Summary of Upper Iowa Flood Events

This story was made with <u>Esri's Story Map Journal</u>. <i>Read the interactive version on the web at <u>http://arcg.is/1CTCb0</u>.



Given the size and scale of the UIR Watershed and the river, where rain falls on the landscape within the watersheds greatly impacts how, or if, river levels are influenced at any particular site along the river. The Upper Iowa River contains 8 stream gages that continually monitor stream and river levels. Stream gages help emergency managers, emergency responders, and watershed residents prepare and react to floods in the Upper Iowa River Watershed.

USGS Gaging Stations



UIR_Gages - Points

- IconStyle00
- IconStyle03
- 🟅 default

There are currently seven U.S. Geological Survey (USGS) gauging systems in the UIR watershed (Shown as green dots on the map). Five of them are directly on the UIR, and two of them are located on tributaries, Dry Run Creek and Waterloo Creek. The three with the longest history, those at Bluffton, Decorah and Dorchester, provide the most useful historic information regarding streamflow and flooding but all seven provide useful information. Stream gauging involves three steps, measuring stage, discharge measurement, and stage-discharge relation. Measuring stage involves measuring the current stream height in reference to a constant reference elevation. It continuously measures the depth of the river or stream.

USGS Gaging Stations also measure the amount of discharge from specific stream or river locations. Discharge is the volume of water moving down a stream or river over time, usually measured in cubic feet per second. Lastly, the gages measure the relationship between the stage and the discharge to get the overall flow. Data collected from the gages about the overall flow of the stream or river is used by Cities, County Emergency Managers, and other Emergency Response personnel to predict when floods are coming and help determine response methods. The volume of water can also be analyzed with water quality data to determine the nutrient load carried by the water. These gages are important tools in predicting and measuring UIR flood stages and estimating nutrient loss.

Iowa Flood Center Gages



The Iowa Flood Center (IFC) developed and maintains an Iowa statewide network of stream stage sensor designed to measure stream height and send that data directly to **Iowa Flood Information System (IFIS)**, where views can see data in real time. IFC maintains nearly 250 stream stage sensors across the state, including one on the UIR near Bluffton (Shown as a purple dot). Locations for these sensors where selected in collaboration with local Emergency Managers, County Engineers, and Watershed Management Authorities, the City of Decorah Water Department, and other local and state entities. Unlike the USGS monitoring stations, the IFC monitors only measure stream stage, which doesn't allow for a full analysis of the stream or river during potential flood events. Because IFC monitors are often less expensive they can be placed more readily throughout the watershed in support of the USGS gaging stations.

In conjunction with the USGS Gaging Stations and the Iowa Flood Center Gages, the UIR Watershed contains eight monitors on its streams and rivers continuously collecting data. Using these two gaging systems in combination with each other gives the best cost benefits and the most accurate flood predictions. The more stream sensor data collected over a wide area of the watershed, the more time emergency responders have to prepare for and



Historic Crests of the Upper Iowa River

Given the size and scale of the UIR Watershed and the river, where rain falls on the landscape within the watersheds greatly impacts how, or if, river levels are influenced at any particular site along the river. However, the Dorchester USGS Gauging Station is far enough downstream, close enough to the mouth of the UIR, that it is more consistently impacted by heavy rainfall events occurring in most areas of the UIR Watershed. For example, in 2016, when the community of Freeport, which is located adjacent and just downstream of Decorah, experienced the most destructive flooding in its history, much of the flooding was attributed to rainfall in southern subwatersheds with tributaries that entered into the UIR just below Decorah, upstream, or at, Freeport. So, although the 2016 event is listed as the fourth largest crest recorded in Decorah and Bluffton, the true magnitude of the 2016 event is evident at Dorchester where it was the highest crest ever recorded by almost two feet.

Dorchester

Decorah Bluffton

<u>Bluffton</u>

Historic Crests of the Upper Iowa River

at Dorchester	at Decorah	at Bluffton (1) 18.30 ft on 03/27/1961 (2) 15.49 ft on 06/09/2008		
(1) 24.30 ft on 08/25/2016	(1) 17.90 ft on 06/09/2008			
(2) 22.46 ft on 06/09/2008	(2) 15.20 ft on 05/29/1941			
(3) 22.20 ft on 02/28/1948	(3) 14.35 ft on 08/17/1993	(3) 15.35 ft on 06/21/1954		
(4) 21.80 ft on 05/30/1941	(4) 13.68 ft on 08/24/2016	(4) 14.41 ft on 08/24/2016		
(5) 20.89 ft on 03/05/1937	(5) 13.08 ft on 03/27/1961	(5) 13.56 ft on 06/23/2013		
(6) 20.02 ft on 06/23/2013	(6) 12.31 ft on 06/01/2000	(6) 12.66 ft on 08/22/2007		
(7) 20.00 ft on 08/17/1993	(7) 12.20 ft on 03/17/1945	(7) 12.24 ft on 07/25/2005		
(8) 19.34 ft on 03/07/1950	(8) 12.10 ft on 01/05/1946	(8) 10.54 ft on 09/25/2010		
(9) 19.20 ft on 07/26/1953	(9) 11.85 ft on 02/28/1948	(9) 10.48 ft on 03/24/2011		
(10) 18.95 ft on 09/06/1946	(10) 11.67 ft on 06/23/2013	(10) 10.26 ft on 05/23/2004		

Understanding Flood Probability



The public sometimes misunderstands the probability that flooding will occur or the commonly used flood recurrence intervals. News media have recognized this in recent years noting the following.

"The concept of the "100-year flood" is one of the most misunderstood terms in disaster preparedness" (fivethirtyeight.com)

"The concept of flood recurrence intervals is a classic example of a communication gap that can form between scientists and the public (winscontext.org)."

"As Earth's climate changes, extreme floods now described as "100-year' and "500-year" events are expected to become more frequent. So will the number of times that the public gets confused by those labels. Some experts wonder if it might be time to scrap such terminology. So-called 100-year floods are becoming so common that the metric "is pretty much useless now as a baseline for an extreme event," said Marshall Shepherd, director of the atmospheric sciences program at the University of Georgia and a former president of the American Meteorological Society. "We are in a new normal," he told HuffPost. (huffingtonpost.com)"

So what does it mean when a flood is characterized as a 100-year or 500-year flood. FEMA characterizes floodplains based on the recurrence interval in years, which is characterized by the probability that they will occur in any given year. A ten year flood event has a 10% chance of happening during any time of the year on any given year, a 100 year flood had a 1% chance to occur, and a 500 year flood has a .2% chance of occurring any time during the year. According to Iowa Flood Center modeling, the strength of the flow measured in cubic feet/ second and the height of water during flood events is increasing over the past 50 years, causing increases in the severity of 50, 100 and 500 year floods. These increases in strength of floods are predicted to continue in the next 50 years (Upper Iowa River Watershed Hydrologic Assessment, 2018).

Table: Summary of Peak stages, streamflows and flood probability estimates for the Upper Iowa River Watershed for floods of 2008, 2013, and 2016.

Site Name	Date	Stage (ft)	Streamflow (cfs)	25-yr flood (estimated cfs)	50-yr flood (estimated cfs)	100-yr flood (estimated cfs)	500-yr flood (Estimated cfs)
UIR at Bluffton	06/2008	15.49	<mark>16,600</mark>		Q		
UIR at Bluffton	06/2013	13.56	12,000	16,300	19,300	22,300	29,600
UIR at Bluffton	08/2016	1 <mark>4.4</mark> 1	13,800				
UIR at Decorah	06/2008	17.90 *	34,100				
UIR at Decorah	06/2013	11.67	17,000	19,200	22,800	2 <mark>6,4</mark> 00	35, <mark>300</mark>
UIR at Decorah	08/2016	13.68	19,800				
UIR at Dorchester	06/2008	22.46	31,200		0	(, , , , , , , , , , , , , , , , , , ,	
UIR at Dorchester	06/2013	20.02	25,500	21,800	26,500	31,200	42,800
UIR at Dorchester	08/2016	24.30	38,000				

*Gage record high Blue: stream flow levels above 100-year flood

Flooding in the United States Midwest, 2008 Professional Paper 1775 U.S. Department of the Interior U.S. Geological Survey By Robert R. Holmes, Jr., Todd A. Koenig, and Krista A. Karstensen

Three major flood events have occurred in the last ten years. These events recorded discharges greater that 20,000 cfs at the USGS Upper Iowa River gaging station near Dorchester, Iowa. These events also recorded large flood events at up stream gages including the USGS gaging station at Decorah and at Bluffton (Upper Iowa River Watershed Hydrologic Assessment, 2018). Each of these three major flood events are explained further below.

Flood of 2008



June of 2008 between 6 and 8 inches of rain fell in the UIR Watershed in a 48-hour period. Producers and conservation professionals report that soils in the watershed were already saturated from an unusually wet period that occurred at the end of May 2008. County Engineers estimated damage to county roads and bridges in the UIR Watershed at \$3.4 million (N. Rissman, L. Bjerke, B. Ridenour). Although no major bridges were completely destroyed, several bridge approach roads were over topped and/or washed out. The majority of the levee system in the City of Decorah remained intact and flood waters did not overtopped the levees. A small section of the levee near Luther College was damaged, which caused the Luther College athletic facilities to flood and probably reduced the flow recorded at the USGS gage in Decorah. This flood fell just short of being considered a 500-Year flood as recorded by the USGS gage in Decorah. Near Dorchester Flood levels reached 100-year recurrence level. For more information about the 2008 flood click <u>here</u>. (Flood of June 8-9, 2008, Upper Iowa River Northeast Iowa, 2010).



Personal Accounts of the Upper Iowa Flood 2016

August 23-24th, 2016

(ettps://www.esri.com)

Ľ

Scroll through the story on the right to learn about the flood of 2016.