Serving lowans

Iowa Flood Center

IOWA STATE ASSOCIATION OF COUNTIES ANNUAL CONFERENCE

IOWA

Larry Weber August 21, 2024



2008 flood, Cedar Rapids

IOWA HOUSE FILE 822

DIVISION VI

Spring 2009



- 1. The state board of regents shall establish and maintain in Iowa City as a part of the state university of Iowa an Iowa Flood Center. In conducting the activities of this chapter, the center shall work cooperatively with the department of natural resources, the department of agriculture and land stewardship, the water resources coordinating council, and other state and federal agencies.
- 2. The lowa flood center shall have all of the following purposes:
 - a. To develop hydrologic models for physically based <mark>flood frequency estimation</mark> and real-time forecasting of floods, including hydraulic models of flood plain inundation mapping.
 - b. To establish community-based programs to improve flood monitoring and prediction along lowa's major waterways and to support ongoing flood research.
 - c. To share resources and expertise of the lowa flood center
 - d. To assist in the development of a workforce in the state, knowledgeable regarding flood research, prediction, and mitigation strategies.

Iowa Flood Center

- Stablished by the Iowa Legislature after the catastrophic Iowa flood of 2008 as the nation's only academic center dedicated solely to flood research
- Offers lowans accurate, scientific information to help them better understand their flood risks and prepare for future flooding
- Shares flood information online through the Iowa Flood Information System



IOWA Iowa Flood Center

FLOOD MONITORING





USGS STREAM GAUGE Satellite -City: Muscatine River: Mississippi USGS Station ID: MUSI4 (NWS) Forecast: NWS Forecast (MUSI4) Last Reported: Thu, July 11, 2024 2:15 pm

Last Reading: 21 ft 5 in Switch Data View: [stage - elevation]

+Google











30 New Hydrostations Provide Data for Floods and Droughts

- ⇒ \$1M through Congress's Community Project Funding to advance monitoring, assessment, and flood and drought forecasting in Eastern Iowa
- → 53 counties with a hydrostation













IOWA FLOOD INFORMATION SYSTEM

Q 📩 着







March 2019 Bomb Cyclone





Missouri River Flood Information System

Pleasant Cemetery

Eastern Nebraska Precision Rifle Shooters

MFIS

Auldon Bar W

Management



Management

Ewell Cemeter

J22

Zion Cemetery

L63

IOWA WATERSHED APPROACH



NATER

PAPROACY

- \$97M awarded
- 700 completed projects
- \$40 million allocated to watersheds
- 90% cost-share assistance

OUTREACH



65 events in 2023

JANG

NDER ARMOUR

Iowa Flood Resilient Communities Cohort

- → AFC's Iowa Flood Resilient Communities Cohort brings together four communities across the state to improve access to federal funding for flood resilience, strengthen ties between communities and residents, and advance solutions to flooding.
- IFC serves as a technical subject matter expert helping making connections with local communities

Iowa Flood Center



ΠΤΛΤΑ



New Research: Improving Flash Flood Forecasting (a) Number of MCS (Radar)

- → There is flash flood risk virtually everywhere in lowa.
- Mesoscale Convective Systems (MCSs) are the primary precursor of flash floods. Iowa is a hotspot for MCSs.
- → IFC aims to improve flash flood predictions and alerts by improving MCS forecasting

INWA









IFC Joins \$360M NOAA Cooperative Institute for Research to Operations in Hydrology

The University of Iowa will receive up to \$21 million over the next five years as a key CIROH partner helping to build a more water and weather-ready nation. IIHR and IFC will contribute their expertise in:

- Flood mapping
- Flood forecasting
- Water quantity and quality monitoring
- Hydroinformatics
- Outreach

The program is administered by the Alabama Water Institute at the University of Alabama.











Iowa Flood Center

Thank you

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Iowa Geological Survey Updates

Keith Schilling, Ph.D.

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



August 21, 2024

Iowa Geological Survey - 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."



<u>Location:</u> University of Iowa Iowa City, IA

Within the University: IIHR Hydroscience & Engineering College of Engineering

<u>State Geologist:</u> Keith Schilling, Ph.D.

Staff:

12 FTE geologists and hydrogeologists
2 shared/part-time
1 administrative support

University of Iowa campus Trowbridge Hall



University of Iowa Oakdale Research Park





IGS history and timeline:



- Established in 1892 celebrating our 132nd anniversary this year!
- → 1892-1986 independent agency reported directly to Governor
- → 1986-2014 moved to Iowa DNR as Bureau and later dropped to section level
- 2014 moved oversight of IGS to University of Iowa, College of Engineering, IIHR Hydroscience and Engineering. Funding provided by IDNR through contract
- → 2018- Code of Iowa changed to recognize IGS as part of U. Iowa. Funding appropriated directly from legislature, State Geologist position moved to U. Iowa.



Consistent with our mission:

- Groundwater resource evaluation
- Geologic mapping and characterization
- Making geologic and water resource information available for the public













Geologic mapping products



Cooperative program with USGS

Compilation of 2017-2022 effort

Unraveled unique geology of region

Data now available for multiple purposes



Geologic mapping in watersheds









c. 16,000 years ago



e. Present





Increasing capacity for subsurface mapping





IGS Geophysics:









Passive Seismic

ER



Mobile EM mapping





New levee mapping project funded through appropriation to HSEMD (complete 900 mi in 5 years)









Year 1-100 levee miles completed

- 25 levees
- 12 levee sponsors
- >260,000 conductivity measurements



Groundwater quantity projects with local comunities 2022-2023 Projects

- → Iowa City
- → Decorah source water
- → Belle Plaine
- → Marshalltown
- → Iowa Lakes Regional Water







Need for Groundwater Plan for Iowa

Plan would balance current and future needs with long-term sustainability

SUNDAY, DECEMBER 3, 2023 | THE NEWS IOWA DEPENDS UPON | DESMOINESREGISTER.COM

IOWA



Des Moines Sunday Register

'Adding another straw to this big drink'

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



Iowa needs a plan for using its precious groundwater

pace with demand. Groundwater in Iowa is not evenly dis-

tributed, and there are water-rich and water-poor areas of the state. Northeast Iowa is relatively groundwater rich be-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 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.

PART OF THE USA TODAY NETWORK

Your Turn

Keith Schilling

reserves in the future.

Guest columnist

tems to keep groundwater supplies on

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), cline because new and increasing deanimal confinements and other users are mands exceed recharge. challenging urban and rural water sys-

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.

cause 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 low-

ered during drought when pumping continues as precipitation recharge stops. Water levels in deep bedrock aquifers de-

Groundwater is NOT evenly distributed in Iowa



Groundwater Planning Effort

- Map aquifers –Use geophysics, drilling and landscape analysis to develop 3D understanding of lowa's aquifers
- How much groundwater is actually available for use? How much is recharged and allocated?
- Construct water budgets for aquifers – just like your checking account







New Funding to IGS

- Start on July 1
- New groundwater planning efforts to map and assess lowa's aquifers

DIVISION X 10 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 the fiscal year beginning July 1, 2024, and ending June 30, 18 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

34 3. Notwithstanding section 8.33, moneys transferred in 35 subsection 1 shall not revert to any fund but shall remain



2024-2025 Groundwater Mapping Initiatives

- Jowa River corridor from Marshalltown to lowa City
- Hit the ground running: connecting aquifer mapping elements from community projects
- → Iowa City, Amana, Belle Plaines, Marshalltown
- Ongoing water table monitoring project



Glacial vs nonglacial sediment





Iowa Geological Survey Approach

Geophysics and drilling are used to delineate sand and gravel aquifers in river valleys







2024-2025 Groundwater Mapping Initiatives

- Dakota aquifer in 2-3 counties in NW lowa.
- Long-term water-level measurements show continuous declines for Dakota wells.
- New insights into the aquifer's response may be obtained with newly collected continuous (hourly) water-level measurements.



Water quantity potential in buried alluvial aquifers – Groundwater study in conjunction with mapping



📕 glacial clay (till

carbonate bedrock

Massive water quantity potential in buried channel aquifers in Iowa – <u>understudied and untapped</u>



Passive seismic investigation in Muscatine







Future Groundwater Availability and Mapping projects

- Ocheyedan River and Spencer system Increasing demand from agricultural, municipal, rural water and industrial interests in the area (FY26)
- Southwest Iowa alluvial aquifers, including Nishnabotna Rivers
- → Buried channel systems
- → Des Moines Metropolitan area
- →Update C-O (Jordan) model



County Scale Aquifer Vulnerability Mapping Example from Black Hawk County

Utilizes four main factors:

- 1. Groundwater recharge
- 2. Time of travel to aquifer
- 3. Groundwater risk from point and nonpoint sources
- 4. Groundwater use capture zones and private wells



County Scale Aquifer Vulnerability Mapping Black Hawk County

- → Increased vulnerability where there is greater recharge, fast vertical groundwater travel times, the presence of point or nonpoint risks and their location within a known capture zone.
- → Other regions underlain by unoxidized till are largely protected from groundwater risks.
- → Goal for the map product is to help guide land use planning within the county for protection of valuable groundwater aquifers.

ΤΠΙΛΙΑ



►E

2.5 5 10 Kilometers



Remember: US Drought Monitor





Streamflow Drought Monitoring

State of Iowa droughts . . .

1988 2012 2021-2022



IOWA



Ocheyden River, NW Iowa, Oct. 2022

Droughts occur on average about once every decade or so

Another one is coming...

Streamflow Drought Monitoring

Establish the Iowa Drought Information System



IGS developed concept of drought regions and proposed streamflow drought criteria The Iowa Drought Information System will help two million Iowans impacted by droughts



A comprehensive online information system will provide lowans with enhanced, reliable, and timely information about drought impacts and will assist local, state, and federal partners with drought forecasting and preparedness

Iowa Geological Survey Updates

- Look for new Geode magazine in December
- → Other IGS activities will continue:
 - Bedrock and Quaternary mapping
 - Nutrient Research Center projects
 - Earth MRI critical minerals
 - Carbon sequestration, Hydrogen



