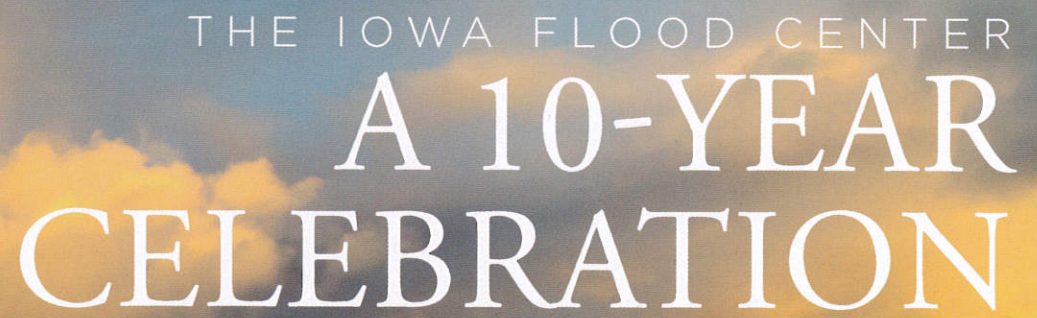


The logo features the year '2019' in white text on a blue square background. To the right, the letters 'IFC' are in a large, white, sans-serif font. Below 'IFC', the word 'INSIGHTS' is written in a smaller, white, sans-serif font. A thin white horizontal line is positioned below the word 'INSIGHTS'.

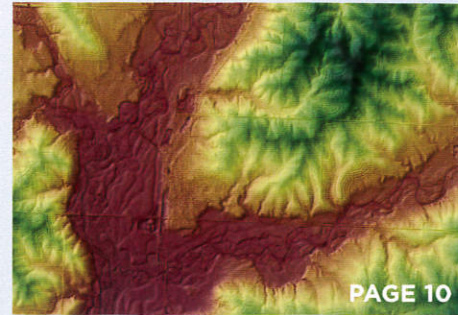
2019 IFC
INSIGHTS

Serving Iowans with Innovative Tools
and Reliable Information

The title is centered in the upper half of the page. It consists of three lines of text: 'THE IOWA FLOOD CENTER' in a small, white, sans-serif font; 'A 10-YEAR' in a large, white, serif font; and 'CELEBRATION' in a large, white, serif font. The background is a dramatic sky with a rainbow and a field of corn.

THE IOWA FLOOD CENTER
A 10-YEAR
CELEBRATION





PAGE 10



PAGE 4



PAGE 12



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ON THE COVER
A serene Iowa landscape captured after a rainstorm near Lisbon, Iowa.
PHOTO BY RICH HERRMANN.



FOLLOW THE IOWA FLOOD CENTER!



PAGE 6



PAGE 23

INSIDE INSIGHTS

PAGE 2 Flood Genie
The Students of IFC

PAGE 3 IFloods
Partnerships Abound

PAGE 4 After the Flood

PAGE 6 Iowa Strong

PAGE 8 IFC Expands Stream
Sensor Network

PAGE 9 Information,
Information,
Information

PAGE 10 Mapping the Risks

PAGE 12 Iowa Flood Center
Timeline

PAGE 14 A Vision for Iowa's
Future

PAGE 16 The Future of
Flooding is Now

PAGE 18 What's Your
Flood Story?

PAGE 19 Overheard

PAGE 20 Flood Response: 'We
Know What's Coming'

PAGE 21 New Hydrostations
Support Iowa
Farmers

PAGE 22 Small Towns, Big
Flood Problems

PAGE 23 Educating the Future

PAGE 24 Following Iowa's
Lead: Big Sioux River
Flood Information
System



Greetings!

When we co-founded the Iowa Flood Center (IFC) 10 years ago, just one year after the flood of 2008, we didn't know what was ahead for Iowa. Would the devastating flood we had just seen turn out to be an anomaly that wouldn't happen again for decades? Since the Iowa Legislature created the IFC, flooding has become an almost-every-year occurrence in Iowa, but we had no way of knowing that at the time. We did know that we wanted to use our expertise in hydrology and river hydraulics to help Iowans avoid the kind of costly and painful damage that happened here in 2008.

We're happy to tell you that the Iowa Flood Center at the University of Iowa has done exactly that. We've been able to put cutting-edge technology to work for Iowans in new ways that are accessible and useful in everyday life. Today, you can use the IFC's online information platform, the Iowa Flood Information System (IFIS), to learn about precipitation, stream levels, flood forecasts, and more for your community — in near real time. Information is power, and IFIS gives Iowans the power to make good decisions well in advance of floods or even when flooding is an active threat.

We often joke that we can't stop floods — yet! But even though we say this with tongue firmly in cheek, our \$97 million Iowa Watershed Approach has the potential to reduce flood damages in Iowa. By working collaboratively with Iowans across the state to deploy conservation practices such as farm ponds, buffer strips, wetlands, and more, we will be able to reduce flooding downstream, while also decreasing erosion, creating valuable habitat for wildlife, and improving water quality. We believe this template for change can be scaled up and implemented almost anywhere. It's a positive, proactive response to the increased occurrence of extreme precipitation in Iowa.

These are just a couple of examples of IFC's value to the state of Iowa — there are many more, and you can read about them in this magazine, which celebrates the first decade of the Iowa Flood Center. And while we are undoubtedly biased on this subject, you don't have to take our word for it — throughout these pages, you will hear from Iowans like yourself who can speak to the value they find in the work of the IFC.

We hope you enjoy the magazine. We look forward to working with you, and for you, for another 10 years — and beyond! Please accept the best wishes from all of us at the Iowa Flood Center.

Witold Krajewski
Director, Iowa Flood Center
Professor, Civil and Environmental Engineering

Larry J. Weber
Primary Investigator, Iowa Watershed Approach
Professor, Civil and Environmental Engineering

Flood Genie

What if a flood genie was able to help answer all of your flood questions? Iowa Flood Center Associate Research Engineer Ibrahim Demir and his talented team of students have developed an artificial intelligence (AI) system, as well as holograms that show projected flood maps. Flood AI is like Siri or Alexa, allowing users to ask questions related to flooding in their area and receive immediate responses, 24 hours a day.

It's like talking to a friend who happens to be a flood expert," Demir says.

The cutting-edge technology received recognition from the U.S. Department of Homeland Security Science & Technology Directorate in their Report on Alerting Tactics.

Flood AI is accessible through many smart devices, including smartphones, chat applications such as Skype, smart home appliances, and more. Holograms provide a visual platform to show the extent and depth of predicted flood waters. These unique tools help people process information faster, allowing first responders to better understand the potential impacts to their community and to react sooner and with more confidence to flood events.

IFC Research Engineer Ibrahim Demir demonstrates virtual reality technology that puts the user in a near real-life flood environment.



The Students of IFC

The Iowa Flood Center (IFC) is no place for slackers. It's a demanding path for the students who collaborate with IFC faculty researchers. Besides making important contributions to cutting-edge research, they must commit to a one-hour seminar each week — where they're asked to present about their work on a regular basis.

Many undergraduates and more than 40 graduate students have been involved with IFC research. Why do they do it? Besides the hands-on training that prepares them to help solve complex flood-related problems in Iowa and throughout the world, many are attracted to the idea of making a difference.

"The program was so innovative, so original, and aligned with what I wanted to do across the board," says Danielle Thomas, who works under the guidance of IFC Director Witold Krajewski. Thomas' research focuses on improving flood prediction by including hydrology in the process.

She hopes to work in water resources for a global civil and environmental engineering consulting firm after graduation, or perhaps for a federal agency related to water resources.

"Everyone is affected by water," Thomas says. "Hopefully, our work can help improve things for people in the future."



"The program was so innovative, so original, and aligned with what I wanted to do across the board."

IFC Graduate Student
Danielle Thomas



IFC rain gauges prepared for deployment during the NASA field campaign in the Turkey River Watershed.

IFloodS

The Iowa Flood Center (IFC) served as the host for NASA's Iowa Flood Studies or IFloodS—a NASA Global Precipitation Measurement mission designed to provide a better understanding of the strengths and limitations of satellite products for flood forecasting and other hydrologic applications.

Through the project, researchers from NASA, IFC, and other institutions deployed a number of scientific instruments across northeast Iowa during the spring of 2013 to collect high-quality precipitation data. The study areas included the Cedar, Iowa, and Turkey River basins.

IFC Director Witold Krajewski says the benefits of IFloodS have been significant. "With this information, we have been able to improve our flood forecasting models for Iowa."

The IFC team deployed a network of rain gauge and soil moisture platforms in coordination with the Agricultural Research Service and NASA Soil Moisture Active Passive community. The Turkey River Watershed was the site of a uniform deployment of 20 rain gauges with soil moisture probes and two IFC XPOL weather radars. Rain gauge stations deployed through the project are still active and are hosted by local landowners.

Partnerships Abound

Scarce radar coverage and limited real-time stream monitoring has left communities in the Upper Wapsipinicon River Watershed with unreliable information, making them more vulnerable during times of flooding. A pilot project with the Silver Jackets, a team of interagency partners, has taken on the task of working together to share resources and identify solutions to improve flood forecasting capabilities and expand data collection.

The Iowa Flood Center (IFC) provides technical expertise to the project and has contributed two stream-stage sensors to monitor river levels. The IFC also maintains a suite of valuable flood-related tools via the Iowa Flood Information System online platform. Partners include IFC, Iowa Homeland Security and Emergency Management, U.S. Geological Survey, Iowa Department of Natural Resources, U.S. Army Corps of Engineers, and local county emergency management coordinators.



TOP: Partners assess 2018 aerial flood impacts near Columbus Junction at the confluence of the Iowa and Cedar rivers. Pictured: National Weather Service Hydrologist Jessica Brooks, Louisa County Emergency Manager Staci Griffin, Pilot Tom Schnell, with the UI Operator Performance Lab, and IFC Associate Director Nathan Young.



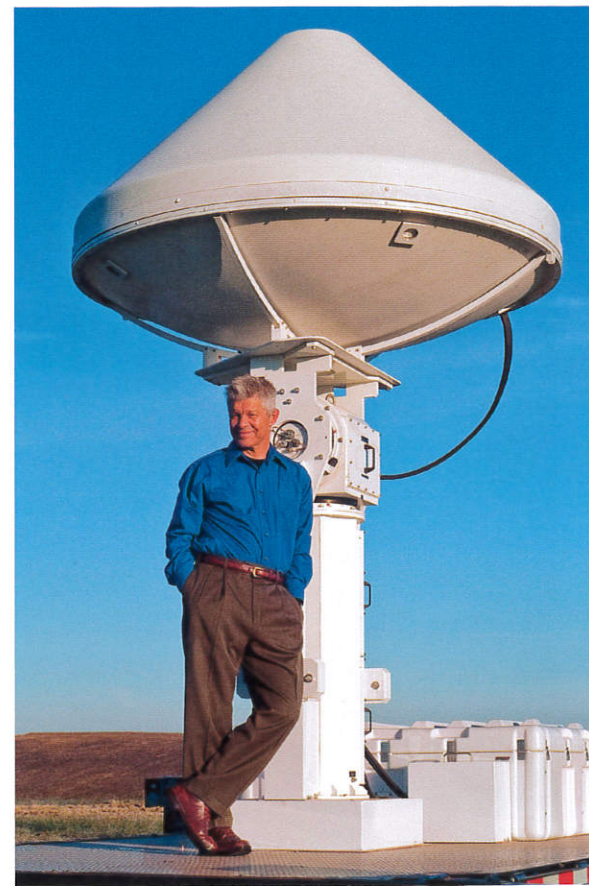
BOTTOM: Nathan Young ready for take-off.



AFTER THE FLOOD

Dedicated to Serving Iowans

BY JACQUELINE HARTLING STOLZE



Witold Krajewski poses with one of the IFC's network of four X-pol mobile weather radar units for monitoring precipitation.

IFC Director Witold Krajewski says the flood of 2008 was a time of intense frustration for him.

As a global expert in hydrology and precipitation, he could do little more than join the crew filling sandbags at the University of Iowa (UI).

A few months after the flood, which inflicted about \$1 billion in damage to the UI campus, several Iowa legislators asked to meet with Krajewski and then-IIHR Director Larry Weber. Both are professors of civil and environmental engineering at the university.

A Tall Order

State Senator Rob Hogg from Cedar Rapids began the meeting with this statement: We want to stop what happened in 2008 from ever happening again!

"Well, that's a tall order," Weber says. "Even at my most egotistical, I know I can't control the weather!" But the legislators were resolved to do something proactive to take on Iowa's flood problem. They asked good questions and listened intently while Weber and

Krajewski explained the evolution of the flood and why it was so much worse than past events.

The legislators asked Weber and Krajewski to write a proposal to create a state-funded flood center. The two-page document they submitted provided the seed for legislation that was signed into law in 2009, creating the Iowa Flood Center (IFC) at the UI and funding its work.

A Decade of Progress

In the 10 years since that historic legislation, the Iowa Flood Center has proven to be one of the best investments ever made in the state. IFC is the nation's first and only academic center devoted solely to the study of floods. Led by Krajewski, the center is providing Iowans with accurate, scientific information to help them better understand their flood risks. Appropriations from the Iowa Legislature support the center's goal of improved flood monitoring and prediction capabilities in Iowa. Through collaborations with communities, government agencies, and decision-makers, IFC is bringing engineering and scientific expertise to flood-related issues.

One of IFC's most innovative programs is the Iowa Flood Information System (IFIS), which gives the people of Iowa easy online access to information about rainfall, river and stream levels, flood predictions, and even flood inundation maps for 26 communities (with more to come) that show what a predicted flood stage will mean for their homes, businesses, and schools. IFIS puts data directly in the hands of the people who need it — emergency managers, public safety personnel, and the public. With this information, Iowans can make better decisions to protect their property, their families, and their livelihoods.

Setting the Standard

IFC researchers have put their ingenuity, vision, and energy to work for Iowans, setting the standard for service to the public. When people come to IFC for results, Krajewski says, they aren't disappointed.

One of the best examples is the Iowa Watershed Approach (IWA). This statewide watershed improvement program, funded with a \$97 million grant from the U.S. Department of Housing and Urban Development, is designed to reduce flooding by strategically building farm ponds, wetlands, and other conservation practices in the watershed.

Researchers hope the project will restore some of Iowa's natural resiliency to heavy rainfall, while also improving water quality, creating wildlife habitat, and restoring ecosystem services.

In addition, IWA's focus on the human and societal aspects of flooding will help Iowans develop flood resilience. As Iowans know all too well, flooding doesn't only damage buildings and infrastructure, it also destroys lives.

A More Flood-Resilient Future

Krajewski says he's proud of what the Iowa Flood Center has achieved. Thanks to IFC, Iowans are more flood-resilient. This new resiliency is evidenced by the minimal damage caused by the 2016 flood in Cedar Rapids, which was devastated in 2008.

However, Krajewski says, he is also humbled, because he understands the immense scope of the work still to do.

"Most of all," he says, "As Iowans, we are honored to serve the people of this state." ■



Witold Krajewski walks alongside a local landowner during a tour of the Soap Creek Watershed looking at constructed flood mitigation projects.



IFC Research Engineer Tony Loeser shows off one of the IFC's network of 250+ stream sensors.

IOWA STRONG



BY JACQUELINE HARTLING STOLZE

Iowa is bordered on the east and west by two of North America's most majestic rivers, the Mississippi and the Missouri. In 2019, both of these mighty waterways reminded us of their immense power. In March, a perfect storm of frozen and saturated soils, melting snowpack, ice jams, and heavy precipitation started a season of devastating flooding that has left our state battered and overwhelmed. At press time, these floods were still ongoing, and the Mississippi River at Davenport had exceeded the record flood levels of 1993.

On Tuesday, April 16, eight Iowa Flood Center (IFC) staff and students left home in the early pre-dawn hours to drive to Hamburg in the far southwest corner of the state to help with flood clean-up. The volunteers weren't sure what to expect but were ready to work hard at whatever needed doing.

When they rolled into Hamburg, they connected with Bruce, their volunteer coordinator with the organization Go-Serv. Bruce is a Hamburg resident working five days a week to supervise volunteers and help his neighbors recover from the destructive early spring flood. In the early morning hours of March 18, the "flashy" flood event brought some of the worst flooding this part of the state has ever seen. The water came up quickly and disappeared just as suddenly. Residents had to evacuate their homes in the middle of the night, some of them in boats. Neighbors rescued neighbors, some of them standing knee-deep in water in the town's central park, waiting for help to arrive.

Bruce took the IFC team to a small complex of low-income senior citizen apartments and set them to work pulling out wet, moldy drywall and clearing ruined cupboards, bathroom fixtures, and more. Everything went out to the curb to add to the endless piles of furniture, appliances, dishes, and more. "It was heartbreaking to see their possessions piled up at the curb like that," says Breanna Shea, communications specialist for the IFC. "Antique furniture, dishes, books, photos — all of it represents someone's life. Imagine starting over at that stage of life! It made us realize in a whole new way how important the work of the Iowa Flood Center is."

The IFC group was part of a small army of volunteers who have turned up in Hamburg and other flood-devastated Iowa communities. Judy Holliman of the Hamburg Kiwanis Club told the Des Moines Register that people in her community are working hard together to recover from the flood. "We're a strong community," she said. "I see that everywhere. Nebraska strong, Iowa strong, and Hamburg's going to be strong, too."

At the end of the day, the IFC team was exhausted, dirty, and proud to be "Iowa strong," working together with the citizens of Hamburg to build a more flood-resilient Iowa. ■

FROM FAR LEFT TO RIGHT: Davenport flooding, spring 2019; IFC staff helping with the flood clean-up in Hamburg, Iowa; Satellite photos of normal Missouri River levels (left) in eastern Nebraska and spring 2019 levels (right). PHOTO BY NASA.



ABOVE: March 2019 flooding on the Cedar River. PHOTO BY RICH HERMANN.



IFC Expands Stream Sensor Network

BY MIKAEL MULUGETA

Record-breaking rainfall in fall 2018 combined with near record snowfall brought flooding to many Iowa rivers and streams in 2019. The Iowa Flood Center's (IFC) network of stream-stage sensors provides Iowans with near real-time river level information to help them prepare when waters begin to rise; however, more than 100 new requests for stream sensors show that we have more work to do.

"Having additional sensors on the Wapsi (Wapsipinicon) River would help fill a huge void where we have scarce radar coverage and little reliable information," says Buchanan County Emergency Manager Rick Wulfekuhle.

Additional stream sensors would enhance flood monitoring and forecasting statewide, which would help improve public safety and awareness. IFC Director Witold Krajewski says he will be working with legislators and state partners to fund the new stream sensors. The Iowa Department of Natural Resources (IDNR) has committed to funding 12 of the new requests.

"We know how valuable the stream sensor information can be for small communities in Iowa. Having access to that real-time data could be life-saving," says Krajewski.

The Iowa Flood Center currently manages a network of over 250 stream sensors across the state, which complements the U.S. Geological Survey (USGS) network of about 150 stream gauges. All the monitoring data are available on a one-stop-shop through the IFC-developed Iowa Flood Information System (IFIS) online web visualization platform. During a flood event, users can access IFIS for the information they need to make informed decisions on how to prepare and respond to rising stream conditions.

Dunkerton Mayor Ed Jessen says placing sensors on Crane Creek has given his town reliable information on upstream conditions. "The flood center and the river gauge will help us know what's

coming down the river," says Jessen. "This will be a several hour heads-up."

Partnerships with the IDNR, Iowa Department of Transportation, and various research projects funded the existing network. The self-contained sensors are mounted on bridges and operate on solar power. The sensors measure river levels using a sonar signal, and data are transmitted via cell modem to the IFIS public interface. ■



ABOVE: Iowa Flood Center stream sensors help monitor smaller rivers and streams.

LEFT: IFC Engineer Dan Ceynar has installed hundreds of stream sensors on bridges across Iowa. The sensors are robust and can withstand floodwaters.

Information, Information, Information

BY BREANNA SHEA

Data—that's the key to Iowa's improved flood preparedness in 2019 compared to the 2008 catastrophic flood event.

Thankfully, the Iowa Flood Center (IFC)—developed Iowa Flood Information System (IFIS) online tool puts critical information in the hands of emergency responders, decision-makers, home- and business-owners, and landowners. IFIS has earned the reputation as a credible, reliable, go-to source for flood information. And here's why.

IFIS' cutting-edge design and technical capabilities are built on a user-friendly Google Maps-based web-platform that is freely accessible to anyone, providing real-time flood information with just a few clicks. A dense instrumentation network of well over 300 IFC-designed, built, and deployed stream sensors, rain gauges, and hydrologic stations measures a suite of parameters, including river levels, precipitation, and soil moisture and temperature conditions. In addition, IFIS harvests hydrological and meteorological data from the U.S. Geological Survey (USGS), National Weather Service (NWS), U.S. Army Corps of Engineers, and others, making Iowa home to one of the densest monitoring networks in the country. The system processes over 50 GB of data per day from radars and sensors in Iowa. Data collected are uploaded to IFIS about every 15 minutes and displayed for users to easily understand, interpret, and apply to mitigate real-life flood impacts.

During the 2008 floods, Iowans lacked the context needed to relate NWS forecasts to their own property and to understand the extent and depth of predicted floodwaters. IFC has developed flood inundation maps that translate forecasted river stages into interactive, scenario-based maps for planning and decision-making in advance of a flood.

"The stream gauge sensors are very helpful to fill in the gaps where USGS gauges don't exist," says KCRG-TV Weather Meteorologist Justin Gehrts. "Inundation maps have proven to be invaluable."

In 2016, the Cedar River in Cedar Rapids had its second highest crest of 22 feet. Using IFIS, emergency responders and city officials were able to make informed decisions about how to protect the city from flooding. Over 12 miles of HESCO barriers were deployed before the river crested, greatly reducing the damages.

IFC's real-time flood forecasting system provides predictions for 2,000 points on Iowa's river network, including 1,000 Iowa communities and other points of interest. The IFC forecasting system is driven by radar-based rainfall data produced in near real-time. Statewide rainfall intensity and accumulation maps are updated every five minutes, processing data from seven Next Generation Weather Radars (NEXRAD) covering Iowa. Information flows through the IFC Central Database, IFC Forecasting Model, and IFC Rainfall System before ultimately being visually displayed on IFIS.

IFIS has been operational since May 2011, estimating flows at over 420,000 locations. Since then, the system has had over 3 million pageviews from users looking for reliable flood information, and thousands more access the system every day. ■

IFIS architect Ibrahim Demir shows off IFIS to University of Iowa President Bruce Harreld.



Statewide Floodplain Mapping Project

MAPPING THE RISKS

BY BREANNA SHEA



Preparing for bathymetric survey work used to develop flood inundation maps.

On June 15, 2010, the city of Kalona, Iowa, was soaked with more than two inches of rain in about an hour. Flash flooding from a nearby drainage ditch forced the evacuation of a mobile home park, where residents found themselves suddenly knee-deep in water.

The floodwaters receded quickly, and, compared to other recent floods in Iowa, this event could have been considered minor. But Kalona's flooding issues were actually quite complex. In 2009, the city received new floodplain maps from the Federal Emergency Management Agency (FEMA), which called for about 60 percent of the community to buy mandatory flood insurance coverage. The city immediately began working to understand and refine the proposed FEMA maps, which delineate the 100-year floodplain (areas with a 1 percent chance of flooding each year, independent of previous years). The maps were going to cost Kalona property owners almost \$1 million in flood insurance premiums each year.

After the FEMA maps were released, the Kalona City Council asked the Iowa Flood Center (IFC) to help evaluate the maps. IFC co-founder Larry Weber and Associate Director Nathan Young met with the Kalona City Council several times over the course of two years to explain the floodplain mapping methodology and discuss refinements to the Kalona map.

The IFC team studied the methods used to create the maps and reran the models. After careful analysis, Weber presented the results of IFC's own 2D modeling of the area. The map looked quite a bit different than the FEMA original. Using LiDAR (laser radar) data to develop a digital elevation model, the IFC team modeled the geometry of the river and creek beds, as well as the surrounding area. The IFC-revised maps were presented and approved by FEMA.

Under the new maps, Kalona's flood insurance tab was cut almost in half.

The services of the Iowa Flood Center were crucial to Kalona as the town had to find a way to navigate through a complicated and costly situation, says City Administrator Ryan Schlabaugh. "The goal was to have the most accurate maps possible," he says, "and the Iowa Flood Center helped us do that."

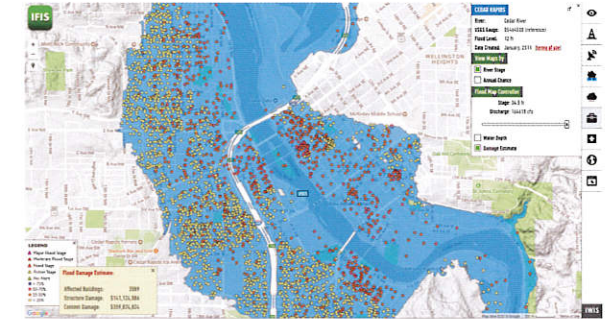
In 2016, the Iowa Flood Center celebrated the completion of the Statewide Floodplain Mapping Project, a \$15 million project to update floodplain maps for all 99 Iowa counties. The project was a collaboration among the Iowa Flood Center, the Iowa Department of Natural Resources (IDNR), the Iowa Natural Heritage Foundation, the U.S. Army Corps of Engineers, and the Federal Emergency Management Agency (FEMA).

IFC researchers used LiDAR data provided by IDNR to map all streams draining one square mile or more. This LiDAR remote-sensing technology allowed researchers to precisely map Iowa's river and stream network, develop computer-based flood simulations, and delineate floodplains with reasonable accuracy.

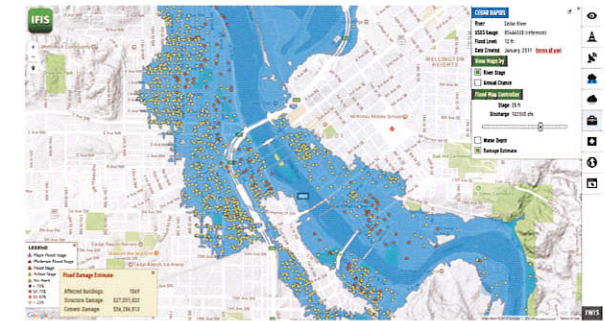
The floodplain maps provide Iowans with sound information on flood risk in their communities, so they can make informed land-use and land-management decisions. The maps define the boundaries of flooded areas for 100-year (1 percent annual chance of flood) and 500-year (0.2 percent chance) floods. Funding from the Iowa Natural Heritage Foundation allowed the team to also create maps for 2, 5, 10, 25, 50, and 200-year floods. The statewide floodplain maps are available to the public through the easy-to-use Google Maps-based Iowa Flood Information System (IFIS) web interface. Upon FEMA review and approval, the maps are becoming regulatory.

Working through the floodplain mapping process, IFC learned important lessons and is using that knowledge to expand mapping products. IFC researchers are using physics-based computer models to predict how a flood wave travels through communities. These high-resolution models can illustrate the extent and depth of flooding under different conditions. Over 25 communities in Iowa have access to an online library of scenario-based inundation maps that show how predicted floodwaters could affect their communities, homes, and businesses.

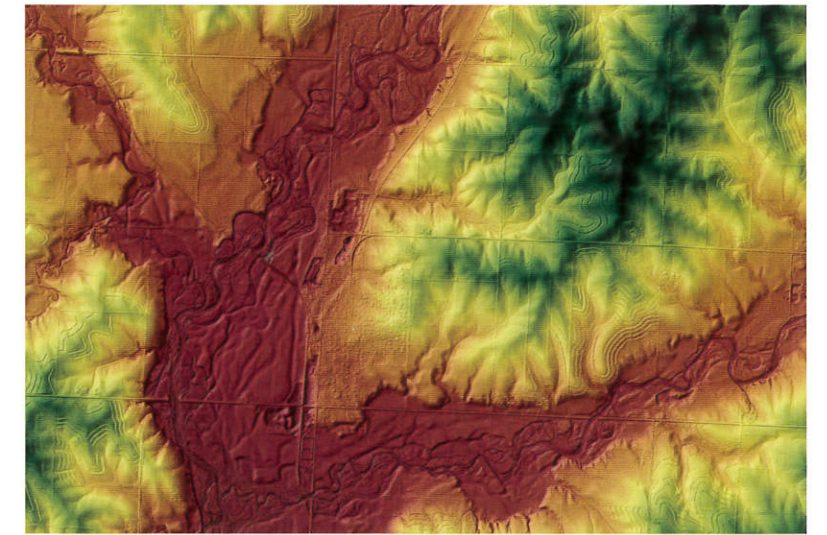
Maps are continually being expanded for other communities across Iowa and are available through IFIS. Recent map developments include the addition of flood damage estimates to buildings and other structures in flood vulnerable areas. These damage estimates come from Hazus, a multi-natural hazard analysis tool developed and distributed by FEMA. The web tool models the effects that natural hazards of various intensities can have on buildings and other structures in a given area, and then quantifies the total damage in dollars.




LEFT: Flood inundation maps of Cedar Rapids provide damage estimates for flooded buildings.

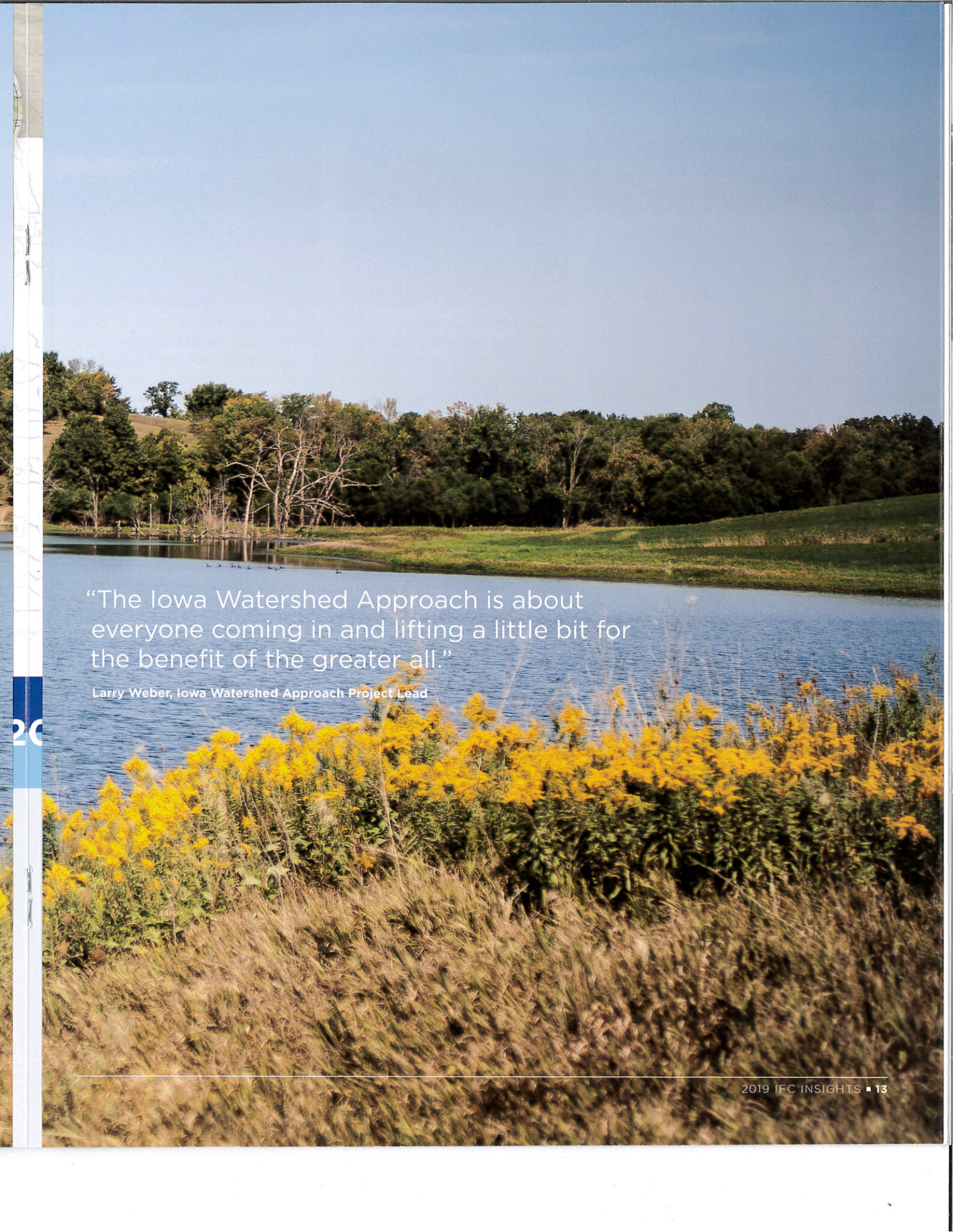


BELOW: IFC researchers use LiDAR data provided by the IDNR to develop computer-based flood simulations and delineate floodplains with reasonable accuracy.





**Look inside for a graphic
timeline of the Iowa Flood
Center's first 10 years!**

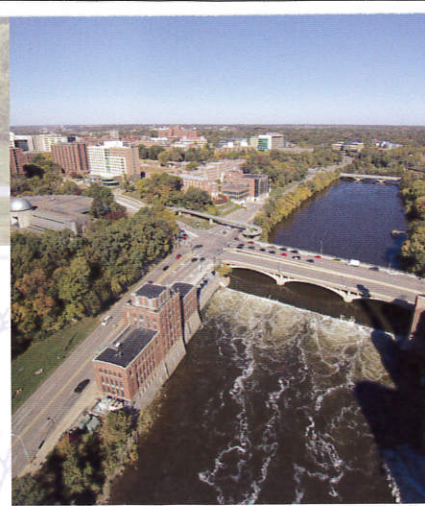


“The Iowa Watershed Approach is about everyone coming in and lifting a little bit for the benefit of the greater all.”

Larry Weber, Iowa Watershed Approach Project Lead

“The 2008 flood was very frustrating for me, because even though I’m an expert on heavy rainfall and floods, there was really nothing I could do then with my professional knowledge. So I helped with the sandbagging ...”

IFC Director Witold Krajewski



Iowa Governor Chet Culver signs legislation establishing the Iowa Flood Center (IFC) at the University of Iowa.

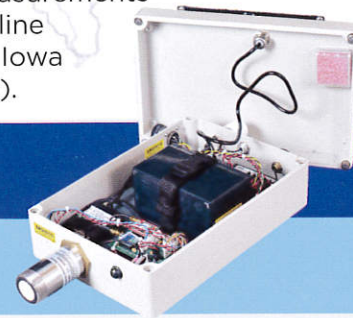


IFC releases the first community-based flood inundation maps for Iowa City, Des Moines, Cedar Falls, Waterloo, and Elkader. Maps provide Iowans with information on the extent and depth of predicted floodwaters.

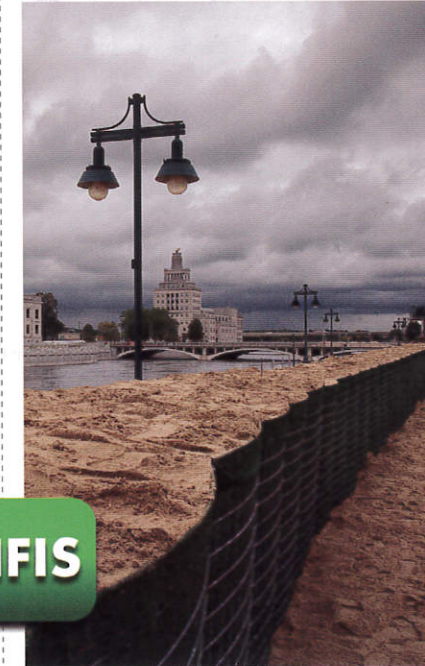
IFC and Iowa Department of Natural Resources (IDNR) partner and receive \$15M from the U.S. Department of Housing & Urban Development (HUD) to update floodplain maps throughout the state. The maps show the probability, extent, and depth of flooding for every Iowa stream draining more than one square mile (completed in 2016).

Iowa receives \$8.8M from HUD for the Iowa Watersheds Project (IWP), overseen by the Iowa Flood Center. The IWP aims to mitigate flood risk in five select watersheds, establish the first watershed management authorities (WMAs) in Iowa, and build small-scale flood mitigation projects in three sub-watersheds (completed in 2016).

The IDNR contracts with IFC to build and deploy a network of 50 stream sensors. Students designed and built the initial prototype; the sensors measure stream height via ultra-sonic sonar. Measurements flow every 15 minutes to the online visualization web platform, the Iowa Flood Information System (IFIS).

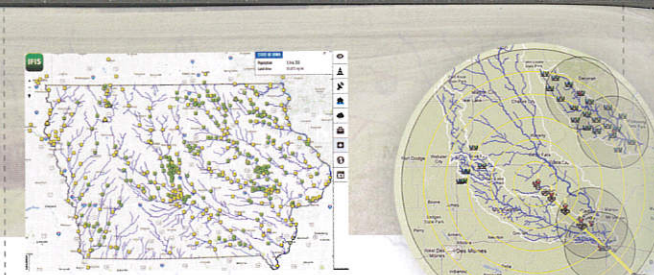


IFC releases community-based flood inundation maps for Hills, Cedar Rapids, and Charles City.



IFIS

IFIS launches to the public in May.



IFC releases community-based flood inundation maps for Ames and Mason City.



IDNR provides funding for an additional 50 IFC stream sensors.

2008

JUNE 13: The Cedar River reaches a historic crest of 31.12 feet in Cedar Rapids, almost 20 feet above flood stage.

More than 120 miles of primary highway in Iowa wash out from flooding, with road closures on 464 miles worth of Iowa’s highway system (NWS Report). Estimated damages totaled over \$10B, and 86 of Iowa’s 99 counties received federal disaster declarations.

2009

January winter storms drop an average of nearly 10 inches of snow statewide in just 5 days.



2010 flooding in Ames

2010

IIHR—Hydrosience & Engineering historian, archivist, and accomplished author Connie Mutel serves as editor of *A Watershed Year: Anatomy of the Iowa Floods of 2008*.

Ames receives over 14 inches of rain in four days, leading to one of the most costly natural disasters experienced by Ames and Iowa State University. The university suffered \$40 to \$50 million in damages.

Iowa receives \$84.1M through the Disaster Recovery Enhancement Fund for flood recovery efforts following the 2008 floods.

2011

The Rebuild Iowa Office, established by Governor Chet Culver in 2008 to coordinate statewide flood recovery efforts, closes.

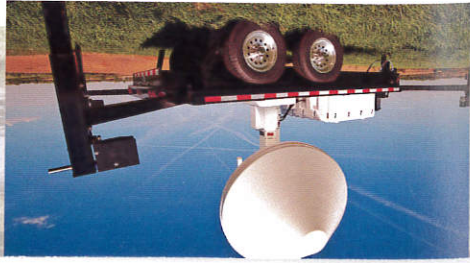
Spring flooding on the Missouri River results in a Presidential Disaster Declaration affecting six counties. The total amount of public assistance grant dollars obligated is over \$46M.

2012

Ceremonial groundbreaking for the National Water Center in Tuscaloosa, Ala.



Iowa experiences a severe drought, recording the driest July since 1975 and the third hottest among 140 years of records.



IFC and NASA partner on a project called Iowa Flood Studies, or IFloods—a Global Precipitation Measurement mission to provide better understanding of the strengths and limitations of satellite products in estimating rainfall. The Turkey River Watershed serves as a study area for the project, and a uniform network of rain gauges with soil moisture and temperature probes is deployed throughout the watershed.

IFC releases community-based flood inundation maps for Ottumwa, Columbus Junction, and Spencer.



Hancher's "Living with Floods" commemorates Iowa's progress toward recovery and mitigation of floods.

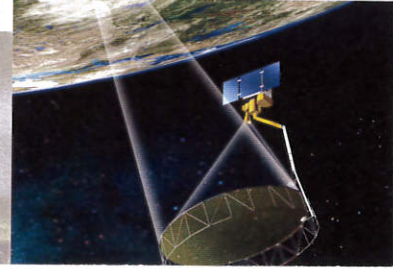


"The Iowa Flood Center is a tremendous resource," says Dr. Louis Uccellini, director of the National Weather Service, during a visit to IFC.



The IFC takes its tabletop watershed model on the road to visit K12 schools and STEM festivals to educate students about watersheds and flooding. The IFC attends dozens of outreach events each year.

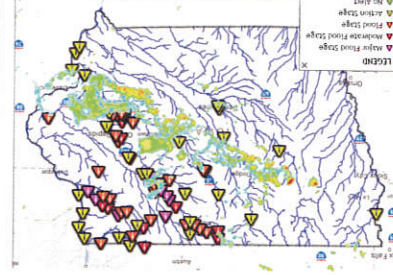
Historic flooding on the Rock River in northwest Iowa devastates treatment plants, and animal feeding operations. More than 700 residents of Rock Rapids have to evacuate their homes.



IFC releases community-based flood inundation maps for Rock Valley and Rock Rapids.



IFC and NASA study soil moisture in agricultural landscapes in the South Fork Watershed. IFC researchers and students participate in the study by comparing data collected by NASA's Soil Moisture Active Passive (SMAP) satellite to information gathered on the ground.



A series of rare winter rainstorms causes more than 100 flood alerts in Iowa. Flooding in Iowa, Missouri, Illinois, and Arkansas forces thousands to abandon their homes, and more than 20 people lose their lives.



In January, Iowa receives a \$97M grant for the Iowa Watershed Approach (IWA) through HUD and Rockefeller Foundation's National Disaster Resilience Competition. Iowa receives the fourth highest grant award out of 14 recipients.

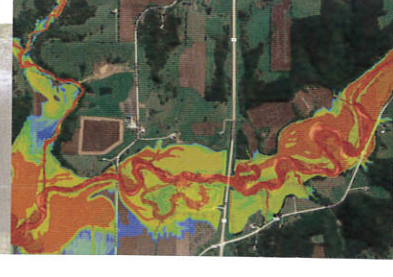
The IWA works in nine watersheds to reduce flooding, improve water quality, and build more resilient communities.

IFC crashes during the September flood event due to the high volume of users wanting access to flood information. Over 160,000 people visit IFIS in the span of a few days.

IFC releases community-based flood inundation maps for Red Oak and Monticello.



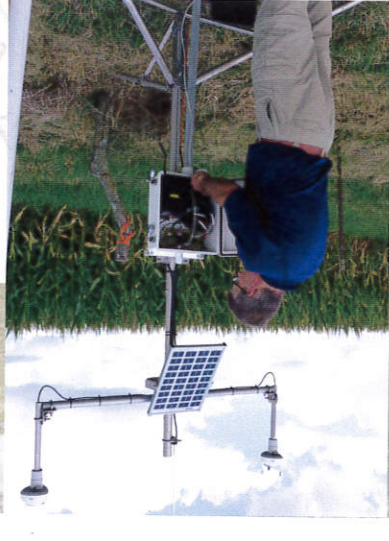
In September, the Cedar River has its second highest crest of 21.95 feet.



IFC releases community-based flood inundation maps for Fort Dodge.



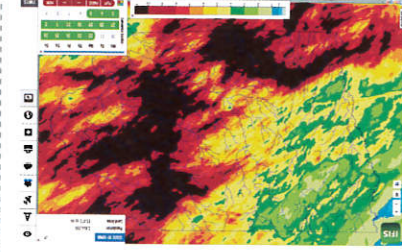
The IFC nearly loses funding in the state budget, but is saved by support from partners across the state. The IFC budget sustains a \$300,000 cut.



IFC deploys 20 new hydrologic weather stations to better measure rainfall, soil moisture and temperature, groundwater levels, and wind speed and direction.

IFC receives over 100 new stream sensor requests from partners across the state. The Iowa Silver Jackets team receives the Association of State Floodplain Managers Award for Excellence in Floodplain Management for the Iowa bridge sensor project.

IFC releases community-based flood inundation maps for Plainfield and Greene.



Iowa has its third wettest fall on record, with precipitation totals almost 10 inches above normal, and 27 counties across northern Iowa experiencing their wettest year on record.

Hurricane Harvey drops two feet of rain in the first 24 hours of the storm, causing catastrophic flooding with damages estimated at \$125 billion in federal relief, affecting 13 million people from Texas to Louisiana, and killing 88 people.

2019



Installation of flood mitigation projects begins in participating IWA watersheds.

IFC staff and students clean up flood debris in April. The Iowa Silver Jackets team receives the Association of State Floodplain Managers National 2019 Tom Lee State Award for Excellence in Floodplain Management for the Iowa bridge sensor project.

IFC releases community-based flood inundation maps for Plainfield and Greene.

2018

A spring bomb cyclone strikes the Midwest and causes historic flooding on the Missouri River, breaching 62 levees and causing an estimated \$1.6B in damages. The Mississippi River at the Quad Cities sets an all-time record, cresting at 22.63 feet and surpassing flood levels recorded in 1993.

2017

2016

2015

2014

2013

The Iowa Watershed Approach

A VISION FOR IOWA'S FUTURE



BY KATE GIANNINI

Flooding has taken a heavy toll on Iowa, costing residents, businesses, and farmers about \$18 billion over the last 30 years. Iowa ranks fourth in the nation for the number of flood-related Presidential Disaster Declarations. Watershed groups across Iowa are working together to enhance their resilience to flooding.

In 2010, the Iowa Flood Center (IFC) received \$4.5 million for the Iowa Watershed Projects (IWP), a five-year project designed to mitigate flood risk in four select Iowa watersheds.

“I can say with the utmost confidence that without the guidance and partnership of the IFC, the Turkey River WMA (watershed management authority) could not have developed its watershed resiliency plan and implementation of that plan.”

Rod Marlatt, Turkey River WMA chair

Conservation practices such as wetlands help slow down water, reducing flood damages throughout the watershed.



The Soap Creek Watershed in southeast Iowa was part of IWP. For decades, farmers there watched the creek flood almost every time they got a decent rain, taking out crops, topsoil, roads, and bridges. In the 1980s, they banded together to form a watershed board. “There’s only so much dirt,” says Tim Sandeen, farmer and watershed board member. He also has a large pond on his property, one of the 135 conservation structures in the basin.

The Soap Creek project is a success story. New members joined the board, but the vision stayed strong. “We all have the same goals,” says member Jerry Parker.

The IWP project ended in 2016, followed by the \$96.7 million Iowa Watershed Approach (IWA). Both projects received funding from the U.S. Department of Housing and Urban Development to voluntarily engage farmers and others in watersheds across Iowa to build a more flood-resilient state.

The IWA program built upon the successes of IWP. The goals were similar: to reduce flood risk and improve water quality. The participation of IFC staff and other partners continues, as does work with the local watershed management authorities (WMAs). The IFC and local partners complete hydrologic assessments to understand the watershed characteristics; develop a watershed management plan; and deploy a dense instrumentation network of real-time weather, stream, and soil- and water-quality sensors to track watershed conditions. At the conclusion, watersheds will have conservation infrastructure to mitigate flood damages and protect communities.

IWA works in nine watersheds across Iowa, including three urban areas. Seven project

coordinators work directly with stakeholders, develop long-term watershed plans, and build community flood resilience.

New One-of-a-Kind Model

IFC researchers conducted a hydrologic assessment of each watershed to understand the hydrology, assess flood and water-quality risks, and evaluate scenarios to maximize results.

To complete this assessment, they developed a new model, the only one of its kind, to simulate the hydrologic response in the watersheds over time periods on the order of decades — the Generic Hydrologic Overland-Subsurface Toolkit, or GHOST. This model takes into account Iowa’s varied topography, soils, and land use. GHOST fully couples surface and subsurface water systems to predict streamflow and groundwater movement.

Researchers identified areas with high runoff potential and ran simulations to understand the potential impact of flood mitigation strategies in the watershed. In addition, they wanted to understand the consequences of projected increases in heavy downpours in the Midwest. They placed the focus of the scenarios on understanding the impacts of: (1) increasing infiltration in the watershed; and (2) implementing a system of distributed storage projects (ponds) across the landscape.

In Phase II of IWA, IFC will evaluate the built projects and make recommendations to guide future watershed planning and implementation activities. They will also use information collected from the dense instrumentation network to track project benefits before and after implementation. The sensor data are publicly available on the Iowa Flood Information System (IFIS), an online tool that provides real-time information on watersheds, precipitation, and stream levels.

Building Community Resilience

Through the IWA Flood Resilience Program, partners are working to help communities improve hazard mitigation efforts and disaster recovery plans. Community flood resilience is defined as the ability of a community to prepare for, respond to, and recover from floods. Funding through federal disaster assistance programs is often contingent on having such a plan in place. The IWA resilience team

iowawatersheadapproach.org

“This is above and beyond what used to be considered normal, but I guess maybe this is the new normal.”

Scott Hansen, Benton County emergency management coordinator, speaking about the 2016 floods along the Cedar River.



will work with watershed communities to lower the barriers to effective hazard mitigation planning, particularly for floods, so communities will be eligible when funds become available.

The IWA Flood Resilience Team has engaged residents, organizations, and local officials to develop flood resiliency action plans.

Iowans like these folks in Vinton have had to learn to live with recurrent flooding.

Dubuque Enhances Its Resilience

The city of Dubuque is improving hundreds of housing units with \$8.4 million in forgivable loans. This program prioritizes properties where repetitive flooding has occurred and that are occupied by low- to moderate-income residents. Renovations and repairs to the homes and surrounding stormwater systems will reduce health and safety issues.

“We look at all the challenges a family might encounter,” says Sharon Gaul, resiliency coordinator for the Bee Branch Healthy Homes Program.



THE FUTURE OF FLOODING IS NOW

BY BREANNA SHEA

ABOVE: 2019 Missouri River floodwaters completely submerge the town of Pacific Junction, Iowa.

Floods in Iowa are changing. We have entered a period of more widespread extreme rainfall, with storms projected to double in intensity by 2050. Back-to-back flooding in 2018 and 2019 has left Iowa battered and soggy. Last year was Iowa's second wettest on record. Statewide average precipitation was almost 10 inches above normal, and 27 counties across northern Iowa experienced their wettest year ever (2018 IDNR Water Summary). On June 30, 2018, Polk County received 8+ inches of rain in less than 24 hours, damaging more than 1,000 properties. From the end of August through October, Iowans dealt with repeated rainfall and ongoing flood threats for weeks, ranking as the third wettest fall. Iowa received a Presidential Disaster Declaration for 30 counties impacted by these events.

"It was an exceptional rainfall year, but these types of flood events can happen anytime and

anywhere in Iowa," says Iowa Flood Center (IFC) Director Witold Krajewski. This was evidenced by spring flooding that began in March 2019. Saturated and frozen soils, melting snowpack, ice jams, and additional precipitation created the perfect storm for devastating flood conditions that impacted dozens of communities across Iowa. Thousands of Iowans lost everything as floodwaters swallowed up and swept away homes, businesses, and livelihoods. At press time, 60 Iowa counties were included in the state's Presidential Disaster Declaration. Recovery costs so far are estimated at over \$1.6 billion based on damages to homes, businesses, agriculture, infrastructure, and levees. It could take communities decades to fully recover from these flood impacts, and individuals may never completely heal from the emotional trauma of the disaster.

"These conditions remind me of 2008," says Krajewski. The historic 2008 floods caused an estimated \$10.9 billion (based on 2018 dollars) in damages, and a Presidential Disaster Declaration was issued for 85 of Iowa's 99 counties. Federal Emergency Management Agency (FEMA) data show that Iowa is near the top nationally in flood-related Presidential Disaster Declarations, a reputation that most Iowans would just as soon have disappear.

The IFC's Antonio Arenas studied the FEMA data, which reveal that the impact of floods in Iowa is even more serious than it is nationwide. Between 1988 and 2016, Iowa received nearly 1,000 flood-related Presidential Disaster Declarations. During this 30-year period, no Iowa county has escaped with fewer than four flood-related presidential disasters, a trend that is only increasing. Clayton County in northeast Iowa experienced 17 disaster declarations from flooding during this time period.

When asked about Iowa's investment in proactive flood mitigation and how best to address the floods, Arenas replied, "The cost of doing nothing is not zero."

Iowa's financial losses due to flooding are huge. Estimates from a University of South Carolina database (SHELDUS) report \$13.5 billion in direct flood-related property losses in Iowa from 1988–2015. Seven of the 10 Iowa counties bordering the Mississippi River sustained property losses exceeding \$100 million.

As an agricultural state, Iowa's crops are also significantly impacted by floods. From 1988–2015, direct crop losses from flooding totaled \$4.1 billion. Marshall County has the highest crop losses in the state at about \$300 million.

Research reveals floods are increasing in frequency across the Midwest, and IFC experts are helping to reduce these flood impacts.

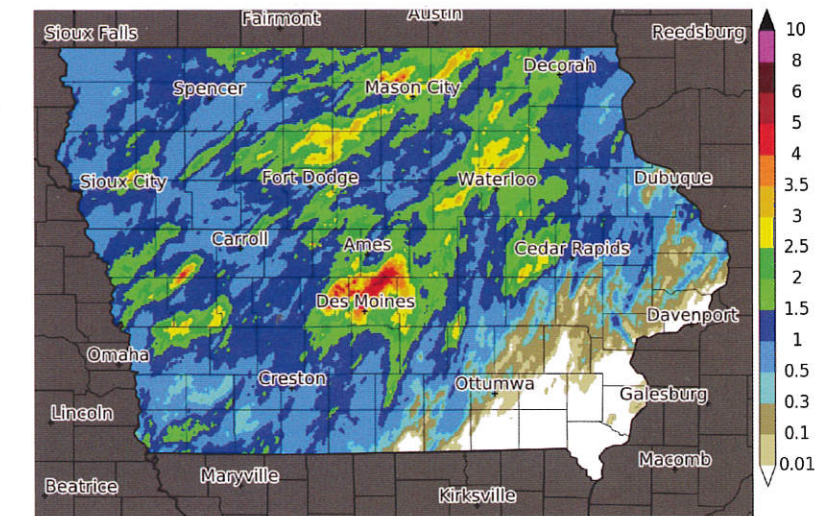
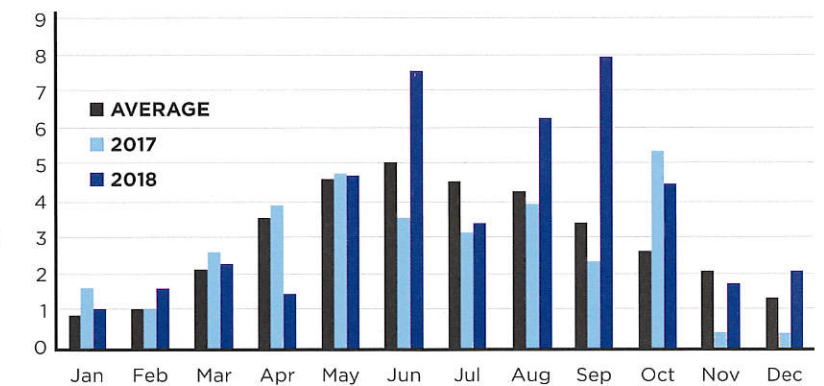
"We cannot stop the floods, but we can provide people with information to help them make informed decisions about the actions they should take when water levels begin to rise," says Krajewski. "During these intense flood events, we stay in close contact with the state agencies we partner with, including the National Weather Service, U.S. Geological Survey, Homeland Security and Emergency Management, and U.S. Army Corps of Engineers," he says. "We've built great working relationships with these entities. Together, we can better serve Iowans."

Flood control and mitigation are expensive, but reacting to disasters after they occur is even more costly—in dollars (think billions), lost economic potential, and even lives. Taxpayers ultimately foot the bill.

"State support for the Iowa Flood Center costs Iowans only about 50 cents per person each year ... The IFC is a proactive investment that repays Iowans many, many times over," says Krajewski.

The future of flooding is now—and IFC's team of dedicated experts stands ready to serve. IFC is helping Iowans adapt to the changing flood season by providing creative, innovative solutions to keep us ahead of the next flood. ■

STATEWIDE MONTHLY PRECIPITATION (INCHES)



Polk County extreme rainfall event, June 30–July 1, 2018 (Iowa Environmental Mesonet).

What's Your Flood Story?

BY JACQUELINE HARTLING STOLZE

Every Iowan has a flood story, and Iowa legislators are no exception. At the Iowa Flood Center's (IFC) Legislative Breakfast at the Iowa State Capitol on March 5, we asked legislators and others to tell us their flood stories.

In June 2018, flash flooding in Mason City damaged the homes of at least half the city's residents. Senator Amanda Ragan said that the IFC's Iowa Flood Information System (IFIS) was an important tool for her constituents. "You did good things for them," she said. Looking around the room at the IFC's flood maps and informational displays, she added, "You just realize all the research that's gone into this, which is now at our finger tips. ... It's really helpful. It may not stop anything, but we have ideas on how to handle situations, and to be aware of what's coming for us."

Bremer County Emergency Management Coordinator Kip Ladage was at the event as well. "Flooding is a big issue," Ladage said. "It's getting worse every year." IFIS tools are an important resource for him in his efforts to keep the people of his county safe from flooding. "IFIS and some of the new things that I'm seeing are outstanding. We do use them regularly."

Senator Liz Mathis lived in Cedar Rapids in 2008. Her family's business was at the base of the Alliant Tower near the Cedar River. "We sustained about 10 feet of water damage," she said. "We have a famous — or maybe an infamous — flood level line painted on the wall. It still makes for interesting stories." More than a decade later, Cedar Rapids is back, and better than ever, Mathis said. "It was unifying, and people knew that we had to hook arms and go in the same direction. Otherwise it was going to be more disaster for us." She is a believer in the work of the IFC. "I think you're more important now than ever before," Mathis said. People have experienced what flooding can do, she explained, and they appreciate the information the IFC provides.

Senator Dan Zumbach represents District 48, which includes the Manchester area. Northeast Iowa

endured record flooding in 2018. He owns property along the Cedar River that is affected almost every time it floods. He watches the nearby USGS gauge (data provided on IFIS) to keep tabs on the rising water. "We watch it really closely," he said, "especially during the spring season."

Thanks to everyone who stopped by the IFC's Legislative Breakfast! We look forward to working with all of our dedicated partners in the years ahead. ■



IIHR — Hydrosience & Engineering Director Gabriele Villarini (right) demonstrates IFIS at the Legislative Breakfast to Representative Cindy Winkler.



Overheard

"IIHR feels like family, only smarter."

Dan Gilles, IFC water resource engineer

"Any time Texas follows Iowa, it is a good day in Iowa."

IFC Director Witold Krajewski

"The Iowa Flood Center is a tremendous asset that is helping fill gaps in the ability to predict impacts of floods on local communities."

Louis Uccellini, director, National Weather Service

"I have just one more question ..."

Marian Muste, IFC research engineer

"Currently, there is only one state that has taken the step that I hope our state will take to seriously address this floodwater problem that we must tackle. That state is Iowa."

South Carolina Governor Henry McMaster

"We [at the Iowa Flood Center] are not going anywhere. We are your partners. Don't forget about us—we won't forget about you."

Antonio Arenas, IFC research engineer

"Let's get to work!"

IFC Director Witold Krajewski

"Of course, the weather man is wrong every once in a while, but who isn't?"

Ricardo Mantilla, IFC flood forecaster

"The stream gauge sensors are very helpful to fill in the gaps where USGS gauges don't exist... Inundation maps have proven to be invaluable."

Justin Gehrts, meteorologist, KCRG TV-Cedar Rapids

"The IFC's importance to river communities can't be overstated. Its value vastly exceeds its budget."

Cedar Rapids Gazette editorial

Flood Response: 'We Know What's Coming'

BY JACQUELINE HARTLING STOLZE

In September 2016, people in Independence, Iowa, were preparing for the worst. Rainstorms of 10 inches or more had drenched northeast Iowa, and the wall of water was headed downstream. Emergency Manager Rick Wulfekuhle knew that Independence was in for another massive flood.

A record-setting flood event in 1999 had taught him valuable lessons, including one moment in particular.

The veteran firefighter watched a hollow-eyed young couple with a baby coming into the office for help. "They were OK," he says. "But literally all they had was the clothes on their backs." The staff turned them away — there was nothing they could do.

Wulfekuhle watched the couple's faces fall. But then a woman stepped up, the wife of the emergency manager at the time. She arranged to open a local store. She bought them diapers, formula, and food.

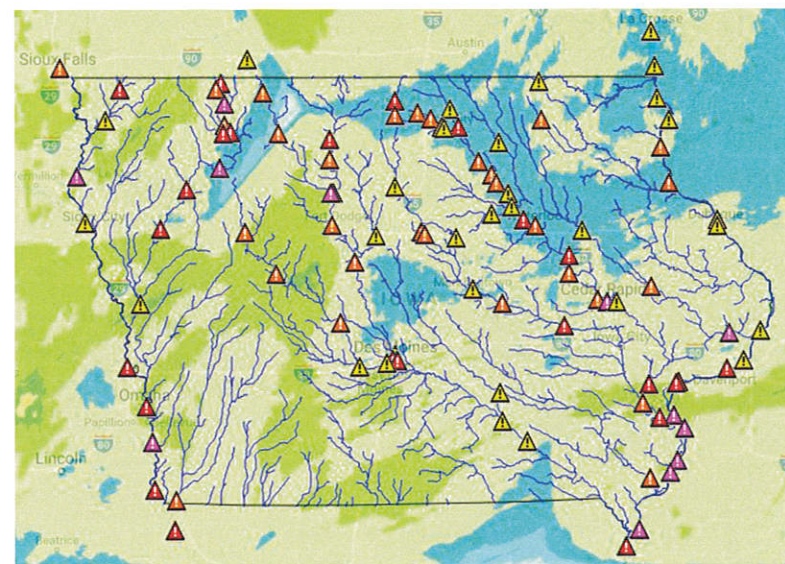
For Wulfekuhle, it was an ah-ha moment. "I knew it was the right thing to do," he says. "First, we can get better at this. We can put better things in place to make sure this doesn't happen. Second, it's about compassion."

'We're Not in it Alone'

Today, Wulfekuhle has experience and resources to make sure people are prepared for flooding. He believes in partnerships, established well in advance of any emergency. He says one of his most valuable partnerships is with the Iowa Flood Center (IFC). Thanks to IFC, he says, "We're not in it alone. ... We know what's coming."

One of the most important tools offered by the IFC is improved flood forecasting for the entire state, all the time available online through the Iowa Flood Information System (IFIS).

"It's all easy access, at our fingertips, and we can get that information out to the public so they don't put themselves in harm's way," Wulfekuhle says.



Out of Harm's Way

Wulfekuhle also appreciates the IFC's flood inundation maps available for Independence. The maps allow users to see what a forecasted river level will mean for their community.

Wulfekuhle recently used the IFC flood inundation maps to convince local officials to reject a new subdivision in one of the most flood-prone areas of the county. In fact, the county had bought out the homes that were there before. "We just can't allow this to happen," Wulfekuhle says. "It's putting people in harm's way." He showed officials that even a minor flood would cut off access to the property.

Thanks to his partnership with the Iowa Flood Center, Wulfekuhle is able to keep the people of his community out of harm's way. He's passionate about his work, and with the Iowa Flood Center, he has the tools and resources to keep people safe from floods. The IFC has established dozens of partnerships like this statewide, making Iowa safer, the Iowa way—together. ■

IFIS provides communities with reliable information, helping them stay alert and prepared before, during, and after floods.

New Hydrostations Support Iowa Farmers

BY KATE GIANNINI

As part of the Iowa Watershed Approach (IWA), the Iowa Flood Center (IFC) has deployed new hydrologic stations that provide real-time weather information that farmers and scientists can use for future flood forecasting and drought monitoring. The stations measure rainfall, wind speed and direction, and soil moisture and temperature. A shallow groundwater well also provides information about the water table. The IFC makes all the data publicly available on the Iowa Flood Information System, an online tool that provides near real-time data on stream levels, flood alerts and forecasts, and weather conditions for the entire state.

With funding from the IWA, the IFC deployed a network of 20 of these hydrologic stations in 2018. The new sensors represent an expansion of the IFC's current network of nearly 50 similar rain gauge stations statewide. This growing network of hydrologic stations is helping the IFC reach its goal of 100 stations deployed in Iowa — at least one in each county. This network will help researchers and stakeholders better predict floods, assess droughts, and manage water resources. In addition, Iowa's farmers can use the information to support their crop management systems and potentially boost yields.

For farmers, timely access to this kind of information is vital. Father and son Stewart and Jared Maas farm about 1,800 acres 25 miles west of Iowa City. Their home farm is the site of one of the new IFC hydrologic stations. "We try to do everything the right way," Jared explains, and data collected by the IFC hydro station can help. As Stewart and Jared prepare for spring fieldwork, they can check the online sensor data to learn when the soil is ready to plant, the best time for field applications, and how to plan for changing weather conditions.

"It helps a lot," Stewart says. One example is the application of fertilizer in the fall. Farmers are encouraged to wait until soil temperatures are 50

degrees F or colder to limit nitrogen loss. Stewart and Jared now have facts on which to base their decisions — a real advantage for big operations like theirs. The data provide peace of mind that they're doing things "the right way."

Stewart has been working with University of Iowa researchers for years. "The university has been really good to us here," Stewart says. "I've got a lot of respect for the hydrology department." ■



Stewart and Jared Maas, a father and son team, host one of the hydrostations deployed through the IWA project on their farm in Iowa County.



Small Towns, Big Flood Problems

BY JACQUELINE HARTLING STOLZE

The Iowa Flood Information System (IFIS) is an evolving web tool that is continually expanding the scope of its features and the communities it covers. IFIS now offers Iowans access to flood inundation maps for 26 Iowa communities, up from 10 communities in 2013. The IFC develops new inundation maps every year, with maps recently released for Plainfield and new maps available for Greene expected by the end of 2019.

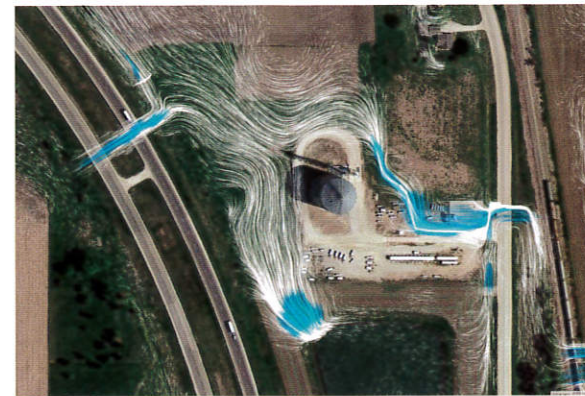
The IFC's goal of providing science-based flood information for Iowans includes serving some of the state's smallest towns. One example is Plainfield, which endured a rare fall flood in 2016. Plainfield and other communities can use IFIS flood inundation maps to simulate flood events and visualize the potential extent of flooding at a range of river levels. This information allows homeowners, business owners, and others to see how predicted flood levels might affect their property so they can make sound mitigation decisions.

Plainfield officials also requested IFC assistance to help find solutions to several water problems. The IFC sent engineer Dan Gilles to model the flow of water through the community. Storm water movement modeling software allowed him to simulate water flows in Plainfield. He also used LiDAR (laser radar) data to create a model of overland flow. "IFC assistance has been instrumental in moving forward with possible mitigation efforts to prevent and minimize future flooding," said Kip Ladage with Bremer County emergency management.

Gilles used the modeling results to write a report recommending mitigation projects for Plainfield to help city officials get funding for the projects. IFC engineers have also worked with officials from Kalona, Clarksville, and other small communities to solve complex water issues.

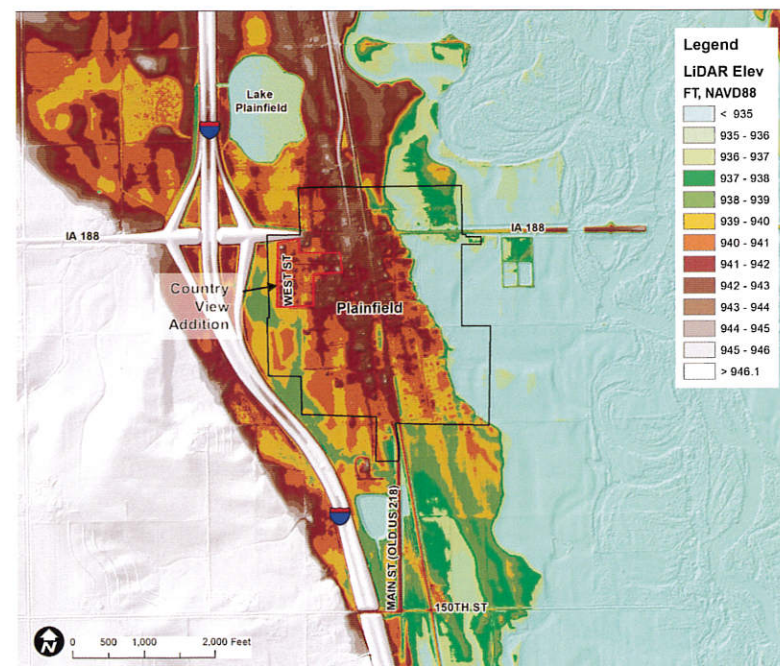
IFIS includes a full set of flood inundation maps for the following communities: Ames, Cedar

Rapids, Charles City, Clarksville, Columbus Junction, Des Moines, Elkader, Fort Dodge, Hills, Humboldt, Independence, Iowa City, Kalona, Lake Red Rock, Manchester, Maquoketa, Mason City, Monticello, Ottumwa, Plainfield, Red Oak, Rock Rapids, Rock Valley, Spencer, Waterloo/Cedar Falls, and Waverly. ■



LEFT: IFC researchers can map how flow moves over the landscape using computer modeling and sophisticated visualizations.

BELOW: LiDAR data allow complex mapping of the landscape's topography in support of flood modeling and mapping. This image shows a LiDAR map of Plainfield.



Educating the Future

BY JACQUELINE HARTLING STOLZE

"Inspire Day" brought a small army of fifth graders to the Norman Borlaug Boyhood Farm near Cresco, Iowa, on Sept. 25, 2018, to learn about Borlaug's efforts to alleviate world hunger, as well as lessons in history and math.

Ponds and flooded fields dotted the countryside around the farm after record-breaking rainfall earlier in the month. It was the perfect day to learn about flooding. Students crowded around the Iowa Flood Center's (IFC) tabletop watershed model for a demonstration on watersheds and flooding. The students cheered as toy cars and Monopoly-style houses floated downstream after the IFC's Breanna Shea poured pitcher after pitcher of water over the model.

"Students like these are the future," Shea explained. "Education is important so that we prepare them for some of the challenging decisions they'll be faced with as adults."

Shea said that the model offers a fun way to help students realize that everyone lives in a watershed — the first step to understanding how flooding works.

"I definitely learned about all the work the flood center does," said Landon Marr, a fifth-grade student from New Hampton. "I think it's really cool!"

IFC staff and students participate in dozens of outreach events each year, ranging from STEM (science, technology, engineering, and math) festivals to K-12 classroom presentations to professional meetings and conferences. In 2018, IFC representatives traveled well over 11,000 miles going to different events statewide.

In 2019, IFC representatives will participate in more outreach events than ever before, including participation at the Iowa State Association of Counties annual conference, the Iowa League of Cities annual meeting, and many more. Watch for the IFC at an event near you! ■



TOP: Fifth graders watch a demonstration of water flow through the landscape on the IFC's tabletop watershed model. "I think it's really cool!" says Landon Marr, a student from New Hampton.

BOTTOM: Breanna Shea demonstrates an interactive watershed model to a group of students at Garner Elementary in North Liberty, Iowa.

Following Iowa's Lead: Big Sioux River Flood Information System

BY MIKAEL MULUGETA

In late 2018, the South Dakota Department of Environmental and Natural Resources (DENR) launched an online flood information system modeled on the system developed by the Iowa Flood Center.

The Iowa Flood Information System (IFIS) is a one-stop web platform that allows Iowans to track flood conditions, view forecasts and community maps, and more. The newly unveiled Big Sioux River Flood Information System (BSRFIS) is the first large-scale implementation of an IFIS-like system in another state.

The project began in 2016, when DENR officials expressed interest in creating a flood information system for the Big Sioux River Basin to enhance flood response and preparedness. Officials wanted flood forecasting models, inundation maps, and community maps for their system, and cited IFIS as an existing system that matched their vision. IFC Director Witold Krajewski jumped at the opportunity to get involved in a project to map the Big Sioux River, which feeds into rivers in northwest Iowa.

The IFC and DENR collaborated with RESPEC, a private engineering company, to develop BSRFIS. IFC staff completed the cyber components of the project because BSRFIS uses most of the infrastructure and code from IFIS. RESPEC and other sub-contractors handled modeling and mapping. In late 2018, the DENR launched the completed system, which includes five community maps, rainfall forecasts, weather conditions, and other features. IFC is under contract to provide maintenance support for the BSRFIS.

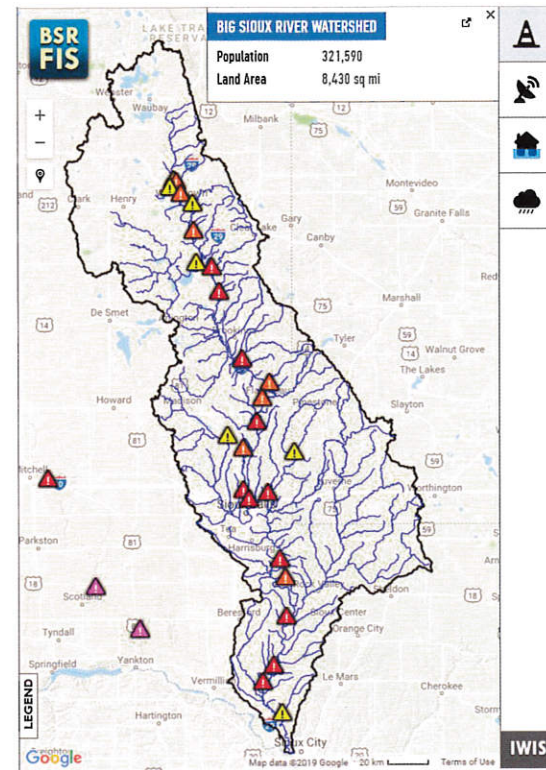
Following the success of this project, the IFC is looking to pursue similar joint projects in the future.

"We're always looking for opportunities to spread what we know and take on projects like this," says IFC researcher Ibrahim Demir, the primary architect

of IFIS and BSRFIS. "If an organization or agency requests this, we'll always consider collaborating."

Krajewski also notes that projects in neighboring states such as Nebraska, Missouri, Kansas, and Illinois will be a topic of discussion moving forward. For the time being, Krajewski says it's an encouraging development that an outside agency has recognized the strength of IFIS. BSRFIS also recently won the 2018 Outstanding Engineering Achievement Award from the South Dakota Engineering Society.

"I think this project serves as an acknowledgement of a job we did well. They recognized the value of IFIS, and wanted a system like it for themselves," Krajewski says. "That made us feel proud of the work we've done."



The IFC-designed BSRFIS won the 2018 Outstanding Engineering Achievement Award from the South Dakota Engineering Society Eastern Chapter. The South Dakota system is based on IFIS, the Iowa Flood Information System.



TOP: A tour of farm ponds for flood control in southeast Iowa's Soap Creek Watershed.

CENTER: The Iowa Flood Center welcomed Iowa National Guard Deputy Commanding General-Operations Steve Warnstadt and his team for a meeting at Stanley Hydraulics Lab.

BOTTOM: IFC's success is driven by a motivated team of over 50 researchers, staff, and students.



Thank you!

We hope you've enjoyed the stories in our magazine, and that you'll continue to use and share the tools and resources of the Iowa Flood Center. As proud as we are of the work of the IFC, we'd like to acknowledge the important contributions of our many partners statewide, starting with the Iowa legislators who made it all possible with their visionary work to establish the center in 2009. We're also delighted to thank the many agencies, entities, and individuals we work with statewide — these partnerships are essential to the IFC and allow us to do more and extend our reach to every corner of the state. Finally, we'd like to thank the people of Iowa for responding so positively to the IFC and for making the center their own. If we've achieved anything in our efforts to make Iowa more flood-resilient (and we have!), it's because we've done it the Iowa way — together.

Thanks again and stay safe!

“I think you’re more important
now than ever before.”

Liz Mathis, Iowa Senator, speaking about the Iowa Flood Center



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