the Iowa Soybean Association's (ISA) Research Center for Farming Innovation's water monitoring lab began a partnership in 2017 for the Middle Cedar Basin.

The template for the study follows one used by the Agriculture's Clean Water Alliance which involves samples from all tributary HUC12s to compare results across the watershed.

In 2018 the project was implemented as a broader monitoring program with ISA staff collecting samples; managing, analyzing and reporting data while Coe College analyzes samples.

In addition to monitoring the city's source water for nitrate, samples are also analyzed for E. coli bacteria, total suspended solids and phosphate.

The city is also engaged in upstream Water Quality Initiative (WQI) projects and uses the data to identify locations to address nutrient runoff.

Cedar Rapids also faces challenges related to flooding, erosion and recreational contact.

Examples of LiDAR derived eroding stream bank areas.

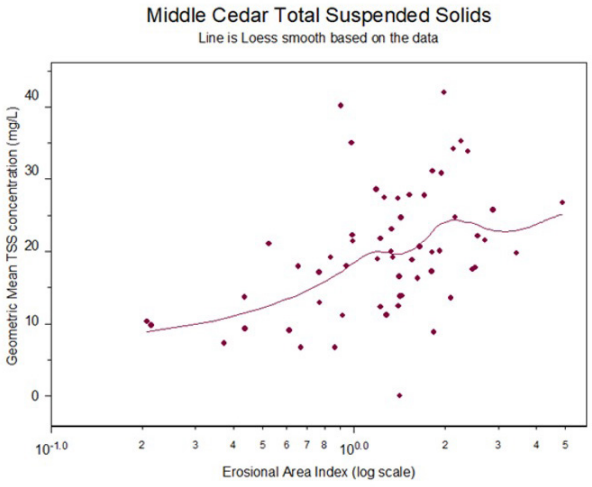
Streambank erosion study

Past data, collected from the project is being compared to modeling conducted and published by the Iowa Department of Natural Resources (DNR) and the Iowa Geologic Survey of eroding streambanks in Iowa.

The authors of the study used the LiDAR high resolution elevation data collected throughout the state and devised a process to estimate the areas of streambank erosion for all stream segments in Iowa.

Iowa DNR staff advised taking the simple line data and using the attributes included to calculate an area value that accounts for bank height.

Although the two data sets were collected over different time frames, there was good agreement suggesting that the model is adequate for targeting purposes.



Study of Streambank Erosion

Results indicated the modeled data does relate to conditions on the ground in the Middle Cedar and provided confidence it can help target resources in areas that don't have stream sediment data.

Cedar Creek Monroe County SWCD

It was a unique situation when the South-Central Iowa Cedar Creek (SCIACC) Watershed Management Authority (WMA) reached out to Iowa Soybean Association's (ISA) Research Center for Farming Innovation (RCFI) to conduct water quality monitoring. It was unique to ISA because there are few row-crop fields in the woodlands and grassland pasture-filled watershed.

In 2010, Iowa legislation authorized the creation of WMAs, an inter governmental group designed for cities, counties, Soil and Water Conservation Districts, and stakeholders within watersheds to cooperate to achieve effective watershed management and watershed health goals. Formed in 2015, the South-Central Iowa Cedar Creek Watershed Management Authority wanted baseline water quality data to assess the watershed.

In addition to analyzing water samples for nitrate, the project called for significant phosphorus and turbidity data to evaluate sediment issues.

Going forward

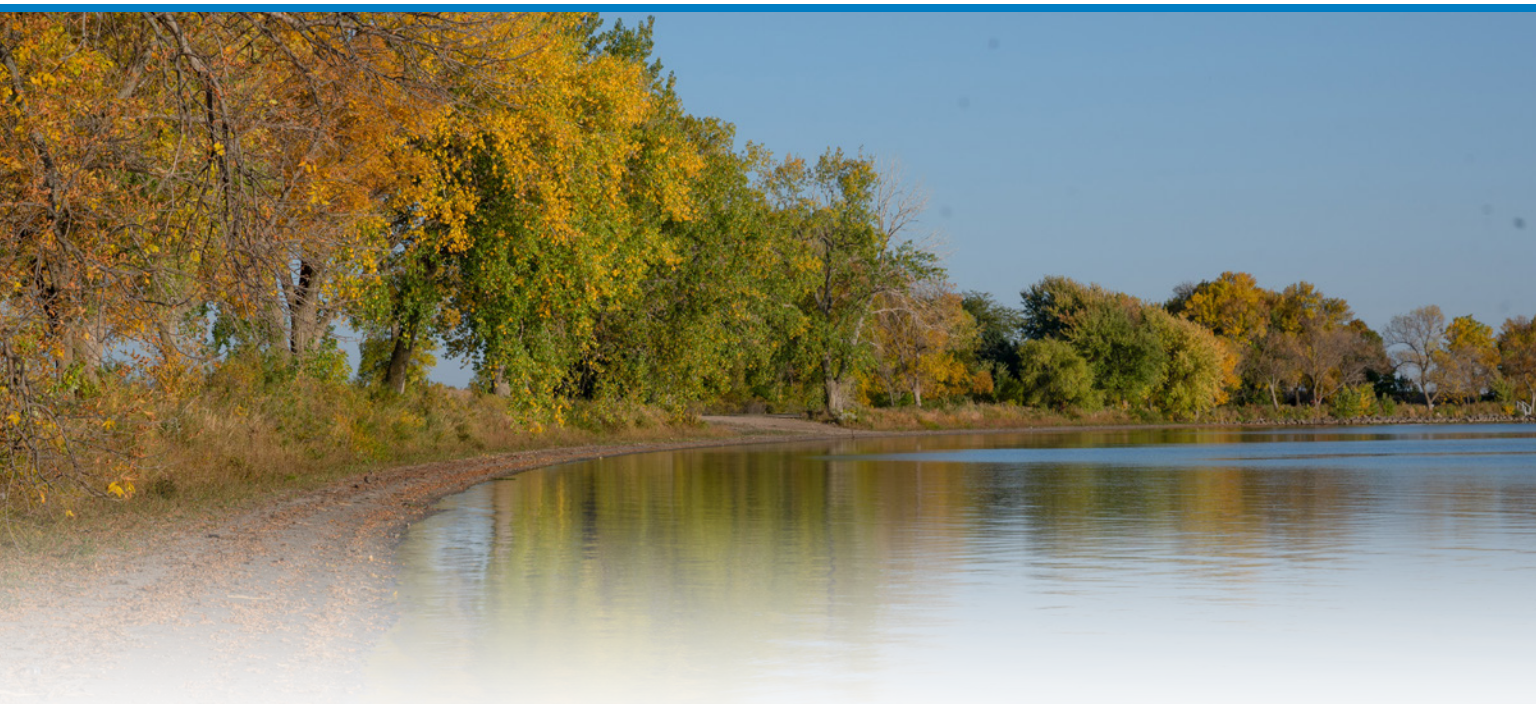
"The SCIACC WMA will be cross-referencing this data with other data sets to help identify priority areas, which will ultimately allow the WMA to set goals accordingly in the Watershed Management Plan," says James Martin, regional basin coordinator for the Southeast Iowa, Iowa Dept. of Agriculture and Land Stewardship.

The Watershed Management Plan is scheduled for completion by June 2022. This is done using the Regional Conservation Partnership (RCPP) and other state, federal and cost-share funding sources. Once the plan is finalized, the WMA will have an increased ability to procure funding for implementation than any individual entity would on their own.

Funding could become available for structural practices to treat gully erosion, provide livestock water, mitigate flood events, and nutrient and soil health practices such as cover crops, wetlands, buffers, and edge-of-field practices.

Funding could become available for structural practices to treat gully erosion, provide livestock water, mitigate flood events and nutrient and soil health practices such as cover crops, wetlands, buffers and edge-of-field practices.

Lyon County SWCD



In early 2021, Lyon County Soil and Water Conservation District (SWCD) contacted the Iowa Soybean Association (ISA) about implementing water quality monitoring throughout the county. The district conservationist and commissioners had dedicated funding to reinvigorate engagement in conservation.

"Much effort has been made to improve water quality above Lyon County in the watershed, but there has never been a focus in Lyon County or below in Iowa," says Justin Trout, district conservationist. "My goal is to talk to my fellow district conservationists in Sioux and Plymouth counties and try and create a large joint effort to get a project like this underway."

Results

Multiple years of data collection will be needed to establish a credible baseline due to the variables that affect surface water. 2021 was a below-average precipitation year in Lyon County. Therefore, samples may or may not give a true representation of the water condition.

The 2021 results showed suspended solids and bacteria were a significant issue.

"Considering the number of animal units present in Lyon County, it makes logical sense as manure application occurs heavily across the entire county," Trout says.

The plan for the project area in 2022 is to continue to collect samples from established sites.

"Continuing the same sampling sites and testing methods for multiple years will help us establish a trend line on which we can make better estimates on the actual quality of the water," says Trout. "The hypothesis is our results show better water quality than we normally have because it was so dry and very few if any tile lines ran during the collection period. The dry weather also kept nitrogen from leaching into the watershed."

Long-term goal

The long-term goal for the project area, and the data collected, is for a joint Regional Conservation Partner Project (RCPP) with partners in South Dakota and Minnesota. The Big Sioux Watershed Project in South Dakota is a long-standing project focused on improving the water quality of the Big Sioux River.

Conservation agronomist

Trout says the data collected in this project supports the need for edge-of-field practices. Rosalie Roberts, ISA conservation agronomist, working in partnership with Cooperative Farmers Elevator (CFE) in their Rock Valley location, can utilize this information to reach producers who may not be involved with NRCS or SWCD programs.

"The data is important for Rosalie to find other partners to help support water quality projects in the Big Sioux watershed," says Trout. "This is a critical component if we successfully find sponsorship and partners to apply for an RCPP."

ISA Unlocks the Benefits of Oxbows

The Iowa Soybean Association (ISA) is helping farmer-members dig for treasure.

The ultimate reward may not be a chest of gold but instead a way to mitigate flooding, prevent nitrate from entering waterways and provide a home to endangered wildlife like the Topeka Shiner.

The "X" marks the spot on former oxbows — the winding, meandering, disconnected pools adjacent a stream that over time become filled with sediment. ISA recently partnered with the U.S. Fish and Wildlife Service (USFWS), to restore seven oxbows located in Greene and Carroll Counties.

"Usually, we don't pair them like this; it is kind of an unusual project," says Brandon Iddings, ISA field services program manager for conservation resources. "Three are less than a mile apart in Greene County; the remaining four in Carroll County are a half-mile apart."

David Ausberger, an ISA member from Greene County who is participating in the restoration effort, says there's no downside to revitalizing the important habitats. In addition to providing habitat for the Topeka Shiner minnow, the Greene County farmer hoped his restored oxbows would also serve as an essential locale for blue heron, deer, and other wildlife.

"It was an easy decision to make with private funding through ISA and cooperation with the Natural Resource Conservation Service (NRCS). I didn't have to lift a finger," Ausberger says. "I think it's going to be good for wildlife, and it's another arrow in my quiver when people say that farmers are just out here mining the land. We're not.

Getting started

For organizations interested in restoring oxbows, Iddings and USFWS Biologist Darrick Weissenfluh collaborated with The Nature Conservancy to create a 29-page Oxbow Restoration Toolkit now available at nature.org. Iddings says funding is earmarked for more than a dozen oxbows in the Raccoon and Boone River Watersheds.

"Those are our priority areas

Brandon Iddings, ISA field service program manager for conservation resources

because the Topeka Shiner is focused in those areas," Iddings says.

Landowners not in the priority watersheds can get in touch with NRCS and the Iowa Department of Agriculture and Land Stewardship (IDALS).

With a project identified, designed and construction beginning, there are only a few steps to getting an oxbow back in working order. Around four layers of black dirt are removed from the top, often finding a new home in the farmer's fields. With the black dirt removed, clay and gravel material remain, which is often used to fill washouts. The bottom layer filling in an oxbow is usually old gravel and rocks.

"Once you get to that old stream bed, usually some water starts leaking in," says Iddings.

For the future

When the seven oxbows are restored, Iddings hopes to increase awareness with farmers and the public due to their visibility near major roadways. He's planning to host oxbow field days in the future, both aimed at targeted watersheds and for would-be oxbow restorers at-large.

"There are so many benefits," Iddings says. "It's great for wildlife and good at nitrate reduction if you have tile flowing into them. When the floodwaters rise, 42% of the nitrates that go into that oxbow will be removed." Ausberger has watched the progress on his oxbows and says it's quite a bit different than when his father took on a solo restoration more than a decade ago.

"The contractor we found made it look a lot easier than my dad did with his old end loader," Ausberger says. "These guys just knock it right out. It's going to look good for years to come."

> "It's great for wildlife and good at nitrate reduction if you have tile flowing into them. When the floodwaters rise, 42% of the nitrates that go into that oxbow will be removed."
>
> *— David Ausberger, an ISA member from Greene County*

Drainage Water Recycling

What if you could capture excess water drained from your fields, store this water in a pond or reservoir, and use it to irrigate your crops during dry periods? It's possible with drainage water recycling (DWR), a forward-looking practice that the Iowa Soybean Association's Research Center for Farming Innovation is studying.

While DWR isn't new, it's an idea worth revisiting.

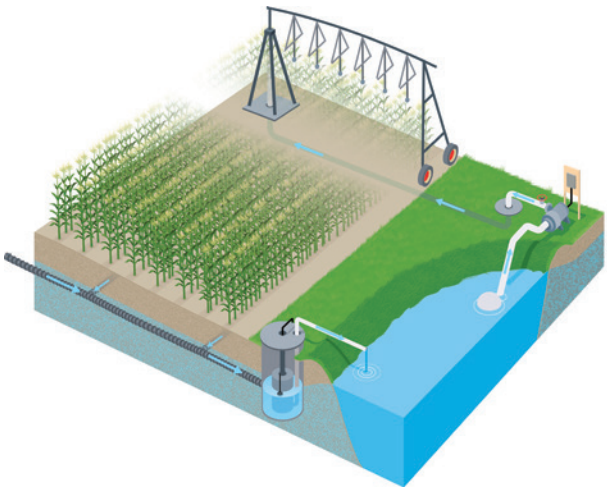
"Iowa State University's (ISU) DWR research in the 1980s showed this system could help improve yields, but the economics weren't there to justify the investment," says Chris Hay, Ph.D., senior manager of production systems innovation at RCFI. "What's changed today is interest in the other benefits of DWR, including water-quality improvement, wildlife habitat and flood control. There are also cost-share dollars to help make DWR viable."

If you're like most Iowa farmers, you have areas in your fields that never seem to drain well. What if you could put that water to work for you?

A.J. and Kellie Blair are partnering with ISA researchers to see how their Dayton-area farm can benefit from an innovative system of drainage water recycling.

The Blairs have started transforming a 3-acre area on their farm into a holding pond. The excess water captured in the pond will be used in a pivot-irrigation system during drier parts of the growing season.

The Blairs are working with Hay to implement a new resource called Evaluating Drainage Water Recycling Decisions (EDWRD). This tool helps farmers estimate the potential benefits of capturing drained agricultural water in ponds or reservoirs. This water can be used for irrigation, either with a center-pivot system, sub-irrigation, or drip irrigation.



This graphic shows a complete Drainage Water Recycling (DWR) system and how it works.

Q: How does DWR work?

ANSWER: DWR captures surface and subsurface (tile) drainage water and stores it in a pond or reservoir for reuse as supplemental irrigation during dry periods. There are many potential configurations for DWR systems. Options include sub-irrigation, where water is applied back to the field through the drainage system, and sprinkler irrigation. "Natural low areas and draws can work well for DWR," Hay says. "Just block off one side with a dam, and you've got a reservoir." On a flat landscape, it will be necessary to excavate the reservoir, with the spoil used as a levee to increase storage. "It's possible to make DWR work in about any situation where you can benefit from both drainage and irrigation," Hay added.

Q: What yield benefits can DWR provide?

ANSWER: DWR can increase corn yields up to 61% and soybean yields up to 31% , based on data from DWR field sites in the Transforming Drainage research project, as well as some earlier research. "However, these results are from a limited number of sites each having unique characteristics, so more research is needed to fully understand the yield benefits that can be achieved with DWR," says Hay, who noted that ISA is a collaborator on the multi-state Transforming Drainage research project. DWR field research at a site near Story City, Iowa, has shown average corn yield increases of 53 bushels per acre using DWR, compared to the control treatment. "Yields are also more stable with DWR," Hay says.

Q: How big does the reservoir need to be?

ANSWER: A reservoir of 6% to 8% of the irrigated field area with an average depth of 10 feet is adequate to fully meet irrigation demands. That's based on modeling research done in collaboration with researchers from Purdue University and ISU over a 10-year period for a site in Indiana and a site in Iowa, respectively. These modeled DWR systems are also able to reduce nitrogen and phosphorus losses from the field by 20% to 35%, on average, and up to 70% to 80% in some years, Hay notes. A deeper reservoir would need less space.

Q: What's next for DWR research in Iowa?

ANSWER: ISA and ISU are collecting their fourth year of data from the DWR system near Story City. Three more DWR systems will be constructed in Iowa within the next year, including two in Calhoun County and one in Webster County, as part of a project with IDALS, ISU and ISA.

Farm to River Project

The North Raccoon Farm to River Partnership project, formerly known as the Elk Run project, covers areas of Sac, Carroll, Green and Calhoun Counties.

The North Raccoon Farm to River Partnership is an Iowa Water Quality Initiative (WQI) to implement in-field and edge-of-field practices that keep nitrogen and phosphorus out of Iowa waters and is funded by the Iowa Department of Agriculture and Land Stewardship (IDALS), the Iowa Soybean Association (ISA) and the Agriculture's Clean Water Alliance (ACWA).

The project has been approved to continue through 2024, according to ACWA.Tributary sampling identified this watershed as a hotspot for nitrogen loss, which led to the ISA and ACWA proposing and initiating a Water Quality Initiative demonstration project in partnership with IDALS.

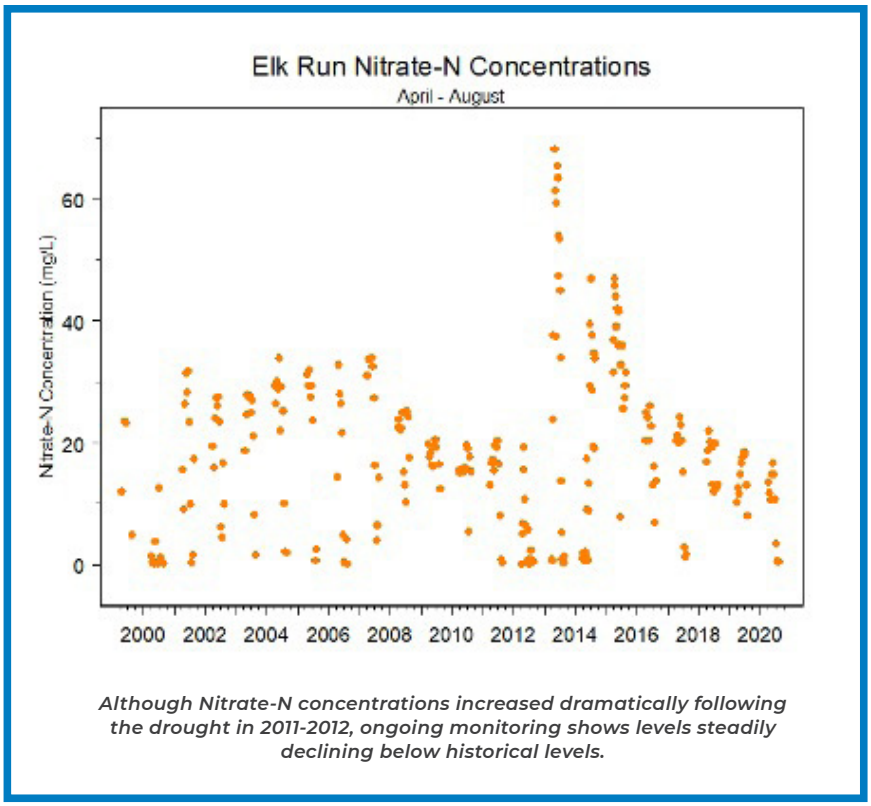
Close to 4,000 cost-share cover crop acres and nearly an additional 4,000 acres of cover crops that were either non-funded or funded through other sources are a result of the project thus far. Installation of two new bioreactors and a saturated buffer were also completed this winter.

Joe Wuebker, ISA conservation agronomist, oversees the Farm to River Partnership project and is working with ag retailers and their customers to reach goals of 20 edge-of-field practices such as bioreactors and saturated buffers and an additional 7,000 new acres of cover crops.

"We use water monitoring and testing to show the landowners how their field water is testing throughout the growing season," says Wuebker.

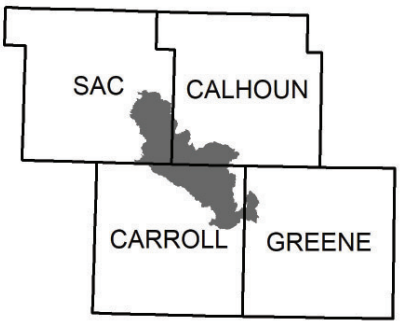
Wuebker, who works with sales agronomists from Landus Cooperative, NEW Cooperative and Nutrien Ag Solutions, says samples are taken from tile lines, edge-of-field installed bioreactors, saturated buffers and creek water samples.

"At the end of the year, we work with the growers on those farms to get in-field data such as tillage practices, previous and current crops, nitrogen application dates, rates and types; cover crop usage and yield," says Wuebker. "We can use the information to sort out the data, look for any strange levels, and figure out solutions."



Although Nitrate-N concentrations increased dramatically following the drought in 2011-2012, ongoing monitoring shows levels steadily declining below historical levels.

Farm to River Partnership



The Farm to River sites within the four counties in Iowa.

IOWA SOYBEAN ASSOCIATION

1255 SW PRAIRIE TRAIL PKWY., ANKENY, IA 50023

515-251-8640 | IASOYBEANS.COM

Partially funded in part by the soybean checkoff.