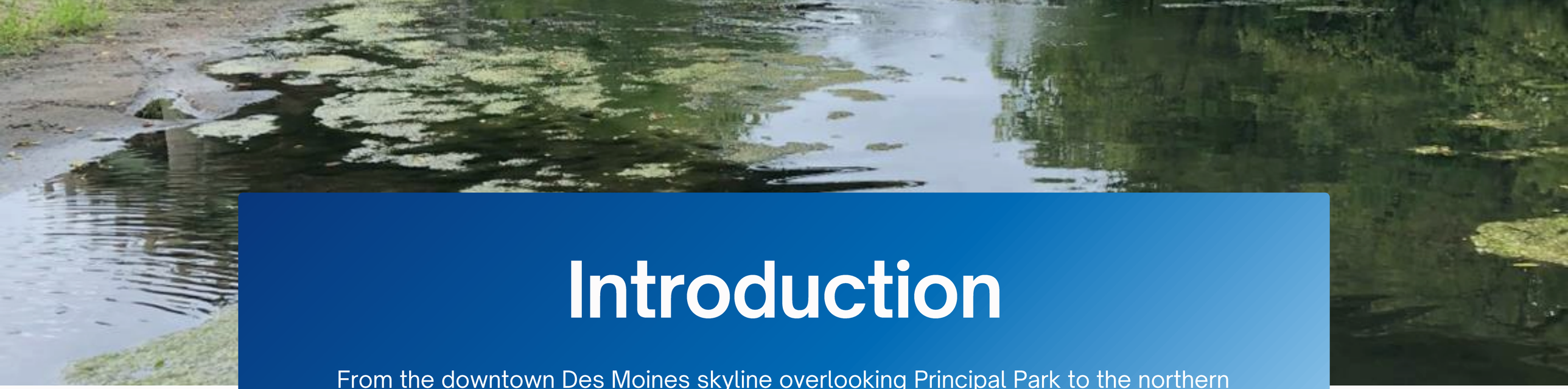
Central Iowa Source Water Research Assessment (CISWRA) Report:

Currents of Change

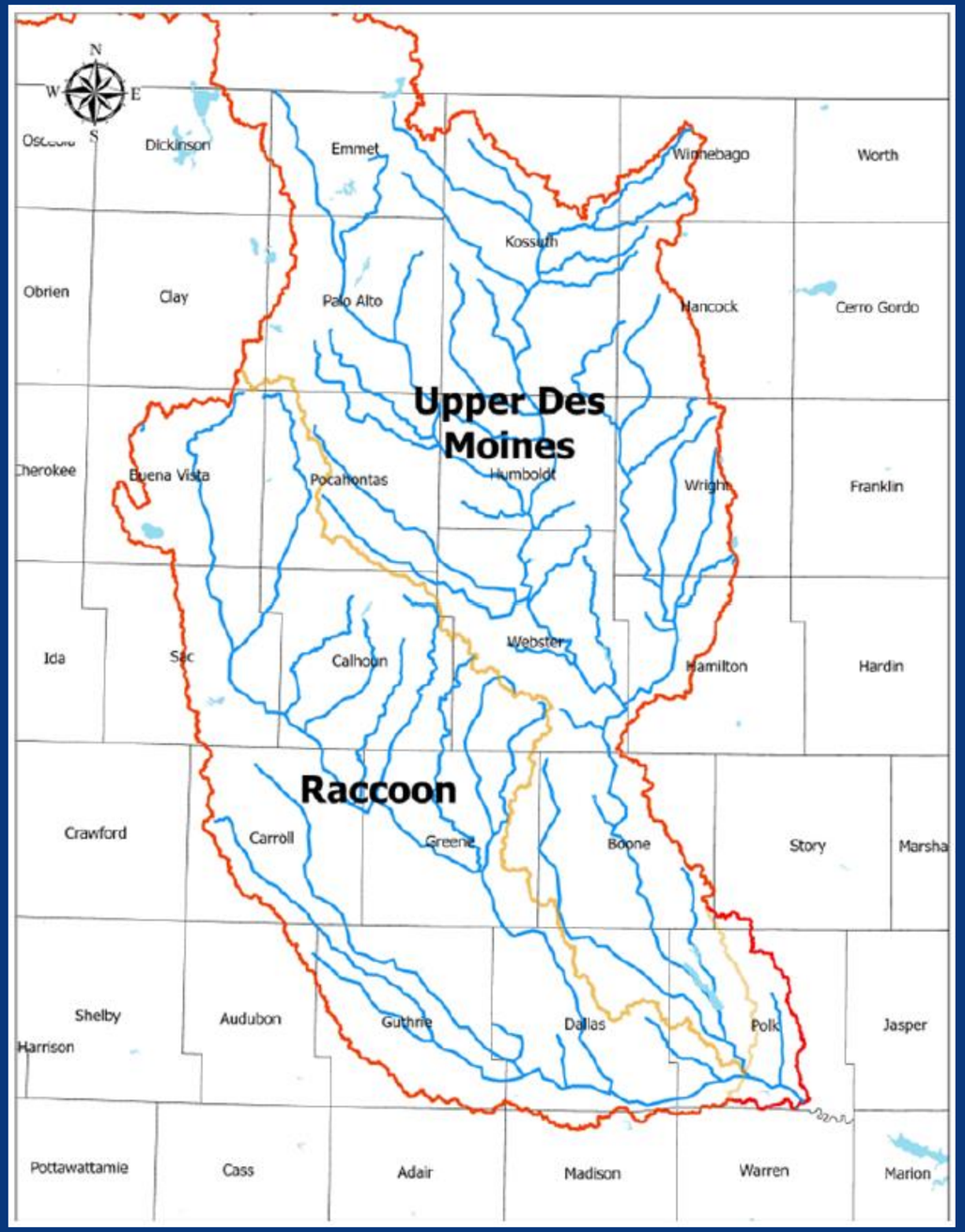


Introduction

From the downtown Des Moines skyline overlooking Principal Park to the northern reaches of the state of Iowa, the Des Moines and Raccoon Rivers (the Rivers) and their trickling tributaries connect the residents of Polk County to our upstream neighbors. Our rivers are the lifeblood of central Iowa—for residents who fish, paddle, and trust there will always be plenty of safe drinking water for the growing region. These are your rivers. Learn more about actions you can take to protect them.

Vision – What is CISWRA?

- A comprehensive study of water-related issues in the Des Moines and Raccoon River Watersheds commissioned by Polk County
- A list of suggested action steps to collaboratively help improve the water and natural resources in these two rivers



CISWRA Science Advisors

16 water quality experts affiliated with leading academic institutions and federal research agencies

Dr. Elliot Anderson
University of Iowa

Dr. Elizabeth Bolton
Argonne National Laboratory

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Argonne National Laboratory

Dr. Matthew Helmers
Iowa State University

Dr. Robert Hirsch
US Geological Survey

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Dr. Keith Schilling
Iowa Geological Survey

Dr. Jerald Schnoor
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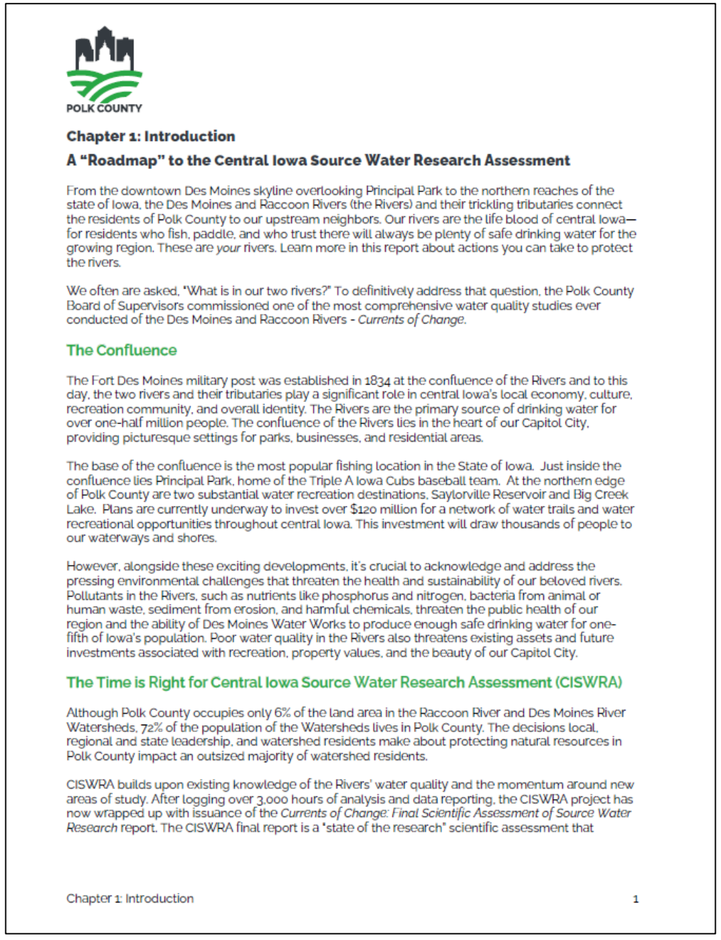
The CISWRA Documents – Published July 2025



POLK COUNTY

Chapter 1: Introduction

A "Roadmap" to the Central Iowa Source Water Research Assessment

From the downtown Des Moines skyline overlooking Principal Park to the northern reaches of the state of Iowa, the Des Moines and Raccoon Rivers (the Rivers) and their trickling tributaries connect the residents of Polk County to our upstream neighbors. Our rivers are the life blood of central Iowa—for residents who fish, paddle, and who trust there will always be plenty of safe drinking water for the growing region. These are *your* rivers. Learn more in this report about actions you can take to protect the rivers.

We often are asked, "What is in our two rivers?" To definitively address that question, the Polk County Board of Supervisors commissioned one of the most comprehensive water quality studies ever conducted of the Des Moines and Raccoon Rivers - *Currents of Change*.

The Confluence

The Fort Des Moines military post was established in 1834 at the confluence of the Rivers and to this day, the two rivers and their tributaries play a significant role in central Iowa's local economy, culture, recreation community, and overall identity. The Rivers are the primary source of drinking water for over one-half million people. The confluence of the Rivers lies in the heart of our Capitol City, providing picturesque settings for parks, businesses, and residential areas.

The base of the confluence is the most popular fishing location in the State of Iowa. Just inside the confluence lies Principal Park, home of the Triple A Iowa Cubs baseball team. At the northern edge of Polk County are two substantial water recreation destinations, Saylorville Reservoir and Big Creek Lake. Plans are currently underway to invest over $120 million for a network of water trails and water recreational opportunities throughout central Iowa. This investment will draw thousands of people to our waterways and shores.

However, alongside these exciting developments, it's crucial to acknowledge and address the pressing environmental challenges that threaten the health and sustainability of our beloved rivers. Pollutants in the Rivers, such as nutrients like phosphorus and nitrogen, bacteria from animal or human waste, sediment from erosion, and harmful chemicals, threaten the public health of our region and the ability of Des Moines Water Works to produce enough safe drinking water for one-fifth of Iowa's population. Poor water quality in the Rivers also threatens existing assets and future investments associated with recreation, property values, and the beauty of our Capitol City.

The Time is Right for Central Iowa Source Water Research Assessment (CISWRA)

Although Polk County occupies only 6% of the land area in the Raccoon River and Des Moines River Watersheds, 72% of the population of the Watersheds lives in Polk County. The decisions local, regional and state leadership, and watershed residents make about protecting natural resources in Polk County impact an outsized majority of watershed residents.

CISWRA builds upon existing knowledge of the Rivers' water quality and the momentum around new areas of study. After logging over 3,000 hours of analysis and data reporting, the CISWRA project has now wrapped up with issuance of the *Currents of Change: Final Scientific Assessment of Source Water Research* report. The CISWRA final report is a "state of the research" scientific assessment that

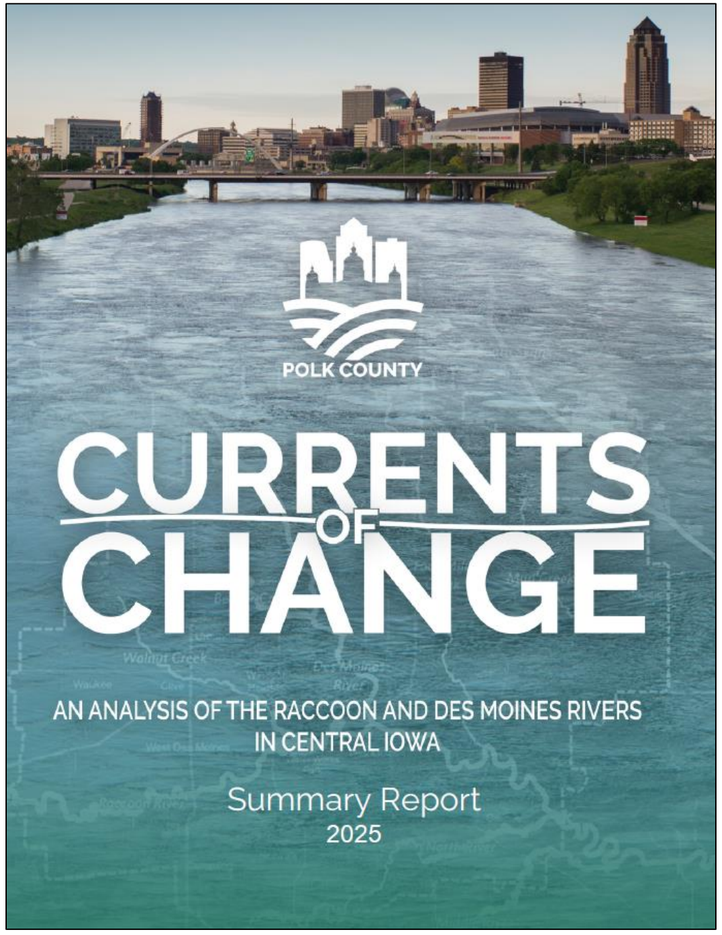
Chapter 1: Introduction 1

Scientific Assessment

200+ page technical report detailing all scientific findings

Currents of Change

~100 page report designed to enhance public readability



CENTRAL IOWA SOURCE WATER RESEARCH ASSESSMENT

Currents of Change: Executive Summary

From the downtown Des Moines skyline to the northern reaches of Iowa, the Des Moines and Raccoon Rivers (the Rivers) connect Polk County residents to our upstream neighbors. The Rivers are crucial for central Iowa, supporting activities such as fishing, paddling, and providing safe drinking water for the growing region. ***Currents of Change*** will help you learn more about the Rivers, what pollutants flow through them, and how to protect the Rivers.

This Executive Summary is intended to highlight some of the greatest concerns that have been identified by this assessment. For more detailed information and analyses, please read the **Currents of Change: Summary Report** or **Currents of Change: Final Scientific Assessment of Source Water Research Report**.

Currents of Change would not be possible without generous funding from the 2023 Polk County, Iowa, Board of Supervisors.

4,000 hours of analysis by CISWRA Science Advisors.
The CISWRA science team consists of 16 water quality experts affiliated with leading academic institutions as well as federal research agencies.

The State of Our Rivers

Iowa's water quality has been significantly impaired by both urban and rural activities. The familiar sights of pavement-filled cities and acres of corn and soybean fields are far different from the native prairies that once dominated Iowa. Historical alterations to Iowa's landscape, along with changes in climate, have had a profound impact on the State's water quality.

Polk County currently faces many threats to its waters, which largely result from human activities in the Des Moines metro's urban areas and the upstream rural landscape. Agricultural production, which is the predominant use of the land in our watersheds, has an overwhelming influence on the rivers. Fertilizer and animal waste move downstream, threatening drinking water sources and increasing the likelihood of harmful algal blooms (HABs). In urban, suburban, and rural areas, alteration of stream and river ecosystems by channel straightening and bank reinforcement has disconnected waterways from their floodplains. Climate change will exacerbate these issues unless timely and decisive actions are taken to reduce human impacts on the Rivers. Our Rivers are inextricably tied to our economic vitality, the health of our citizens, and the sustainability of our communities; as such, they need to be our priority.

1

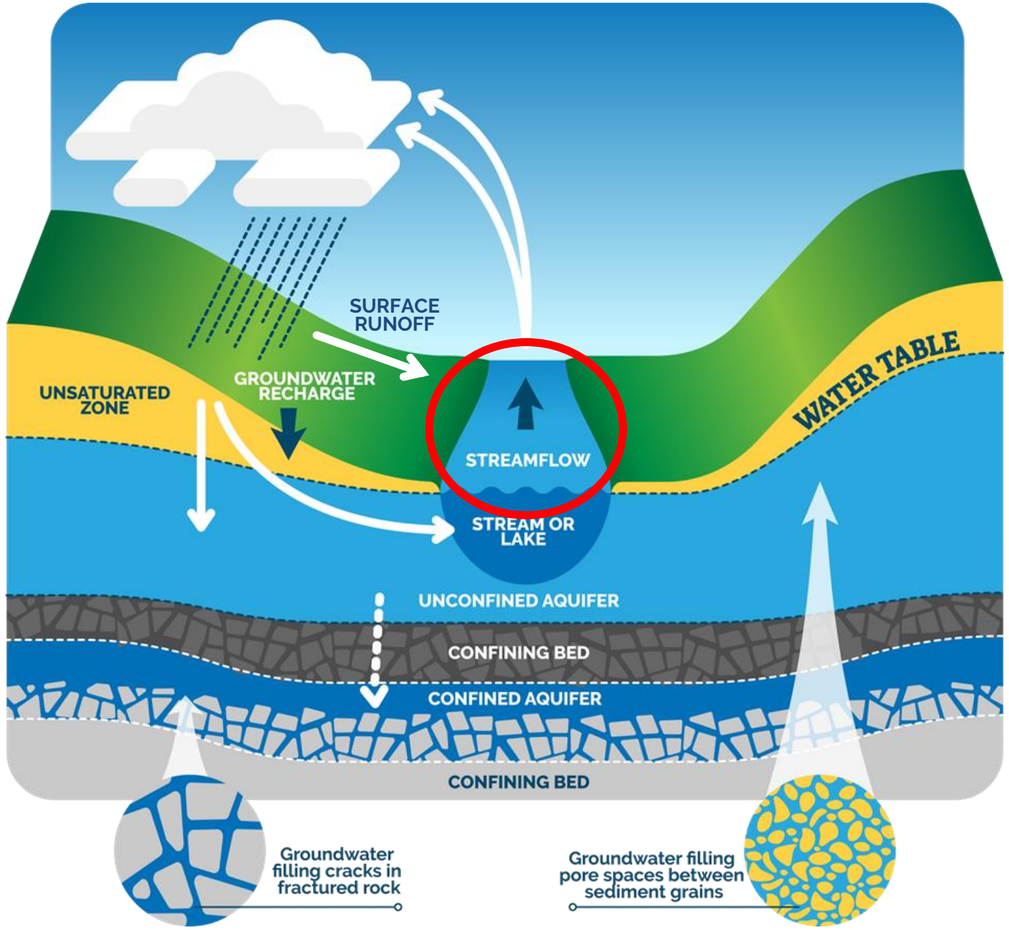
Executive Summary

5 page summary of major findings and areas of concern


River Flow
(Streamflow)

River Flow (Streamflow)

The amount of water that travels through a river or stream at any given location and time.



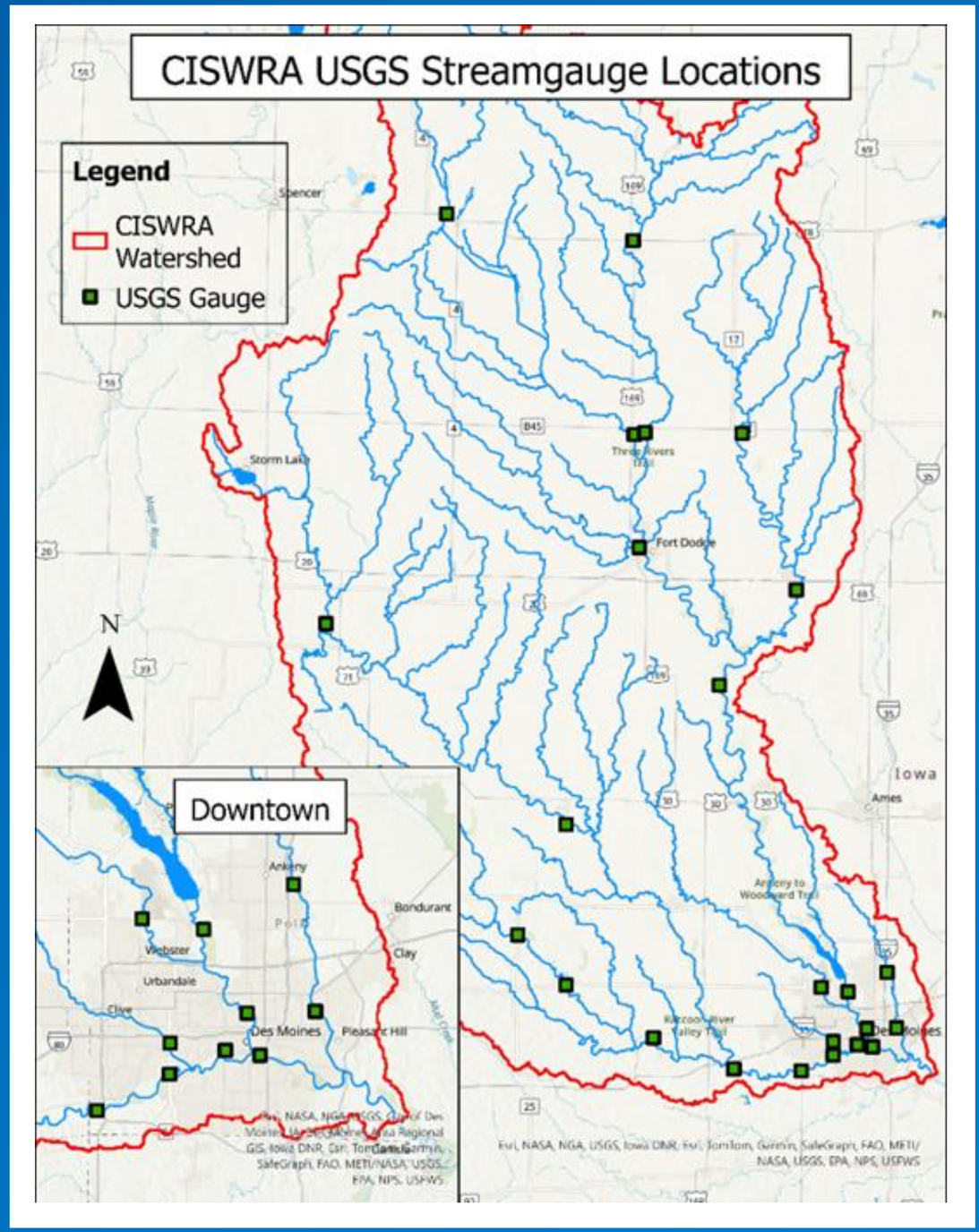
River Flow is Vitally Important

River Flow Impacts Water Quality

It is a **vital aspect of the water cycle**. In central Iowa, river flow shapes **both the quality and quantity of water** in the Des Moines and Raccoon Rivers, as well as the health and diversity of the ecosystems they support.

Measuring River Flow

The USGS operates a robust **network of 24 stream gauges** that continuously monitor river flow throughout the CISWRA Watersheds



River Flow: Heavily Influenced by Changes to Climate and Land Use

Rainfall patterns have changed in Polk County

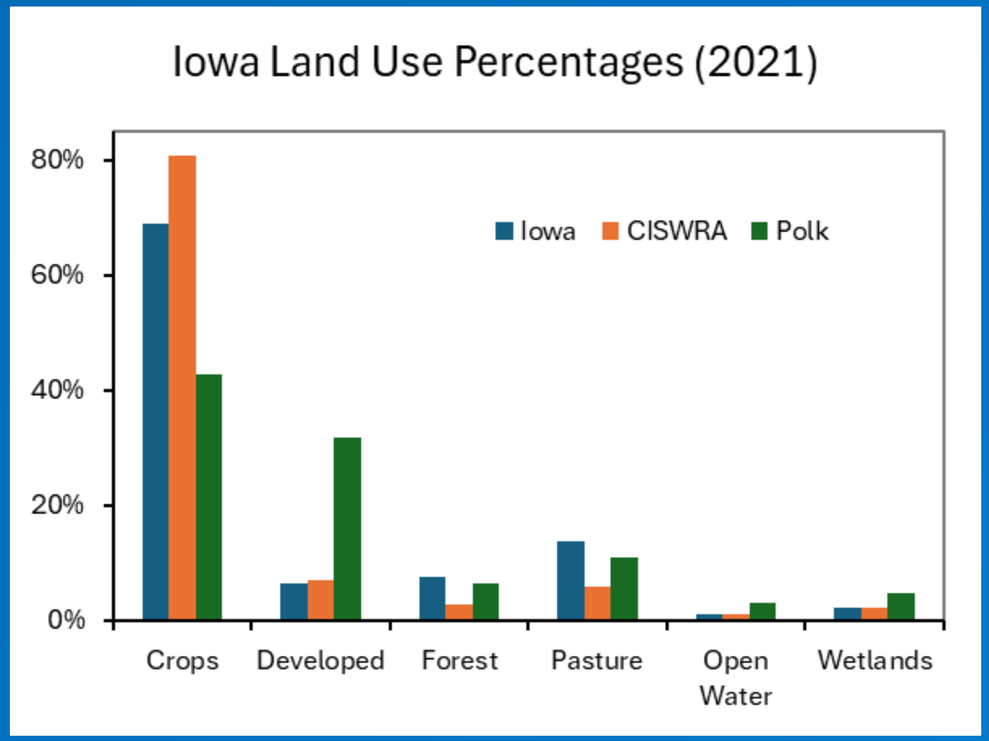
The total amount of precipitation has increased, along with a trend of more days with heavy rainfall

Seasonal patterns play a large role river flow (and water quality)

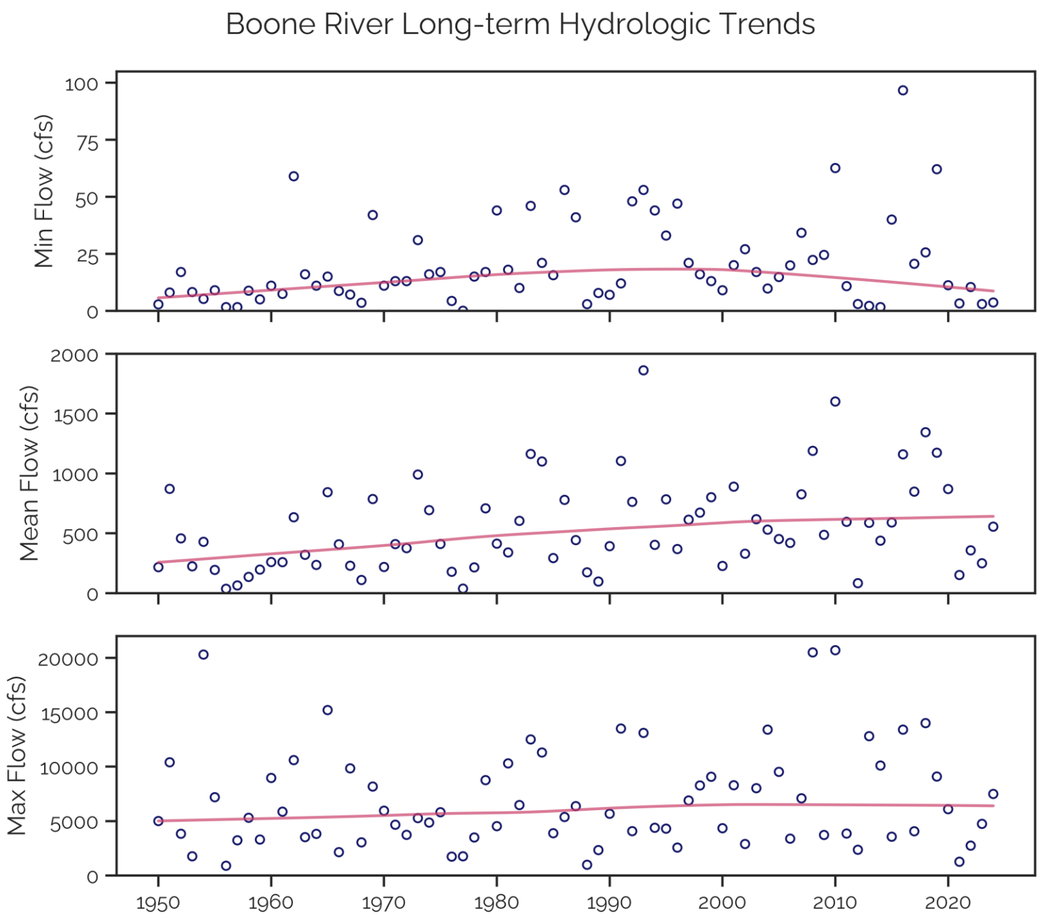
Polk County tends to get more heavy rainfall events (and therefore more flow) in the spring and summer

Rainfall increased about 20% from 1950 to 2023, with averages rising from 30 to 36 inches.

REGION	LAND AREA		POPULATION	
	Value (mi²)	% of Total	Value	% of Total
Des Moines watershed	6,245	62%	289,700	42%
Raccoon watershed	3,625	36%	285,600	42%
Polk County	592	6%	492,400	72%
CISWRA watershed	10,077	100%	688,000	100%



River Flow: Generally Increased over the Past Several Decades



Low Flows

Large Increases (~200%)
Statistically Significant

Average Flows

Moderate Increases (~100%)
Statistically Significant

High Flows

Minor Increases (~30%)
Not Statistically Significant

Pros…

- More water for users
- Increased recreation opportunities
- Dilution of *some* pollutants

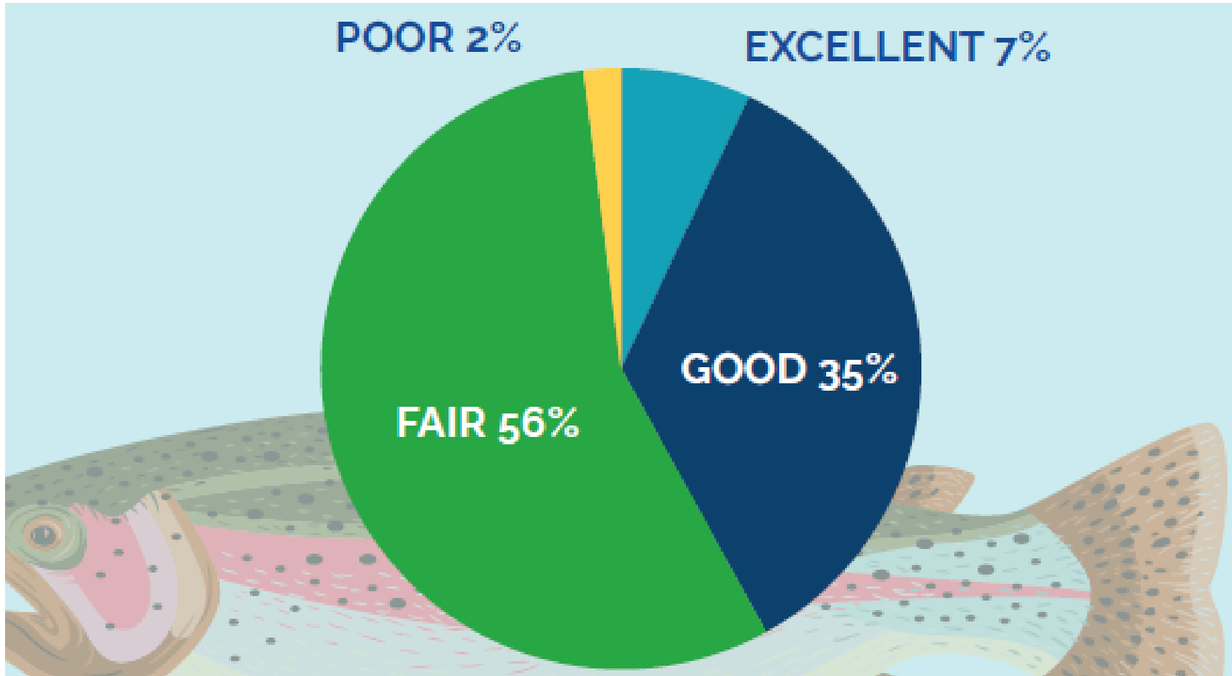
Cons…

- Greater streambank erosion
- Increased flood risk
- Transport of other pollutants

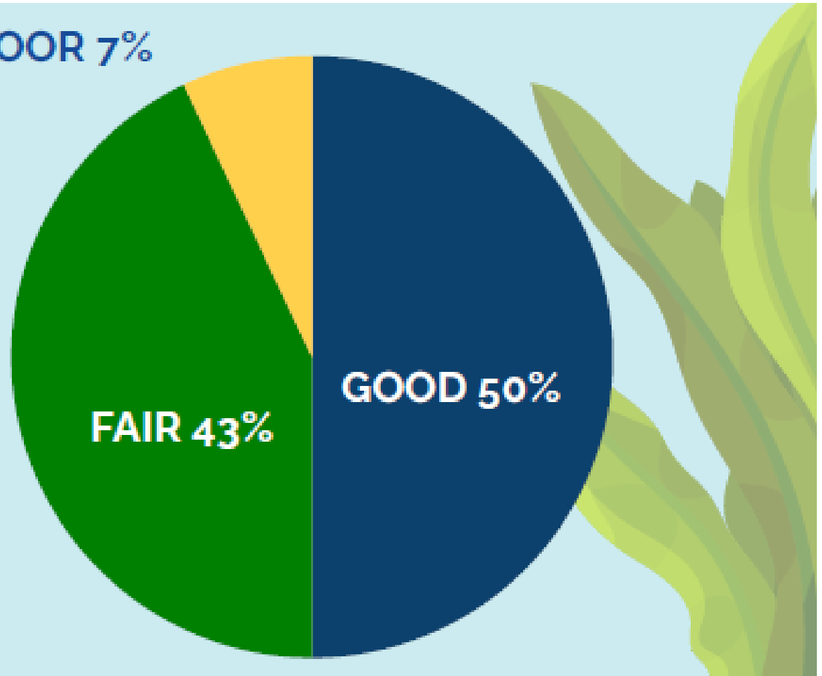

Ecological Health
& River Life

“FIBI” and “BMIBI” Scores are widely used to assess the quality of ecological health

Unfortunately, more than half of the assessed stream and river segments are considered in only **Fair Condition** in the CISWRA Watersheds.



Stream Classifications in the CISWRA Watersheds according to FIBI scores (a fish health index).



Stream Classifications in the CISWRA Watersheds according to BMIBI scores (a macroinvertebrate index).

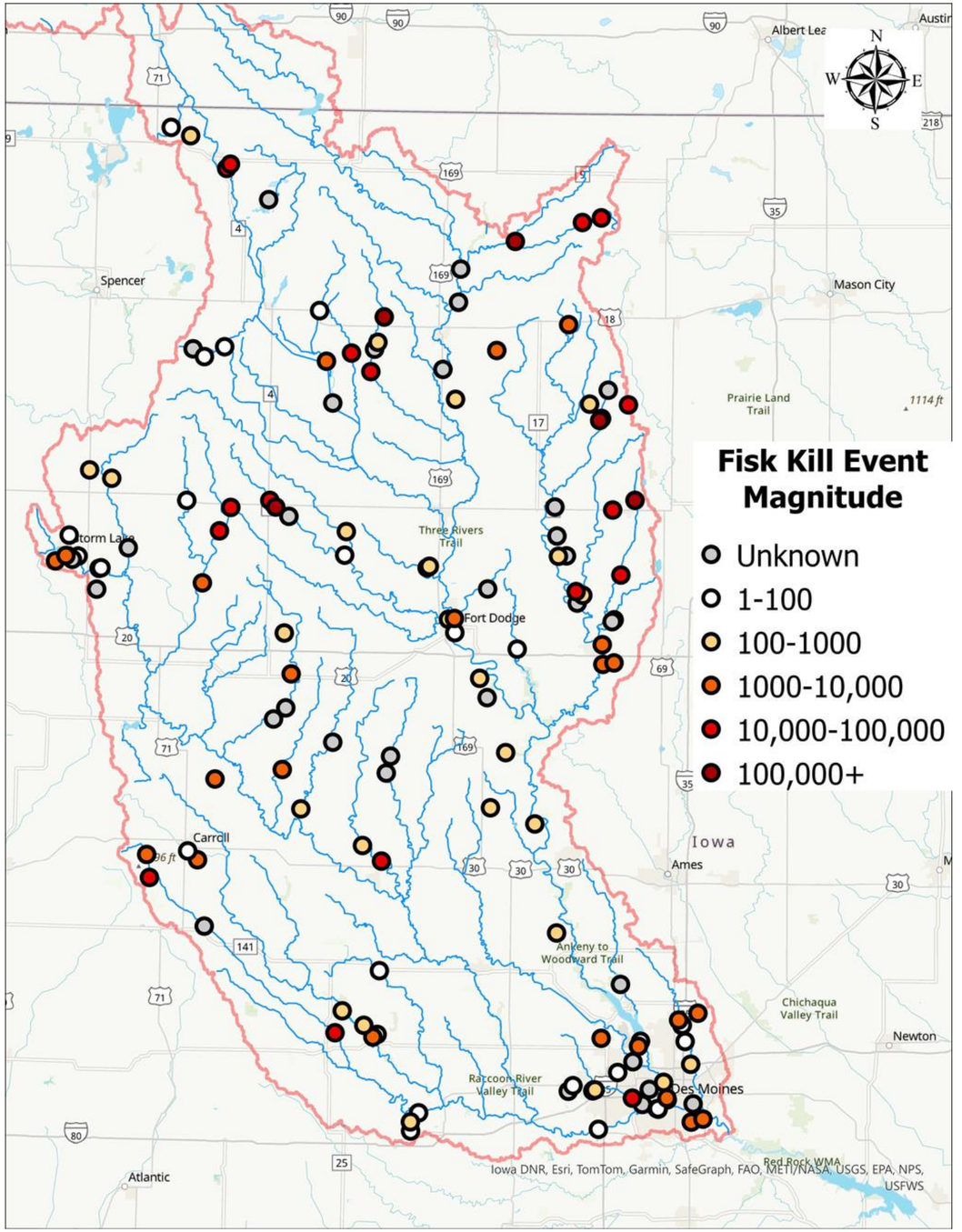
Fish Kill Events Routinely Cause Economic and Ecological Damage

About 60% of Events are caused by “Human” Activities

The most commons causes are spills of animal waste or fertilizer

Events can vary widely in scale and magnitude

The largest event on record resulted in 1.3 million dead fish along the Des Moines River (December 2001)

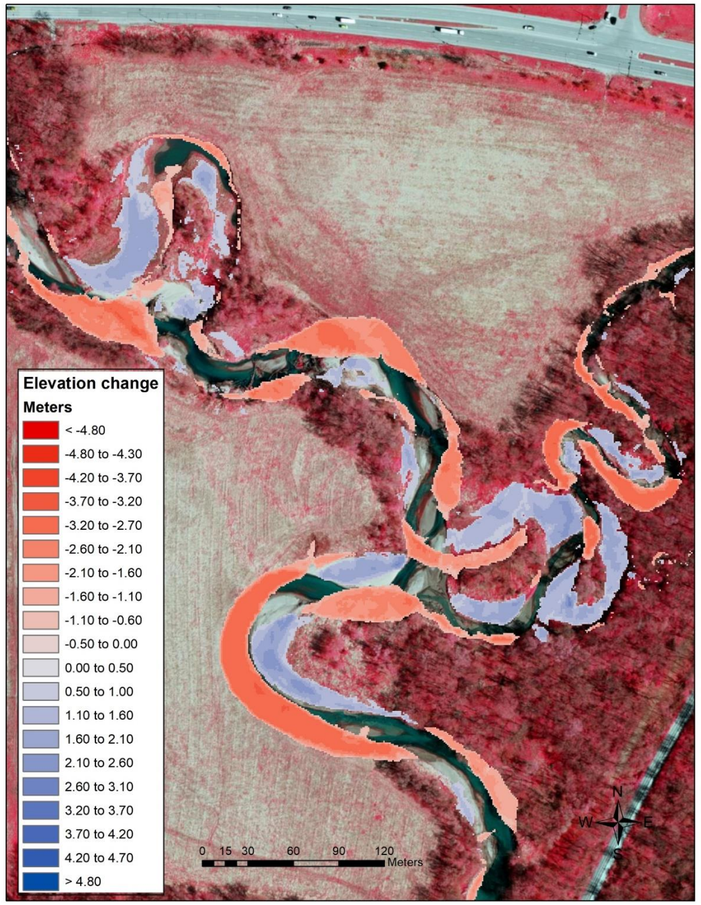


Protecting Habitat Around Rivers is Extremely Important

Streambank erosion is a major concern for ecological health and human developments

2009 Aerial Photo

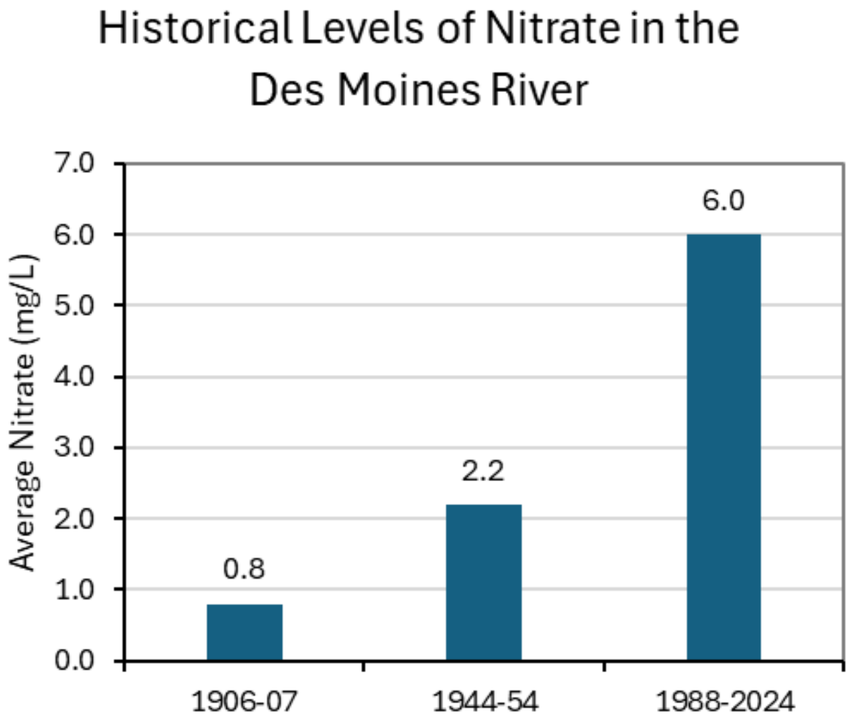
2016 Aerial Photo

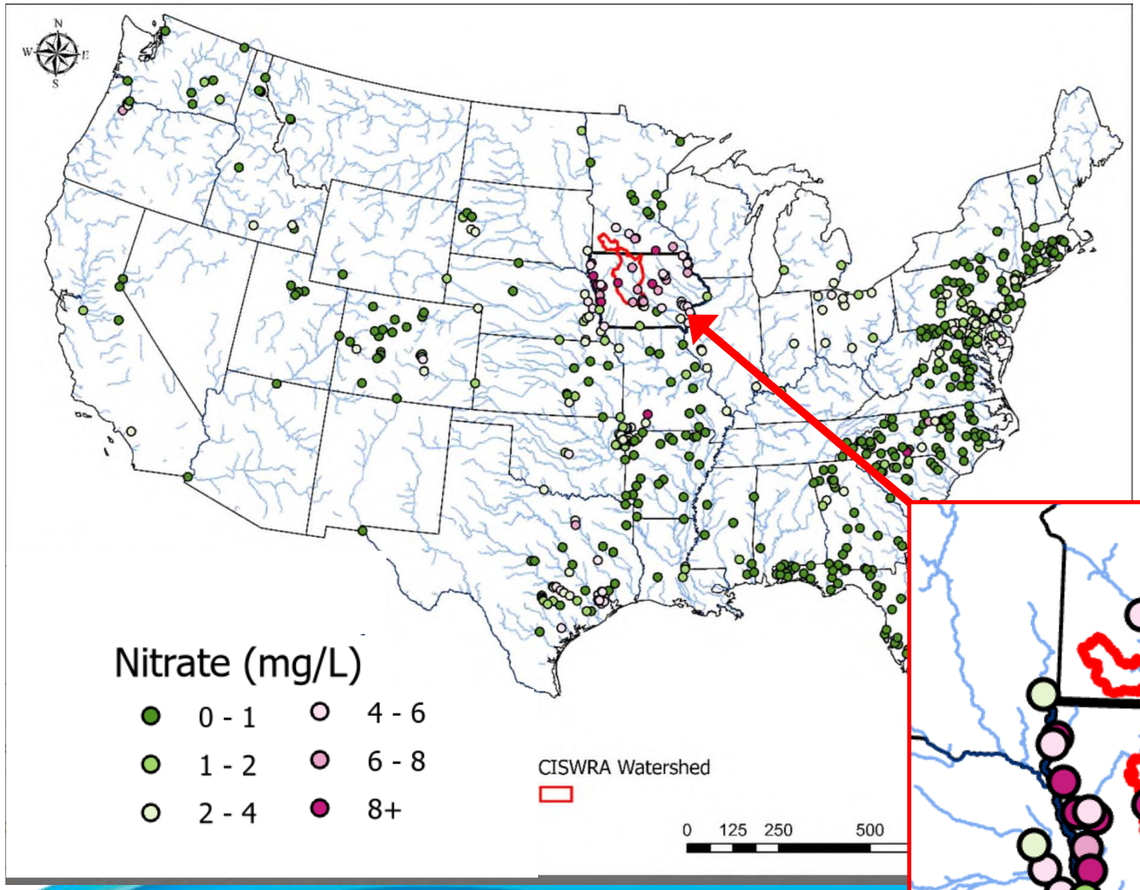


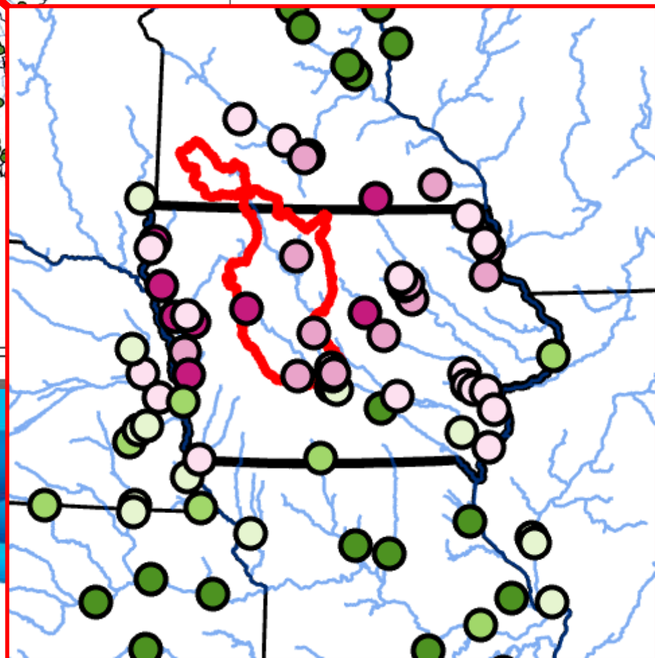
Erosion difference 2009-16

Drinking Water

Nitrate Concentrations in these Rivers Far Exceed their Natural Levels and are Among the Highest in the Nation





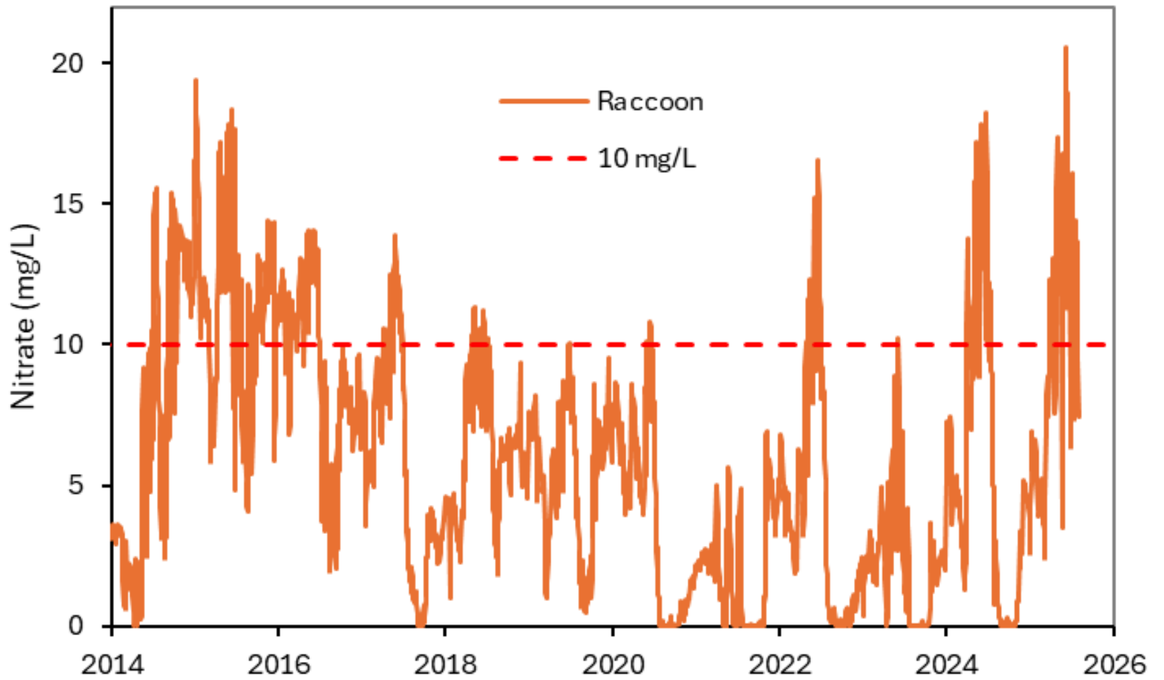


Nitrate is a Constant Burden for DMWW; Treatment is Expensive and Complex

***Note*: Nitrate is the most common form (~90%) the nutrient Nitrogen takes in central Iowa's rivers**

All drinking water utilities must ensure nitrate concentrations in their finished water are below 10 mg/L

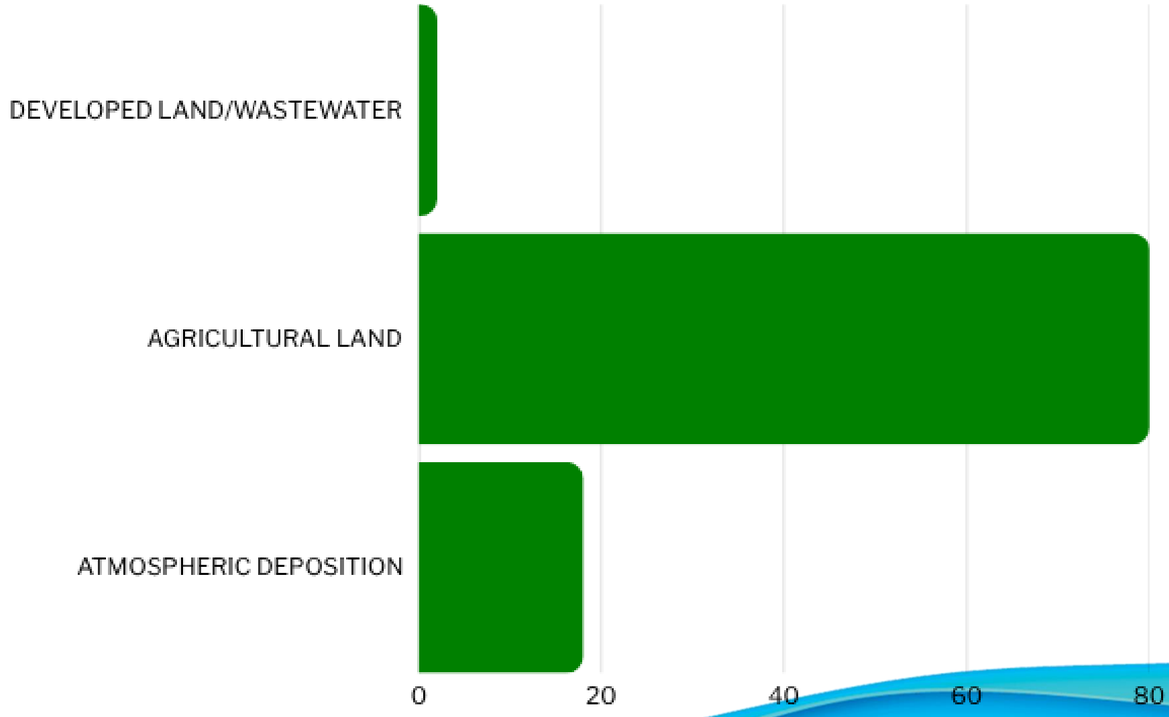
Nitrate concentrations at DMWW's intake along the Raccoon River



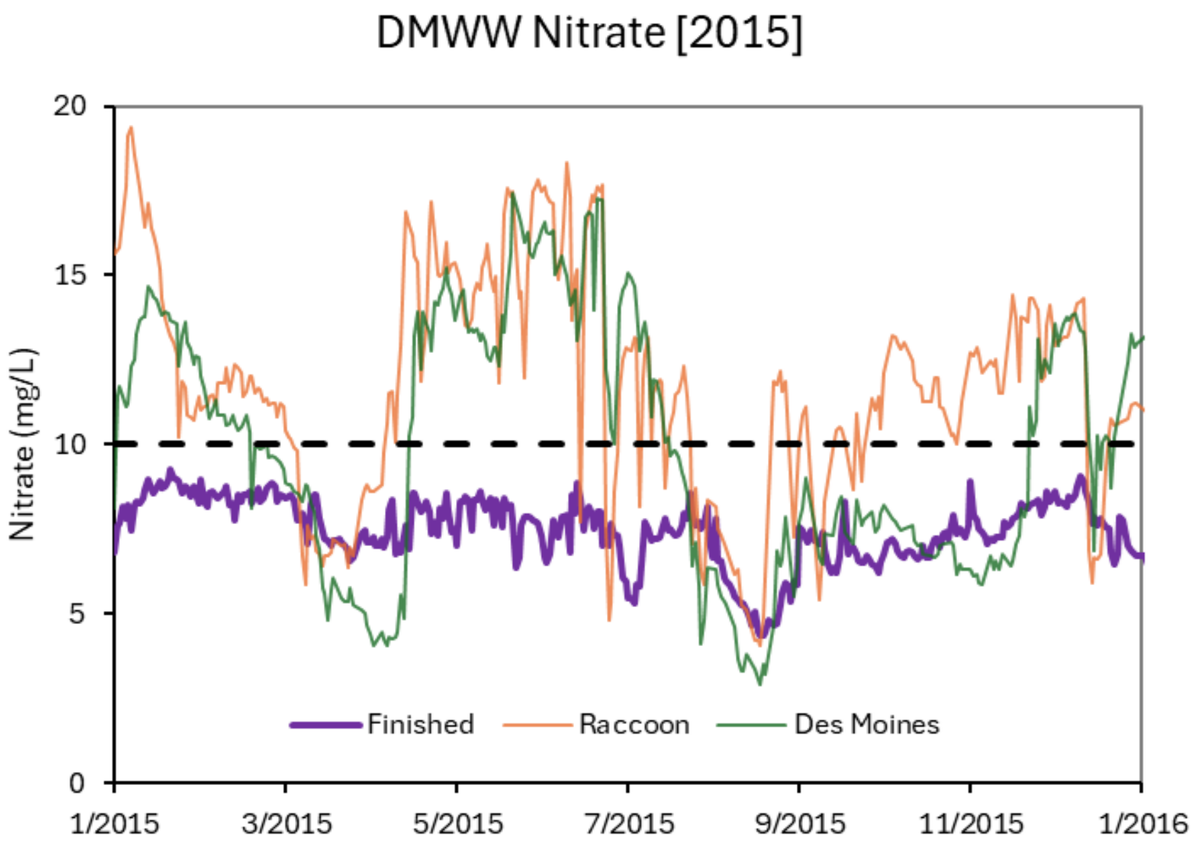
CENTRAL IOWA SOURCE WATER RESEARCH ASSESSMENT

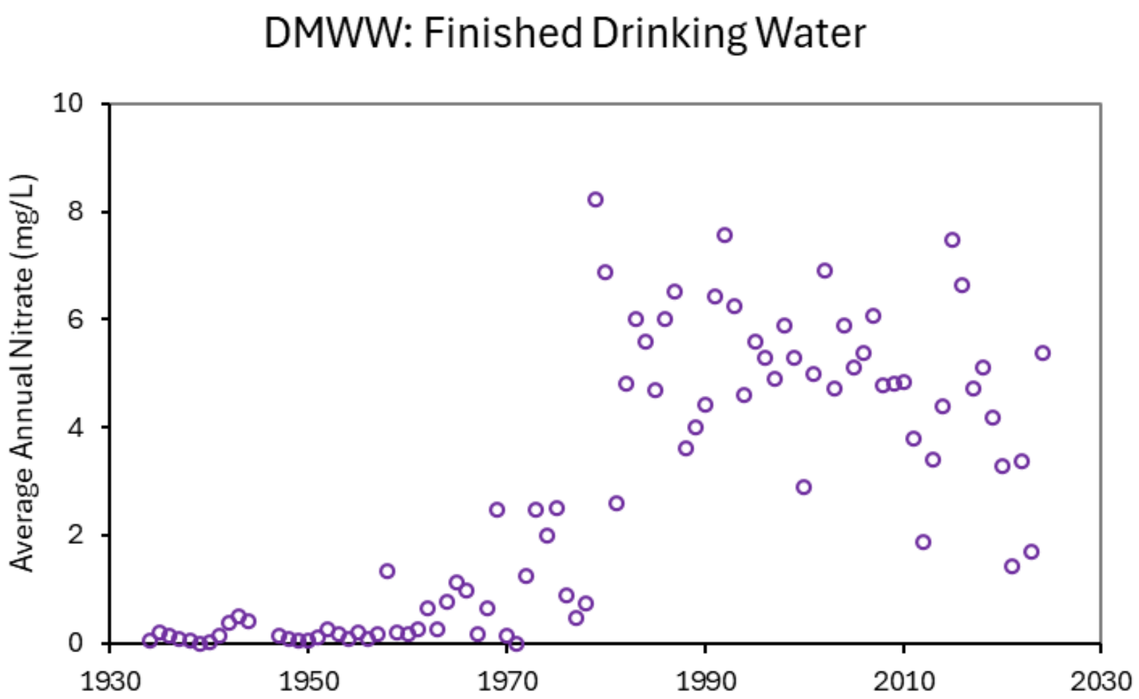
Nitrate is a Constant Burden for DMWW; Treatment is Expensive and Complex

Approximately 80% of nitrate in these rivers comes from agricultural sources



DMWW reliably lowers nitrate in its finished drinking water to less than 10 mg/L…





… but consumers are routinely exposed to nitrate at concentrations that may pose long-term health risks

Toxins from HABs have been found in several waterbodies in Polk County

...including the Des Moines and Raccoon Rivers

Certain harmful algal blooms (HABs) produce toxic chemicals (e.g., microcystin)

HABs are especially problematic when they occur in a drinking water source, and levels occasionally exceed standards in the Rivers

To date, DMWW has avoided and treated HAB toxins to meet standards in drinking water

Pesticides are Another Potential Drinking Water Contaminant . . .

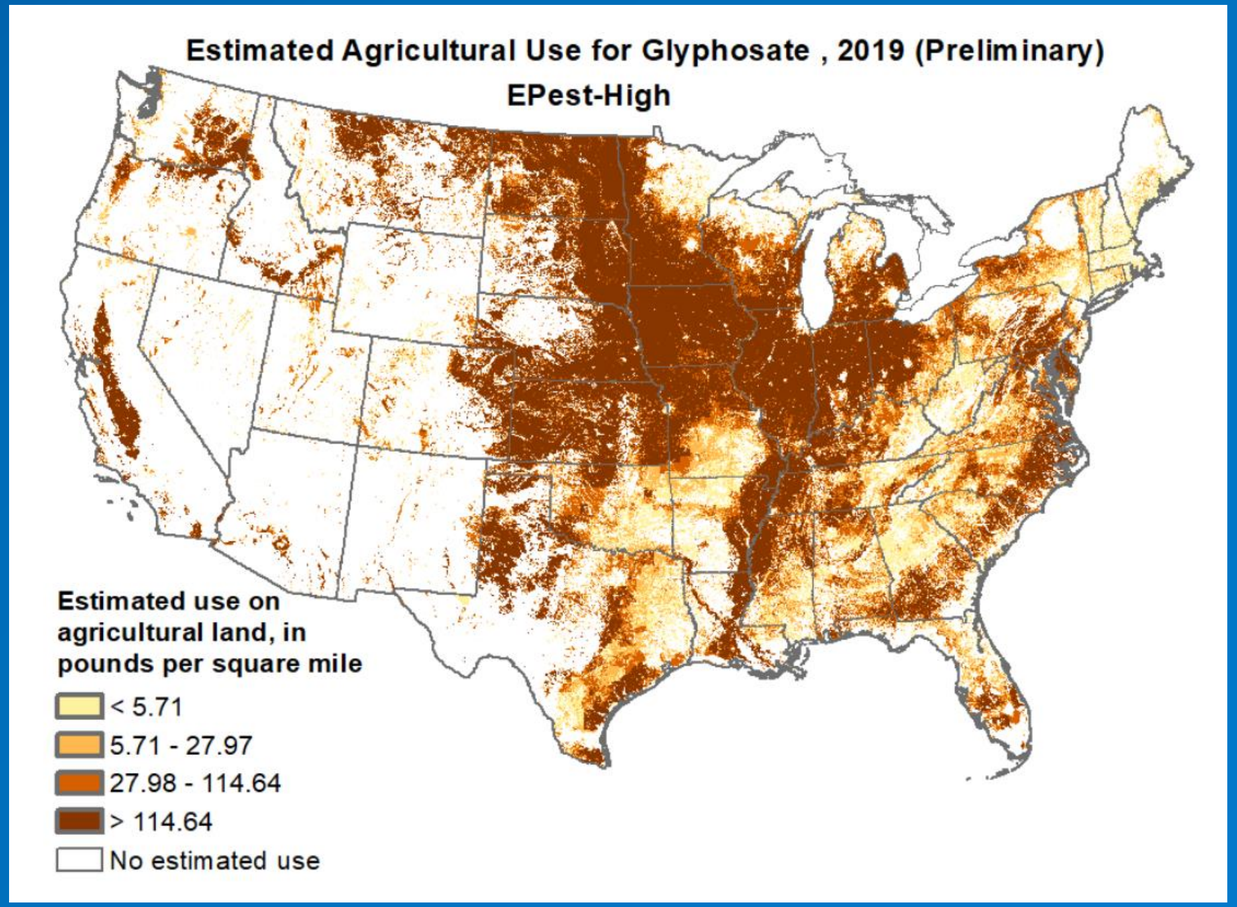
but concentrations in DMWW's finished water have met all standards

Iowa's most widely used pesticides are:

- Glyphosate
- Acetochlor
- Atrazine

The greatest risk of contamination is generally in the Spring following application and rainfall

The health impacts of exposure to many pesticides is unknown



Many other Contaminants have been found in the Rivers and have the Potential to Impact Drinking Water

Water Treatment Challenges

Ammonia and organic carbon can form harmful disinfection byproducts when water is chlorinated

PFAS

These “forever chemicals” resist degradation in the environment and pose several health risks

Pharmaceuticals

Many drugs and personal care products have been found in drinking water, and the impacts of these chemicals are not fully understood


River & Lake
Recreation

Rivers and Beaches Regularly Exceed Recreational Standards for Indicator Bacteria

E. coli are often used to assess risk of waterborne disease

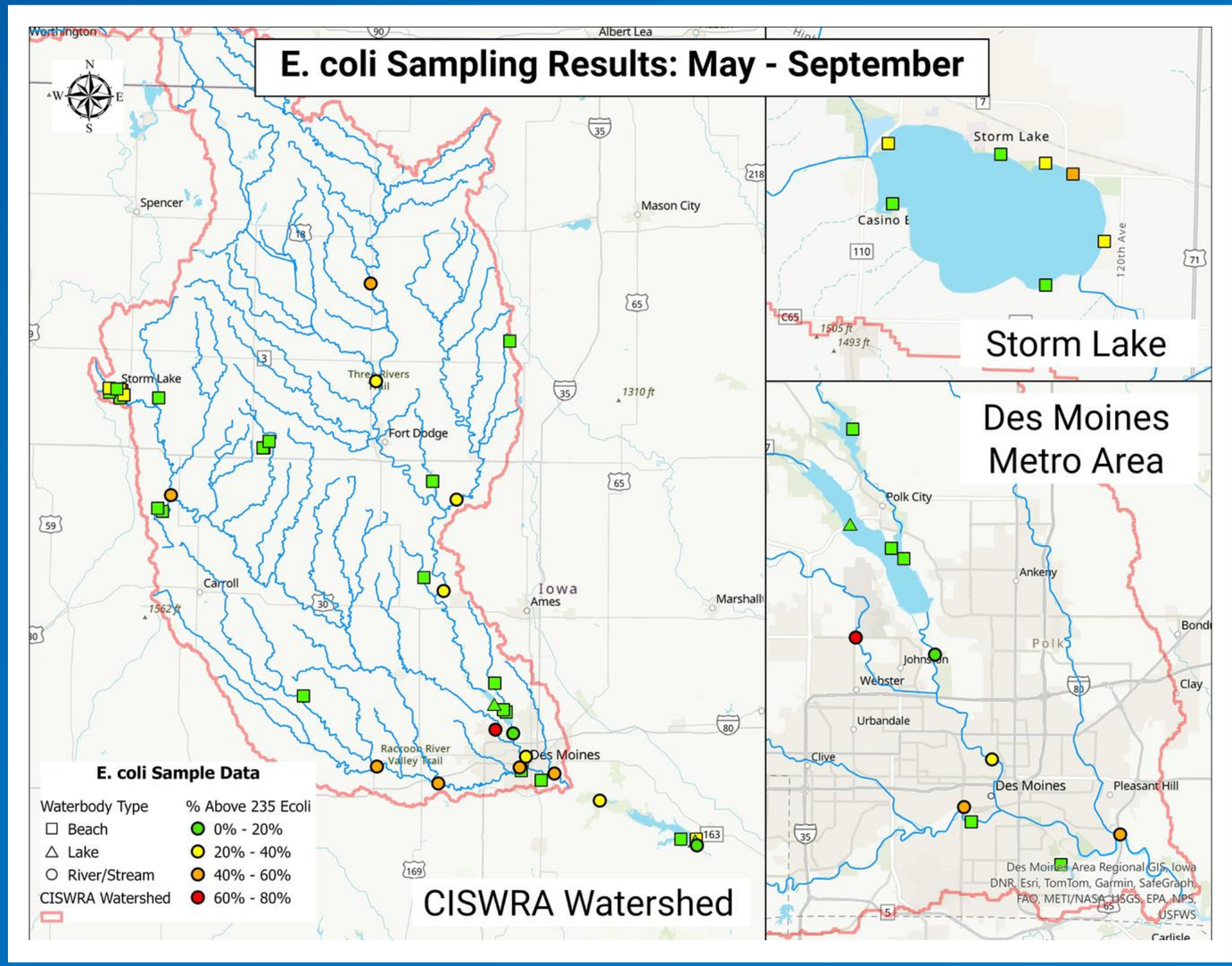
There are many harmful microorganisms (pathogens) that are challenging to measure, so *E. coli* are used as **indicators**

E. coli levels vary greatly but some hotspots and sources have been identified

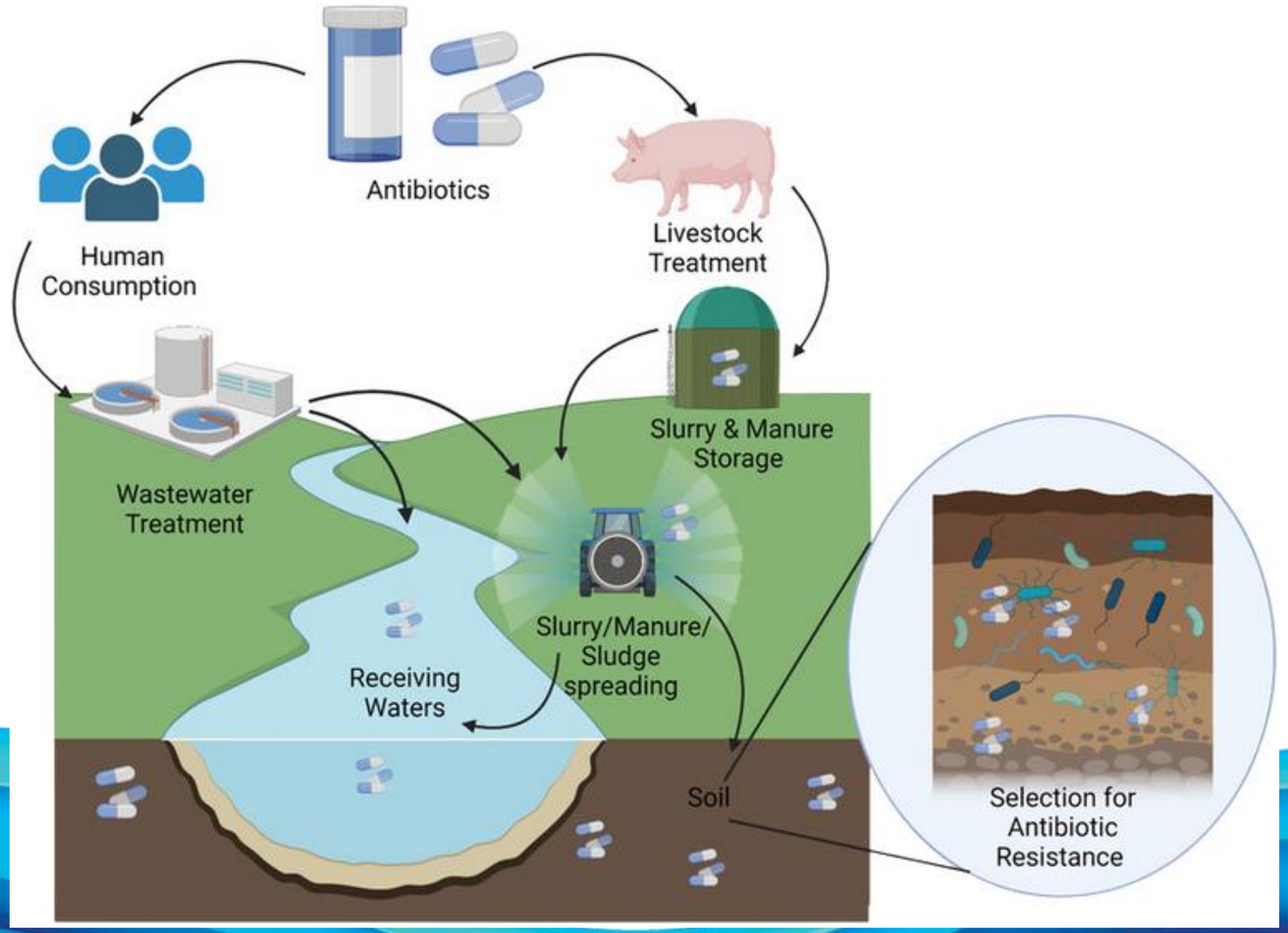
- *E. coli* levels are generally higher in rivers than at beaches, and lowest in open lake waters
- In Metro area streams, human waste has been shown to contribute significantly to microbial contamination, along with livestock, wildlife, and pets
- *E. coli* levels are often higher during high flows and high temperatures, but exposures to pathogens can also occur at low flow conditions when there are direct discharges upstream

Several resources exist to provide guidance on water safety

https://programs.iowadnr.gov/aquia/beaches



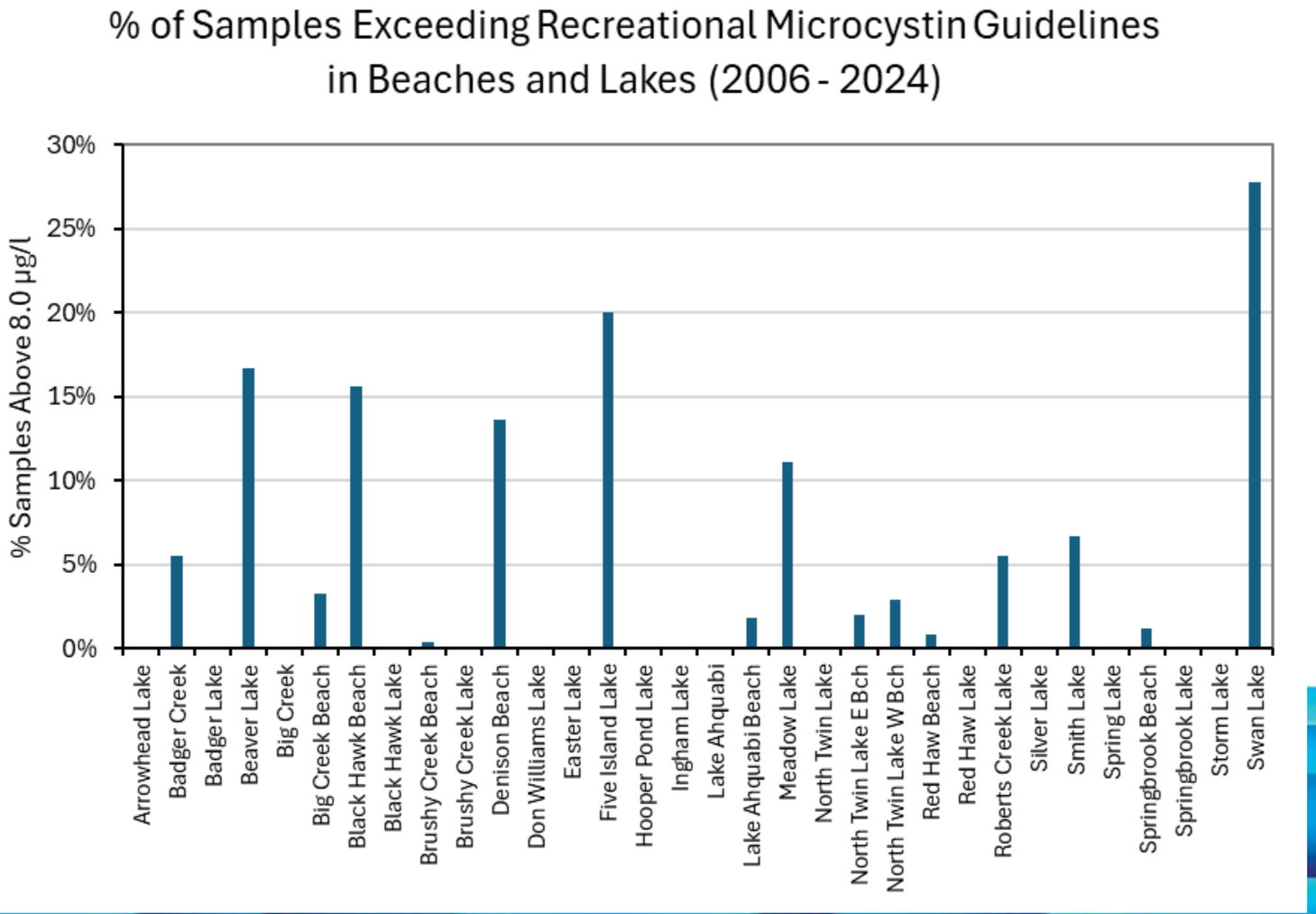
Antibiotics and antibiotic-resistant bacteria exist in Iowa's waterways



Potential **health risks to humans** and animals through direct exposure and environmental **spread of antibiotic resistance** are possible

CENTRAL IOWA SOURCE WATER RESEARCH ASSESSMENT

Harmful Algal Blooms (HABs) can Pose Recreation Risk



HABs result from nutrient pollution.

They are difficult to predict but generally occur under **warm weather** and in **still water** or **low flows.**

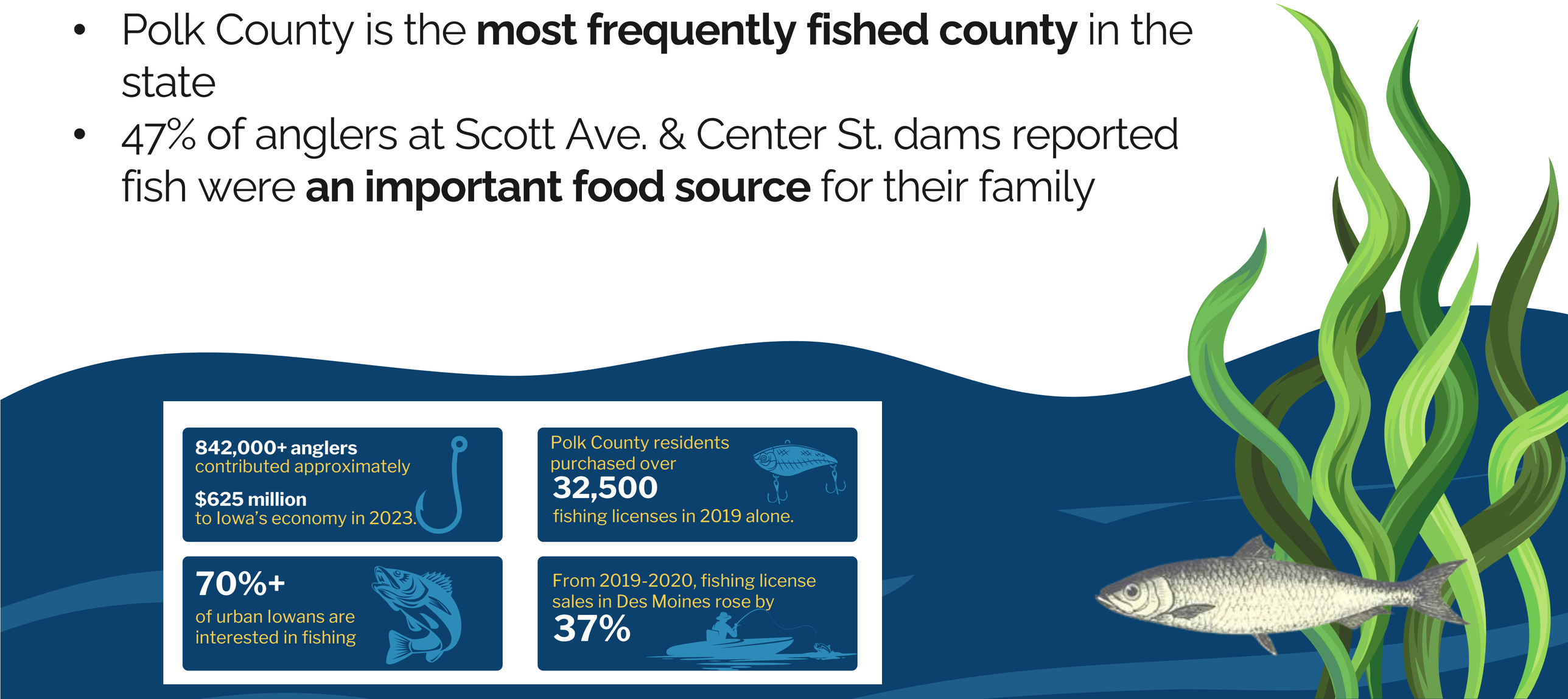
Water Users:
Be Aware of Changing Conditions in the Lakes and Rivers;
Stay Informed;
Take Appropriate Precautions

Some general tips for recreators:

- Wash hands with soap or use sanitizer.
- Minimize the amount of water that goes into the nose or mouth.
- Stay out of the water if you have open wounds or lowered immunity.
- If you do develop an illness, visit a doctor and be sure to tell them when and where you were recreating.

Fishing: Popular Activity *and* Food Source

- Polk County is the **most frequently fished county** in the state
- 47% of anglers at Scott Ave. & Center St. dams reported fish were **an important food source** for their family



842,000+ anglers
contributed approximately
$625 million
to Iowa's economy in 2023.

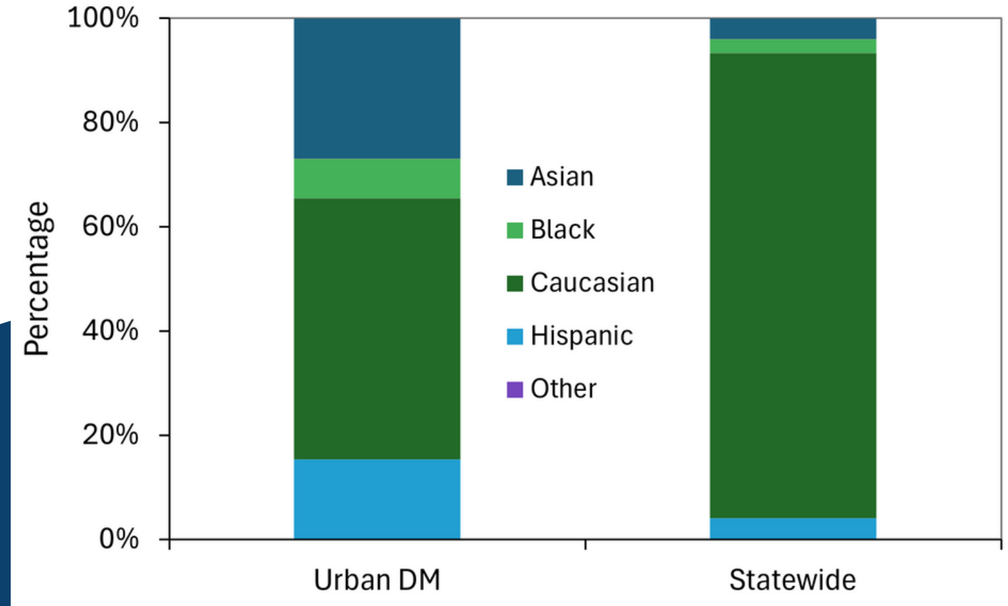
Polk County residents purchased over
32,500
fishing licenses in 2019 alone.

70%+
of urban Iowans are interested in fishing

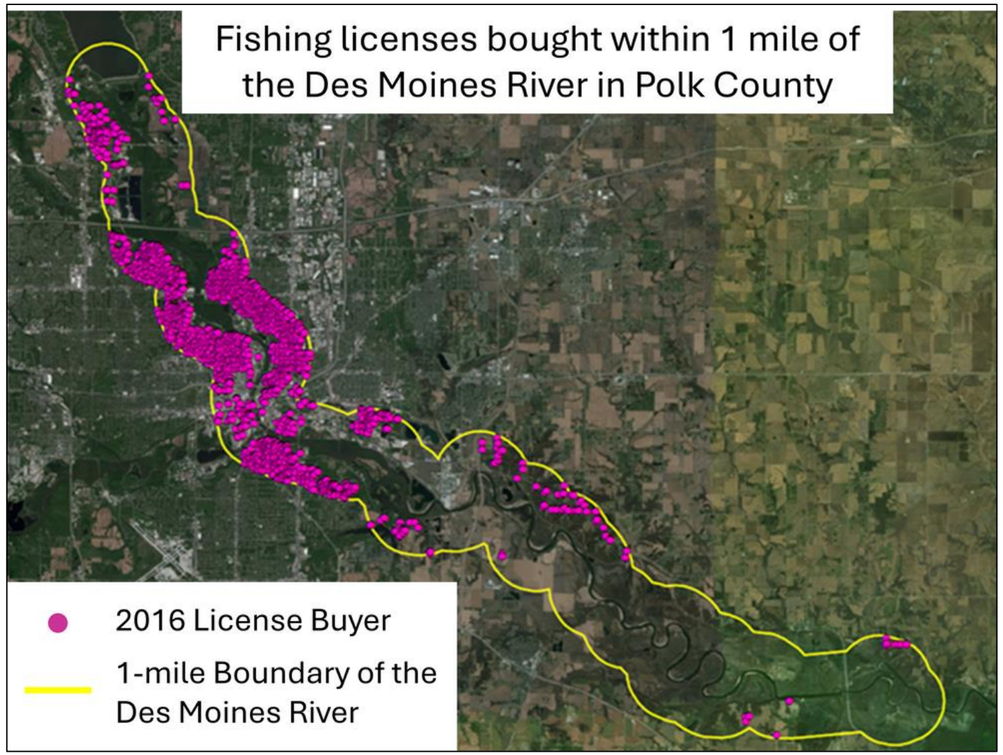
From 2019-2020, fishing license sales in Des Moines rose by
37%

Fishing: Popular Activity *and* Food Source

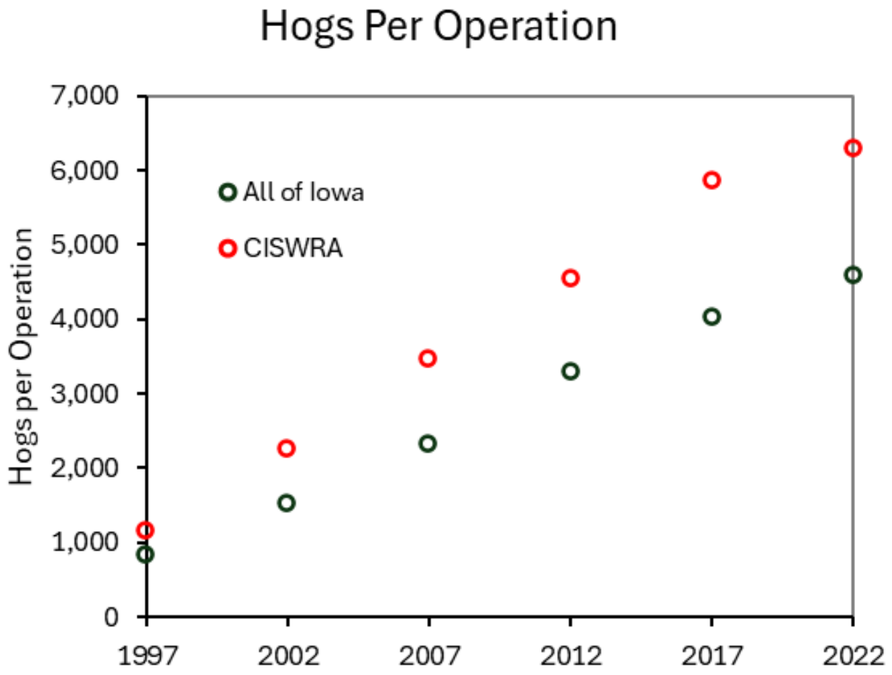
Minority groups represent 50% of anglers at downtown dams: much higher than elsewhere in Iowa

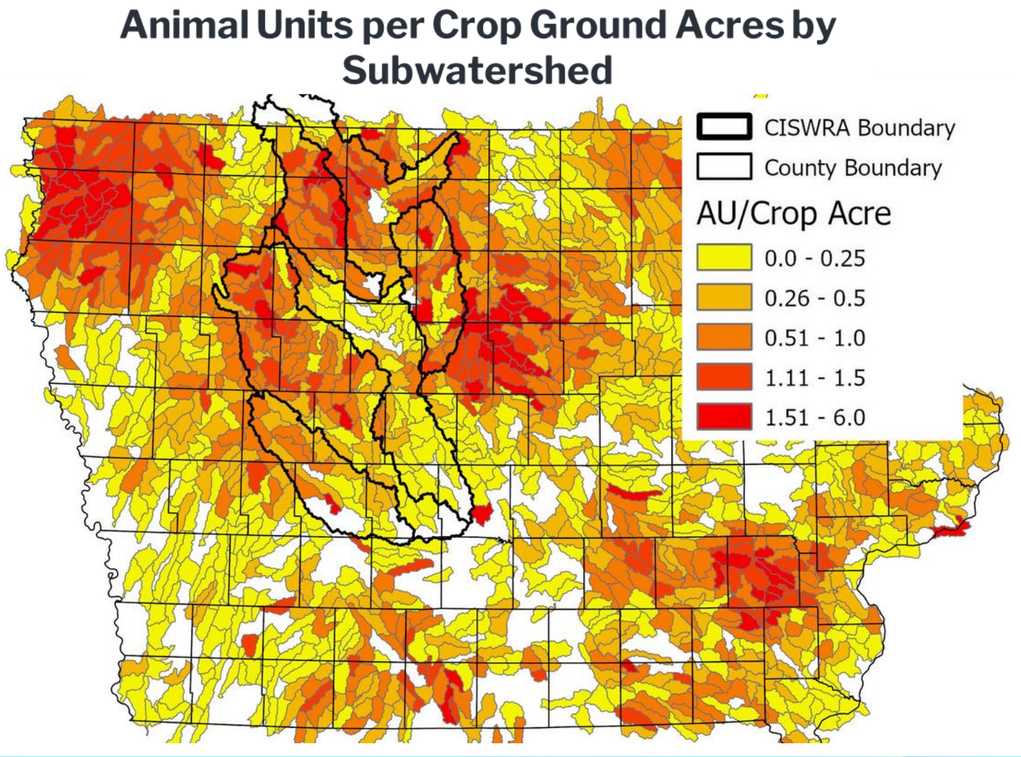


Several of the most popular fishing locations along the Des Moines River are downtown

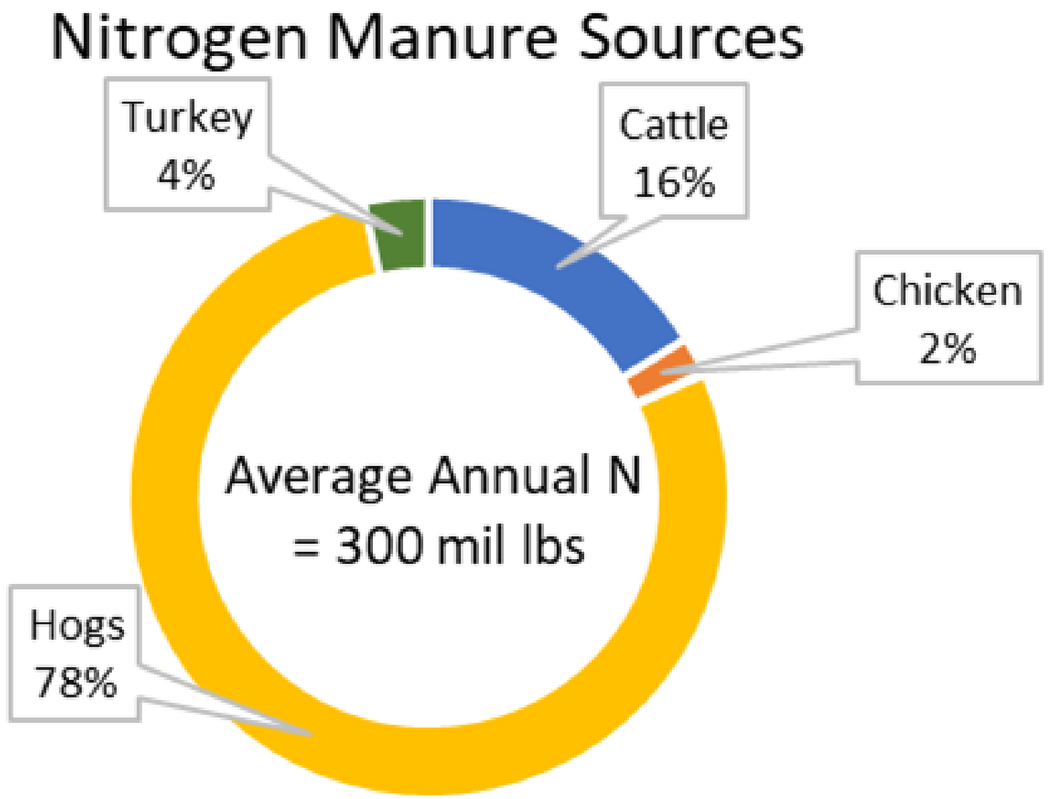


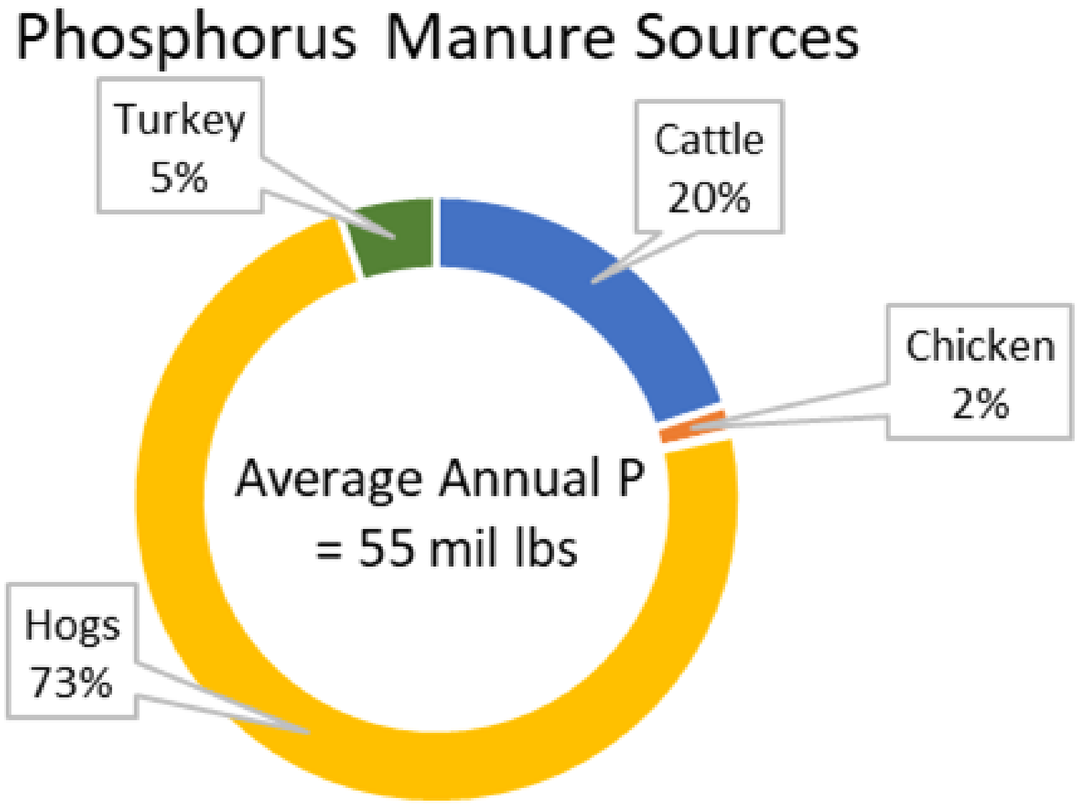
Management of Livestock Manure: Critical Issue with Many Water Quality Implications





Large Amounts of Manure are Generated by Livestock within the CISWRA Watersheds

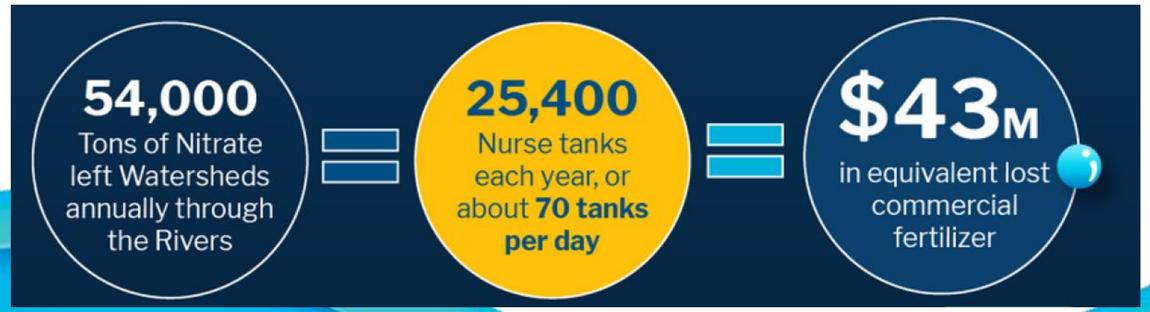




Impacts of Manure in Source Water

- Nutrients
- Pathogens
- Harmful Algal Blooms
- Pharmaceuticals
- Antibiotic Resistance
- Fish Kills

~20% of Nitrogen and Phosphorus in the Rivers originate from manure



“What concerns us most?”

See the Executive Summary for further details...

Livestock Manure Management

Stream Channel Protection

Land Use Adjacent to Rivers

Harmful Algal Blooms

Waterborne Pathogens

Nutrients

CENTRAL IOWA SOURCE WATER RESEARCH ASSESSMENT

Suggested Action Steps

Local and Individual Actions

01 Saylorville Reservoir Management and Operation

02 Community-based Data – Residents Take Action

03 Public Health and Safety Risk Education

04 Solid Waste Reduction

05 Urban Stormwater Practices

06 Water Quality Education and Outreach

Regional/Watershed Actions

1. Plan for Trends and Variability: Drinking Water
2. Contingencies for Compliance: Drinking Water
3. Continue to Build Partnerships Upstream
4. Comprehensive Monitoring and Modeling: Fill the Data Gaps
5. Inform the Public and Policy Makers
6. Outcome-based Conservation Practices
7. Riparian Corridors
8. Comprehensive Watershed Plans - Regular Updating
9. Reduce Manure Impact on Water Quality
10. Overapplication of Manure
11. Protect Habitats
12. Enhance Habitats
13. Monitor Ecosystem Health with Robust Data Sampling and Assessment
14. Expand Fishing Opportunities for All Residents
15. Promote Food-focused Agriculture
16. Forecast and Communicate Ri Lake Water Quality Conditions

Statewide Actions

01

Allocate Additional Funding - Wastewater

02

Develop Digital Geospatial Manure Database

03

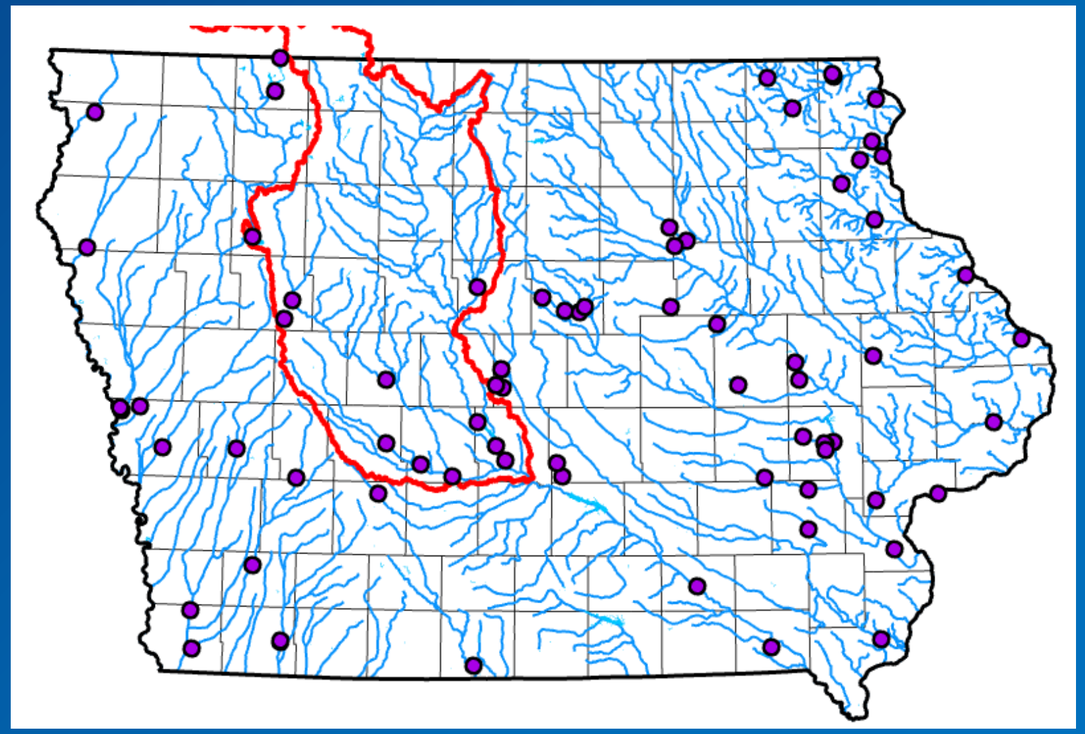
Form Partnerships to Create Pollution List and Benchmarks

Iowa has long maintained an extensive network of nitrate monitoring sensors…

…but this network is scheduled to be greatly reduced next year

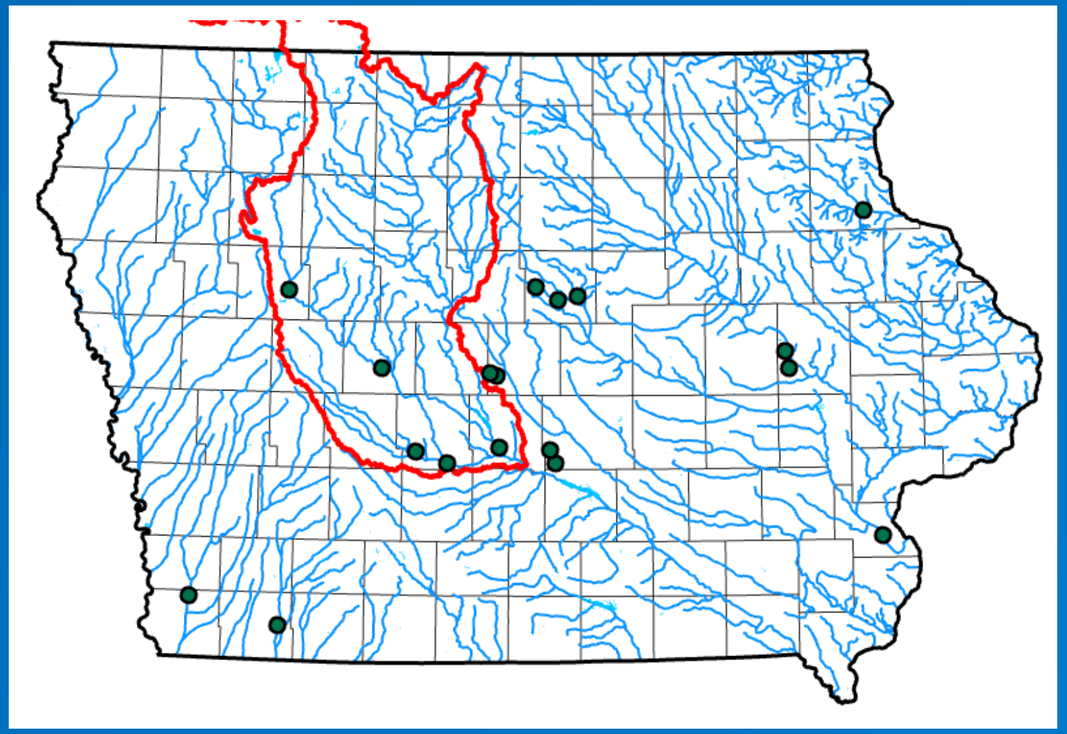
Current Nitrate Sensor Network

~80 sensors in 2024-25



Anticipated Nitrate Sensor Network

~20 sensors in 2026



Thank You!

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To view and download all CISWRA documents, please visit:

https://www.polkcountyiowa.gov/public-works/water-resources/polk-county-water-quality-initiatives