



Iowa's Approach to Reducing Flood Risk

Executive summary

Since 2009, the Iowa Flood Center (IFC) has served as a central authority for communicating and managing flood risk in Iowa. As a national leader in flood science, the IFC provides technical support to many local, state, and federal partners by developing innovative tools and creative strategies to reduce and mitigate flood risks. This case study describes some of the center's major activities and achievements, focusing on the Iowa Watershed Approach and flood-risk data and modeling efforts.

Case study process

The Iowa Flood Center produced this case study of their work to reduce flooding in Iowa. The case study was initiated and supported by the American Flood Coalition, on behalf of the State Resilience Partnership. This executive summary represents the American Flood Coalition's analysis of the full case study.

Iowa Flood Information System

In 2011, IFC launched the Iowa Flood Information System (IFIS) to help Iowans better prepare for floods. A dense monitoring network of nearly 300 IFC-deployed stream-stage sensors and roughly 150 U.S. Geological Survey gauges update river-level information on IFIS in real-time. This online tool puts critical information in the hands of emergency responders, decisionmakers, community leaders, and home- business- and landowners. The IFC is continuing to expand the sensor network to improve the system's prediction and mapping of future flood hazards.

Iowa Watershed Approach

In 2016, IFC developed the Iowa Watershed Approach (IWA). The program set up watershed management authorities in nine watersheds across the state to develop a replicable model for other communities where the landscape has lost its natural resilience to floods. The goals of the IWA included reducing flood risk and improving water quality by carrying out upstream projects, and enhancing community flood resilience through collaboration, outreach, and education. Throughout the lifecycle of the IWA, Iowa built nearly 700 flood risk reduction and water quality projects, and invested over \$40 million in land conservation.

Overall, results show that significant additional resources are needed to continue implementing best practices to have a meaningful impact on reducing flooding and improving water quality. The IWA was constrained by its project timeline and lack of sustainable funding to continue working toward a longer-term vision. States looking to the IWA as a model framework need to consider how to protect and enhance the investment in this type of program. As of early 2023, the State of Iowa and the Iowa Flood Center are still working to secure funding for the continuation of the IWA and watershed management authorities.

IOWA



Iowa Flood Center

IOWA'S APPROACH TO REDUCING FLOOD RISK

A case study of Iowa's approach to reducing flood risk through monitoring, modeling, mitigation, and community outreach to provide state-level decision-makers and agency personnel with a successful model framework.

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ACKNOWLEDGEMENTS

IHR—Hydrosience and Engineering and the Iowa Flood Center would like to thank the American Flood Coalition for initiating and supporting the development of this case study. This report provides an overview of Iowa’s approach to flood risk reduction, which includes monitoring, modeling, mitigation, and community outreach to provide state-level decision-makers and agency personnel with a successful model framework based on the Iowa Watershed Approach (IWA) program.

The IWA is an adaptive framework that has transformed integrated watershed management in Iowa and beyond. The success of the IWA depends on collaborative partnerships among local, state, and federal partners, who together carry out the work necessary to achieve the program goals. Partners include but are not limited to the U.S. Department of Housing and Urban Development; Iowa Economic Development Authority; Iowa Homeland Security and Emergency Management; University of Iowa; Iowa State University; University of Northern Iowa; Iowa Department of Natural Resources; Iowa Department of Agriculture and Land Stewardship; cities of Coralville, Dubuque, and Storm Lake; and many Iowa counties and private contractors. These partnerships have evolved to support many other projects outside of the Iowa Watershed Approach.



CREATION OF THE IOWA FLOOD CENTER



Figure 1. The 2008 flood in Cedar Rapids, Iowa described as an “epic surge.”

After the record-breaking Iowa flood of 2008, 85 of the state’s 99 counties were declared as federal disaster areas. Many consecutive days of heavy rainfall had led to flood damages across the state estimated at \$10 billion; one local government official described the event as “Iowa’s Katrina.” In Cedar Rapids, the Cedar River crested at 31.12 feet, shattering the previous record of 20 feet. The river rose 19 feet above flood level, inundating 10 square miles of the city. Clean-up crews removed nearly 42,000 tons of flood debris and demolished 1,300 properties. The floodwaters dislocated about 18,000 residents and flooded critical infrastructure, including the primary hospital, fire station, library, and police station.

Iowans lacked access to critical information to help them understand, plan, and prepare for the 2008 flood and to mitigate their flood risk. In response, Iowa legislators established the Iowa Flood Center (IFC) at the University of Iowa in 2009 with the mission of:

- Developing hydrologic models for physically-based flood frequency estimation and real-time forecasting of floods, including hydraulic models of floodplain inundation mapping;
- Establishing community-based programs to improve flood monitoring and prediction along Iowa’s major waterways and to support ongoing flood research;
- Sharing the resources and expertise of the Iowa Flood Center;

- Assisting in the development of a knowledgeable workforce in the state with expertise in flood research, prediction, and mitigation strategies; and
- Conducting activities in cooperation with various state and federal agencies.

The Iowa Flood Center is a unit of IIHR—Hydroscience and Engineering (IIHR), a 103-year-old research institute within the University of Iowa College of Engineering. IIHR is a world-renowned center for education, research, and public service dedicated to providing innovative solutions to solve our world's greatest water resource challenges. At IIHR, students, staff, faculty members, and research engineers work together to understand how water impacts the built and natural environment. IIHR's expertise made it the natural home for the Iowa Flood Center (IFC), the nation's first and only academic center devoted solely to flood-related research and education. The Iowa Flood Center provides science-based information to help Iowans understand and reduce current and future flood risks. The IFC receives an annual state appropriation of \$1.1 million and has leveraged its base funding to secure more than \$50 million in additional state and federal support for specialized research projects and initiatives.

In 2010, the Iowa Flood Center became more actively involved in watershed management across the state, serving as a technical resource to provide local stakeholders with nature-based flood mitigation and water quality improvement strategies. With IFC's leadership and expertise, this successful framework has grown and is now known as the Iowa Watershed Approach (IWA), a vision for Iowa's future that voluntarily engages stakeholders throughout the watershed to achieve common goals, while moving toward a more resilient state.

As a national leader in flood science, the IFC provides technical support to many local, state, and federal partners by developing innovative tools and creative strategies that are reducing and mitigating flood risks. This case study describes some of the center's major activities and achievements, focusing on the Iowa Watershed Approach and flood-risk data and modeling efforts.

Reliable Information

In 2011, IFC launched the Iowa Flood Information System (IFIS) to help Iowans be better prepared for floods. This online tool puts critical information in the hands of emergency responders, decision-makers, community leaders, home- and business-owners, and landowners. IFIS' cutting-edge design and technical capabilities are built on a user-friendly Google Maps-based web-platform that is freely accessible to anyone; IFIS provides real-time flood information with just a few clicks.

A dense monitoring network of nearly 300 stream-stage sensors that was designed, built, and deployed by IFC researchers updates river-level information on IFIS in real-time. The sensors use ultrasonic technology to collect stage data, which are transmitted to IFIS using cell modem-based communication. The stream sensor network complements about 150 U.S. Geological Survey (USGS) gages by filling in data gaps to improve flood monitoring and forecasting. IFIS also collects hydrologic data on precipitation, soil moisture and temperature, and groundwater levels in shallow wells from about 20 state-of-the-art hydrostations built and deployed by IFC through the Iowa Watershed Approach program. In 2023, the IFC will



Figure 2. IFC stream-stage sensor in action.

deploy 30 new hydrostations in Eastern Iowa to better predict floods, assess droughts, and manage Iowa's water resources. The hydrostation network expansion is supported by Congress' Community Project Funding package and gets the IFC halfway to its goal of having one station in every Iowa county.

IFIS harvests hydrological and meteorological data provided by the USGS, National Weather Service (NWS), U.S. Army Corps of Engineers (USACE), and other groups, making Iowa home to one of the densest flood-risk data 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, where they are displayed for users to easily understand, interpret, and apply to mitigate real-life flood impacts. Since its creation, the system has had over 4 million pageviews from users looking for reliable flood information, with thousands more users accessing the system every day.

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

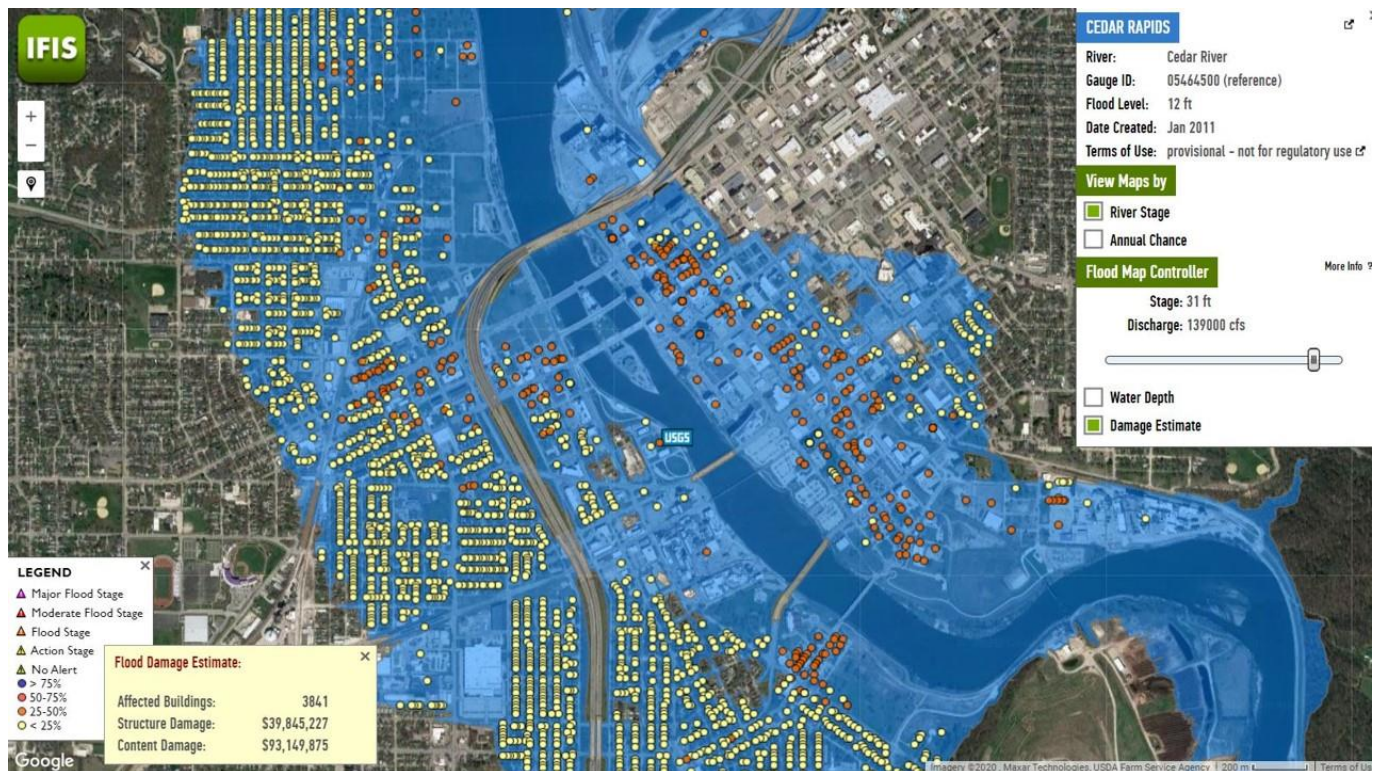


Figure 3. IFIS community-based flood inundation maps for the city of Cedar Rapids visualizing the extent of floodwaters and associated damage estimates under a 2008 flood scenario.

In 2016, the Cedar River in Cedar Rapids had its second-highest crest of 22 feet. Using flood inundation maps available in IFIS, emergency responders and city officials were able to make proactive decisions to protect areas of the city threatened by forecasted flood levels. The city deployed over 12 miles of HESCO barriers before the river crested, greatly reducing the flood impacts and damages.

The Iowa Flood Center celebrated the completion of the Statewide Floodplain Mapping Project in 2016, a \$15 million project to update floodplain maps for all 99 counties in Iowa. The project was a collaboration that included the IFC, Iowa Department of Natural Resources (DNR), USACE, Federal Emergency Management Agency, and Iowa Natural Heritage Foundation. IFC researchers used laser radar (LiDAR) data provided by Iowa DNR to map all streams draining more than one square mile. This LiDAR remote-sensing technology allowed researchers to precisely map Iowa's river and stream network, develop computer-based simulations, and delineate floodplains with reasonable accuracy. The maps define the boundaries of the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year floods and are accessible in IFIS. Upon review and approval, FEMA may adopt them as regulatory maps.

A detailed description of IFC flood mapping methodologies is described in the "Flood Mapping" section of [this paper](#).

IFC's real-time flood forecasting system ingests rainfall, evapotranspiration, and runoff information into a distributed model and outputs 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.



The Iowa Flood Center has much more detailed information that we're able to see in real-time...it's our eyes and ears."

-Sandy Pumphrey, (former) city of Cedar Rapids Engineer

The IFIS structure allows other state and regional institutions to easily develop similar systems for transferring knowledge and disseminating flood-related data and information to the public. [This paper](#) provides an overview of the design and capabilities of the IFIS developed as a platform to provide one-stop access to flood-related information.

The IFC's advanced technical capabilities, which are tied to its mission, are also critical components to improving watershed management across the state through the Iowa Watershed Approach (IWA).

IOWA WATERSHEDS PROJECT

In 2010, Iowa received \$84.1 million from the U.S. Department of Housing and Urban Development (HUD) to support ongoing disaster recovery programs following the 2008 floods. Of that allocation, \$10 million was for watershed demonstration projects to reduce flooding and for educational programming. The IFC received \$8.8 million to lead a pilot program called the Iowa Watersheds Project (IWP), which was designed to evaluate and implement flood mitigation practices in five select Iowa watersheds; \$800,000 was used to establish the first watershed management authorities (WMA) in Iowa.

In 2010, Iowa lawmakers passed legislation authorizing the creation of watershed management authorities. A WMA brings together representatives from cities, counties, soil and water conservation districts, and other stakeholders, who work together on strategic watershed planning and management activities. The WMA's foster a grass-roots approach for effective and sustainable long-term watershed management in Iowa and serve as catalysts for making change.

In phase one of the IWP, the Iowa Flood Center completed hydrologic assessments and built hydrologic models using the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) for each watershed. These included detailed information to understand the movement of water within the watershed, identify areas with high runoff potential, estimate the watershed response to different rainfall events, quantify the impact of hypothetical flood mitigation scenarios, and identify subwatersheds for the construction of small-scale flood mitigation projects. The hydrologic assessments supported the development of long-term watershed management plans and enhanced the social, economic, and environmental sustainability and resiliency of the watershed. The IFC deployed a dense instrumentation network, including stream sensors and water quality stations, to benchmark current watershed conditions and assist with hydrologic model calibration and validation.

In phase two, the IFC shared recommendations from the hydrologic assessments with the WMAs on the best types of flood mitigation projects and the best locations for them to help the WMAs reach their flood-reduction and water-quality improvement goals. The WMAs found volunteer landowners willing to implement these distributed storage practices, which included ponds, terraces, wetlands, and water-and sediment-control basins. Landowners received 75% cost-share assistance to participate in the program. By the end of the project, the IWP had constructed more than 150 distributed storage practices. The IFC provided technical reports to the WMAs that evaluated the effectiveness of the constructed practices and the project's replicability at a larger scale to guide future watershed management efforts. For these reports, researchers identified a smaller catchment (known as a HUC12 subwatershed) to construct flood mitigation projects and run small-scale hydrologic simulations. IFC researchers evaluated the flood mitigation performance of proposed projects through monitoring and detailed hydrologic modeling.



Figure 4. Farm pond constructed in the Soap Creek Watershed designed to capture runoff and reduce flooding.

LOCAL IMPACT

The Soap Creek Watershed was the first formally recognized watershed board in Iowa. In 1986, a group of local landowners and decision-makers came together to address flooding concerns. In 1988, they had a study completed that identified 154 farm ponds and water detention structures to reduce flooding. Through local efforts and with the support of the Iowa Watersheds project, more than 130 of the identified projects have been built. Modeling results from the Soap Creek Watershed showed a 43% reduction in streamflow at the outlet during a 100-year storm event (7.5 inches of rain in 24 hours) because of the long-term investment in the implementation of farm ponds strategically placed in the upper reaches of the watershed. The added flood storage the farm ponds created provided local counties and communities with significant economic savings in road repairs and maintenance as well as bridge reconstruction costs compared to previous flood events.

The program empowered local governments to come up with their own creative strategies to support flood reduction and water-quality improvement goals. In far Northeast Iowa, Fayette County developed its own policy that considers on-road water retention structures at locations where an existing road, bridge, or culvert has been damaged by flooding. The on-road structures use the roadway embankment as a dam to create temporary flood storage during large precipitation events. The structures are more sustainable and economically feasible than conventional culverts.

IOWA WATERSHED APPROACH

As the Iowa Watersheds Project was concluding in 2016, HUD and the Rockefeller Foundation announced \$1 billion in available funding through the National Disaster Resilience Competition (NDRC); a program through the Community Development Block Grant program motivated by the aftermath of Hurricane Sandy. The competition focused on helping communities and vulnerable populations recover from previous disasters while also improving their resiliency to future extreme events. States that had received a Presidential Disaster Declaration because of a major natural disaster between 2011-2013 were eligible to compete in the NDRC.

From 2011–13, Iowa suffered eight Presidential Disaster Declarations encompassing 73 counties and more than 70% of the state. As devastating as these events were, this period represents only a small portion of Iowa’s long history of enduring and recovering from major floods. Long-term data show that heavy precipitation and flood events are increasing in frequency across the Midwest, and Iowans need to be prepared for economic, social, and environmental impacts spurred by climate change.

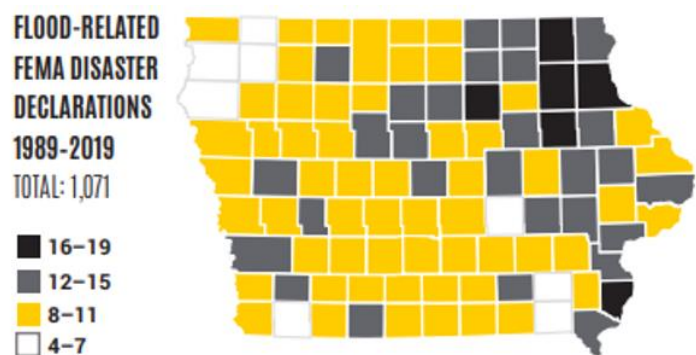


Figure 5. County-level flood-related FEMA disaster declarations between 1989-2019.

Leveraging the experiences and successes of the Iowa Watersheds Project, the Iowa Flood Center led the successful NDRC proposal development on behalf of the state of Iowa. In January 2016, Iowa received the fourth largest NDRC grant award of \$96,887,177 for its proposal titled, “The Iowa Watershed Approach for Urban and Rural Resilience.” The IWA was funded for its holistic approach to the reduction of flooding, the improvement of water

quality, and the development of equitable strategies to increase community resilience to water resource challenges. Based on the Iowa Watersheds Project framework, the IWA brought together local, state, and federal partners, empowering them with science-based information to develop long-term watershed management plans and to guide strategic conservation practice implementation efforts that work progressively with agriculture.

The IWA is a replicable model for other communities where the landscape has lost its natural resilience to floods. The goals of the IWA include:

- Reduction of flood risk;
- Improvement of water quality;
- Enhancement of community flood resilience;
- Engagement of stakeholders through collaboration, outreach, and education;
- Improvement in the quality of life and health for Iowans, especially for vulnerable populations; and
- Development of a program that is scalable throughout the Midwest and the United States.

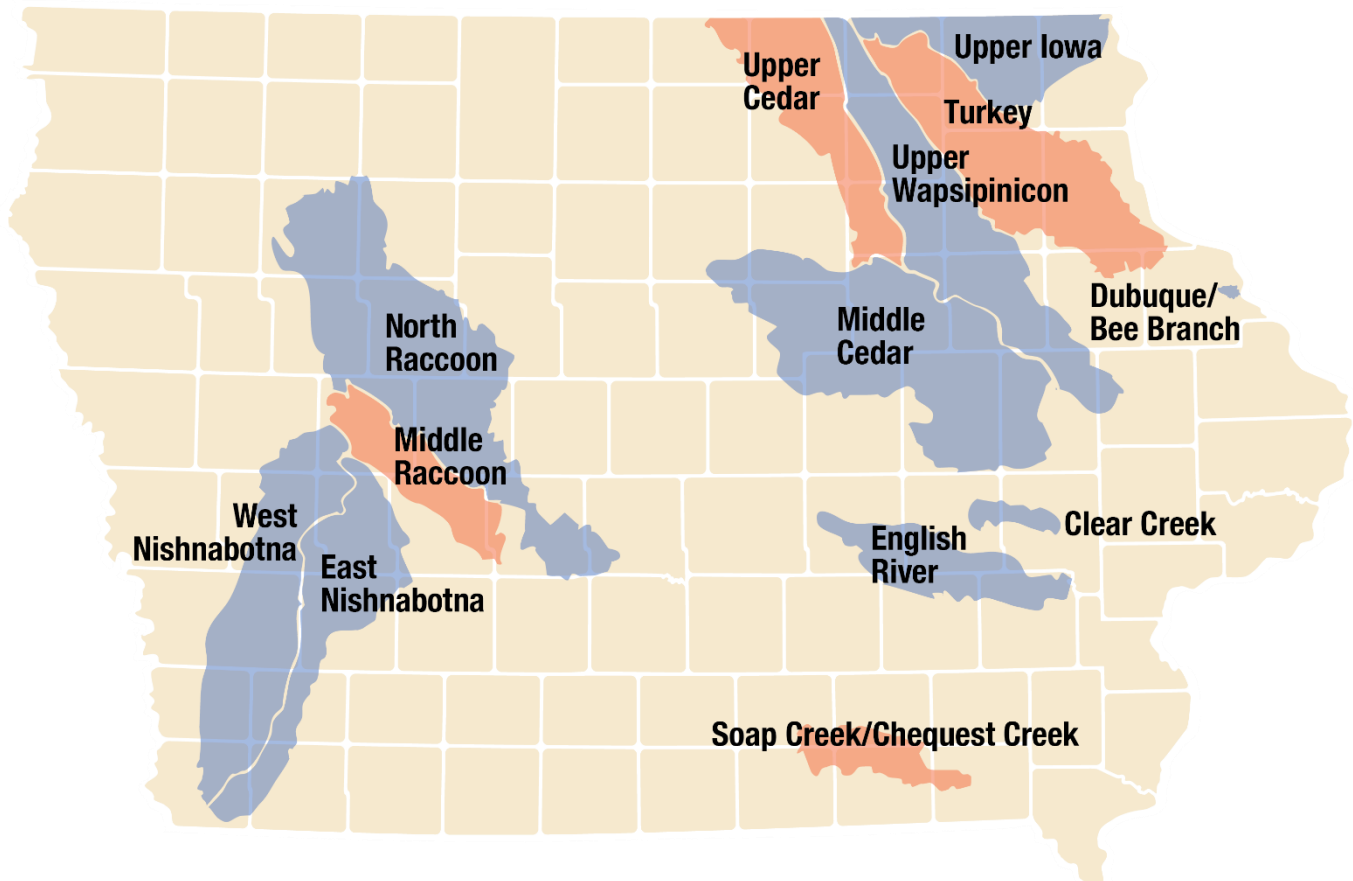


Figure 6. Iowa Watersheds Project (2010-2016) participating watersheds in red, and Iowa Watershed Approach (2016-2022) participating watersheds in blue.

Nine distinct watersheds representing different Iowa landforms served as IWA project sites (figure 6). Similar to the Iowa Watersheds Project, each formed a watershed management authority (WMA), developed a hydrologic assessment and watershed plan, and built conservation practices in select subwatersheds to reduce the magnitude

of downstream flooding and to improve water quality during and after flood events. Flood resilience programs were implemented in each watershed to help increase community resilience to future floods.

Like the Iowa Watersheds Project, the Iowa Watershed Approach emphasized the creation of watershed management authorities to carry out the program goals. The WMAs build local capacity and serve as a mechanism to sustain and advance the goals of the IWA program into the future. There are currently 28 WMAs in Iowa. Many were established through the IWP and IWA programs, though others formed on their own, looking to the IWA as a model framework and recognizing the benefits of bringing people together to address water resource concerns.

The IWA funded dedicated project coordinators in each watershed, a critical resource that did not exist in the original Iowa Watersheds Project. The project coordinators served as boots-on-the-ground liaisons between the WMA's, landowners, and project partners. The project coordinators worked with landowners to identify suitable locations on marginal farmland to implement flood mitigation practices such as ponds, terraces, and wetlands to help restore the landscape's ability to absorb heavy rainfall. Volunteer landowners received up to 90% cost-share assistance to implement practices. By the end of the IWA project in December 2022, more than 700 nature-based flood mitigation projects had been completed and \$40 million had been invested in conservation.



Figure 7. The Albert Wetland project installed in the Middle Cedar River Watershed has a drainage area of 112 acres, a pool of 8.5 acres, and an approximate cost of \$148,500.

IWA researchers at IIHR and IFC developed and implemented a new, state-of-the-art watershed-scale hydrologic model, the Generic Hydrologic Overland-Subsurface Toolkit (GHOST), to estimate watershed responses to rainfall events. GHOST considers Iowa's varied topography, soils, and land use to simulate the hydrologic responses at watersheds over time periods on the order of decades. IWA modelers used GHOST to evaluate the flood reduction benefits expected from both nature-based and structural mitigation strategies for all IWA watersheds. This modeling effort included scenarios based on climate change predictions based on mid-century and late 21st-century projections for Iowa and the Midwest as identified in the **Climate Science Special Report**. Researchers modified the model parameters to understand the impacts of increasing infiltration in the watershed and to simulate the flood

reduction benefits of implementing cover crops, native vegetation (e.g., tall-grass prairie), and distributed storage (farm ponds) located in headwater regions of the watersheds. IFC delivered the results to each WMA in a hydrologic assessment report to assist with strategic flood mitigation practice implementation and to support the WMAs' development of long-term watershed management plans to guide future decision-making. The combined cost of hydrologic assessment and modeling activities for all the watersheds was approximately \$1.5 million, ranging from \$150,000 to \$350,000 per watershed depending on the size and availability of existing modeling resources. The reports were shared with the WMA's during the fall of 2019.

GHOST is an open-source model and the code is available for other states upon request through the [Iowa Watershed Approach website](#). Improvements to the model are ongoing.

Further IWA program innovations include the creation of Flood Resilience Action Plans for four select pilot communities (Freeport, Vinton, Quasqueton, and Coralville). These plans connect local partners and stakeholders to improve the use of social resources in watersheds, enhance watershed planning efforts, and increase the awareness and communication of established and novel flood resilience initiatives. More than \$3.5 million was invested in community flood resilience programming. A component of the IWA program also focused on the city of Dubuque's Bee Branch Healthy Homes Resiliency Program, which retrofitted nearly 300 homes with stormwater infrastructure improvements for low-to-moderate income populations costing nearly \$8.5 million. The IWA funded additional stormwater infrastructure improvements in Dubuque, Coralville, and Storm Lake.

RESULTS & RECOMMENDATIONS

The IWA has had a positive impact on people and Iowa's landscape that will leave a lasting impression for generations to come. The program's success is a reflection of the dedication, commitment, and passion of everyone who participated in the program. Working together, nearly 700 projects to reduce floods and improve water quality were built to enhance Iowa's landscape, and over \$40 million was invested in conservation. The IWA's end-of-project tour in June 2022 attracted over 100 people from five states including HUD officials, water resource professionals, state and federal agency staff, engineers, media, IWA partners, and the public. The program has received national awards in recognition of Iowa's leadership and holistic approach to improving flood resilience.

The IWA was able to overcome the challenges of a complex administrative system, significant impacts from ongoing flooding along the Missouri River in 2019, and a global pandemic. A critical component of its success was the inclusion of ongoing program evaluation and assessment activities led by the University of Iowa Center for Evaluation and Assessment (CEA). Throughout the entire project, the CEA carried out a strategic plan for conducting surveys and interviews with project partners, WMA board members, landowners, and project coordinators. These results were used to make important program pivots in real time to address areas of concern, identify resource concerns, and enhance the program's efficiency and effectiveness.

At the end of the project, each WMA received a final report evaluating the effectiveness of constructed flood mitigation projects. Overall, results show that significant additional resources are needed to continue implementing nature-based flood mitigation practices to have a meaningful impact on efforts to reduce flooding and improve water quality. The IWA is constrained by its project timeline and lack of sustainable funding to continue working toward a longer-term vision. When the IWA ended, watershed management authorities across the state were left with limited resources to sustain momentum moving forward and retain stakeholder engagement. The WMAs have few resources to support a project coordinator, assist with administrative costs, address goals and priorities identified in their watershed management plans, and continue to implement flood mitigation and water-quality improvement projects.

As the project was ending, preliminary efforts were underway to work with Iowa legislators and the Governor on an \$800,000 General Fund appropriation to provide the WMA's with a funding source to support a project coordinator who could seek external funding to continue watershed improvement efforts.

States looking to the IWA as a model framework need to consider how to protect and enhance the investment in this type of program. In 2010, more than 60 percent of Iowans voted in support of the **Natural Resources and Outdoor Recreation Trust Fund** which would create a permanent and protected funding source to improve natural resources. However, this has not been accomplished because it would require a state sales tax increase of 3/8ths a cent to fund the Trust. Iowa will never reach its flood-reduction and water-quality goals by relying solely on a voluntary approach to conservation practice adoption. Policy changes backed by science-based information are essential to address current and future flood risks and build more resilient communities.

OUTREACH & FUTURE WORK



Figure 8. In August 2019, the IFC hosted more than 20 delegates from North Carolina, including farmers, elected officials, conservation professionals, and scientists, who came to Iowa to learn about the IWA program and how a similar framework could be adapted in North Carolina. Similarly, the IFC hosted a delegation from Texas in January 2020, who were interested in learning about IFC's activities as their state was rebuilding from Hurricane Harvey and subsequent coastal flooding disasters.

The Iowa Watershed Approach leaves behind a legacy that will support efforts to successfully bring people together at the local, state, and federal levels to leverage resources, exchange ideas, and lead a program driven by science-based data and information. The IFC's interdisciplinary approach to communicating flood information and mitigating flood risk has improved watershed literacy and overall resiliency across the state and beyond. IFC students, staff, and researchers attend dozens of public meetings, WMA board meetings, K-12 student outreach opportunities, conferences, webinars, and legislative events every year, connecting with thousands of Iowans from across the state to help them understand and reduce their flood risks. IFC's robust outreach and education program has earned it the reputation of "being everywhere, all the time."

Though funding for the Iowa Watershed Approach has ended, the framework and partnerships remain. The Iowa Flood Center continues to serve as a resource for watershed management authorities across the state to provide technical support for additional modeling, mapping, and data interpretation as well as assist with outreach and education. The WMAs have also proven to be a significant asset for IFC research initiatives and other grant-funded projects. As a long-time supporter and promoter of WMAs, IFC's leadership team actively engages with policymakers on the importance of finding sustainable funding to support these groups and continue the work of the Iowa Watershed Approach.

Lastly, the Iowa Flood Center strives to maintain and expand partnerships to advance technologies, tools, and resources to communicate and mitigate flood risk. The IFC is part of the new \$360 million NOAA Cooperative Institute for Research to Operations in Hydrology (CIROH), led by the Alabama Water Institute at the University of Alabama. A consortium of partners will work together to address CIROH's mission to build a more water- and weather-ready nation. As a key partner, the University of Iowa will receive up to \$21 million in the first five years of the program to contribute the expertise of IIHR and the Iowa Flood Center to advance the forecasting of floods, droughts, and water quality.



Figure 9. Through partnerships established by the Iowa Watershed Approach, the Iowa Flood Center, Northeast Iowa Resource Conservation & Development, American Flood Coalition, and local partners are exploring the flood reduction benefits of multi-cropping, harvesting more than one crop from the same field in a year. The field site was visited by Congresswoman Ashley Hinson in August 2021.

“ Iowa really knows...They’ve modeled and mapped the state, they have great data visualization tools, and they have really effective outreach and communication. To really have a complete flood approach, you have to do all of those things. ”

-Sam Marie Hermitte, Texas Water Development Board

APPENDIX - LINKS & RESOURCES

WEBSITES

- IIHR—Hydrosience and Engineering – <https://www.iihr.uiowa.edu/>
- Iowa Flood Center – <https://iowafloodcenter.org/>
- Iowa Flood Information System – <https://ifis.iowafloodcenter.org/ifis/>
- Iowa Watershed Approach – <https://iowawatershedapproach.org/>

REPORTS

- Real-time flood forecasting and information system for the state of Iowa – <https://journals.ametsoc.org/view/journals/bams/98/3/bams-d-15-00243.1.xml>
- Iowa Watersheds Project Hydrologic Assessment for the Soap Creek Watershed – <http://iowafloodcenter.org/wp-content/uploads/2018/06/Soap-Creek-Hydrologic-Assessment-Oct-2014.pdf>
- Iowa Watersheds Project Soap Creek Watershed Project Evaluation – http://iowafloodcenter.org/wp-content/uploads/2018/06/SoapCreek_PhaseIIReportFINAL.pdf
- Iowa Watershed Approach Middle Cedar River Hydrologic Assessment Report – http://iowafloodcenter.org/wp-content/uploads/2018/06/SoapCreek_PhaseIIReportFINAL.pdf
- GHOST model report – https://iowawatershedapproach.org/wp-content/uploads/2019/11/GHOST_V02.pdf
- Flood Resilience Action Plan: Guidebook for Planners – https://iowawatershedapproach.org/wp-content/uploads/2021/08/Guidebook_For_Planners_4.3_Version_FINAL_August_26th.pdf
- Quasqueton Flood Resilience Action Plan – https://iowawatershedapproach.org/wp-content/uploads/2021/09/Quasqy_Resilience_Plan_2021_Interactive.pdf

IWA PROGRAM RESOURCES

- Dubuque Bee Branch Health Homes Resiliency Program – <https://www.cityofdubuque.org/2339/Bee-Branch-Healthy-Homes-Resiliency-Prog>
- Iowa Watershed Approach video – <https://www.youtube.com/watch?v=M4yh2PIhPuQ&t=1s>
- Iowa Watershed Approach Story Map – <https://storymaps.arcgis.com/stories/1f5fd6cac60b4fafa7089b9073a8d30f>

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