Application

FY26 Iowa Cancer Plan Implementation Grant Cycle

Iowa Cancer Consortium
www.canceriowa.org

Applicant Information:

Name of Project Lead: Cara Matteson
Project Lead Email Address: Cara.Matteson@linncountyiowa.gov
Project Lead Phone Number: 319 892-5148
Organization: Linn County Sustainability
Street Address: 935 2ND St. SW
City: Cedar Rapids
Zip Code: 52404

Project Details:

Project Title: Linn County Water Sampling and Monitoring Program
Total Amount of Funds Requested for FY26 (up to $25,000): 21,800

Provide a brief description of your intended project and any relevant background information about your organization. *(Suggested: 1,000 words or less.)*

The Linn County Sustainability Department was established in 2020 by the Board of Supervisors. The department promotes environmental sustainability and community resilience through economic development, environmental services, and coordination. It uses the Triple Bottom Line framework—which balances environmental, social, and economic factors—to guide decision-making and define sustainability.

The Linn County Sustainability Department currently includes a Sustainability Director and plans for future department growth. In the meantime, there is ample opportunities to work with various departments in the County, facilitating coordination, and providing support for project momentum. One example of this is an internal watershed stakeholder group that consists of the following departments: Sustainability, Planning and Development, Conservation, and Soil Conservation. This group began meeting in 2024 to discuss the overall watershed efforts being done in the County and how best to synergize efforts and provide the best value to Iowans (specifically Linn County). In our discussions we had a couple strategic planning sessions where we identified opportunities and then ranked them for prioritization.

Watershed efforts have been going on for years with various partners and jurisdictions at the table to conduct planning and implementation projects. Watershed efforts in Iowa generally focus on flooding and water quality needs. Water quality needs in Iowa are multifaceted, including surface water and groundwater. Surface water quality is a general indicator of the overall health of the ecosystem since it is impacted first and is the

most vulnerable. Iowa has nutrients (nitrate and phosphorus) and bacteria that run off the landscape and soak into the ground in high amounts due to land use.

Water quality has impacts on all aspects of life, including human health. For the purposes of this application, we are focused on nutrients in surface water since they are very prevalent and an indicator of anthropogenic impacts. Excessive nutrients are known for producing algae blooms that can kill fish and damage ecosystems. In addition, nutrients and bacteria are not good for human consumption and have been linked to various health concerns including gastrointestinal illnesses, blue baby syndrome, and cancer. Surface water is used in various ways in the County including recreation and drinking water. The City of Cedar Rapids has shallow wells for their drinking water supply that pull water from the river through sand that is naturally underground. Communities all around Iowa are seeing nitrate concentrations increase in their drinking water supplies. The Environmental Protection Agency (EPA) has set a Maximum Contaminant Level (MCL) of 10 mg/L for nitrate in drinking water. Beyond the health implications, there is also a huge cost for treatment systems that remove nitrate. It is more cost advantageous to prevent nutrients from getting into the water so there is a concerted effort to work with landowners on best management practices that will remove nutrient concentrations before they runoff.

Some of the prioritized opportunities identified in our internal watershed strategic planning included targeting areas that are modeled to have higher nutrient loads and install practices to remove nutrients, create a more robust and comprehensive water sampling program, assist watershed management authorities in getting administrative support, and internally lead watershed efforts more cohesively. Currently Linn County is a partner with six(6) different watershed management authorities (WMA). Each WMA has different funding and approaches with surface water sampling and where and how they share the data.

Our proposed project is to design a county-wide surface water sampling and monitoring program. The project would be completed in multiple stages. The first stage involves gathering various data sets related to surface waters across the County. Some WMAs have more extensive sampling efforts than others and there is also volunteer sampling efforts being done. The second stage focuses on analyzing that data to identify trends, gaps, and potential areas of concern. In the third stage, we will engage county end-users to determine their intended uses for the data and their priorities. The final stage will involve presenting a range of options, models, and recommendations for establishing an effective and sustainable surface water monitoring program.

How many individuals in Iowa do you expect to reach through your project?

There is a potential to reach the 230,702 individuals that live in Linn County but the ability to reach beyond the borders as well. In particular those Iowans that live in the associated watersheds that cover Linn County. These include: Middle Cedar, Upper Wapsipinicon, Maquoketa, Lower Cedar, and Middle Iowa.

In which Iowa counties do you expect to reach people through your project?

Linn County

Please describe how your project addresses one or more of these priority areas: *(Suggested: 1,000 words or less.)*

- Addressing cancer disparities across the cancer continuum.

- Addressing cancer prevention and/or early detection.
- Expanding successful local projects statewide in Iowa.
- Formalizing lasting and broad change in cancer control through policy and systems change within organizations, systems, and communities. (Funds may not be used for lobbying.)

This project addresses cancer prevention and/or early detection. Surface water can carry environmental carcinogens such as nitrates, agricultural runoff and industrial pollutants. These contaminants may infiltrate groundwater, affecting drinking water sources, or they may accumulate in recreational bodies of water. According to Dr. Rena Jones with the National Cancer Institute (NCI): "Contamination of drinking water by nitrate is a growing problem in many agricultural areas of the country. Ingested nitrate can lead to the endogenous formation of N-nitroso compounds (NOC), which are potent animal carcinogens." Increased risks of various cancers were identified in studies. Our project will begin to identify areas of concern through monitoring and trend analysis, allowing for a focused effort for best management practices on the landscape and also provide public awareness. This project functions as a prevention tool--reducing exposure before illness can occur.

In addition, there is potential for expanding the water sampling model on the county-scale statewide.

Please indicate which type of funding you are applying for (choose one):

☐ **Single Year** (applying for one year of funding only)

☒ **Multi-Year: Year 1** (applying for the first year of a two- or three-year project with the intention of applying for Year 2 in FY27, if awarded)

☐ **Multi-Year: Year 2** (FY25 Year 1 awardees only) *

☐ **Multi-Year: Year 3** (FY25 Year 2 awardees only) *

If you are applying for continued funding (funded last year for the same multi-year project), please describe your success and challenges in previous years of funding. *(Suggested: 250 words or less.)*

Click or tap here to enter text.

Which goal(s) and strategy(ies) from the Iowa Cancer Plan will your project support/help to implement? (*Suggested: 100 words or less.)*

This project will support the Iowa Cancer Plan's priority of reducing exposure to environmental carcinogens. Implemented strategies will include improving water testing practices and supporting initiatives to reduce chemicals/pollutants/carcinogens in drinking and recreational water. This project will aid in achieving Priority 6, Strategy E of supporting research that further identifies environmental factors involved in cancer development and primary prevention strategies to reduce exposure.

Project Objectives:

These objectives will serve as the grant deliverables for your project, if awarded. The Iowa Cancer Consortium Board of Directors may request to change, add, or remove objectives with your agreement prior to funding. Where applicable, please include baseline (current) data. Please add additional objectives, if desired.

Objectives should be SMARTIE goals: **Specific, **M**easurable, **A**ttainable, **R**elevant, **T**ime-Based, **I**nclusive, and **E**quitable. The CDC's National Breast and Cervical Cancer Early Detection Program put together a helpful resource for SMARTIE objectives. (This and additional resources can be accessed at https://canceriowa.org/grants/ifp)*

***Objective #1:** Compile all relevant existing data on Linn County's surface water quality from the Cedar Rapids Utility Department, volunteer groups, Middle Cedar and Indian Creek Watershed Management Authorities, and Iowa Department of Natural Resources' state databases AQuIA and Bionet into one comprehensive dataset for analysis.

- Deadline *(funding period is July 1, 2025-May 31, 2026):* October 1, 2025
- Baseline data: 20 years of multiple points in the Indian Creek watershed; Morgan Creek, Otter Creek, and Bear Creek have been sampled by Coe College for 10 years; McLoud Run has been sampled by Coe College for 10 years; Morgan and Silver Creek have been sampled by Coe for 3-5 years at multiple points; Middle Cedar Watershed Management Authority has 8 sites in Linn County, 7 years of sampling, sampled by Iowa Soybean Association/City of Cedar Rapids; Wapsipinicon Watershed Management Authority has been sampled at 5 sites in Linn County for 5 years by Coe College; the United States Geologic Survey (USGS) has insitu nitrate sensors on Morgan Creek and Cedar River/Palo; the University of Iowa has past deployment of nitrate sensors on McLoud Run, Morgan Creek oxbow, Wapsipinicon River at Central City; volunteer efforts associated with the Izaak Walton League and other data sources to be determined.
- Target by deadline: Identify all the available data that is being collected in surface water in Linn County and put it into one format for easier evaluation.

***Objective #2:** Use the comprehensive dataset to evaluate the spatial coverage and quality of existing water quality data for Linn County's natural bodies of water.

- Deadline *(funding period is July 1, 2025-May 31, 2026):* December 31, 2025
- Baseline data: Baseline data from Objective 1
- Target by deadline: Review data for sampling analytes, frequency, and location.

***Objective #3:** Potential end-users from Linn County (Conservation, Planning and Zoning, Sustainability, etc...) and collaborative partners should evaluate the collected data to determine what additional needs may need to be addressed with additional monitoring and analyses.

- Deadline *(funding period is July 1, 2025-May 31, 2026):* March 1, 2026
- Baseline data: Linn County has an internal watershed group that has been talking with some other counties (Dubuque, Polk, Story) on their water sampling program and how their data is used. Various watershed groups in Linn County also meet to discuss various things, including water quality. The rise in cancer cases in Iowa is a concern with the watershed group and will be a mutually beneficial partnership that connects cancer and environmental work.
- Target by deadline: Discuss with the internal Linn County group and external stakeholders how they could perceive utilizing or better utilizing a more comprehensive water quality data set. Based on discussions, come up with a utilization plan.

***Objective #4:** Provide recommendations for a successful County monitoring program. The data-based recommendations will be the foundation for providing a path forward that will allow for partners and the public to access and understand water quality data and the condition of the waterways in Linn County. We anticipate applying for a FY27 Iowa Cancer Plan Implementation Grant for funding support for an implementation program based on the recommendations.

- Deadline *(funding period is July 1, 2025-May 31, 2026):* May 31, 2026
- Baseline data: Will be the compilation of Objectives 1-3.
- Target by deadline: A final report summarizing the recommendations for a comprehensive sampling program for Linn County, it is anticipated this could include a stepped approach of establishing a firm baseline dataset and program expansion timeline.

Project Collaborators:

The Iowa Cancer Consortium seeks to fund collaborative proposals. **At least one collaborator is required per project.** A letter of support is required for each listed collaborator.

Collaborator #1 (required)

Name: Justin Schroeder
Organization: City of Cedar Rapids
Mailing Address: 7525 Bertram Rd SE, Cedar Rapids, IA 52403
Phone: 319-450-1856
Email: J.Schroeder@cedar-rapids.org
Please describe the collaborator's proposed responsibilities/role in the project. *(Suggested: 100 words or less)*

- Provide data background.
- Provide input on desired end-user goals for a more cohesive sampling program.
- Provide continued support of sampling efforts.

Collaborator #2 (optional)

Name: Mike Tertinger, Chair
Organization: Indian Creek Watershed Management Authority
Mailing Address: 935 2nd St SW, Cedar Rapids, IA 52404

Phone: 319 892-5141

Email: mike.tertinger@linncountyiowa.gov

Please describe the collaborator's proposed responsibilities/role in the project. *(Suggested: 100 words or less)*

- Provide data background.
- Provide input on desired end-user goals for a more cohesive sampling program.
- Provide continued support of sampling efforts.

Evidence & Evaluation:

Resources for Evidence-Based Interventions and Evaluation: (This and additional resources can be accessed at https://canceriowa.org/grants/ifp)

- *The Iowa Cancer Consortium has put together a blog post, A Public Health Professionals Guide to Evidence-Based Cancer Control Interventions (EBIs), which contains state and national resources for public health professionals to visit when selecting interventions.*
- *CDC's Program Evaluation Framework guides public health professionals in conducting program evaluation. It is a practical, nonprescriptive tool, designed to summarize and organize essential elements of program evaluation.*

What scientific evidence is there that your project will be effective? (*Suggested: 500 words or less.)*
Surface water is a recreational resource that many Iowans enjoy. The ability to interact with our local water resources has a proven positive impact on our emotional well-being and is an easy assessment of the health of our lands. Creating a robust sampling program for Linn County is critical to increase awareness of the local water quality. There are numerous potential environmental variables that may be a part of cancer risk. Showcasing water quality based on sound science will bridge the connection between a small portion of the potential environmental carcinogens and cancer risk. Exposures to the water vary depending on the activity, including direct or indirect contact. Water quality is directly correlated to the practices occurring on the land surface and running off into our waterways.

Having a readily accessible water sampling and monitoring program will provide public awareness and also allow epidemiologists and researchers to better include the environmental contributions towards human health, specifically cancer. There is potential for future work that would include correlation assessment of water quality and cancer clusters.

The research article, “Spatial association of surface water quality and human cancer in China” came to some conclusions that can eventually be utilized and bridged for Iowa. According to this article, some evidence of the importance of environmental data collection, specifically surface water include:

- “Water monitoring and population-level cancer data have enabled ecological studies to make more efficient and comprehensive inspections of the association.”
- “Surface water pollution is likely one, but not the only, critical environmental driver of increased cancer.”

Wang, Z., Gu, W., Guo, X. et al. Spatial association of surface water quality and human cancer in China. npj Clean Water 6, 53 (2023). https://doi.org/10.1038/s41545-023-00267-5

The publication, “Saving water for the future: Public awareness of water usage and water quality” notes that ‘fresh water is a limited resource under anthropogenic threat’ and that ‘educating the public about…water quality …becomes an absolute necessity. They cite that ‘one way to achieve this is through engaging citizens in water issues’. *Seelen LMS, Flaim G, Jennings E, De Senerpont Domis LN.*

Saving water for the future: Public awareness of water usage and water quality. J Environ Manage. 2019 Jul 15;242:246-257. doi: 10.1016/j.jenvman.2019.04.047. Epub 2019 May 3. PMID: 31048230.

How will you evaluate your project? How will you know if you have been successful? (*Suggested: 250 words or less.)*

The Linn County Water Sampling and Monitoring Program will be evaluated based on the identified need, gaps, and recommendation for a more robust program. Success will be measured when a program is established based on the data-driven recommendations that this grant will fund. After a program is rolled out it will be deemed a success when the public can readily utilize data for various purposes, public becomes interested in water quality and sampling, and points of discussion on local water quality can be expanded based on data.

How will you modify your project to meet the unique needs of certain populations? *(Suggested: 500 words or less.)*

This project is meant to be robust to cover the entire county to provide a non-biased water quality assessment. This level of data collection will benefit everyone and will be based on sound science.

Budget:

Allowable budget categories have been identified below. If funding is requested within a specific category, a brief explanation or funding justification is required.

Staff Support

- Applicants may request funds for key personnel. Funds may not be requested to supplant existing job responsibilities.
- For any staff support requests through this grant mechanism, a copy of staff resume/CV, estimate of project hours, and list of staff project-related responsibilities must be included along with the budget request. Resumes should be included as an attachment.

Travel

- Travel essential to the proposed project may be funded under this proposal.
- Travel reimbursement is allowed at the following rates: $0.50/mile; in-state travel reimbursements follow Iowa Department of Administrative Services (DAS) guidelines, which is $37/day for meals ($27.75/day for first and last day of travel); out-of-state travel reimbursements follow Iowa DAS guidelines, which varies by destination. Maximum lodging reimbursement for in-state hotels is $80 plus taxes per night (see the Iowa DAS travel webpage for more information and resources).

Printing and Copying

- Estimate the total number of document pages that will be copied or printed. Use $0.06/page for calculating costs. Example: 500 pages X $.06/page =$30.00

Supplies

- Estimate the unit cost for each item to be purchased and the total number of items needed. Example: 200 brochures X $1.25/brochure = $250.00

Indirect/Administrative Costs

- Applicants for whom the Iowa Cancer Consortium is not serving as a fiscal agent may charge an indirect rate limited to 8% of the direct costs proposed in the budget.
- The total budget, including indirect or administrative costs, may not exceed the total requested funds (maximum of $25,000).
- Administrative costs are those incurred for common or joint objectives and cannot be identified readily and specifically with a sponsored program but are still necessary to the organization's operations.
- For example, the costs of operating and maintaining facilities, depreciation and administrative salaries are generally treated as indirect/administrative costs.
- If there is a need for indirect funding beyond 8% of direct program costs, requests should be written into the applicant's budget and justified heavily.
- The applicant shall maintain documentation to support the administrative cost allocation. The Consortium reserves the right to request the documentation at any time.

Other:

- Equipment
    - Describe equipment needed for project implementation.
    - Equipment costs must be justified, and an explanation provided for equipment use after the grant period ends.
    - Items that cost $5,000 or more are not routinely funded but will be considered on an individual basis.
- Incentives
    - Incentives are an allowable expense only if proven to be effective as part of an evidence-based intervention. The research or evidence case must be outlined.

- Clinical Care/Service Delivery
    - Clinical care, including the provision of medication, vaccinations and/or treatment, is not an allowable expense. Service delivery, including radon mitigation and cancer screening test purchases, will be reviewed individually.
    - Community organizations and collaborators are encouraged to provide financial support for service delivery components.

Please explain your budget in words: *(Suggested: 100 words or less)*

We are applying for a total of $21,800 for this Linn County Water Sampling and Monitoring Program. The data compilation and review of existing data, and recommendations will be contracted out to Iowa Geologic Survey. That is the bulk of our budget, at $20,000. The scope will include Objectives 1,2, and 4.

The administrative costs will be conducted by Linn County Sustainability Department, Sustainability Director and will include Objective 3, various coordination efforts, and grant administration. An estimate of project hours would be 40-60 hours.

Use the table below to complete your proposed budget:

Reminder: Funding period is July 1, 2025, to May 31, 2026. This is an 11-month period, not a full year.

Budget Items and Explanation	Grant Funds Requested	Other Funding	Total Funds for Project
If possible, please divide them into categories. Examples include staff support, travel, supplies, equipment, etc. If service delivery or incentives are included within the budget, please include a statement of need along with each budget item.	*Funds being requested from the Iowa Cancer Consortium.*	*Include in-kind support, volunteer hours, collaborator financial support, and other types of financial support.*	*Include requested Iowa Cancer Consortium funds + items outlined in the Other Funding category.*
Staff Support			
Administrative Support	$1,800		$1,800
Travel			
Printing			
Supplies			
Shipping			
Other			
Sampling and Monitoring Program	$20,000		$20,000
Totals:	$21,800	$0	$21,800

Submit your completed application, along with letters of support from all collaborators and resumes/CVs for anyone whose salary will be supported by requested funds, to orton@canceriowa.org by 11:59pm (CDT) on May 14, 2025.

CEDAR RAPIDS
City of Five Seasons®

04/21/2025

Iowa Cancer Consortium
PO Box 859
North Liberty, IA 52317-0859

Dear Iowa Cancer Consortium Board of Directors,

I am writing on behalf of the City of Cedar Rapids in support of Linn County's Water Sampling and Monitoring Program proposed to the Iowa Cancer Consortium as part of the FY26 Iowa Cancer Plan Implementation Grant.

The City of Cedar Rapids has been sampling surface water through snapshot sampling events for 7 years in the Middle Cedar Watershed. Sampling is conducted at the drainage area hydrologic unit code (HUC)12 level. Eight(8) of those sampling locations are in Linn County. The City understands the value of collecting data, long-term trends, and reportability and will fulfill the following roles in this partnership:

- Provide data background.
- Provide input on desired end-user goals for a more cohesive sampling program.
- Provide continued support of sampling efforts.

The City of Cedar Rapids has been doing watershed work in the Cedar River Basin. This work includes partnering with conservation-minded organizations and upstream agriculture producers to implement best management practices in order to keep nutrients on their land and out of Iowa waterways. The partnership and voluntary approach for watershed efforts relies heavily on public outreach and communication. Having a more robust public-facing sampling program would bring water quality to the forefront in the watershed.

Sincerely,

Justin Schroeder
Environmental Manager
City of Cedar Rapids

Indian Creek
Watershed Management Authority
COOPERATION • FLOOD MANAGEMENT • CLEAN WATER

04/9/2025

Iowa Cancer Consortium
PO Box 859
North Liberty, IA 52317-0859

Dear Iowa Cancer Consortium Board of Directors,

I am writing on behalf of Indian Creek Watershed Management Authority (ICWMA) in support of Linn County's Water Sampling and Monitoring Program proposed to the Iowa Cancer Consortium as part of the FY26 Iowa Cancer Plan Implementation Grant.

ICWMA has been sampling surface water for 20 years and understands the value of collecting data, long-term trends, and reportability. ICWMA will fulfill the following roles in this partnership:

- Provide data background,
- Provide input on desired end-user goals for a more cohesive sampling program,
- Provide continued support of sampling efforts.

ICWMA is a cooperative agreement among jurisdictions within the watershed to provide a framework for watershed level planning and management. Our goal is to increase communication and coordination within the Indian Creek Watershed to reduce flood risk and improve water quality. Indian Creek drains 93 square miles of land within Linn County. Encouraging more recreation on Indian Creek is a priority and this water sampling and monitoring effort would directly support that. Having a more robust public-facing sampling program would bring water quality to the forefront in the watershed.

Sincerely,

Mike Tertinger

Chairperson
Indian Creek Watershed Management Authority

Martin A. St. Clair

Education:

Ph.D., Chemistry California Institute of Technology, Pasadena, California	1989
B.S., Chemistry and Environmental Studies *cum laude*, with high honors Butler University, Indianapolis, Indiana	1983

Professional experience:

University of Iowa

Research Scientist, IIHR-Hydroscience and Center for Health Effects of Environmental Contamination	2023-present
Visiting Scientist, Dept. of Civil and Environmental Engineering (sabbaticals)	2000-2001; 2006; 2011; 2021
Visiting Scientist, Iowa Geological Survey (sabbatical)	2016 (spring)
Senior Research Assistant/Laboratory Director, Dept. of Civil and Environmental Engineering	1990-1993
Visiting Assistant Professor. Dept. of Chemistry	1989-1990

Coe College

Ben Peterson Chair in Chemistry	2019-2023
Professor	2007-2023
Associate Professor	1999-2007
Assistant Professor	1993-1999
Department Chair (chemistry)	1997-2000 2001-2007 2021-2023
Program Coordinator, Environmental Studies	2016-2022
Faculty Co-Director, C3: Creativity, Careers, Community	2019-2023
Associate Dean of Faculty	2006-2010 2016-2019

Occidental College

Dreyfus Teaching and Research Fellow, Dept. of Chemistry	1988-1989

Honors and Awards:
Charles J. Lynch award for outstanding teaching, Coe College, 2019
Outstanding Faculty Mentor, Coe College, 2013-14
Camille and Henry Dreyfus Fellow, Occidental College, 1988-89

Selected External Grants and Contracts Funded:
"Watershed Scaling Effects Measured Via Nested High Frequency Sensors", Iowa Nutrient Research Center, 2024-2026, $140,000/year.
"IIHR Hydroscience and Engineering Work Plan", Iowa Nutrient Research Center, 2023-24, $295,000.
"Cedar River Tributary Study", City of Cedar Rapids, $15,000 in 2001-2010; $19,000 in 2011-2015; $28,000 in 2016-19; $20,000 in 2020; $30,000 in 2021 and 2022; additional $15,000 in in-kind support from Iowa Department of Natural Resources in 2002, 2004-2009, 2011-2013.
"Evaluating a Two Stage Roadside Ditch Design to Improve Environmental Performance", Iowa DOT to Keith Schilling (IGS), September 2019. $293,702 total; sub-contract to Coe for $35,000 (2020-23).
"Indian Creek Soil Health Partnership", Iowa Partners for Conservation – Natural Resources Conservation Service, Jon Gallagher (PI), $306,500, 2018-2023. (Coe share: $24,000)
"RAPID: Using a drought-enhanced nitrate pulse to understand stream N retention and processing", National Science Foundation, (co-PI with Amy Burgin, Adam Ward, Terrence Loecke, Diego Riveros-Iregui) $197,568 total, 2012-2013.

Selected Publications (ORCID ID: 0000-0002-2221-2181; SCOPUS ID: 56287220000**):**
"Subsurface nitrate processing beneath drainageways: are they landscape opportunities for tile drainage remediation?", Keith Schilling; Matthew Streeter; Sophie Pierce; Greg Brennan; Marty St Clair, *Journal of the ASABE*, **2022,** *65(5)*, 985-995.
"Dissolved phosphate concentrations in Iowa shallow groundwater", Keith Schilling, Peter Jacobson, Martin St. Clair, Christopher Jones, *Journal of Environmental Quality*, **2020**, *49(4)*, 909-920.
"Subsurface Nutrient Processing Capacity in Agricultural Roadside Ditches", Keith Schilling, Matthew T Streeter, Martin St Clair, Justin Meissen, *Science of the Total Environment*, **2018**, *637-638*, 470-479.
"Effectiveness of a Newly Reconstructed Floodplain Oxbow to Reduce NO3-N Loads from a Spring Flood", Keith E. Schilling, Bryce J. Haines, Christopher S. Jones and Martin St. Clair, *Journal of Environmental Management*, **2018**, *215*, 385-393.
"Weather whiplash in agricultural regions drives deterioration of water quality", Terrance D. Loecke, Amy J. Burgin, Diego A. Riveros-Iregui, Steven A., Thomas , Adam S. Ward , Caroline A. Davis , and Martin A. St. Clair. *Biogeochemistry*, **2017**, *133:7*, 7-15.
"Antecedent moisture controls on stream nitrate flux in an agricultural watershed, Clear Creek, Iowa", Davis, Caroline; Ward, Adam; Burgin, Amy; Loecke, Terry; Riveros-Irequi, Diego; Schnoebelen, Douglas; Just, Craig; Thomas, Steve; Weber, Larry; St. Clair, Martin, *Journal of Environmental Quality*, **2014**, *43:4*,1494-1503.

Biographical Sketch

Keith E. Schilling, Ph.D.
State Geologist and Director
Iowa Geological Survey
300 Trowbridge Hall, University of Iowa
Iowa City, IA 52242-1319
Email: keith-schilling@uiowa.edu
https://orcid.org/0000-0002-3499-220X

EDUCATION

Ph.D. Geology
University of Iowa, Iowa City, IA, 2009.
M.S. Water Resources
Iowa State University, Ames, IA, 1988.
B.A. Geology
Knox College, Galesburg, IL, 1985.

EMPLOYMENT

2014-present	University of Iowa, Iowa City, Iowa
1998-2014	Iowa Department of Natural Resources, Iowa City, Iowa
1991-1998	Montgomery Watson, Des Moines, Iowa
1988-1991	Iowa Department of Natural Resources, Des Moines, Iowa

PROFESSIONAL EXPERENCE

2018-present	State Geologist and Director, Iowa Geological Survey, University of Iowa
2014-2018	Research Engineer, Iowa Geological Survey, University of Iowa
1998-2014	Research Geologist, Iowa Department of Natural Resources, Geological and Water Survey, Iowa City, Iowa
1991-1998	Senior Hydrogeologist, Montgomery Watson Consulting Engineers, Des Moines, Iowa
1988-1991	Environmental Specialist, Iowa Department of Natural Resources, Des Moines, Iowa

HONORS & AWARDS

2025	Board of Regents Staff Excellence Award
2012	Educational Materials Award, Council for Agricultural Science and Technology
2011	Outstanding reviewer, Journal of Environmental Quality
2010 – 11	President (2011) and Vice-President (2010), Iowa Groundwater Association
1985	Hunter Trophy, Knox College

PROFESSONAL SERVICES & SYSERGISTIC ACTIVITIES

2023-	Guest Editor, Frontiers in Environmental Science, Special Issue "Nitrate from Field to Stream".
2015-2021:	Associate Editor, Wetlands,
2012:	Member, Science Team, Iowa Nutrient Reduction Strategy
2008-	Member, Research Advisory Board, Neal Smith National Wildlife Refuge.

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PROFESSIONAL AFFILIATIONS

Member, Association of American State Geologists

Member, American Geophysical Union (AGU)
Member, Geological Society of America (GSA)
Member, Iowa Groundwater Association

PROJECTS INVOLVED (last four years)

Iowa Department of Homeland Security, $500,000, Geophysical levee analysis services, 2023-2028; **PI** 50%
Iowa Nutrient Research Center, $140,192, Quantifying Nutrient Load Reduction Practices at Multiple Field Sites, 2023-2024, **PI** 100%
Environmental Defense Fund, $79,962, Investigating Basin-wide Goals for Water Quality Improvement and Flood Mitigation, 2022-2023, **PI** 100%
U.S. Army Corps of Engineers, $194,133, Nitrate Reduction via Reservoir Water Level Management in Central Iowa, 2021-2024, **PI** 100%
Iowa Nutrient Research Center, $31,967, Developing design criteria to test a new saturated waterway conservation practice, 2021-2022. **PI** 100%
U.S. Department of Agriculture, $574,255, Diverse Corn Belt, 2021-2016, **Co-PI** 50%
Iowa Nutrient Research Center, $11,929, Evaluating the Nutrient Reduction Benefits of Farm Ponds, 2022-2023, 100%
Environmental Defense Fund, $90,000, Natural infrastructure Water Quality and Flood Reduction Benefits, 2021-2022, **PI** 100%
Iowa Department of Natural Resources, $293,467, A Vision Toward a More Resilient Iowa Great Lakes, 2020-2024, 2021-2024, **PI** 100%
Iowa Nutrient Research Center, $96,964, Evaluating the relation of total phosphorus to turbidity during high flow events to improve quantification of phosphorus export, 2020. **PI** 100%
Iowa Department of Transportation, $446,118, Evaluating a Two-Stage Roadside Ditch Design to Improve Environmental Performance (collaboration with Marion Muste, College of Engineering, University of Iowa), 2019-2024. **Co-PI** 75%
Iowa Department of Agriculture & Land Stewardship, $38,000, Evaluating the combined effects of N application with and without manure on groundwater quality using a paired field design at the Kirkwood Community College farm, 2019-2021. **PI** 100%
National Science Foundation, $ 599,999, Spokes: MEDIUM: MIDWEST: Collaborative: An Integrated Big Data Framework for Water Quality Issues in the Upper Mississippi River Basin (collaboration with Chris Jones, Ibrihim Demir), 2018-2021.**Co-PI** 10%
US Environmental Protection Agency, $1,064,926, Connecting Rural and Peri-urban Farmers to Demonstrate and Disseminate Innovative Nutrient and Sediment Reduction Practices (collaboration with Craig Just, Chris Jones, College of Engineering, University of Iowa), 2019-2022. **Co-PI** 10%

PUBLICATIONS (last four years) (Google Scholar through October 2024: 218 publications: 9,497 citations; h-index = 51)

1. Schilling, K.E., Streeter, M.T., Kerr, P., Wolter, C.F., Anderson, E., Gomez, A., and Arenas, A. 2025. Hydrogeology and groundwater flow in a hummocky prairie pothole complex, northern Iowa. Wetlands, 45, 3 https://doi.org/10.1007/s13157-024-01886-5.
2. Zhou, Y., Liang, X., Kewei Chen, E.M., Schilling, K., Zheng, T., Zheng, Y., Zhang, Y-K., Zheng, C. 2024. Spectral analysis of hydrological signals to estimate watershed

properties considering impacts of unsaturated zone. Water Resources Research, 60, e2023WR036680.

3. Mount, J. Sermet, Y., Jones, C.S., Schilling, K.E., Gassman, P.W., Weber, L.J., Krajewski, W.F. and Demir, I. 2024. An integrated cyberinfrastructure system for water quality resources in the Upper Mississippi River basin. Journal of Hydroinformatics. 26:1970.
4. Anderson, E. S. and Schilling, K. E. 2024. Intensive short-term sampling with long-term consequences: characterizing pollutant transport with implications for developing monitoring. Environmental Monitoring and Assessment, 196:1130.
5. Schilling, K.E., Anderson, E.S., Mount, J., Suttles, K. Gassman, P.W., Cerkasova, N., White, M.J. and Arnold, J.G. 2024. Evaluation of flood metrics across the Mississippi-Atchafalaya River Basin and their relation to flood damages. PLoS ONE.
6. Anderson, E. S., Schilling, K. E., Just, C.L. and Seo, B.C. 2024. Quantifying the impact of a constructed wetland on downstream nitrate concentrations and loads in the U.S. Midwest. Frontiers in Environmental Science, in press.
7. Anderson, E. S., Schilling, K. E., Jones, C. S., Weber, L. J., & Wolter, C. F. 2024. Iowa's Annual Phosphorus Budget: Quantifying the Inputs and Outputs of Phosphorus Transport Processes. Land, 13(9), 1483
8. Anderson, E. S., Schilling, K. E., Jones, C. S., & Weber, L. J. 2024. Estimating Iowa's riverine phosphorus concentrations via water quality surrogacy. Heliyon, 10(17), e37377.
9. Theiling, C., Calomeni, A, Bosco, N., Dinsmore, S., Howe, H., Gosselink, T., Schilling, K., Streeter, M., and Thostenson, P. 2024. Advancing Lake Red Rock Reservoir management practices to maximize ecological benefits: from planning to monitoring. Wetland Science & Practice, July 2024, 224-230.
10. Anderson, E. and Schilling, K.E. 2024. The Speciation of Iowa's Nutrient Loads and the Implications for Midwestern Nutrient Reduction Strategies. Journal of Soil and Water Conservation, in press.
11. Moustakidis, I.V., Schilling, K.E., and Weber, L.J. 2024. Soil texture and vegetation root density assessment on regulating erosion across river floodplains. International Journal of Sediment Research. DOI: 10.1016/j.ijsrc.2024.06004.
12. Moustakidis, I.V., Schilling, K.E., and Weber, L.J. 2024. River floodplains as source or sink for fine sediment and total phosphorus export in an agricultural watershed. Earth Surface Processes and Landforms. DOI: 10.1002/esp5849.
13. Streeter, M.T., Schilling, K.E., Stoeffler, T. and Anderson, E. 2024. Sedimentology of a delta formed by agricultural discharge into a flood-control reservoir, Iowa. River Research and Applications, DOI: 10.1002/rra4326.
14. Schilling, K.E., Streeter, M.T., Gibertini-Diaz, V., Betret, E. and Arenas‐Amado, A. 2024. Hydrogeology and subsurface water flow beneath grass waterways: implications for exploiting waterways for nitrate reductions. Agricultural Water Management 298:108847.
15. Anderson, E.S. and Schilling K.E. 2024. Expanding the applications of the standardized streamflow index through regionalization. Journal of the American Water Resources Association, DOI:10.1111/1752-1688.13205.
16. Schilling, K. E., Streeter, M. T., Anderson, E., Merryman, J., Isenhart, T., Arenas‐Amado, A., Theiling, C. 2024. Potential for managing pool levels in a flood‐control reservoir to increase nitrate‐nitrogen load reductions. Journal of Environmental Quality,

53:209-219.
17. McLellan, E.L., Suttles, K.M., Bouska, K.L., Ellis, J.H., Flotemersch, J.E., Goff, M., Golden, H.E., Hill, R.A., Hohman, T.R., Keerthi, S. and Keim, R.F., 2024. Improving ecosystem health in highly altered river basins: a generalized framework and its application to the Mississippi-Atchafalaya River Basin. Frontiers in Environmental Science, 12, p.1332934.
18. Wilson, C. G., Streeter, M. T., Ettema, W. D., Abban, B. K., Gonzalez, A., Schilling, K. E., and Papanicolaou, A. N. 2024. Assessing the Effectiveness of Alternative Tile Intakes on Agricultural Hillslopes. Water, 16(2), 309.
19. Streeter, M.T., K.E. Schilling, C.S. Jones and M. St. Clair. 2023. Effects of cattle manure and soil parent material on shallow groundwater quality. Agroecosystems, Geosciences & Environment 6(3), e20380.
20. Schilling, K.E., Wolter, C.F., Palmer, J.A., Beck, W.J., Williams, F.F., Moore, P.L. and Isenhart, T.M. 2023. An assessment of streambank erosion rates in Iowa. Environments, 10(5), 84.
21. Schmitz, E.V., Just, C.L., Schilling, K., Streeter, M. and Mattes, T.E. 2023. Reconnaissance of oxygenic denitrifiers in agriculturally impacted soils. mSphere, e00571-22.
22. Schilling, K.E., Streeter, M.T., Jones, C.S., and Jacobson, P.J. 2023. Dissolved inorganic and organic carbon export from tile-drained Midwestern agricultural systems. Science of the Total Environment, 883, 163607.
23. Pierce, S. and Schilling, K.E. 2023. Nutrient retention in tile-fed and non-tile reconstructed oxbows in north-central Iowa. Journal of the American Water Resources Association, In press.
24. Schilling, K.E., Anderson, E. Streeter, M.T. and Theiling, C. 2023. Long-term nitrate-nitrogen reductions in a flood-control reservoir. Journal of Hydrology, 620, 129533.
25. Schilling, K.E., Mount, J., Suttles, K.M., McLellan, E.L., Gassman, P.W., White, M.J. and Arnold, J.G., 2023. An Approach for Prioritizing Natural Infrastructure Practices to Mitigate Flood and Nitrate Risks in the Mississippi-Atchafalaya River Basin. Land, 12(2), p.276.
26. Beck, W., T. Isenhart, P. Moore, K. Schilling, R.C. Schultz, K. Cole and M. D. Tomer. 2022. Fine-grained sediment and phosphorus storage in a suspended-load-dominated, alluvial channel. Journal of the ASABE, 65(5):1149-1162.
27. Zhang, J. X. Liang, Y-K Zhang, X. Chen, E. Ma and K. Schilling. 2022. Groundwater Responses to Recharge and Flood in Riparian Zones of Layered Aquifers: An Analytical Model. Journal of Hydrology, 614:128547..
28. Wilson, C., K.E. Schilling and A.N. Papanicolaou. 2022. Evaluating Causal Factors That Influence the Spatial and Temporal Variability of Streambank Erosion in Iowa. Journal of the ASABE, 65(6):1465-1473.
29. Streeter, M.T., J. Vogelgesang, J. K.E. Schilling, C.L. Burras. 2022. Use of high-resolution ground conductivity measurements for denitrifying conservation practice placement. Environmental Monitoring and Assessment. 194:784.
30. Schilling, K.E., M.T. Streeter, S. Pierce, G. Brennan, and M. St. Clair. 2022. Subsurface nitrate processing beneath grass waterways: are they landscape opportunities for subsurface drainage remediation? Journal of the ASABE, 65(5): 985-995.
31. Schilling, K.E. and M.T. Streeter. 2022. Paired riparian water table monitoring to

quantify hydraulic loading to a saturated buffer. Environmental Monitoring and Assessment. Doi.org/10.1007/s10661-022-10134-4.

32. Brighenti, T.M., P.W. Gassman, K.E. Schilling, R. Srinivasan, M. Liebman, and J.R. Thompson. 2022. Determination of accurate baseline representation for three central Iowa watersheds within a HAWQS-based SWAT analyses. Science of the Total Environment 839:156302.
33. Zhang, J., Lu, C., Crumpton, W., Jones, C., Tian, H., Villarini, G., Schilling, K., and Green, D. 2022. Heavy precipitation impacts on nitrogen loading to the Gulf of Mexico in the 21st century: model projections under future climate scenarios. Earth's Future. 10, e2021EF002141.
34. Ayers, J.R., G. Villarini, K. Schilling, C. Jones, A. Brookfield, S.C. Zipper and W.H. Farmer. 2022. The role of climate in monthly baseflow changes across the continental United States. Journal of Hydrologic Engineering, 27: 1-13.
35. Schilling, K.E., Isenhart, T.M., Wolter, C.F., Nouri, A., Streeter, M.T. Kovar, J.K., 2022. Contribution of streambanks to phosphorus export from Iowa. Journal of Soil and Water Conservation.77:103-112.
36. Thomas, N.W., T.B. Ayalew, A.A. Renas, K.E. Schilling, L.J. Weber, and W.F. Krajewski. 2021. Characterizing the effect of dry antecedent soil moisture conditions, channel transmission losses, and variable precipitation on peak flow scaling. Advances in Water Resources. 104061.
37. Robinson, T.C., D.E. Latta, L. Notini, K.E. Schilling, and M.M. Scherer. 2021.Abiotic reduction of nitrite by Fe(II): a comparison of rates and N2O production. Environmental Science Processes & Impacts. 23(10):1531-1541.
38. Brunet, C.E., E.R.C. Gemrich, S. Biedermann, P.J. Jacobson, K.E. Schilling, C.S. Jones and A.M Graham. 2021. Nutrient capture in an Iowa farm pond: insights from high-frequency observations. Journal of Environmental Management 299:113647.
39. Schilling, K.E., R.J. Langel, C.F. Wolter and A. Arenas-Amado. 2021. Using baseflow to quantify diffuse groundwater recharge and drought at a regional scale. Journal of Hydrology, 602:126765.
40. Liang, X., K.E. Schilling, C.S. Jones, and Y.K. Zhang. 2021. Temporal scaling of long-term co-occurring agricultural contaminants and the implications for conservation planning. Environmental Research Letters, 16 094015.
41. Streeter, M. T., and K.E. Schilling. 2021. Quantifying the effectiveness of a saturated buffer to reduce tile NO3-N concentrations in eastern Iowa. Environmental Monitoring and Assessment, 193(8), 1-17.
42. Schilling, K.E., M.T. Streeter, B. Slater, J. Vogelgesang, M. St. Clair, and A. Martin. 2021. Aquifer lithology affects shallow groundwater quality more than the nitrogen fertilizer form and placement method in an Iowa agricultural field. Agrosystems, Geosciences & Environment. 4(2):e20163.
43. Ayers, J.R., G. Villarini, K. Schilling, and C. Jones. 2021.Projected changes in monthly baseflow across the U.S. Midwest. International Journal of Climatology.
44. Streeter, M.T., K.E. Schilling, C.L. Burras, C.F. Wolter. 2021. Erosion and sediment delivery in southern Iowa watersheds: implications for conservation planning. Journal of Soil and Water Conservation. 76 (2):103-115.
45. Wolter, C. F., Schilling, K. E., Palmer, J. A. 2021. Quantifying the extent of eroding streambanks in Iowa. JAWRA Journal of the American Water Resources Association,

57(3), 391-405.
46. Ayers, J.R., G. Villarini, K. Schilling, and C. Jones. 20201. Development of statistical models for estimating daily nitrate load in Iowa. Science of the Total Environment 782:146643.
47. Ayers, J.R., G. Villarini, K. Schilling, and C. Jones. 2021. On the statistical attribution of changes in monthly baseflow across the U.S. Midwest. Journal of Hydrology 592:125551.

CARA L. MATTESON, PG

(319) 331-4554
caramccabe@yahoo.com

PROFESSIONAL HISTORY

Sustainability Director, Linn County, Cedar Rapids, IA April 2024-present.

- Schedule: Monday-Friday, 40hours/week
- Leads Linn County's sustainability efforts, coordinates with other directors and departments and prioritizations.
- Oversees the daily activities of the Office of Sustainability including strategic planning, overseeing staff, managing budget, develop policies and procedures, and funding requirement compliance.
- Serves as the subject matter expert on sustainability best practices related to water, storm water management, land use, and environmental conservation.
- Seeks and leverages partnerships with various entities such as higher education, other jurisdictions, non-governmental organizations, and grants.

Senior Geologist/Project Manager, Stantec, Independence, IA, October 2023-April 2024.

- Schedule: Monday-Friday, 40hours/week
- Manages environmental, water resources, and resiliency projects including developing proposals, managing project budgets and schedules, coordinating with clients, stakeholders, regulatory agencies, and internal project staff.
- Design and lead environmental due diligence projects including Phase 1 environmental site assessments (ESAs), and soil, soil vapor, and groundwater investigations.
- Lead resiliency projects that includes incorporating stormwater treatment options in public infrastructure projects such as green infrastructure, wetlands, streambank stabilization, and native habitat. Manage stormwater regulatory and programmatic review for large municipalities and provide programmatic and ordinance revision recommendations for more efficiency.
- Prepare technical correspondence, technical reports, work plans, investigation and cleanup grant applications, and project specifications including cost estimates and budgets.
- Manage data, QA/QC, interpretation, evaluation/comparison to applicable State environmental regulatory standards.

Senior Scientist, Braun Intertec, Cedar Rapids, IA, February 2023-October 2023

- Schedule: Monday-Friday, 40hours/week
- Manages environmental projects including due diligence environmental site assessment, site investigation, and compliance assistance projects.
- Lead business development efforts for the environmental group in Iowa

Water Resources Manager, City of Cedar Rapids, January 2016-January 2023

- Schedule: Monday-Friday, 40hours/week, on-call as needed.
- Managed the administration and compliance efforts associated with the National Pollution Discharge Elimination System (NPDES) permit to operate a Municipal Separate Storm Sewer System (MS4).
- Managed creation, revision, and staff oversight of numerous Standard Operating Procedures (SOPs) related to the MS4 permit and essential job functions of the City's stormwater and sanitary sewer infrastructure.
- Compiled data and documentation for future Environmental Protection Agency and Iowa Department of Natural Resources audits. Prepared and submitted required reporting.

- Provided program recommendation for the strategic planning, policy and program development, and data collection of the stormwater and sewer collection systems.
- Developed and initiated a preventative maintenance program for the stormwater grey infrastructure, established maintenance policy for publicly owned green infrastructure.
- Provided guidance on stormwater and sanitary sewer infrastructure maintenance goals and benchmarks.
- Coordinated and collaborated with external entities on various initiatives including, education/outreach, funding, watershed efforts, and enforcement.
- Directed City ordinances revisions and associated policies and procedures.
- Lead stormwater training, marketing, and public outreach initiatives for the City.
- Managed stormwater drainage complaints and coordinates with other departments for efficient and effective follow-through with the public and associated documentation.
- Administered and managed the City's stormwater cost-share programs.
- Managed the wetland mitigation program.
- Interacted with federal, state, and local agencies on environmental impacts and compliance.
- Managed and supervised stormwater environmental staff
- Managed and directed field staff after hours on the stormwater and sanitary sewer collection system.

Watershed Coordinator/Grant Writer, Delaware Soil and Water Conservation District, Manchester, IA; April 2009-February 2015

- Schedule: Monday-Friday, variable, 20hours/week
- Planned, wrote, and implemented grants for environmental education. Wrote successful grants for over $3 million dollars for Delaware SWCD (IDALS, MRBI, WIRB).
- Implemented watershed projects in Delaware County.
- Managed grant agreements that included managing budgets, assessments, data analysis, creating maps using Geographical Information Systems (GIS), and writing reports.
- Identified water quality concerns in Delaware County by sampling numerous streams and wetlands.
- Created marketing fact sheet for water quality project and disseminated materials.
- Analyzed data to identify water quality trends.
- Educated landowners on conservation practices and partnered with Natural Resources Conservation Service (NRCS) in facilitating partnerships between urban and rural populations.

Engineering Geologist (Site Cleanup Section), California Regional Water Quality Control Board- Central Valley Region, Fresno, CA; June 2007-March 2009

- Schedule: Monday-Friday, 40hours/week
- Identified, prioritized, and supervised the cleanup of soil and groundwater-impacted sites in the Central Valley Region of California.
- Enforced California regulations including the California Water Code, California Groundwater Basin Plans, and other resolutions related to groundwater.
- Reviewed and interpreted professional engineering-geological work. Requested and reviewed geotechnical data and reports, hydrological information, feasibility studies, and remedial action plans. Evaluated the effectiveness of investigation and remediation activities, assessed site progress, coordinated with other agencies, water purveyors, and responsible parties to discuss the hydrogeology and appropriate cleanup measures required to meet the California Water Code of Regulations.
- Performed engineering geological calculations and applied computer aided modeling and other techniques to aid in the evaluation of groundwater hydraulics, soil and groundwater remediation techniques, contaminant fate and transport, groundwater extraction well capture zone analysis, and other data evaluation as required.
- Reviewed the construction of groundwater monitoring wells, and remediation systems to determine if they were installed in compliance with California Department of Water Resources guidelines.
- Conducted field reviews of disposal facilities and used professional judgment to ascertain the presence of water quality threats. Obtained waste, groundwater, and soil samples as necessary to assist in performing engineering geological assessments on the threat to groundwater and surface waters.

- Required appropriate enforcement actions, prepared the necessary letters, reports, and enforcement orders. Organized site-specific information and communicated effectively with other agencies and the public.

Staff Geologist, **Geomatrix Consultants, Fresno, CA; May 2005-June 2007**

- Schedule: Monday-Friday, 40hours/week
- Completed geologic investigative studies that included soil and groundwater contaminant assessments for environmental facilities and groundwater resource evaluations.
- Prepared proposals, coordinated field work, managed projects, analyzed data, and drafted reports. Prepared cost estimates and budgets for project expenses. Supervised subcontractors and tracked project billing and budgets.
- Collected soil and groundwater, logged soils according to the Unified Soil Classification System (USCS), installed monitoring wells, and decommissioned wells. Trained on a variety of drilling techniques that include direct push, air rotary, mud rotary, hollow stem auger, and cone penetration testing.
- Analyzed data using graphical and statistical analysis, and drafted field work and conclusions in a report. Prepared potentiometric maps, calculated groundwater gradient, prepared cross sections, used Rockworks to prepare still and piper diagrams and evaluate ion balance. Collected data for water balance evaluations and assessed the available water supply. Used GIS to prepare maps and evaluate data.
- Experience working at landfill facilities, hazardous waste sites, pesticide sites, municipal sites, and industrial sites.
- Developed a water resources business plan targeted in assisting small utilities with a raw water source in an impaired watershed (303d list). Researched different California funding mechanisms including Proposition 50 and Proposition 84, networked with the California Department of Health Services (DHS) District Offices, State DHS, and other California water agencies. Contacted small communities in the San Joaquin Valley and recommended approaches to meet the water quality objectives, and assisted in receiving grant funding.

Groundwater Specialist, Iowa Rural Water Association, Newton, IA; July 2003-April 2005

- Schedule: Monday-Friday, 40hours/week
- Developed wellhead protection plans for municipalities and regional water systems. Worked closely with water operators, superintendents, utility managers, mayors, city councils, state primacy agency (Department of Natural Resources), Environmental Protection Agency (EPA) Region 5, Iowa Geologic Survey Bureau (IGSB), and NRCS. Coordinated with IGSB to assess the vulnerability of the water purveyor's well fields and groundwater system. The water system's assessment included identifying the capture zone, evaluating the vulnerability of the current well field, and reviewing background water quality.
- Coordinated management efforts that included education landowners on abandoned wells, septic systems, underground storage tanks, and agricultural land practices such as application rates and set-aside land. Located potential contaminants and plotted them on maps using ArcView. Summarized the findings and recommendations and submitted the plans to DNR and city councils.
- Prepared and made presentation to city councils on the vulnerability of their water system. Made presentations at water operator classes in Iowa and nationally presented at National Rural Water Association conference.

EDUCATION

Bachelor of Science, University of Iowa; Iowa City, IA; 2003

- Environmental Science and Geoscience Major

Iowa State University; Ames, IA; 2004

- Coursework completed: Environmental Engineering

Morningside College: Sioux City, IA; 2015

- Iowa Intern Teacher's License

LICENSES and LEADERSHIP

- California Professional Geologist #8527
- Iowa Water Operator #6817; Water Treatment Grade 3, Water Distribution Grade 1
- California Water Operator #27416/#30521; Water Treatment 3, Water Distribution 1
- Certified Professional in Erosion and Sediment Control (CPESC)
- Certified Professional in Municipal Stormwater Management (CPMSM)
- Iowa Groundwater Association Vice President/President/Board Member, 2013-2014
- Middle Cedar Watershed Management Authority Vice President, Hiring Committee, Technical Committee, Executive Committee, Board Member 2017-2022
- Indian Creek Watershed Management Authority Board Member, Hiring Committee 2017-2023
- Iowa Stormwater Education Partnership Board Member, 2016-2018
- Marion First United Methodist Board of Trustees, 2018-2021
- Prairiewoods Operating Board Member, 2022-2023
- Marion First United Methodist Youth Leader, 2021-current
- Iowa Groundwater Association Board Member, 2024-current
- Iowa Floodplain and Stormwater Management Association Education Committee, 2024-current

SPECIALIZED TRAINING

- 40 Hour Hazwoper, 2005; 8 Hour Hazwoper Refresher, 2006, 2007, 2008, 2023
- Princeton Groundwater Pollution and Hydrology Course, 2005
- Introduction to Groundwater and Watershed Hydrology, GRA, 2006
- Disinfection and Basic Water Treatment, CRWA, 2006
- CRWA Education and Exhibitor Expo, 2006
- Contaminant Chemistry & Fate and Transport, 2008
- Risk Based Corrective Action (RBCA) Training, 2009
- Iowa Source Water Protection and Collaboration Workshop, 2010
- Cover Crops Workshop, 2014
- Stream & Watershed Integrated Management Workshop, 2016
- Driftless Area Symposium, 2014
- Backyard Forest Conference, Trees Forever, 2016
- Growing Sustainable Communities, 2016
- Iowa Stormwater Summit, 2016, 2017
- Iowa Water Conference, 2016
- Watershed & Stormwater Symposium, 2017, 2018
- Stormwater Solutions Conference, 2017
- Informal Influencer Program, 2018
- Management Foundations: Managing People, 2021
- Utility Management Conference (AWWA), 2019
- Iowa's River Restoration Toolbox Level 1, 2021
- LeadCR, 2022
- Project Management Training, 2023