

IFC UPDATE

RESEARCH AND ACTIVITIES AT THE IOWA FLOOD CENTER SPRING 2021



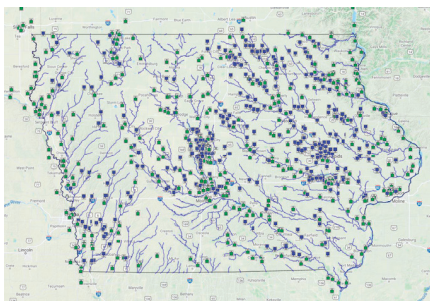
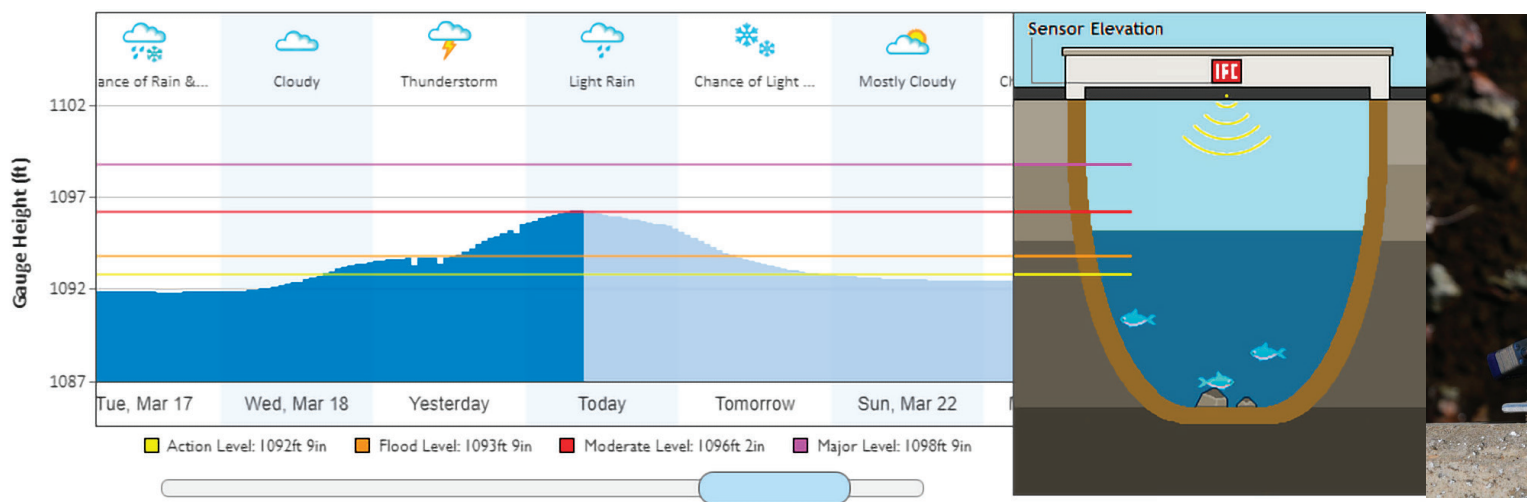
Working Together The Iowa Watershed Approach

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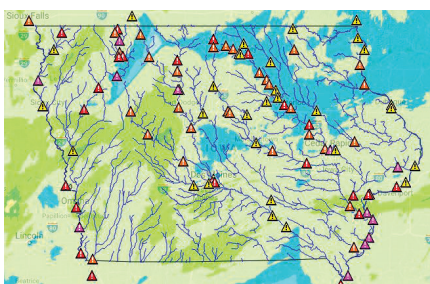


The Iowa Flood Center (IFC) at the University of Iowa is the nation's only academic research center devoted to flooding. The IFC develops critical tools and information that community leaders, decision-makers, and individuals depend on to help them better understand and reduce their flood risks.

Real-Time River Levels



IFC AND USGS SENSOR LOCATIONS



IFIS FLOOD ALERTS — MARCH 2019

Over 35 new Iowa Flood Center stream-stage sensors have been installed, bringing the statewide total to nearly 300 locations. The stream sensors measure river levels in real-time and visualize data on the Iowa Flood Information System (IFIS) Google Maps-based web platform. The new sensors fill flood monitoring and forecasting gaps to help individuals, communities, and state agencies better understand and reduce flood risks. The stream sensors communicate reliable information to plan and prepare in advance of a flood and complement existing U.S. Geological Survey (USGS) stream gages.

The IFC built stream sensors are attached to the side of a bridge and use an ultrasonic transducer to measure the water level. They

are completely self-contained and solar powered. Every 15 minutes, a cell modem transmits data from the sensor to IFIS, where the data are publicly displayed in an easy-to-use online environment. The robust design allows the sensors to remain deployed year-round and to withstand overtopping.

The need for additional flood monitoring became apparent after the 2018 fall floods when IFC received requests from state and local partners for over 100 new monitoring sites on Iowa's rivers and streams. Funding support from the Iowa Department of Natural Resources (IDNR) and local communities helped to expand the statewide network. Most of the new stream sensors were selected by the Iowa Silver Jackets team, a group of interagency state partners.

Helping Neighbors

Following the 2019 floods that caused an estimated \$1.3 billion in losses, Nebraska turned to the Iowa Flood Center for help to be better prepared for future flood events. With funding from the Mid-America Transportation Center, IFC will build and deploy eight stream-stage sensors in Nebraska that will collect and communicate river level information to improve flood response and preparedness efforts.



“This is a great thing for our community and our region, and at \$10 per month to keep the transmitter running, a pretty great investment in my opinion.”

■ RIVERDALE COUNCILMAN ANTHONY HEDDLESTEN



“The environment at the University of Iowa and within IIHR nurtures independent thought and creative ideas. This is a special place. Membership into NAE is an honor and a responsibility.”

■ IOWA FLOOD CENTER DIRECTOR WITOLD KRAJEWSKI

IFC Director Krajewski elected to the National Academy of Engineering

IIHR—Hydrosience & Engineering Faculty Research Engineer and Iowa Flood Center Director Witold Krajewski has been elected to the National Academy of Engineering (NAE), one of the highest honors conferred in the field of engineering, for his advances in flood prediction and flood risk reduction.

Student Spotlight

Jessica Ayers: IFC graduate student Jessica Ayers fell into the position of weather briefer for weekly team meetings that bring together students, staff, and faculty for announcements and research presentations. “At first, I didn’t know if I was the right person for the job, but I have really grown into the role and I love giving them every week. I embrace the challenge, as I have had to teach myself a lot about weather and climate. My goal in giving the briefing is to bring everyone along for that journey so that they can learn something new too,” says Ayers.

John Brammeier: Former IFC student and weather briefer, John Brammeier secured a job working for the U.S. Army Corps of Engineers Rock Island District as a hydrologist. When we recently caught up with him, he said, “While going through graduate school, there was an emphasis in the curriculum on scientific communication and presentation skills. I was lucky to have opportunities to regularly present forecasts at the flood center meetings. I can now comfortably interact with stakeholders and present technical information in an understandable way.”





The Iowa Watershed Approach



ABOVE: A tour of the Soap Creek Watershed highlighting flood mitigation projects.

BELOW: IWA project partners come together for a retreat in the Upper Iowa River Watershed.

ON THE COVER: Before and after photos of a 20 acre wetland complex installed in the Middle Cedar River Watershed.

The Iowa Watershed Approach has entered the home stretch. As the project comes to an end, it leaves behind a lasting legacy for how to successfully build partnerships and develop equitable strategies to address flooding and water resource challenges based on sound scientific principles. Highlights include:



For more information → www.iowawatershedapproach.org

"I enjoyed the opportunity to get to know, learn from, and work collaboratively with so many smart, passionate, and committed professionals from so many different state, federal, and private sector organizations that all believed in the program and were fully committed to its success. Iowa is fortunate to have this level of professionalism and commitment."

■ ALLEN BONINI, FORMER IOWA DNR WATERSHED IMPROVEMENT SECTION SUPERVISOR



Creation of a state-of-the-art new hydrologic model – GHOST

(Generic Hydrologic Overland-Subsurface Toolkit) developed by the Iowa Flood Center to estimate watershed responses to rainfall events and evaluate the flood reduction benefits of hypothetical and actual flood mitigation practices

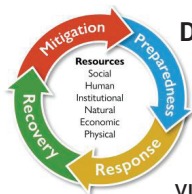


Construction of over 800

conservation practices such as farm ponds, wetlands, and water and sediment control basins that capture runoff, reduce flooding, and improve water quality

Over \$30 million invested in voluntary conservation practices installed on private and public lands

Nearly 300 homes retrofitted with stormwater infrastructure improvements through the city of Dubuque Bee Branch Healthy Homes Resiliency Program



Long-term watershed management plans developed for each watershed to guide future planning and decision-making strategies

Promotion and encouragement of watershed management authorities, which have increased from 15 at the start of IWA in 2016 to 26 across the state today

Design of a resilience framework that integrates social, human, institutional, natural, economic, and physical resources emphasizing under-served and vulnerable populations

Development of Flood Resilience Action Plans to assist leaders and decision-makers in Freeport, Quasqueton, Vinton, and Coralville with strategies to build more flood-resilient communities

Growing a renowned team of local, state, and federal partners!

Award-Winning!

The IWA received the 1000 Friends of Iowa 2020 Best Development Award for innovative leadership. Sippy Family Farms (below: Pat Sippy) in the Clear Creek Watershed constructed five flood mitigation practices through the IWA and was also an award recipient in the stormwater management category.



According to the First Street Foundation National Flood Risk Assessment released in 2020, nearly 300,000 properties in Iowa have a substantial risk of flooding over the next 30 years. The Iowa Flood Center is helping communities and decision-makers better understand and prepare for flooding.

Flood Mapping for the Missouri River

The 2019 floods along the Missouri River brought devastating inundation to areas that had never flooded before. Damage to crops was estimated at over \$2 billion, and more than 460 businesses were affected. In 2011, historic flooding caused five deaths and flooded over 4,000 homes. These events damaged or destroyed critical infrastructure, such as levees, and left the region vulnerable to increasing flood threats.

The Iowa Flood Center is developing a Missouri River hydraulic model capable of estimating flood impacts based upon historical, forecasted, and hypothetical flow scenarios. This project fosters collaboration among agencies, communities, and individuals to work together to make informed floodplain management

decisions along the Missouri River. IFC's model results will be publicly available and visually displayed on the Iowa Flood Information System (IFIS). IFIS users will have access to real-time flood inundation maps that show the propagation of floodwaters across the river valley and will include levee failure impacts.

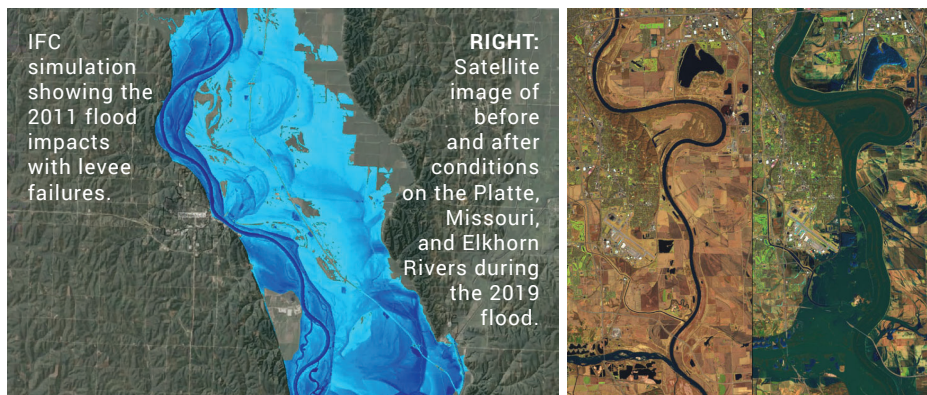
IFC's contributions will provide critical information to assist with comprehensive, long-term planning and redevelopment strategies focused on helping bring vitality and economic stability back to the region. The project is funded by the U.S. Department of Commerce and is administered by the Iowa Economic Development Authority in collaboration with many federal, state, and local partners.

New Mississippi River Flood Maps

The 2019 floods also impacted the Mississippi River on Iowa's eastern border. In search of better information to help communicate flood risks to river communities, federal partners looked to the Iowa Flood Center. Leveraging IFC's experience and expertise in flood modeling and mapping, researchers developed scenario-based flood inundation maps for the Mississippi River stretching from Lock and Dam No. 11 in Dubuque to Lock and Dam No. 19 in Keokuk. The new maps show the extent and depth of predicted floodwaters, providing communities with advanced flood information for planning and decision-making.

"Keep up the good work – I think the progress we are making is good. We can't keep having these events over here on the Missouri and the Mississippi River."

■ IOWA REPRESENTATIVE DAVID SIECK

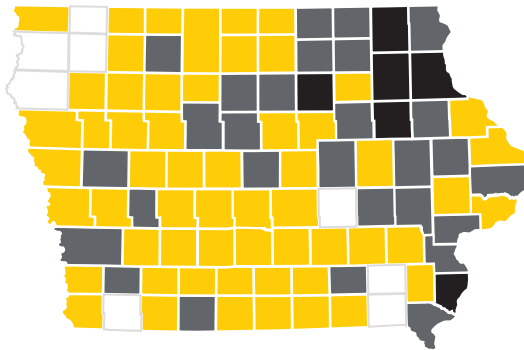


The new Mississippi River flood inundation maps are publicly available online through the Iowa Flood Information System. IFIS now offers Iowans access to flood inundation maps for over 35 cities and towns in Iowa, with more added every year. Community maps complement statewide floodplain maps available for all 99 counties showing the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year floodplain boundaries. The IFC-developed floodplain maps show the probability, extent, and depth of flooding for every Iowa stream draining more than one square mile.

Research Highlights

FLOOD-RELATED
FEMA DISASTER
DECLARATIONS
1989-2019
TOTAL: 1,071

■ 16-19
■ 12-15
■ 8-11
□ 4-7



Preparing for Iowa's Flood Future

During a 30-year period from 1989–2019, property and crop losses from flooding in Iowa cost nearly \$20 billion. The Fourth National Climate Assessment predicts the annual cost of addressing flood-related climate change impacts on urban stormwater systems will exceed \$500 million annually for the Midwest by the end of the century. We must act now.

Through a project in collaboration with the Iowa Department of Transportation, IFC researchers are exploring the impacts of increased heavy rainfall and flooding on Iowa's highway system to determine how resilient this critical infrastructure is to extreme weather. Through sophisticated hydrologic modeling and statistical analyses, this project will identify areas in Iowa that are at a higher flood risk based on climate projections. This information will be used to reduce future flood impacts and costs and to prioritize mitigation efforts.

Flood Reduction Benefits of On-Road Structures

On-road structures provide an alternative to conventional culverts. Pioneered in northeast Iowa, on-road structures use the roadway embankment as a dam, and flow through the culvert is restricted to provide flood storage for large precipitation events.

The IFC is using advanced hydrologic modeling and GIS-based analysis to quantify the flood reduction benefits of existing structures and to create an online statewide visualization database for suitable new locations and their estimated flood storage potential. The Iowa Department of Transportation is funding the project.

Des Moines Flood Study

Through a project with the city of Des Moines, the Iowa Flood Center completed an upstream mitigation study of the Des Moines River Watershed that identifies watershed-scale structural and nature-based solutions to reduce flood risks. The study was conducted to help facilitate watershed coordination and guide long-term watershed management planning and implementation efforts.



Results from the GHOST model evaluate potential flood mitigation scenarios, including the adoption of native vegetation, cover crops, and distributed storage ponds.

“The study completely changed our philosophy of managing floodwater in the landscape. It revealed to us for the first time that the single best way to reduce the impacts of floodwater was to manage each raindrop where it landed through better soil health.”

■ JONATHAN GANO, CITY OF DES MOINES PUBLIC WORKS DIRECTOR

Could the 2008 Floods Have Been Worse?

On June 13, 2008, the Cedar River at Cedar Rapids rose 19 feet above flood level, inundating 10 square miles of the city and causing \$5.4 billion in damages.

Many consecutive days of rainfall set the stage for the 2008 flood in Cedar Rapids. To study the flood impacts from rainfall amounts and locations within the Cedar River Watershed in the days before the peak, Iowa Flood Center researchers used Stochastic Storm Transposition (SST) to see how real storms that occurred elsewhere in the Midwest could have changed the intensity of the 2008 flood. Model results show the potential for an even larger flood event. Modeling the effects of real storm events that happened elsewhere in the region can simulate rainfall scenarios that more closely reflect natural phenomena.

We've Missed You

Unprecedented, exhausting, relentless, “you’re on mute”—these are just a few of the phrases commonly used to describe 2020. Amidst the chaos of a global pandemic, sustaining 140 mph hurricane-like winds during the August derecho, an intense presidential election, and everything in between, the Iowa Flood Center has forged ahead. The IFC has been able to preserve the integrity of its outreach and education program by adapting and pivoting to virtual opportunities to stay connected with key partners and stakeholders.

Outreach activities in 2020 included online STEM careers presentations, legislative webinars, watershed management authority meetings, presenting at virtual conferences (Conservation Districts of Iowa, Association of State Floodplain Managers, Soil & Water Conservation Society), building on out-of-state partnerships with Texas, Nebraska, Missouri, North Carolina, and Louisiana, and much more.

Technology has kept us connected during this lonely time, but we’ve missed you. We look forward to in-person reunions! Until then, we will embrace this period of uncertainty and use it as a time for transformation, perseverance, and hope.

TOP: The Iowa Flood Center’s home at the historic C. Maxwell Stanley Hydraulics Lab in Iowa City along the Iowa River.

BOTTOM: IFC Co-Founder Larry Weber during a media event celebrating the center’s 10-year anniversary in 2019.



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 on rainfall, stream levels, and more, 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 → ifis.iowafloodcenter.org



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