

**IOWA**

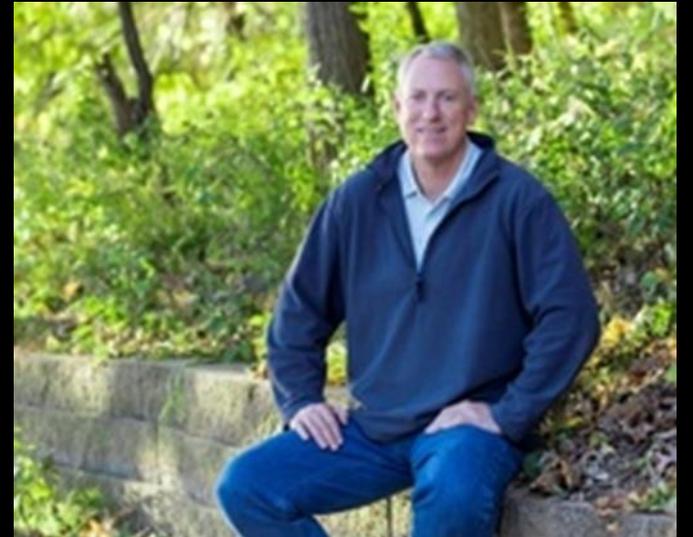
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# ***Iowa Geological Survey Legislative Update***

**Keith Schilling, Ph.D.**

**Director and State Geologist, Iowa Geological  
Survey, University of Iowa**

February 10, 2025



# Who We Are



## **Our Mission:**

*“To collect, reposit, and interpret geologic and hydrogeologic data, to conduct foundational research, and to provide lowans with the knowledge needed to effectively manage our natural resources for long-term sustainability and economic development.”*

## **Fun Facts**

- Established in **1892**
- IDNR 1986-2014
- IIHR **2014**-present
- State Geologists is Keith Schilling, Ph.D.
- Currently **16** staff:
  - 13 FTE scientists
  - 2 shared/part time
  - 1 admin support

## UI Main Campus: **Trowbridge Hall**



## UI Oakdale Research Park: **IGS Rock Library**



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Iowa Geological Survey

# IGS Celebrates 10-Years at University of Iowa

- Celebration in December 2024
- Productive move for IGS - more entrepreneurial in securing additional funding
- Change in culture, new mapping initiatives, partnerships with state and federal agencies

However, we could be doing more for the State of Iowa if we had additional state funding



# Base Funding for last 10 years

## Division 5 Environment First Fund General Appropriations

Sec.26. STATEUNIVERSITYOFIOWA—IOWA GEOLOGICAL SURVEY. There is appropriated from the environment first fund created in section 8.57A to the state university of Iowa for the fiscal year beginning July 1, 2022, and ending June 30, 2023, the following amounts, or so much thereof as is House File 2560, p.16 necessary, to be used for the purposes designated:

1. OPERATIONS For purposes of supporting the operations of the Iowa geological survey of the state as created within the state university of Iowa pursuant to section 456.1, including but not limited to providing analysis; data maintenance, collection, and compilation; investigative programs; and information for water supply development and protection:.....\$200,000
2. WATER RESOURCE MANAGEMENT For purposes of supporting the Iowa geological survey in measuring, assessing, and evaluating the quantity of water sources in this state and assisting the department of natural resources in regulating water quantity as provided in chapter 455B, subchapter III, part 4, pursuant to sections 455B.262 Band 456.14:.....\$495,000

- IGS appropriation of \$695,000 was constant from 2014 to 2024

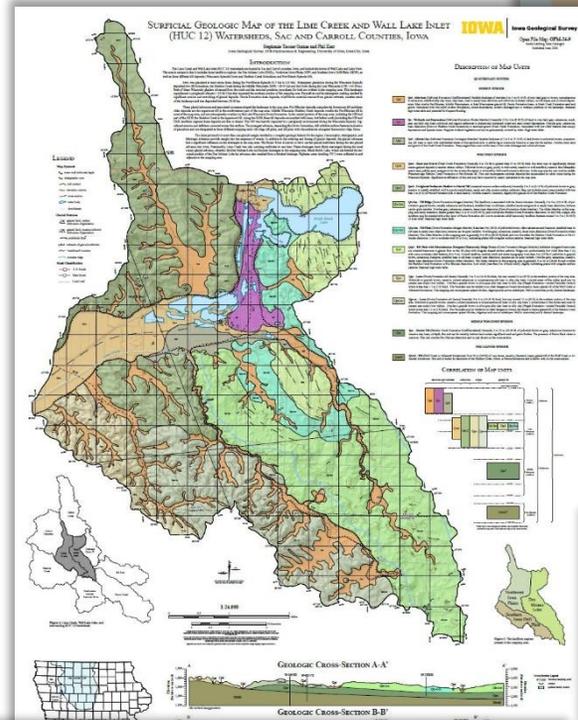
Comparison of state appropriations to midwestern state geological surveys:

State	2022
Minnesota	\$1,473,526
South Dakota	\$2,450,000
Nebraska	\$2,500,000
Indiana	\$2,700,000
Wisconsin	\$2,026,146
Kentucky	\$4,181,029
Illinois	\$4,492,841
Ohio	\$6,082,584
Kansas	\$8,800,000
Missouri	\$6,512,479
Michigan (2023)	\$3,000,000
<b>Average appropriation</b>	<b>\$4,019,873</b>
<b>Iowa appropriation</b>	<b>\$695,000</b>

*The State of Iowa appropriation is less than one-fifth (17%) of the average state appropriation provided to other geological surveys in the region*

# Decade at IHR/UI...by the numbers

- Doubled IGS staff from **8** to **16**
- Employed **>60** student interns
- Increased public databases from **1** to **5**
- Published **76** geologic maps
- Issued **11** Water Resources Investigations
- Lead or co-authored **142** peer-reviewed publications
- Countless public engagements via phone, email, STEM events, job shadows, fairs, field trips...



### IGS Data Portal

Providing data access to the public with web applications

- GeoCore – Photographs of the IGS' Rock Library core collection
- GeoLab – Laboratory results of various geological materials
- GeoSam – Information on wells, rock exposure, & quarry
- Publications – Contains a list of all IGS publications
- PumpTest – Information on hydraulic testing of aquifers

<https://www.iuhr.uiowa.edu/igs/iowa-geo>

### Erosion and sediment delivery in southern Iowa watersheds: Implications for conservation planning

M.S. Switzer, K.L. Schilling, C.L. Burns, and C.S. Walter

**Abstract:** Soil sediment export from agricultural watersheds is a major environmental concern and is a primary constraint to suspended sediment in streams. The purpose of this study was to quantify total suspended solid (TSS) export and current sediment delivery ratios (SDR) in four southern Iowa watersheds and evaluate how existing and potential best management practices (BMPs) have affected SDRs. Our study updated estimates of SDRs that were previously developed using soil "D" content data and length sediment method. We estimated TSS export using continuous subsurface measurements and soil phosphorus (P) data and modeled soil erosion using soil "D" content data and length sediment method. We estimated TSS export using continuous subsurface measurements and soil phosphorus (P) data and modeled soil erosion using soil "D" content data and length sediment method. Current SDRs were significantly lower than previous estimates. This new analysis provides an exceptional array of conservation options to our study watersheds over the past four decades. Further, they are likely a worst-case scenario for sheet and rill erosion sediment export since TSS export does not distinguish among other sediment sources such as stream bank and gully erosion. Based on the extent of BMP implementation in the watersheds and the potential for future BMPs, we found that there is only limited potential for further reducing TSS export using additional on-farm practices. Hence, we believe that further work toward reducing TSS export in these Iowa watersheds should be directed to reducing contributions from other TSS sources including from stream bank, soil gully erosion.

**Key words:** best management practices—sediment delivery ratios—conservation—soil erosion

**Soil sediment export from agriculturally dominated watersheds is a global crisis that has vast-reaching and severe environmental and economic impacts. (Brown and Wolf 1994; Myers et al. 2014; Sedell 1999). Management options are limited to control the sediment export from these watersheds, including on-farm sheet and erosion (Johnson and Moldenhauer 1970; Ephemeral gully erosion (Gardner et al. 2003; Olgund 1984). In the last 20+ years, Paerl et al. (1995) estimated that the effects of soil erosion alone produce societal costs exceeding \$250 billion annually. However, these costs are difficult to attribute to individual sources since the effects of soil erosion are not temporally or spatially contained (Yan et al. 2016) and relatively little research has been completed that accurately determined sources of sediment transport. (Waters 1995). Soil, new research over the last decade is working to solve this conundrum of sediment sourcing by using new methods to tracking like soil carbon tracking (Barnes et al. 2016), tree tracking (Culotta et al. 2013), and however tracking (Culotta et al. 2016). However, these methods are not refined and more are developed are very targeted, multiple environments (Culotta et al. 2013), rather than tracking landscape processes.**

In Iowa, United States, agricultural watersheds are a major contributor of suspended sediment to the Gulf of Mexico (Furness et al. 2013; Schilling 2015). Suspended sediment also contributes to total carbon (TC) export (Culotta et al. 2013), which contributes to eutrophication (Culotta et al. 1996) and the export of seasonal hypoxic conditions to the Gulf of Mexico (Furness et al. 2013; Schilling 2015). Suspended sediment also contributes to total carbon (TC) export (Culotta et al. 2013), which contributes to eutrophication (Culotta et al. 1996) and the export of seasonal hypoxic conditions to the Gulf of Mexico (Furness et al. 2013; Schilling 2015). Suspended sediment also contributes to total carbon (TC) export (Culotta et al. 2013), which contributes to eutrophication (Culotta et al. 1996) and the export of seasonal hypoxic conditions to the Gulf of Mexico (Furness et al. 2013; Schilling 2015).

The sediment delivery ratio (SDR) is a ratio of sediment that reaches a point in a watershed. SDRs make comparisons of estimated mass of soil eroded in a watershed to the estimated mass of total suspended sediment (TSS) exported to a stream. SDRs are calculated for ephemeral soil erosion (US NRCS 1976), sheet erosion (US NRCS 1976), ephemeral gully erosion (Gardner et al. 2003), and stream bank erosion (Gardner et al. 2003). However, it is difficult to differentiate among TSS in watershed studies (Blick et al. 2016).

**Matthew S. Switzer is a soil scientist and a Ph.D. student at the Iowa Geological Survey, University of Iowa, Iowa City, Iowa. He is currently a Ph.D. student at the Department of Agricultural and Environmental Engineering, Iowa State University, Ames, Iowa. He is currently a Ph.D. student at the Department of Geological Engineering and Science, Georgia Institute of Technology, Atlanta, Georgia.**

Received June 26, 2020; Revised September 8, 2020; Accepted September 8, 2020.

### Aquifer Characterization and Drought Assessment Ocheyedan River Alluvial Aquifer

Iowa Geological Survey  
Water Resources Investigation Report 10

**IOWA GEOLOGICAL SURVEY**

**IOWA**

Iowa Geological Survey

# Groundwater resources = Economic development

**Des Moines Sunday Register**  
SUNDAY, DECEMBER 3, 2023 | THE NEWS IOWA DEPENDS UPON | DESMOINESREGISTER.COM PART OF THE USA TODAY NETWORK

SUBSCRIBER-EXCLUSIVE SPECIAL SECTION INSIDE **SNOW GETAWAYS** YOUR BEST BETS FOR AFFORDABLE WINTER FUN

## 'Adding another straw to this big drink'

Parts of Iowa drier than the Dust Bowl; state preps for water shortages



**Authors of banned books reject criticisms**  
Say they wanted to educate, not create porn  
Phillip Sitter and Chris Higgins  
Des Moines Register  
USA TODAY NETWORK

### Iowa needs a plan for using its precious groundwater



**Your Turn**  
Keith Schilling  
Guest columnist

A conversion of several factors, some natural and some self-imposed, is leading to recognition that the state of Iowa needs a plan to safeguard groundwater reserves in the future.

Droughts occur on average about once per decade in Iowa, and current drought was preceded by droughts in 2012, 2000, 1988-89 and beyond. Less rainfall during drought reduces infiltration recharge to shallow groundwater, lowers water table levels and reduces groundwater discharge as baseflow to rivers and streams. Drought conditions invariably increase the demands for agricultural crop irrigation, and many communities find that water use increases during drought from lawn watering and other outdoor water uses. In addition, new and increasing pumping demands from a rapidly urbanizing population, ethanol plants and other industrial facilities, data centers (requiring vast quantities of cooling water), animal confinements and other users are challenging urban and rural water systems to keep groundwater supplies on

pace with demand.

Groundwater in Iowa is not evenly distributed, and there are water-rich and water-poor areas of the state. Northeast Iowa is relatively groundwater rich because the bedrock aquifers in the area consisting of fractured carbonate rocks are able to store, transmit and yield large quantities of groundwater for use. Groundwater in this area is rapidly replenished with rainfall and snowmelt. On the other hand, western and southern Iowa are relatively groundwater poor, as the bedrock is either too fine-textured and impermeable to yield much water, or the aquifer is capped by hundreds of feet of clay-rich glacial soils that limit precipitation recharge. In these areas, water suppliers often focus on extracting groundwater from shallow sands and gravels that occupy rivers valleys (alluvial aquifers) or pumping from deep bedrock aquifers like the Cambrian-Ordovician aquifer (aka "Jordan" aquifer). Both of these aquifer types are vulnerable to drought and overuse. Water levels in shallow alluvial aquifers are rapidly lowered during drought when pumping continues as precipitation recharge stops. Water levels in deep bedrock aquifers decline because new and increasing demands exceed recharge.

A groundwater plan is needed for

Iowans to sustainably balance groundwater use with recharge. Think of a groundwater supply like your checkbook at home. You get paid on a regular basis, and from this weekly "recharge" to your bank account, you pay your mortgage, bills, and occasionally go out to eat. It is important to have your checkbook balanced so that your expenses do not exceed your income and you fall into debt. The aquifers that contain our groundwater supply are similar to your checkbook. They receive recharge from precipitation or from leakage through other geologic units, they build up their water levels, and from this supply, we are able to withdraw water from the aquifer "bank" to meet societal needs.

A groundwater plan would produce a water budget for the major aquifers of Iowa. The budget would tell us how much water is recharged to the aquifers, how much groundwater they contain, how much water is discharged to streams and leaked to lower aquifers, and how much water can be sustainably withdrawn without depleting them. For alluvial aquifers, creating a water budget would include mapping the horizontal and vertical extent of the sand and gravel deposits in the state. The Iowa Geological Survey is well equipped to do this with geophysics, drilling and landscape analysis

of glacial and post-glacial sedimentology. Although some mapping of alluvial deposits is done at local scales for water supply systems, there is a need to do this at a statewide basis where local interests can be put in the context of statewide needs. For example, local users of the Raccoon River alluvial groundwater rightly focus on their individual piece of the pie, but how much groundwater is available to everyone and how much can be sustainably pumped without depleting the resource and impacting flow to the Raccoon River? For bedrock aquifers where groundwater exploration can be expensive, groundwater budgets can be created using existing geospatial and rock core data available at Iowa Geological Survey.

Computer models of bedrock systems can then be developed to evaluate groundwater sustainability.

There is a need to for the state to fund the research, mapping and analyses needed to improve our understanding of Iowa's groundwater resources. A groundwater plan would balance the current and future needs for groundwater extraction with long-term sustainability for future generations.

Keith Schilling is state geologist and director of Iowa Geological Survey at the University of Iowa.

**The Gazette**  
Eastern Iowa's independent, employee-owned newspaper  
Sunday, January 5, 2025 Slight chance of flurries. H 21 L 11 6c | www.thegazette.com | ©The Gazette



The \$140.6 million Sub-Zero plant, shown last month, is being built at 10015 Sixth St. SW in Cedar Rapids near The Eastern Iowa Airport. The 614,000-square-foot factory, which is to open this fall, is part of the \$1 billion in industrial development made in southwest Cedar Rapids since 2017. (Photo courtesy of James Perkins/Whirlybirds)

## C.R.'s Southwest Growth Area BOOMING

City sees \$1 billion-plus in industrial development since 2017

petitive land prices.  
"Generally speaking, these (questions) include, is there land available, and how expensive is it?" Micheel said. "Is there water available, and is there power?"

**IOWA**

# IGS Update from 2024 Legislative Session

- New Legislative Funding – \$250,000 for *groundwater planning and resource assessment*

## What did we do with this new funding?

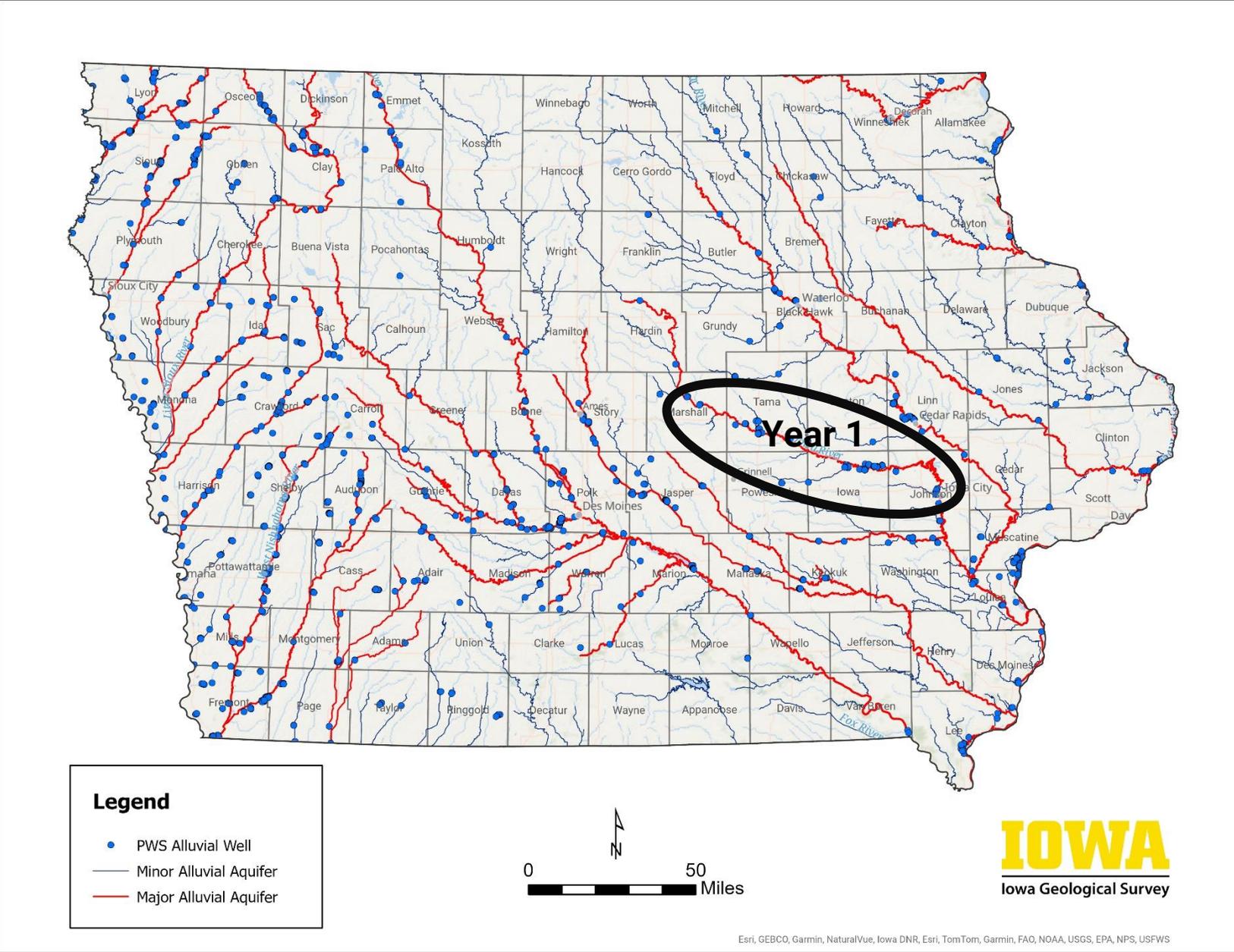
- Hired new hydrogeologist
- Supported other current IGS staff to work on aquifer mapping initiatives
- Focused on Iowa River alluvium initially
- Geophysics, mapping and installation of new nested wells
- NW Iowa bedrock aquifer and buried channel systems

10 DIVISION X  
11 BLUFFLANDS PROTECTION REVOLVING FUND  
12 PART A  
13 APPROPRIATIONS AND TRANSFER  
14 Sec. 29. APPROPRIATION TO SUPPORT IOWA GEOLOGICAL SURVEY.  
15 1. Notwithstanding sections 161A.80A and 161A.80B, there  
16 is appropriated from the blufflands protection revolving fund  
17 created in section 161A.80A to the state **university** of Iowa for  
18 the fiscal year beginning July 1, 2024, and ending June 30,  
19 2025, the following amount, or so much thereof as is necessary,  
20 to be used for the purposes designated:  
21 For purposes of supporting a groundwater planning and  
22 resource assessment project to be administered by the Iowa  
23 geological survey of the state as created pursuant to section  
24 456.1:  
25 ..... \$ 250,000  
26 2. The moneys appropriated in subsection 1 shall be used  
27 by the Iowa geological survey to map and assess the condition  
28 of this state's aquifers. The Iowa geological survey may  
29 measure the volume of groundwater that is available for various  
30 uses, the current and predicted allocations of groundwater to  
31 support those uses, the recharge rate for the aquifers, and  
32 the development of models for budgeting this state's water  
33 resources.  
34 3. Notwithstanding section 8.33, moneys transferred in  
35 subsection 1 shall not revert to any fund but shall remain

# Alluvial Aquifers

More than 40+ other  
similar alluvial systems  
that are heavily utilized in  
the state

How long before they can  
be similarly evaluated?

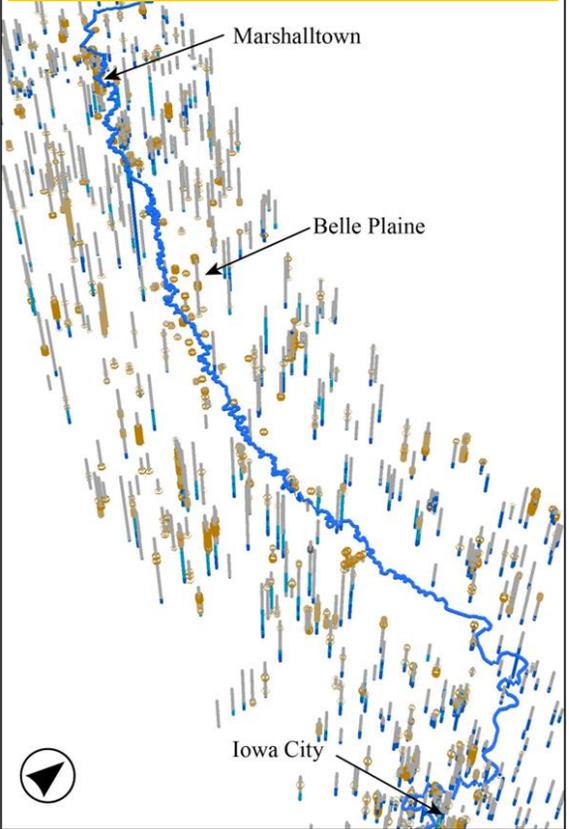


Esri, GEBCO, Garmin, NaturalVue, Iowa DNR, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

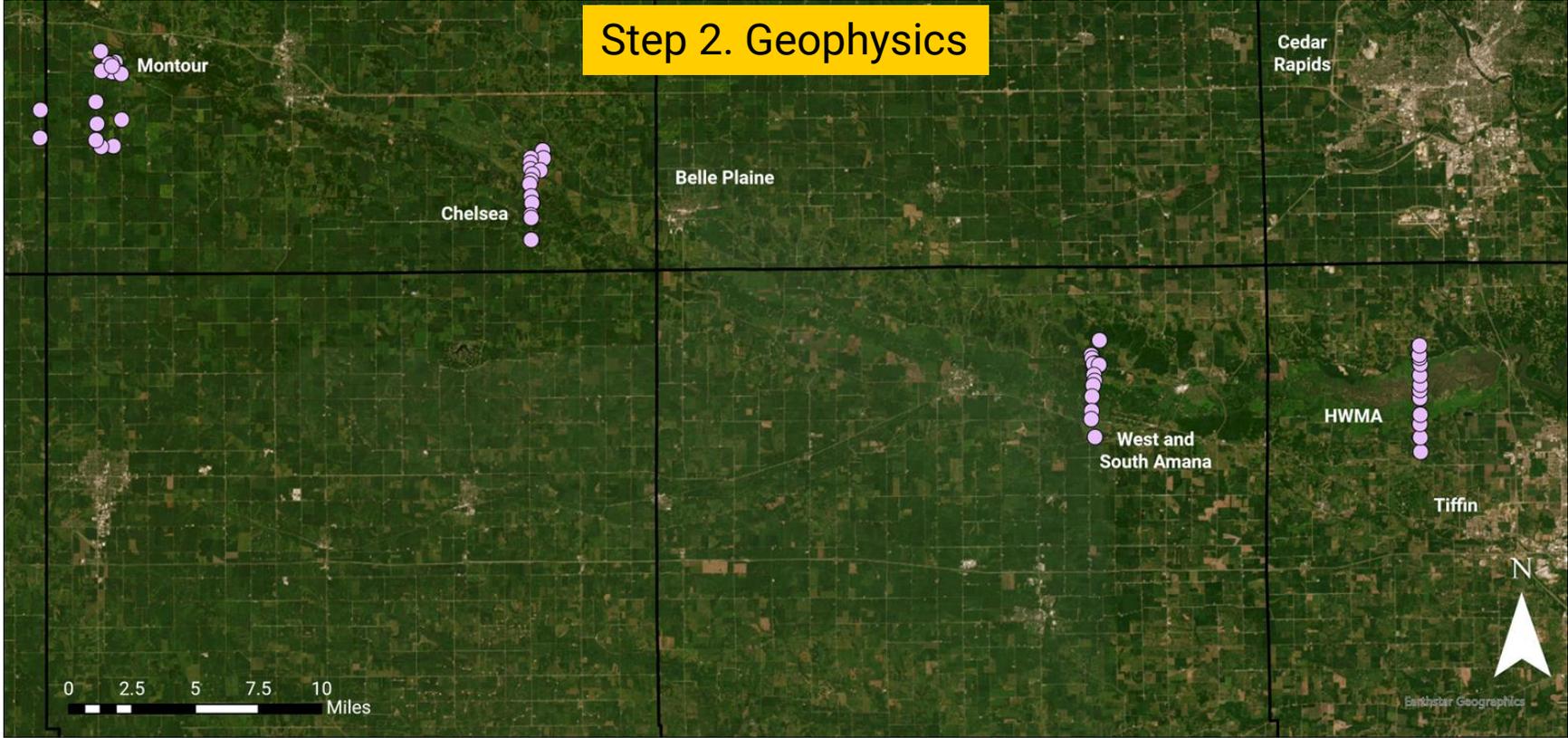


# Iowa River Alluvial Aquifer

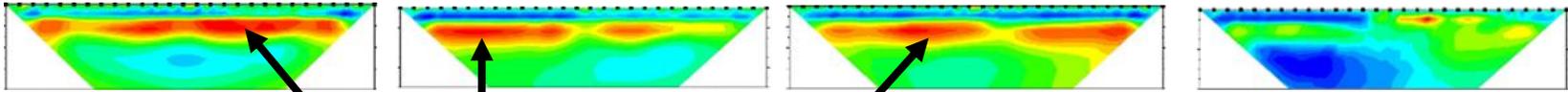
Step 1. Analyzed >5,100 well records in the area



Step 2. Geophysics



Electrical Resistivity



sand and gravel (aquifer)

# BELLE PLAINE

## Aquifer mapping paying dividends

Union News Sports Community Opinion Obituaries Special Sections SEIA Live! Public Notices

**MORE STORIES**

Fairfield Beautification Commission honors volunteers, plans lots of projects for 2025

After passing strict ordinance, Washington County puts moratorium on wind turbines

Scott Reneker reflects on 32 years as Jefferson County Auditor

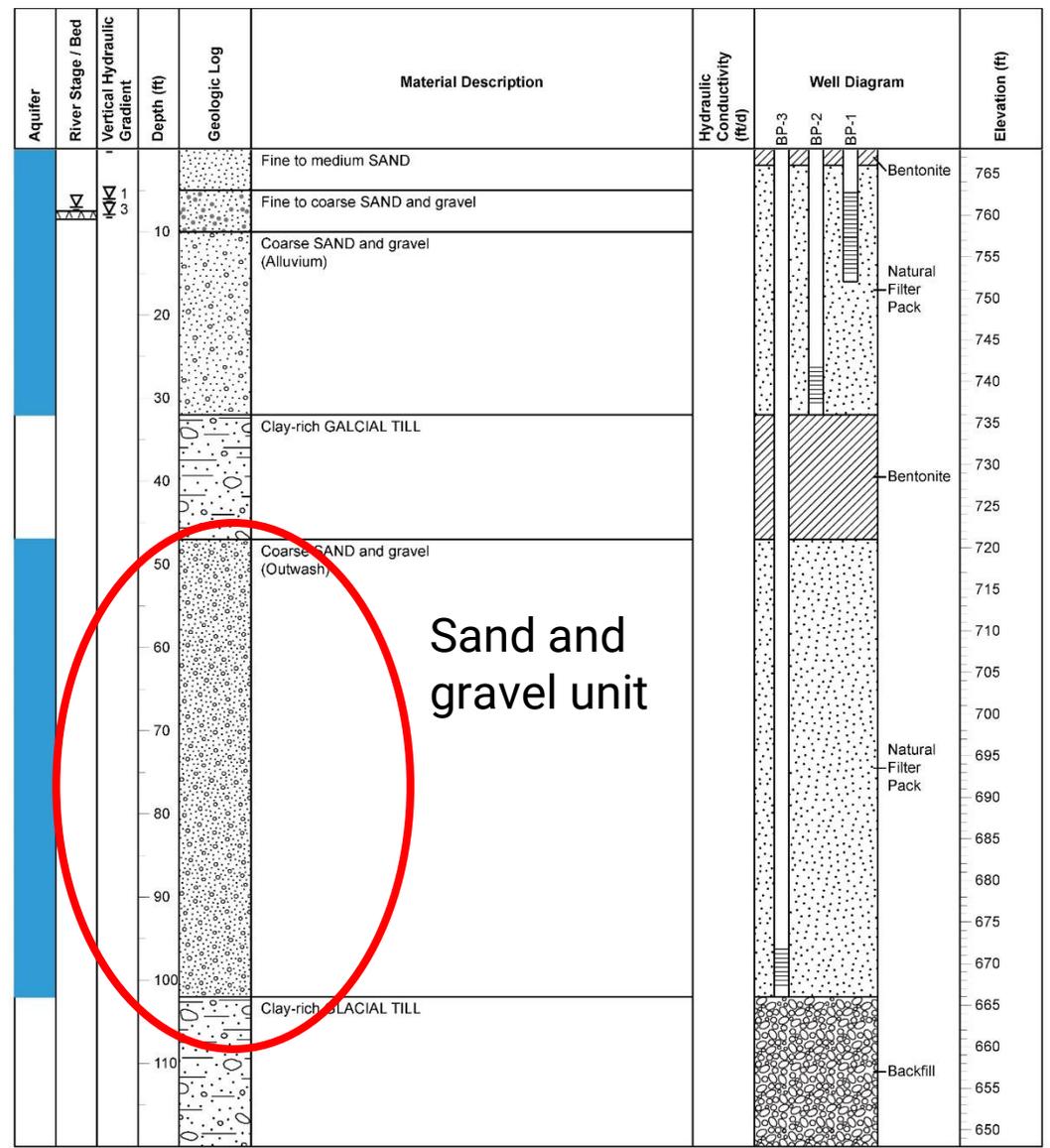
HOME / HOMETOWN CURRENT

### Long-term water problems need long-term solutions

Belle Plaine tackles complaints one by one



“What put us in distress as a community was the D4 drought designation,” said City Administrator Steve Beck



Location: Iowa River valley, ~ 750 feet SE of the south end of the Belle Plaine airport runway

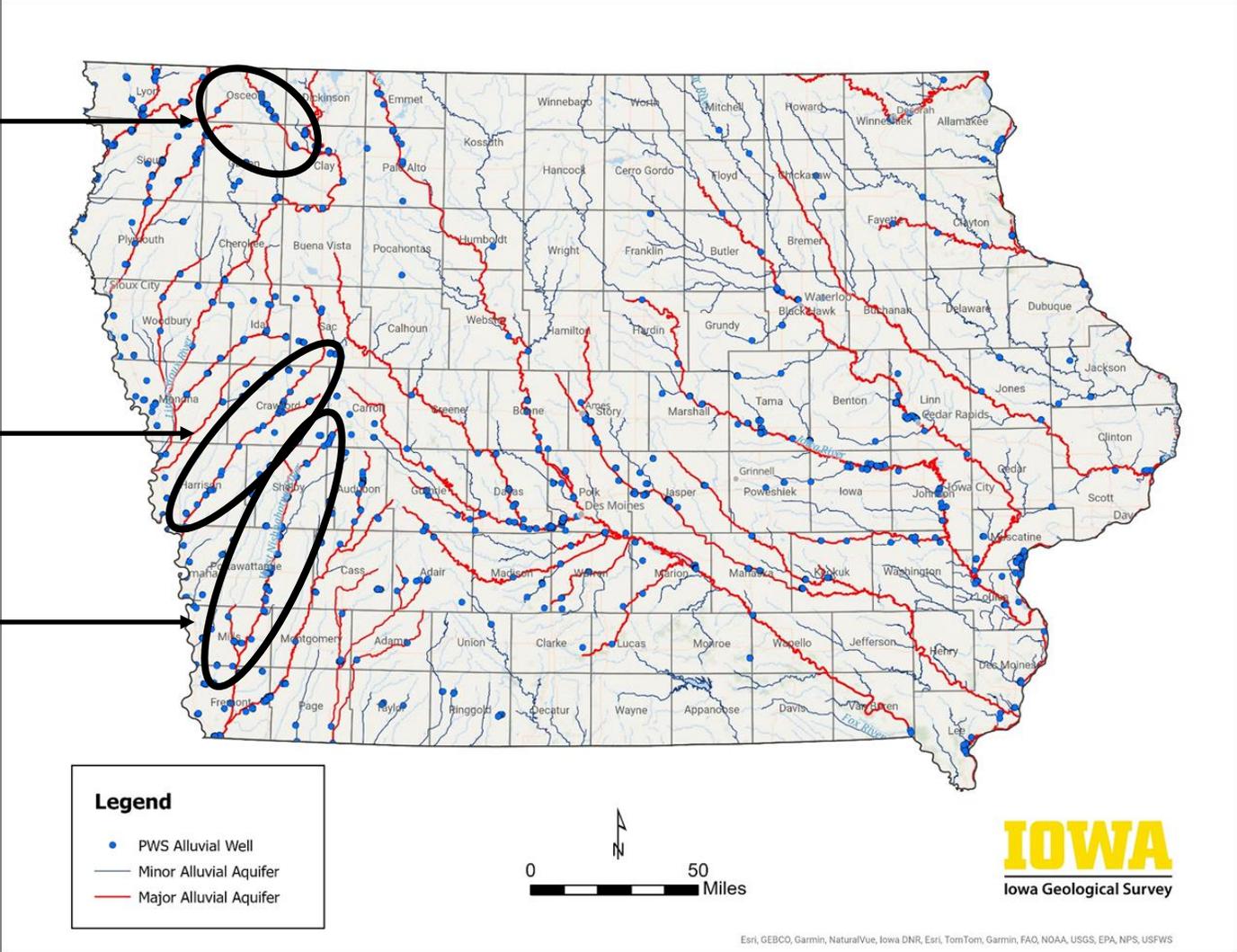


# Future alluvial aquifer assessments

Ocheyedan River from headwaters to the Little Sioux River (FY26)

Boyer River from glacial margin to Missouri River (FY27)

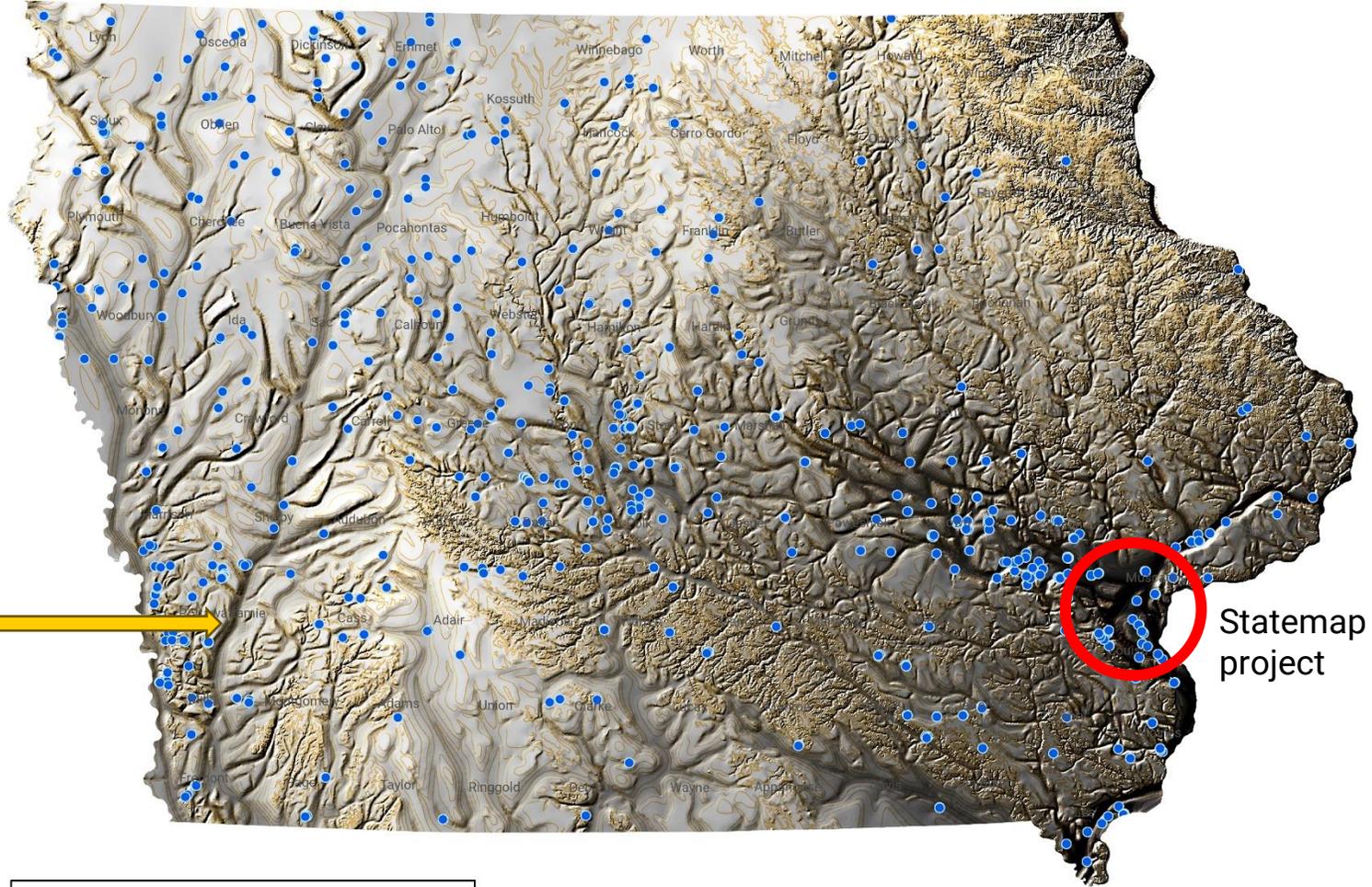
West Nishnabotna from glacial margin to Missouri River (FY28)



# Buried Channel Aquifers

## Fremont Channel

- >500 feet deep
- Unknown sand and gravel (aquifer) resources



### Legend

- Buried Valley Aquifer PWS Well
- Bedrock Surface Showing Buried Valleys



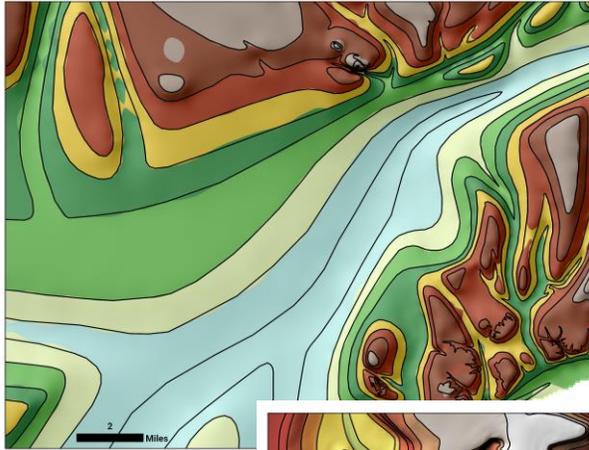
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Esri, GEBCO, Garmin, NaturalVue, Iowa DNR, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS

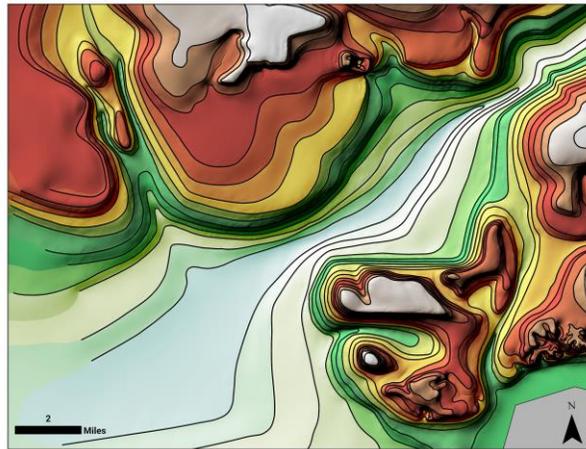
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# Cleona Channel in Muscatine County

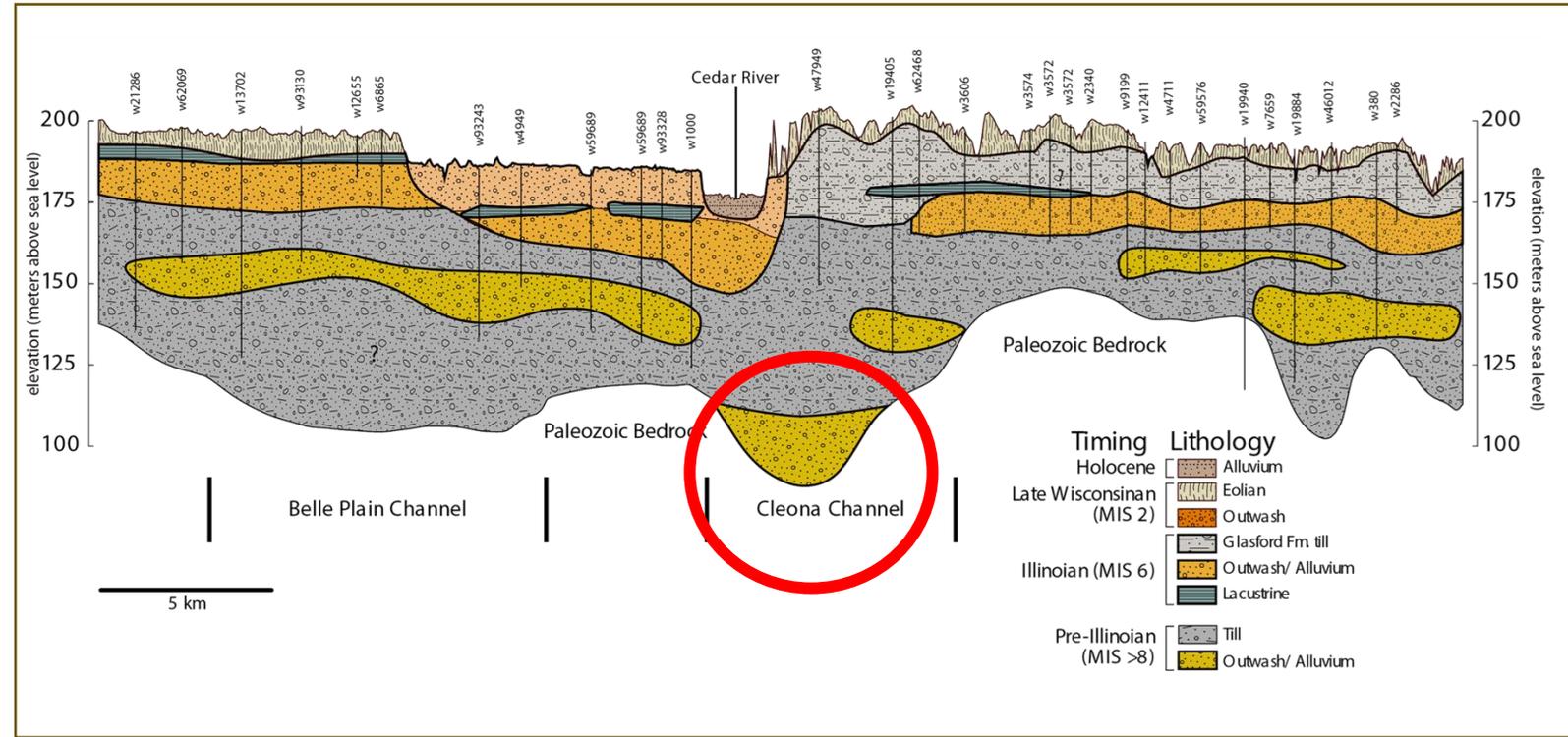
*Massive water quantity potential in buried channel aquifers in Iowa – understudied and untapped*



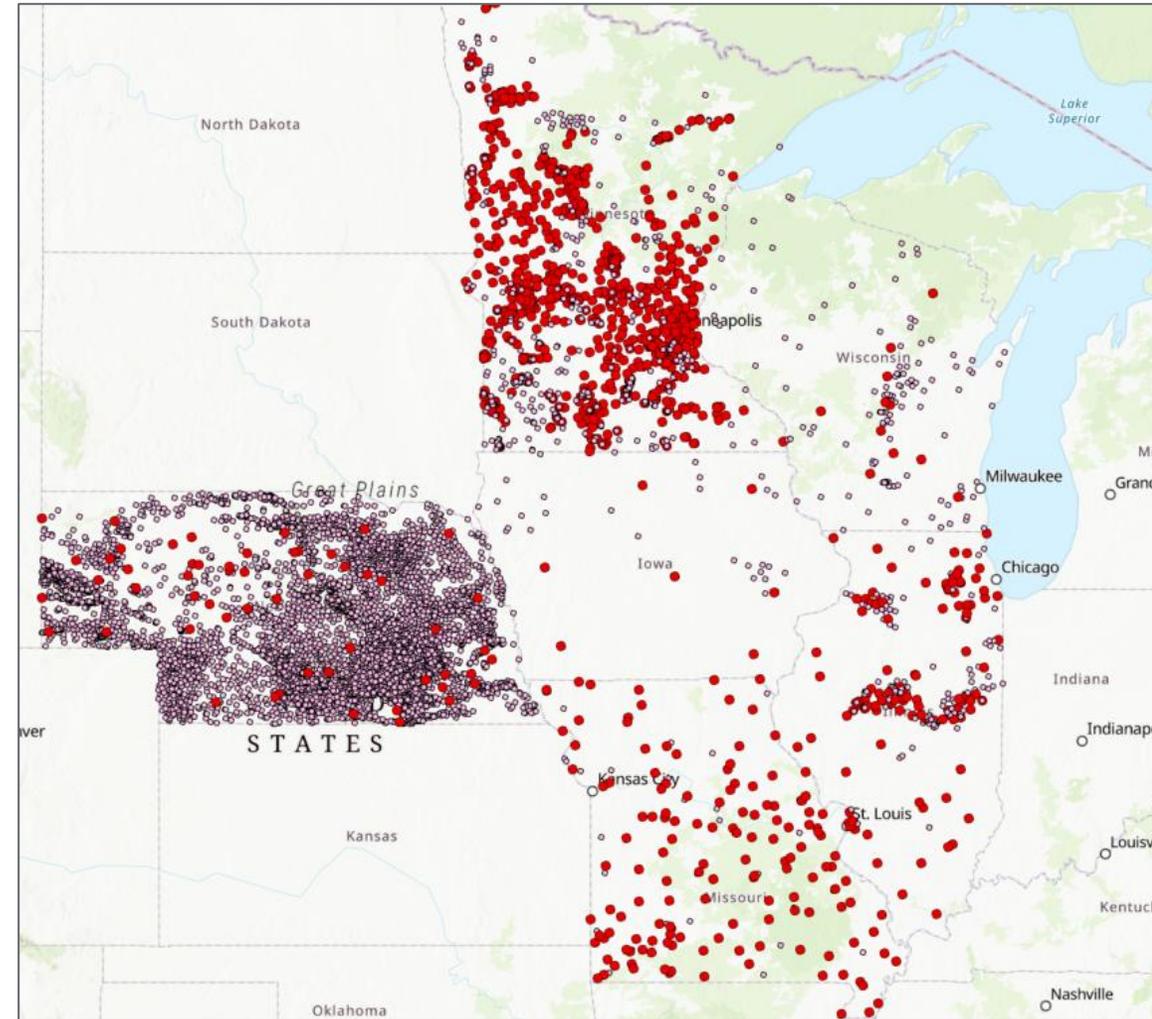
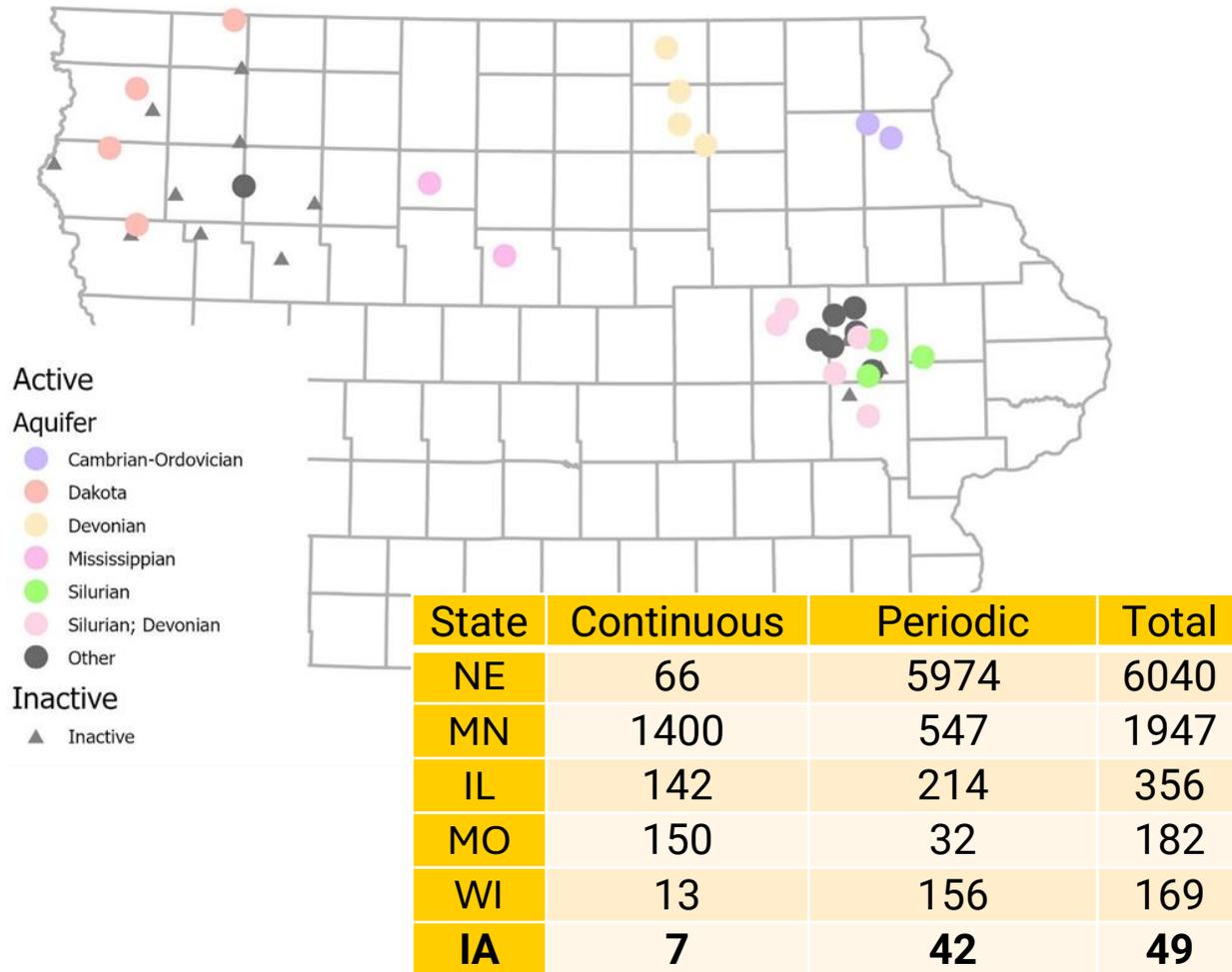
Before



After

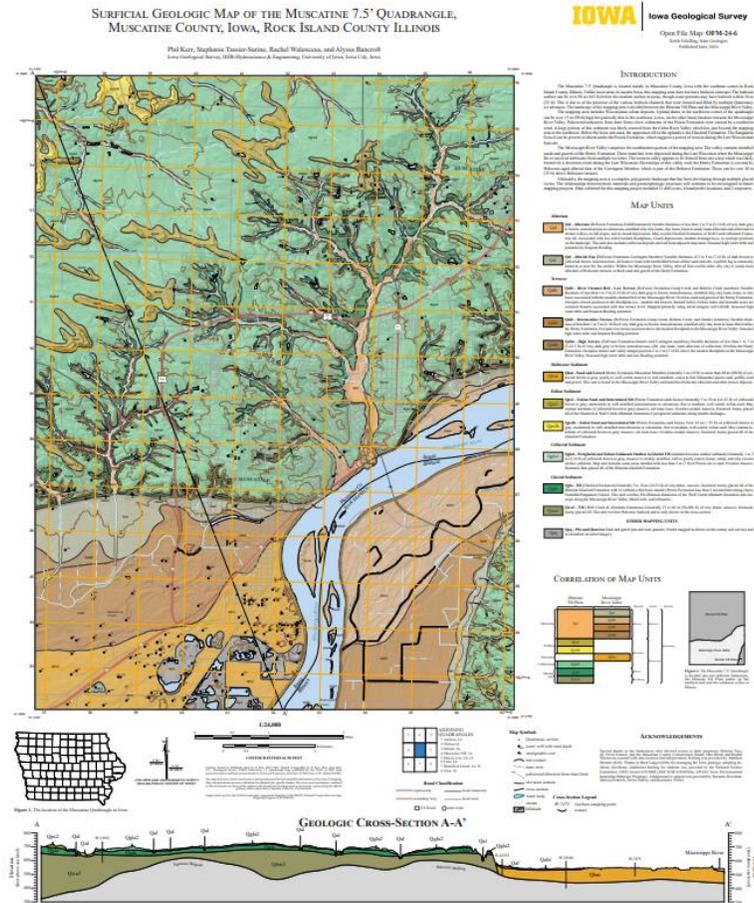


# Iowa Groundwater Level Monitoring Network



# Current USGS-match funded mapping initiatives

## Muscatine County



Tete des Morts / Mosalem formations

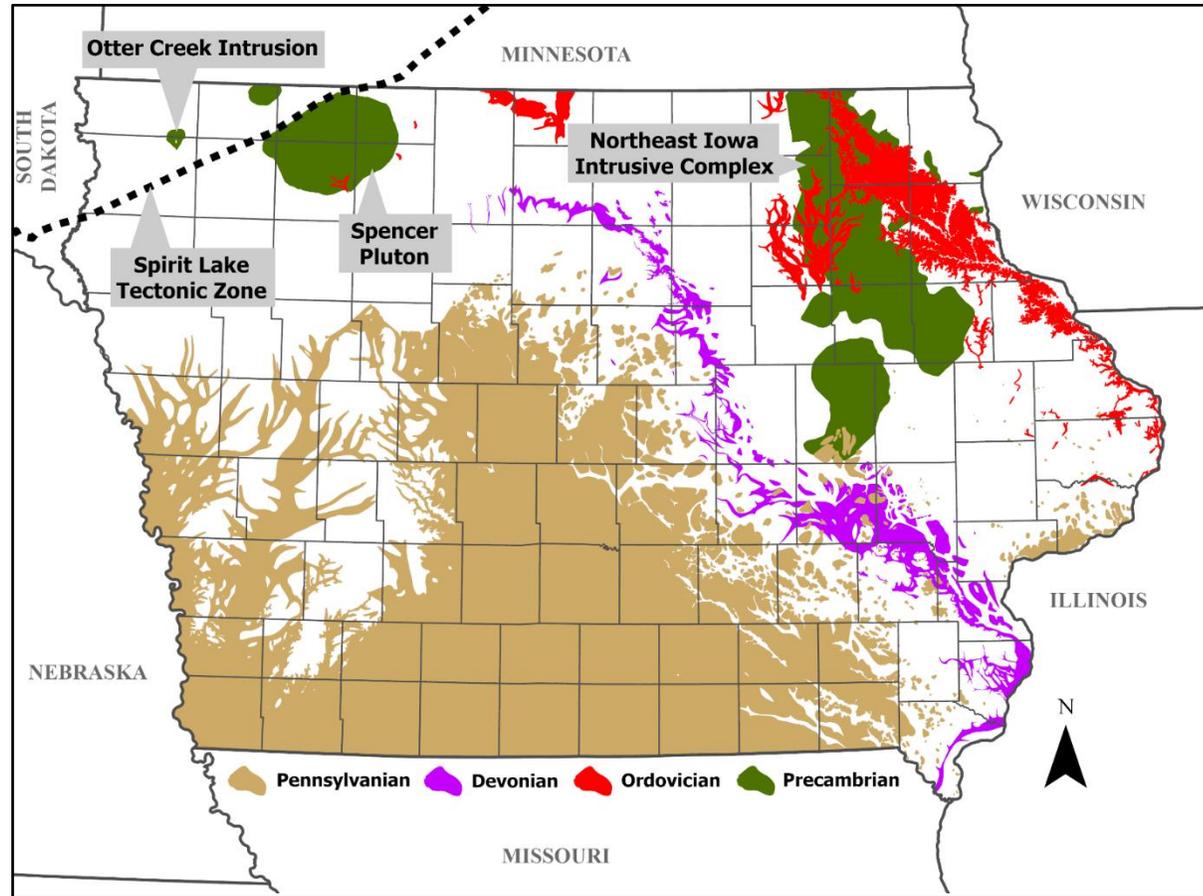
Maquoketa Formation

## Dubuque County

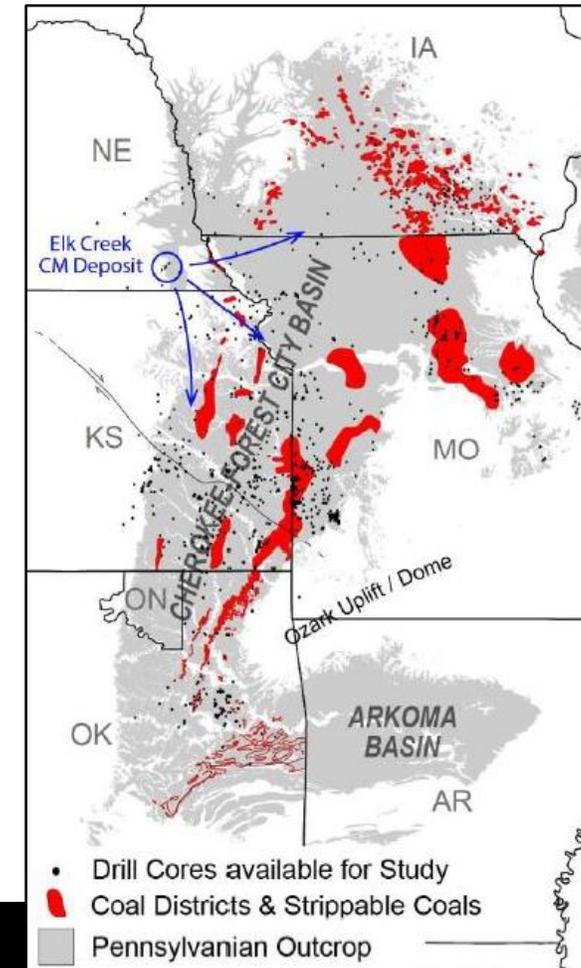


# Searching for Critical Mineral Resources in Iowa

**USGS:** Earth Mapping Resources Initiative (Earth MRI)



**US DOE:** Carbon Ore, Rare Earth, and Critical Minerals (CORE-CM)



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Iowa Geological Survey

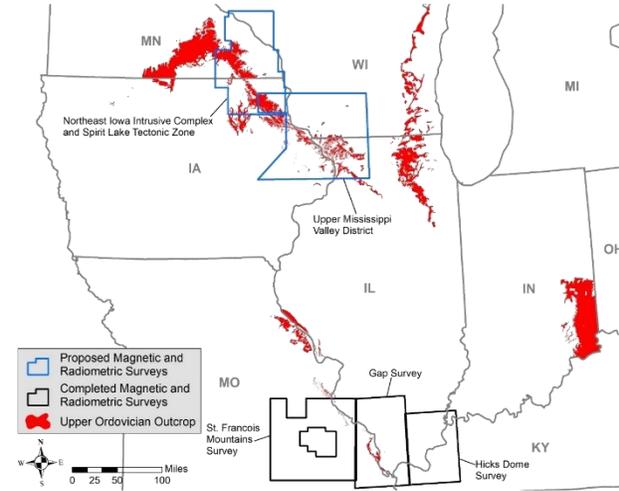
# EMRI: Rare Earth Element-Enriched Phosphate

## Ordovician REE-Enriched Phosphate

- 11-state collaboration lead by the IGS
- 3-year project from FY22-FY25
- 700 geochemical samples from >100 sites
- Confirmed the basal Maquoketa Phosphorite is thicker and more enriched in Dubuque area
- Final report coming soon

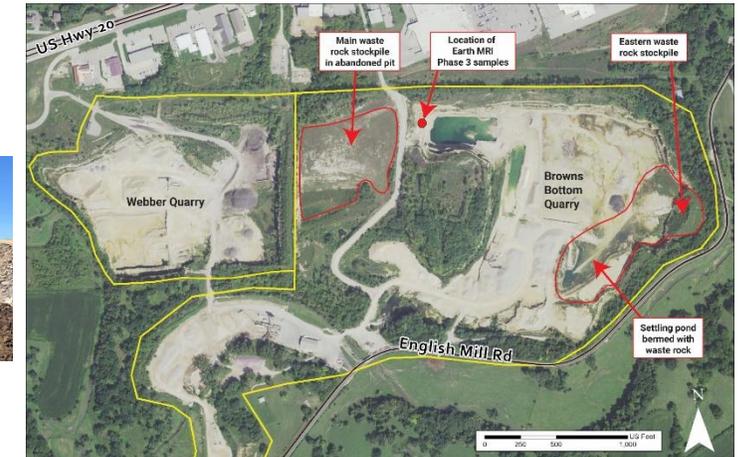
## Characterization of Mine Waste at Browns Bottom Quarry

- 2-year project: 7/23 – 6/25
- Characterize CM endowment of waste rock stockpiled in old pit
- Drilling and sampling completed July 2024
- Preliminary estimates ~1,000 tons of rare earth elements (REE)

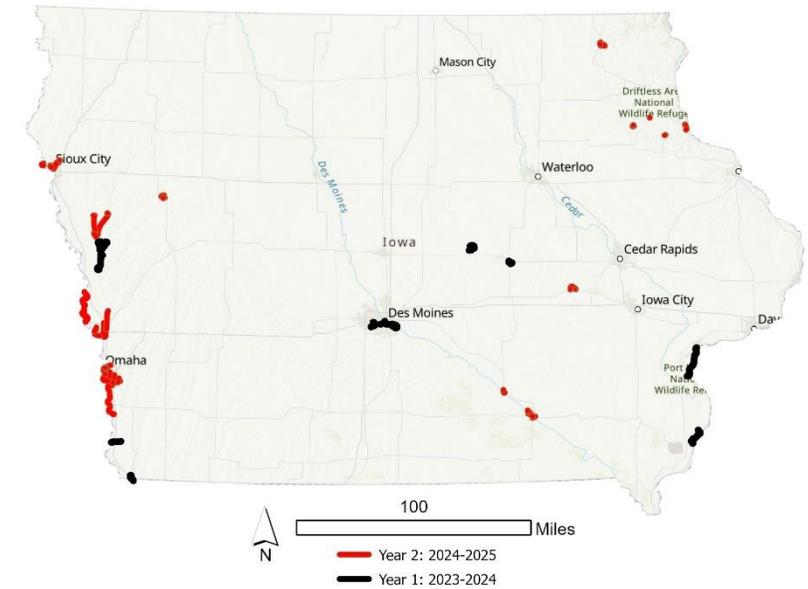
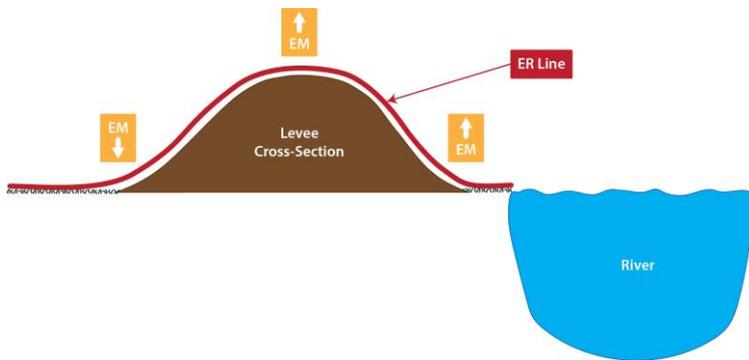
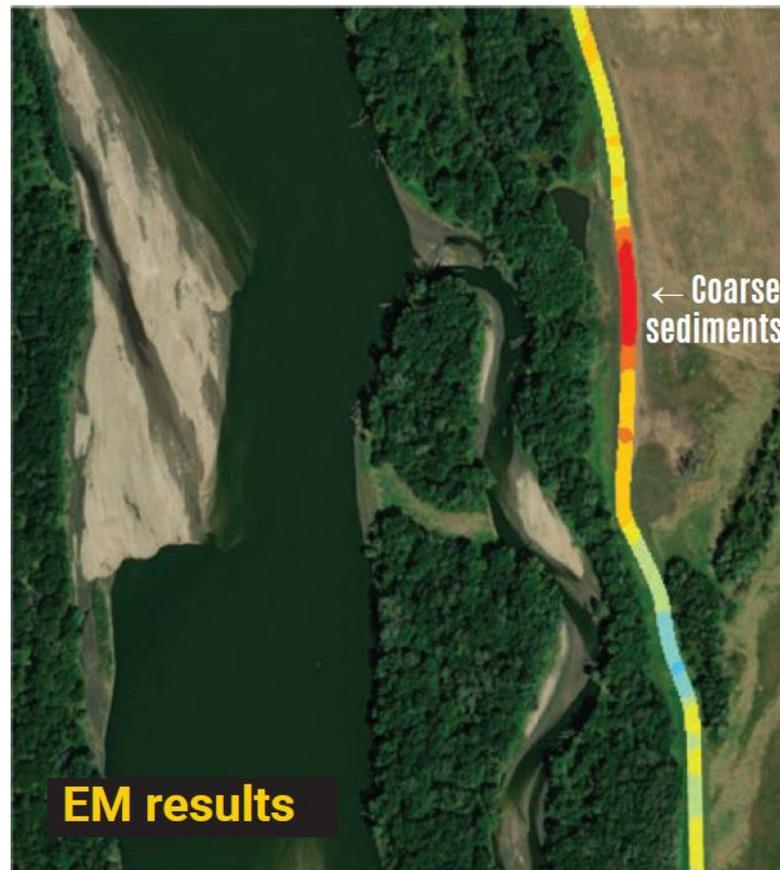


## Additional EMRI projects stemmed from this:

- Airborne EM survey of Dubuque Area (FY25)
- Mapping phosphorite in NE Iowa (FY25-28)



# Levee mapping project funded through appropriation to HSEMD (complete 900 mi in 5 years)



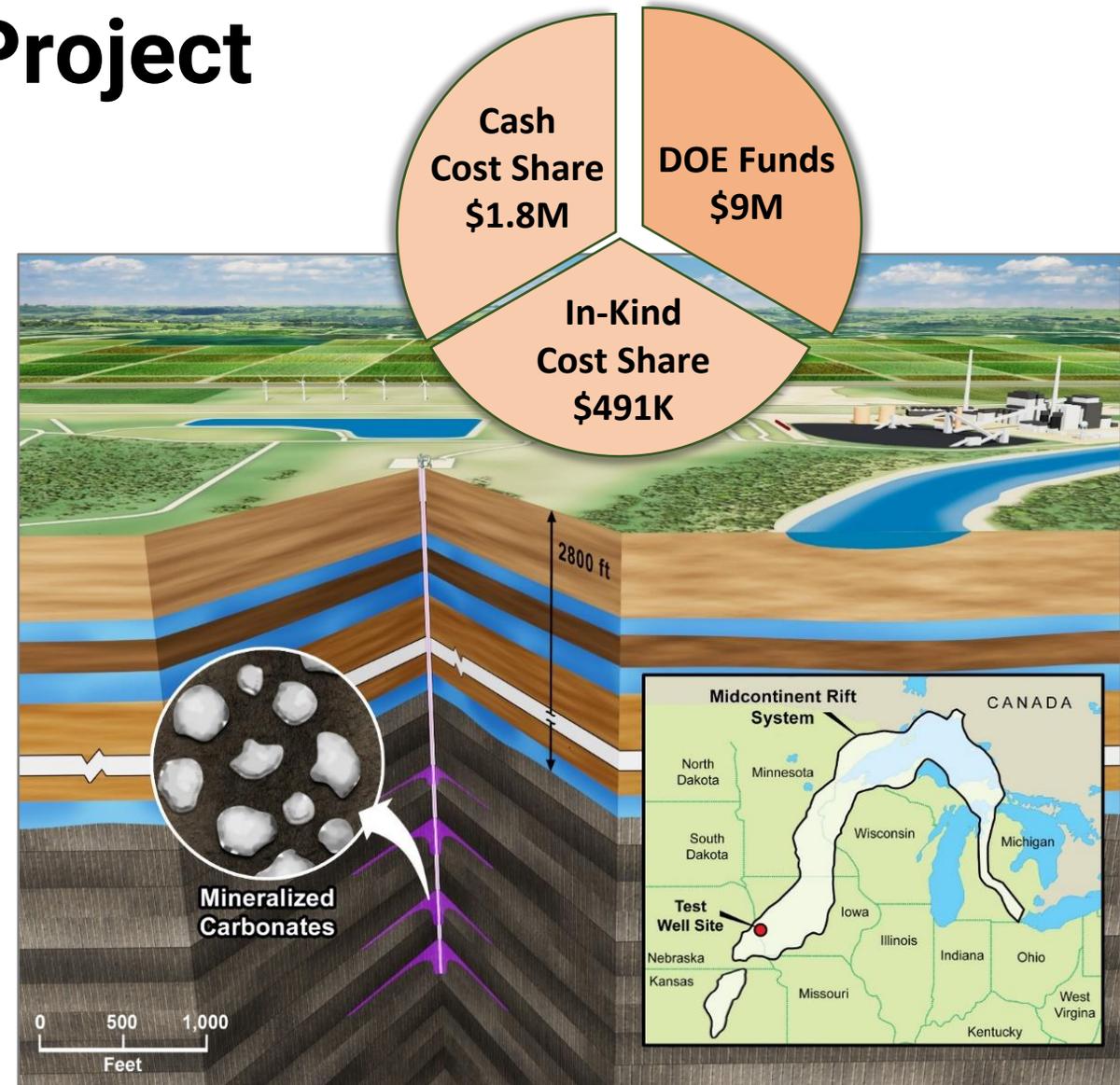
## Year 2 - 200 levee miles completed

- 38 levees
- 16 levee sponsors
- >500,000 conductivity measurements

# New Carbon Sequestration Project

## Southwest Iowa Carbon Storage (SICarbS) Project

- DOE CarbonSAFE – Phase II Feasibility Study
- Selected for award negotiation Oct. 2024
- 2-year project with \$11.3M budget
- \$1.8M cost share from MidAmerican Energy
- Characterize basalts of the **Midcontinent Rift System** for CO<sub>2</sub> mineralization/storage beneath power plant in Council Bluffs
- *Recent executive order halted negotiations*



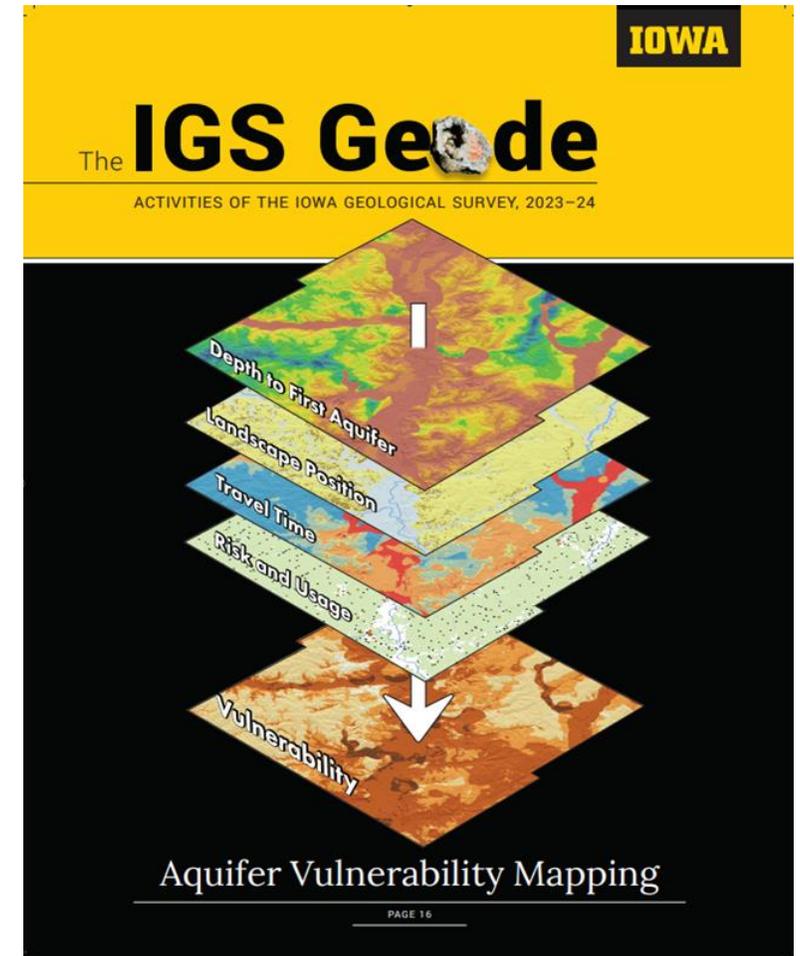
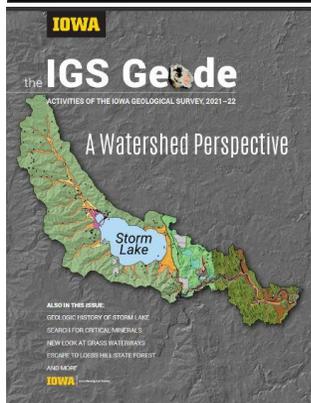
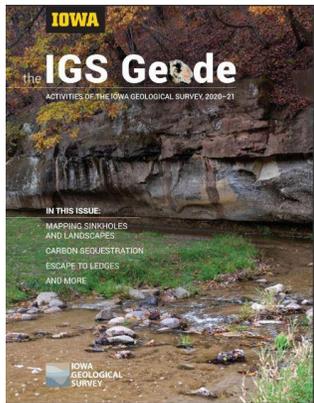
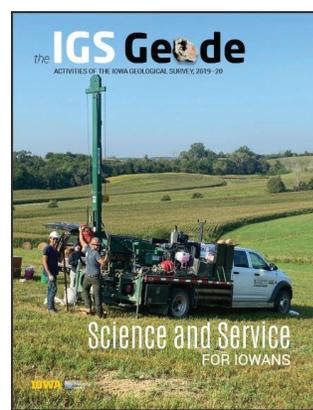
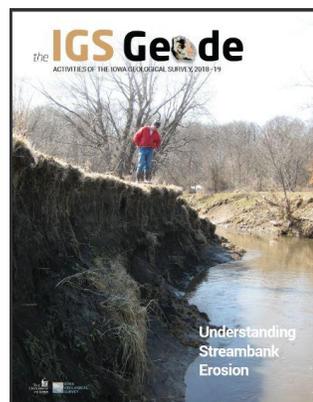
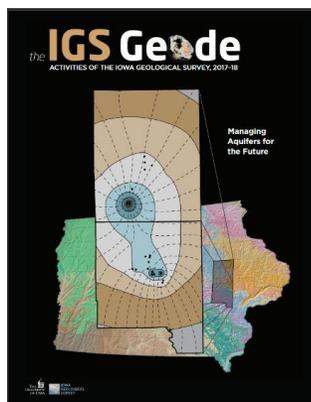
# Funding request

- Additional funding support for aquifer mapping (\$250K/yr)
  - Full time hydrogeologist to focus on aquifer mapping and assessment
  - Additional support for wells, geophysics and water level recorders
- Funding for new IGS drilling rig capable of penetrating into deeper alluvial and buried channel aquifers (\$300K/one time)
  - Current rig has insufficient power and capability
  - Drilling rig from Simco Drilling Equipment - Iowa company based in Osceola
- Funding to support installation of bedrock monitoring wells to evaluate static water levels and future trends (\$100K/yr)



# Geode Annual Report

- Began in 2016-17 with new State Geologist appointment
- Annual issues highlight IGS activities



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