

Study finds Midwest flooding more frequent

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This aerial view of a flooded Midwestern farm has been all too common during four severe floods that have affected the region since 2008. Credit: Photo courtesy of Aneta Goska.

The U.S. Midwest and surrounding states have endured increasingly more frequent flood episodes over the past half-century, according to a study from the University of Iowa.

The UI researchers based their findings on daily records collected by the U.S. Geological Survey at 774 stream gauges in 14 states from

1962-2011, a data-collection period in common for all the stations.

They found that 264 (34 percent) of the stations had an increase in frequency in the number of flood events, while only 66 stations (nine percent) showed a decrease.

"It's not that big floods are getting bigger, but that we have been experiencing a larger number of big floods," says Gabriele Villarini, UI assistant professor of [civil and environmental engineering](#) and corresponding author on the paper, published Feb. 9 in the advance online edition of the journal *Nature Climate Change*.

The findings likely come as no surprise to millions of people in the Midwest and bordering states. During the past several decades, large floods have plagued the region in 1993, 2008, 2011, 2013 and again in 2014. The floods have caused agricultural and economic losses in the billions of dollars, displaced people and led to loss of life.

"There is a pattern with increasing frequency of flood events from North Dakota south to Iowa and Missouri and east into Illinois, Indiana and Ohio," says Iman Mallakpour, UI graduate student in civil and [environmental engineering](#) and lead author on the paper.

"We related this increasing number of big floods to changes in rainfall and temperature. There was an overall good match between the areas with increasing frequency of flood events and areas experiencing increasing frequency of heavy rainfall events," adds Villarini, who is also assistant research engineer at IIHR - Hydroscience & Engineering.

He notes that seasonal analysis revealed that most of the flood peaks in the upper Midwest occur in the spring and stem primarily from snow melt, rain falling on frozen ground and rain-on-snow events. Interestingly, spring—in addition to being a season with increasing

frequency of heavy rainfall—also has the strongest increase in temperature over most of the northern part of the region studied, he says.

The findings jibe well with current thinking among climate scientists about how the hydrological cycle is being affected by global warming. In general, as the atmosphere becomes warmer, it can hold more moisture. One consequence of higher water vapor concentrations is more frequent, intense precipitation.

Villarini says the current study did not attempt to link the increase in the number of episodes to climate change.

"What causes the observed changes in precipitation and temperature is not something we have addressed because of the difficulties in doing so just based on observational records," Villarini says.

The study region included: Iowa, Illinois, Indiana, Wisconsin, Ohio, Michigan, Minnesota, Kansas, Nebraska, Missouri, West Virginia, Kentucky, North Dakota and South Dakota.

The methodology used in the study involved establishing a threshold level of two flood events per year, on average, for each of the 774 stream gauges in the study, so as to focus on the larger flood events. In order to avoid counting the same event twice, the researchers allowed for the recording of only one event within a 15-day period.

More information: The Changing Nature of Flooding across the Central United States, www.nature.com/nclimate/journal/nclimate2516.html.

Provided by University of Iowa

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