News: Explainer

Why Mississippi floods were expected

A combination of bad weather, ocean conditions and land development conspired to produce high waters.

Richard A. Lovett

Last year, it was Pakistan and Russia. This spring, all talk of disasters attributable to freak weather conditions turns eyes to the United States.

First, it was snowfalls that never seemed to end. After that came tornadoes. Now, a massive slug of water is working its way down the Mississippi River, forcing the US Army Corps of Engineers to deliberately flood farmland to spare riverside towns such as Cairo in Illinois, and threatening near-record water levels all the way to New Orleans. *Nature* looks at the underlying causes of these extreme events, and how the surge might have been predicted.

Floodwater engulfs a farm after the Army Corps of Engineers blew a massive hole in a levee at the confluence of the Mississippi and Ohio Rivers near Wyatt, Missouri, to divert water from the town of Cairo, Illinois.

Photo by Scott Olson/Getty Images

Why did it happen?

The simple answer is because it rained. A lot. Parts of the US Midwest reported rainfalls up to four times the norm in April. And that came on top of a winter that saw some regions receiving unusually high snowfalls.

But that's only part of the answer. For decades, people have been building shopping malls and parking lots that cause water to flow quickly into rivers, rather than soak into the ground. They've built levees that constrict the flow of rivers, forcing water to travel downstream faster. In places, this has been referred to as a 'levee war', whereby one town's levees funnels water downstream to become the next town's crisis.

"People don't realize how dramatically humans have altered many of these river systems," says Len Shabman, an economist at Resources for the Future, a think tank in Washington DC.

But the much-publicized diversion of water into Missouri farmlands to spare Cairo was actually a success, Shabman adds. "That was always part of the plan," he says. The federal government long ago purchased easements — the right to flood the land — from the farmers who own it, precisely for this purpose. "The farmers may not have remembered they had an easement," Shabman says. "But they were there."

Has anything like this happened before in the United States?

Yes. The greatest flood of the twentieth century occurred in 1927, but there were also large floods in 1937, 1973, 1993 and 2008, although only the 1927 flood compared to this year's.

"This is the blessing and curse of farmers in the American Midwest," says Bill Patzert, a climatologist at NASA's Jet Propulsion Laboratory in Pasadena, California. "They're blessed with rich farmland and the rivers that irrigate it. The downside is that sometimes they overflow."

Could this have been predicted?

Of course. Large snowfalls and heavy spring rains are a classic formula for flooding. All of the water has to go somewhere.

"By January or February, everybody should have known we were going to have May floods," Patzert says. "To be shocked and awed by these kinds of events is disingenuous. It means you haven't read your history."

But that's only after the snow and rains hit. Forecasting the weather patterns that produced them is still a science of the future.

It may not be so very far away, however. Even before the storms hit, a research group led by Upmanu Lall at Columbia University in New York had been trying to correlate a century's worth of floods in the Midwest to continent-wide weather patterns.

What they found, Lall says, is a surprisingly consistent pattern whereby a pair of high-pressure systems — one over western Texas and another off the US Atlantic coast — conspire to force moisture inland from the Gulf of Mexico "like a funnel".

It is possible, he adds, that these persistent high-pressure zones may be produced by two well-known oceanographic patterns: La Nina and El Nino in the Pacific Ocean (which mark alterations in warmer and cooler conditions between that ocean's eastern and western equatorial waters) and the North Atlantic Oscillation (which results from weather patterns between Iceland and the Azores).

If so, he says, it may someday be possible to predict weather patterns likely to produce flooding in the Midwest, perhaps 30–90 days in advance.

So why were people taken by surprise?

Partly because conditions have changed since 1927. The population has soared and urban development has encroached onto many areas that were once farmland. There are simply a lot more people, and a lot more infrastructure, in harm's way.

Nicholas Pinter, a geologist at Southern Illinois University in Carbondale, who works on flood

hydrology, has a word for this: "hydro-amnesia". It causes people to build in places that were flooded a generation ago and will be flooded again a generation hence.

"In 1927, everyone had a boat," Patzert adds. "They knew it was coming. One thing I noticed about this particular flood was that all these people living in harm's way didn't have boats in their backyards."

Did global warming play a part?

Maybe, but not a big one. In Northern Europe, Pinter says, it's clear that global warming is producing bigger floods. But in the Midwestern United States, the impact is less clear.

Not that this lets us off the hook. A much bigger factor is the degree to which we have altered the rivers. "The river dynamics in no way resembles what it did 200 years ago," Pinter says.

In The Netherlands, Shabman adds, there is an official policy of leaving room for rivers. "In the US, we've done the opposite," he says. "Then we're horrified when the inevitable occurs."

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Finally an article that doesn't turn a story into Global Warming propaganda based on hand waving **#21241** arguments.

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Report this comment   Posted by: **Nik From NYC** │ 2011-05-13 04:40:12 PM

Nik from NYC: I believe there is a difference between doubt and refutation. You may doubt that, **#21256** for example, Darwinian evolution is real, but such doubt does not amount to refutation. Sure, AGW is not proven (we will not have to wait for a century or so for either proof or disconfirmation), but to grasp at a

few contrarian tidbits of evidence as amounting to "refutation" is about as scientific as to claim that the complexity of the human eye amounts to a refutation of Darwinian evolution. Neither AGW nor Darwinian evolution attain the certainty of, say, quantum mechanics, but lack of certainty does not equal disproof. It's all about a gamble... driving 180 mph on the interstate will not necessarily lead to a fatal accident, nevertheless IMHO driving 180 mph is not worth the risk to self or others. You think it's worth the risk? Throw the dice, but just realize the potential payment will pay, not by you, but by your grandchildren.

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Yes,flood threatens,and we can do nothing.We change the river dynamics, taking too much. That **#21393** just what we called "nature's reve". For surviving, we may suffer more.

Report this comment   Posted by: **liuj yeji** | 2011-05-17 11:12:54 AM

David South of the Monolithic Dome Institute used the term "hazard amnesia" to cover all natural**#21838** hazards, including flooding. The Monolithic Dome is more oriented to protect against hazards like tornadoes, earthquakes, hurricanes, and fires. The most glaring example of "hazard amnesia" is Greensburg, Kansas after their EF5 tornado. Their immediate direction for rebuilding was to take a cue from the "green" in the name to emphasize "green building." At *no* time have the city leaders thought "we'd like to rebuild using construction that will protect us from that tornado which just destroyed our town." And FYI I *did* promptly tell them about the options. CBS News ran a story about stone markers left by the ancients along Tohoku's coastline, warning future generations about the tsunami hazard. An expert said these lessons lend to be lost after 3 generations. In the USA, the lesson is lucky to last until next week – and then, many people don't even learn the right lesson, e.g. Greensburg. But Netherlands' policy of 'leaving room for rivers' is laughable. They still refuse to leave room for the ocean, trying to flood the coast on the low end of post-glacial isostatic rebound.

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