

IOWA

IFC

UPDATE

RESEARCH AND ACTIVITIES AT THE IOWA FLOOD CENTER **SPRING 2025**

**New research advances
flash flood forecasting
in Iowa**
Page 2

**Improved flood and
drought information
for Iowans**
Page 4

**Supporting Iowa
communities with
technical assistance**
Page 6



Improving Flash Flood Forecasting for Iowa

The Iowa Flood Center (IFC) is part of IIHR—Hydroscience and Engineering (IIHR) within the University of Iowa’s College of Engineering and is the nation’s only academic research center devoted solely to flooding. The IFC develops critical tools and information that community leaders, decision-makers, and individuals depend on to help them understand and reduce their flood risks.

Record-breaking Floods Impact Northwest Iowa

In June 2024, communities in northwest Iowa were devastated by floods after receiving more than 15 inches of rain within a 72-hour period. The historic rainfall amounts exceeded the 1,000-year annual chance flood occurrence, causing levee failures and significant damage to critical infrastructure. Thousands of people were evacuated, and hundreds of people required emergency water rescue services. In Spencer, Iowa, it is estimated that up to 80% of the city’s 5,100 homes and businesses were damaged or destroyed.

Preceding the flood, much of the state had been in a prolonged drought—with more than \$248M allocated in crop insurance payments from drought in 2023. Iowa Flood Center staff provided technical assistance to emergency management professionals and local decision-makers during the flood event, though additional resources and information are needed to help Iowans prepare for quick shifts in these weather extremes.

The IFC is working on improvements to its heavily relied on network of more than 270 stream sensors deployed across the state that measure river levels every 15 minutes and communicate data to the publicly accessible Iowa Flood Information System online web application. As the stream sensors have far exceeded the life expectancy they were designed for, the IFC is seeking support to build the next generation of stream sensors that will utilize newer available technology to ensure the network remains efficient and reliable. The IFC also hopes to fulfill partners’ and local communities’ requests for additional stream sensors across the state to help fill in data gaps.

“The disaster we experienced was an all-hands-on deck scramble. We’re fortunate for the Iowa Flood Center’s expertise and partnership as we navigate how to improve our community’s flood response efforts and be better prepared for future situations.”

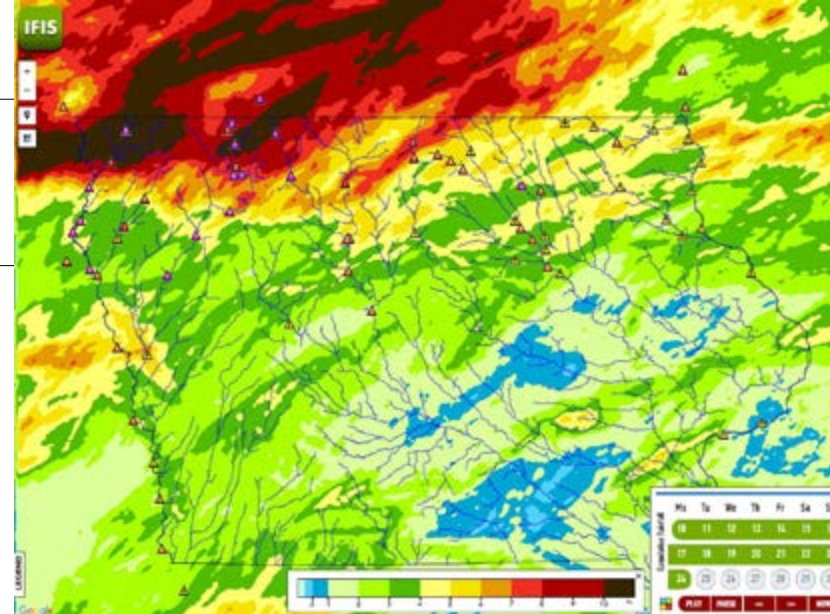
KEVIN ROBINSON, SPENCER CITY MANAGER

New research shows that mesoscale convective systems (MCS) have made Iowa a hotspot for flash floods, showing the need for reliable and enhanced real-time data. An improved stream sensor network will support the IFC’s efforts to provide real-time, community-specific flash flood forecasts utilizing internal expertise that helped develop the national flash flood forecasting model used by the National Weather Service. Developing an advanced flash flood forecasting system for Iowa will enable emergency responders and local decision-makers to anticipate flood risks with more accuracy and deploy flood mitigation measures earlier to better protect communities.

In October 2024, IFC staff joined a public meeting in Spencer, Iowa, to engage with the community about the past summer’s flood. City officials provided an overview of the series of flood events and local actions that were taken as the situation was evolving. Larry Weber, a professor of civil and environmental engineering and interim director of the IFC, described IFC tools and resources available to help the community with future flood response and preparedness efforts. More than 175 residents attended, with another 100 people joining virtually as the meeting was being livestreamed. Through the partnership, the city is exploring developing a community alerting system that will integrate IFC data.



The IFC joins a public meeting with residents from Spencer, Iowa to discuss resources available following the June 2024 floods.



Congratulations, Witek!

Iowa Flood Center students, staff, colleagues, and partners joined together to celebrate the retirement of Witold (Witek) Krajewski as IFC director. Following the 2008 floods, Krajewski helped co-found the IFC in 2009 alongside IIHR director Larry Weber, who is currently serving as IFC’s interim director. Krajewski’s expertise, leadership, and vision guided the IFC through its transformative years and nurtured its success and impact on helping improve Iowa’s flood resiliency. He will continue to be involved in IFC’s activities in his position as a faculty researcher. We thank and congratulate him for his incredible dedication and years of service!

Sharing Expertise

Following the 2019 floods along the Missouri River, the Missouri Hydrology Information Center (MoHIC) was established to improve public safety and protect property and critical infrastructure during both flood and drought conditions. The Iowa Flood Center hosted MoHIC’s leadership team to share best practices on flood monitoring, flood mapping, developing public-facing water information systems, and outreach and education efforts. The flood center continues to serve as a replicable model for other states looking to effectively improve their watershed management efforts.



MoHIC visits IIHR and IFC for an informational exchange.

Water Professionals Discover IIHR

The 18th annual Iowa Water Conference brought together more than 300 water resource professionals and environmentalists from across the state, embracing the conference theme of “Life Depends on Water. Water Depends on You.” Organized by the Iowa Water Center at Iowa State University, the conference was held in Coralville, Iowa, and included a pre-conference tour of IIHR research facilities, including its Wave Basin facility that supports ship hydrodynamics research for the U.S. Navy and lab spaces that support the Iowa Flood Center and Iowa Geological Survey. A highlight was a visit to the Johnson County Historic Poor Farm that serves as a nature-based makerspace, igniting research collaborations between local partners and the University of Iowa, serving K-12 educational programming, and inspiring conversations about watershed management in Iowa.



Iowa Water Conference attendees see IIHR’s physical modeling expertise in action during the pre-conference tour.

“When I toured the campus earlier in the year during the Iowa Water Conference, I was blown away by the kindness and the generosity of the faculty and staff in sharing information and answering every question I could possibly think of that day. These people make a tremendous difference in our great state, and it is difficult to describe all the wonderful things they do there.”

STEPHEN BECK, BELLE PLAINE CITY ADMINISTRATOR

IFC Deploys Advanced Flood and Drought Network

The Iowa Flood Center installed 31 new hydrologic monitoring stations (hydrostations) in Eastern Iowa to better monitor and predict floods and droughts. The new stations were funded by a \$1 million federal award from Congress’s Community Project Funding championed by Congresswoman Ashley Hinson and Congresswoman Mariannette Miller-Meeks.

The hydrostations measure rainfall, wind speed and direction, soil moisture and temperature, and water levels in a shallow groundwater well. Data collected by the hydrostations are publicly available on the Iowa Flood Information System (IFIS) online tool to help state agencies and communities better understand flood and drought risks and mitigate their impacts. The information collected supports farmers’ land management decisions and research efforts to monitor the impacts of extreme weather on water resources sustainability in Iowa.

“Recent events have shown how quickly Iowa can change from drought to flood conditions. This funding allows the Iowa Flood Center to continue providing high-quality real-time information for Iowans,” said Larry Weber, professor of civil and environmental engineering and interim director of the IFC. “Having a more uniform hydrostation network across the state helps us better support agencies and communities in making flood and drought mitigation, forecasting, and response decisions.”

With this recent expansion, the IFC now has hydrologic monitoring stations in 53 counties, over halfway to its goal of placing one hydrostation in every county in Iowa. The IFC is working with partners and local leaders to expand the network in Western Iowa, as well as to develop an Iowa Drought Information System built off the successful IFIS framework.

In addition to the new hydrostations, the IFC developed detailed hydrologic assessments for the Maquoketa River and Lower Cedar River watersheds. Both watersheds have established a Watershed Management Authority, bringing together decision-makers and stakeholders from across the watershed to improve watershed health and mitigate flooding. Technical support from the IFC assisted these groups in identifying priority project areas and evaluating potential future funding opportunities.

ABOVE: The IFC hydrostation at the Johnson County Historic Poor Farms serves as a demonstration site for education and outreach.

RIGHT: IFC assistant research scientist Jim Niemeier manages the statewide hydrostation network.



HYDROSTATION NETWORK EXPANSION



- Existing hydrostations
- Anticipated hydrostation expansion in 2025
- Seeking funding support

Iowa Flood Resilience Communities Cohort



In 2024, four Iowa communities joined the Iowa Flood Resilient Communities Cohort, a collaboration between the American Flood Coalition (AFC) and the Iowa Flood Center. This initiative was modeled after a similar project in the Carolinas led by AFC and funded by the Walton Family Foundation and aims to streamline access to federal funding for flood resilience projects, a process that is often too cumbersome for small communities. The selected Iowa communities included Columbus Junction, Dubuque, Manchester, and Muscatine. These communities were chosen based on their flood challenges, resource needs, and capacity for a one-year commitment.

A key component of the program emphasized working closely with existing established relationships with community-based organizations, ensuring long-term sustainability and local engagement. The program's primary goal is to provide administrative and technical assistance to help communities navigate federal funding opportunities, ultimately improving access to resources for flood resilience projects. Additionally, AFC gathered insights from participating communities to inform federal policymakers about the challenges and solutions in securing funding for small communities with the hopes of making the process more accessible and easier to navigate.

"Our hope is that the cohort will walk away with a roadmap of clear next steps to advance federal grant applications while knowing IFC is here to help beyond the program funding," says Kate Giannini, IFC program manager.

IFC staff played a vital role in community outreach, community selection, and technical assistance for the communities. The technical reports developed strengthen future federal funding applications, further advancing the community's flood resilience efforts.

"Receiving this type of administrative and technical assistance is invaluable to a community our size. We understand that our actions impact others downstream, and this is the first step toward becoming more flood resilient."

TIM VICK, MANCHESTER CITY MANAGER

AFC and IFC during field visits with local community leaders in Muscatine (above) and Manchester (below).



Student Spotlights



Vanessa Robledo, a PhD student in civil and environmental engineering (CEE), is helping improve the Iowa Flood Center's abilities to forecast flash flood events. Her research focuses on improving methods for predicting weather patterns to enhance flood forecasting, working with a team led by Humberto Vergara, assistant professor of CEE and IFC faculty research engineer. "The ensemble Framework for Flash Flood Forecasting (EF5) is the hydrologic model we're working on right now to predict and forecast flash floods. We're studying the atmosphere alongside it to better predict how much precipitation certain storms are causing," says Robledo. Her work studies the dynamics and characteristics of rainstorms using a tracking approach she developed. "Our goal is to improve early warning systems for communities at risk," says Robledo. The tracking method allows the team to identify different types of rainstorms, determine when and where they occur, and analyze their movement patterns.



Logan Mahoney's research helped to identify potential flood mitigation strategies in the Cedar River Watershed. As a master's student in civil and environmental engineering, she developed a computational model of the Cedar River to demonstrate the flood reduction benefits of various mitigation practices such as native prairie, farm ponds, cover crops, and wetlands. Mahoney's model showed how peak streamflow could be reduced with these practices, and the recommendations were shared in a comprehensive report to the Lower Cedar River Watershed Management Authority to support local decision-making and planning efforts. "Part of the project's value was not only creating the model but also directly sharing it with local authorities who would benefit from it," says Mahoney. Upon her graduation in December 2024, this hands-on experience helped Mahoney secure a position as a graduate water resources engineer at ISG, a respected engineering firm in Minnesota that does projects across the Midwest.

Iowa Delegation goes to D.C.

In May 2024, select Iowa leaders attended the American Flood Coalition Local Elected Leaders Summit in Washington, D.C. Representing Iowa were public officials from Cedar Rapids, Columbus Junction, Coralville, Dubuque, Dyersville, Iowa City, Muscatine, Waterloo, and the board chair of the Turkey River Watershed Management Authority. The summit facilitated important discussions regarding critical flood infrastructure funding, enabled networking with key federal agencies, and provided a platform for direct engagement with Iowa's Congressional representatives to enhance the state's flood resilience initiatives. Thank you to our local elected leaders for representing Iowa and to our partners at the American Flood Coalition for organizing this important gathering to work together towards a more flood-resilient future!



ABOVE: Iowa's delegation meets with Senator Joni Ernst during their trip to D.C.

BELOW: Columbus Junction city councilman Keenan Todd during a roundtable discussion with AFC executive director Melissa Roberts.

Flood Education Across Generations



In 2024, the Iowa Flood Center participated in over 70 outreach events including classroom and summer camp visits, teacher trainings, community meetings and events, and conference exhibits. In the summer, University of Iowa alumni and their grandchildren joined IFC as part of the UI Center for Advancement's Grandparents University event. Alumni shared personal stories and memories from some of Iowa's most devastating floods and reflected on the changes they've seen in waterways across the state.

"This event was a unique opportunity for intergenerational learning," says Ellen Carman, IFC program coordinator. "Our grandparent participants were able to share memories of the 2008 flood. These stories act as a reminder of just how important it is to ensure Iowans are aware of and have access to reliable tools like the Iowa Flood Information System."

Grandparents and their students worked together to solve an engineering challenge, build their own paper watershed model, and discuss strategies to make our watersheds more resilient to flood impacts, combining nature-based solutions like ponds and wetlands with hard infrastructure projects like dams and levees.

The IFC is developing watershed-based learning activities that will be available to educators across the state by the end of 2025.



"Learning about the watershed we live in was a great opportunity for students to consider how humans impact the environment in which we live, how streams flow and travel in our area to larger bodies of water and how our impact goes beyond just our county."

JACKIE BAXTER, CLEAR CREEK AMANA SCHOOL DISTRICT SCIENCE CURRICULUM COORDINATOR



Iowa Flood Information System (IFIS)

Reliable Information

IFIS is a free, user-friendly online application that helps Iowans prepare for flooding. IFIS displays up-to-the-minute community-specific information, including:

- Real-time stream levels at nearly 300 locations in Iowa;
- Flood alerts and forecasts for more than 1,000 Iowa communities;
- Weather conditions including current, future, and past rainfall accumulations;
- Statewide flood map coverage for all 99 counties; and
- Scenario-based flood inundation maps for dozens of communities.

→ For more information www.iowafloodcenter.uiowa.edu



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