

FLOODS MAY WORSEN AS THE CLIMATE CHANGES

BY: Jim McKay on December 1, 2008



It has become apparent as floods increase in number and severity that terms like "100-year flood" are outdated and so are the country's strategies for protecting citizens against major events -- save some forward-thinking communities.

Experts warn that reliance on decrepit levee systems and continued buildup of floodplain areas, combined with warmer temperatures and more rain, will result in more death and damage from flooding. They urge a more balanced approach to flood management to mitigate this looming threat.

In spring 2008, floods killed more than 20 people around the country, destroyed tens of thousands of homes and inundated cropland, resulting in rising commodity prices. Much of the damage occurred in the Midwest where flooding was termed "historic." In Missouri during a 36-hour period, four rivers crested at record levels March 17-19. These "historic" floods are occurring more often than calculations suggest they should.

In 1993, Midwest flooding caused more than \$15 million of damage and killed 50 people. That flood, called the Great Flood of 1993, was estimated by the Army Corps of Engineers as perhaps a 250-year flood.

In 2001, Bob Criss, professor of earth and planetary sciences at Washington University in St. Louis, wrote that the 1993 flood was, in reality, a 30- or 50-year flood. "They said I was Chicken Little," Criss said. But he feels vindicated by recent events. "We're seeing more floods and worse ones," he said.

There's been progress at mitigating these risks in areas like Tulsa, Okla., and the Pacific Northwest, where progressive strategies have controlled flooding. But overall it's been slow, with a continuation of the same philosophies.

"We, as emergency managers, have to start saying, 'Look, we have to take a much broader view, otherwise as our climate changes, this is going to be a big deal,'" said Bob Freitag, a former emergency manager with FEMA [Federal Emergency Management Agency] and currently professor of urban design and planning at the University of Washington. "We, as emergency managers, see everything that goes wrong: all the mistakes that were made on that stream -- upstream in terms of fencing it in, removing all storage, removing the forest that provides detention. All those failures -- we see [them] at a point when it comes downstream and destroys homes."

Warming Trend

According to the National Climatic Data Center, the Earth's summer temperature rose above average for the 30th straight year in 2008.

Some areas of the country are experiencing more rainfall instead of snow, which means more severe flooding in the spring. "The Governmental Panel on Climate Change has said that in many cases, we're going to see less water in an area because of climate change, but when it comes it's going to be the gullywasher," said Gerry Galloway, a civil engineer and former brigadier general who was assigned by the White House to lead a committee assessing the Great Flood of 1993.

In response, most areas are trying to funnel more water through narrower channels, the age-old strategy. In the Midwest, the Army Corps of Engineers is deepening channels with wing dikes and other structures to allow more water to pass through.

"That's what they *think* they're going to do," Criss said. "You might be able to do that locally with continued maintenance and dredging, but thinking they're going to change the bottom of the river for any significant difference is folly."

The idea of creating narrower, deeper channels has been the Midwest's flood-control philosophy for more than 100 years, but 19th-century maps show the Mississippi River is no deeper now than it was then, Criss said. "How do you dig a hole in the bottom of a river? You don't, and thinking that we can is not very bright."

Any dredging done on the bottom of a river, in this case the Mississippi, is pointless because it will just fill back up with mud without continuous dredging, Criss said. That leaves the water nowhere to go but up.

Criss said more than 100 years of tinkering with nature's flow is creating unpredictable systems. "We not only have more floods and higher flood stages, but they occur at every time of the year now," he said. "Basically we have a more chaotic river than we had historically. It's not the controlled system we think we're trying to make. We delude ourselves with these concepts."

Levees have been the main form of flood protection for much of the country, but a recent report suggested that the Army Corps of Engineers, which oversees many of the levee systems, lacks an inventory of thousands of levees that may be unsafe. That report came amid heightened concerns after the record floods in spring 2008 and more extreme weather forecast because of climate change.



Indiana residents boat down a street that flooded as a result of remnants of Hurricane Ike in September 2008.

For the most part, the levees have held up, but there were breaches this spring in Missouri and elsewhere. And everyone knows of Hurricane Katrina, where 60 percent of damage resulted from a failed floodwall. "When

you're dealing with a levee, you're dealing with a pile of dirt," Galloway said. "In some cases, it literally started with a 'wind row' from a farmer's grader, then somebody else added something to it and you have no idea what's in it. Some levees have a history of 150 to 200 years and it's hard to tell what's down at the base."

Behind those levees, communities developed and are still developing despite the hazards. Galloway led a blue ribbon study in 1994 that concluded with the *Galloway Report* on the 1993 floods. "That same report could be put out today on the Midwest floods that we just had, and it started with, 'Don't let people build in the floodplain when they don't need to,'" Galloway said.

Yet development in dangerous areas continues nationwide. Galloway pointed to parts of St. Louis near the St. Louis River where development continues despite the flood threat. "Why? It's close to downtown. There is lots of land in Missouri on higher ground, but it's cheaper to develop; it's closer in and people can say, 'Oh, I'm by the river,' so they let them do it."

These communities spring up behind aging levees that offer protection from a 100-year flood. "One hundred years means a one-in-four chance in the life of a 30-year mortgage that the levee is going to be topped and that there's going to be some sort of disaster," Galloway said.

The term "100-year-flood" is misleading and not applicable anymore, experts say. "I think we're really overstating; I don't think those terms are useful," Criss said. "We need to acknowledge that the language is flawed and there are better approaches."

Galloway said the 1994 report called for 500-year protection, but no one has been willing to buy into it. "The Corps of Engineers said by 2011 they're going to have 100-year flood protection," he said of the rebuilding effort in New Orleans. "Aren't they lucky? They're still in huge danger."

Big Risk

Besides New Orleans, California probably faces the biggest risk of a catastrophic flood. Developers there continue to build in floodplains behind questionable levees. "It's simply because that's where the money is and that's where developers go," said Jeff Mount, geology professor at the University of California, Davis and director of the Center for Watershed Sciences. "It's more subsidized bad choices."

California is searching for ways to strengthen deteriorating levees that protect populous areas. In the Natomas community in Sacramento County, a levee breach could put more than 11,000 homes 20 feet underwater. The state recently passed a \$4.1 billion bond measure to shore up weak and eroded levees.

But that's not enough, Mount said. The 2006 bond measure amounted to patching an old tire, he said, and the state's efforts have progressed little since then. "The tire's bald, all worn out and wobbly, and the rim is rusted," Mount said. "Right now we've brought the car into the shop and we're all standing around looking at the tire."

Mount said patching the levees is necessary. "It's an emergency." But he said those repairs are merely a Band-Aid. As in flood management elsewhere in the United States, there are a number of solutions, all of which comprise a balanced approach that experts say is necessary.

Mount said truly fixing the levees might mean relocating them or removing them altogether, letting water spill over onto farmland to ease pressure downstream. "As long as we're primarily agricultural, that's a viable alternative to creating fortresslike levees, which are so bloody expensive and environmentally damaging."

A proposed Auburn Dam along the American River above Sacramento would help, but is expensive and environmentally harmful. "On a purely economic basis, it doesn't work," Mount said. "And where are you going to mitigate the drowning of 37 miles of river to the [Sierra Nevada]?"

During the Missouri floods this spring, levees in the upper watersheds failed, which ironically saved the communities downstream from being inundated. "The urban areas owe their livelihoods and safety to the fact that their upstream neighbors absorb the shocks of the very large floods," Mount said. "It's the same as a levee setback, in a sense. The levee breaks, takes the top off the hydrograph and reduces the stage downstream so the suffering of a few is the salvation of thousands."

It could be a lesson in flood management.

Instead of flushing water downstream as quickly as possible, keep it in the upper watersheds longer with detention areas, by setting back levees or by flooding farmland. "It's an excellent idea, but it's turned out to be damned hard to do," Mount said, principally because the United States is a nation that puts private property rights as highest values.

But the concept has worked in the Pacific Northwest and Tulsa, Okla.

Retaining Water

Parts of the Pacific Northwest are experiencing more rain and less snow, which mean more runoff in the spring and less water during the summer. It's essential to find ways to keep the water where it falls for a longer period of time. That was accomplished with retention ponds in Oregon, where a stream called Buck Hollow -- a tributary of the Deschutes River -- used to flow intermittently. When it did flow, it was big, brown and laden with silt.

Farmers along the stream built detention ponds, which keeps the water longer in the upper levels of Buck Hollow. The result is a consistent flow of cooler, cleaner water for fish and more water on the farmers' fields.

Freitag said it's important to understand that flooding is natural, even beneficial. Prior to the 1980s, Tulsa was continually hit with severe floods. During a 15-year stretch, the federal government declared Tulsa County a flood disaster area nine times.

That's history. Since 1986, the area hasn't had a major flood. "They've removed homes in the floodplain, they've made large detention areas," Freitag said. "They've removed some of the tax base at a cost, but they don't have to have huge repairs and now they have more attractive areas."

It started with a citizen-driven movement that eventually gained support from City Hall, said Ann Patton, a founding partner of Tulsa's Project Impact, part of a short-lived federal initiative aimed at creating disaster-resistant communities. "We've moved well over a thousand buildings out of the floodplains physically; we've done a lot of visually appealing detention ponds to hold water back and release it more slowly," Patton said. "We have a lot of trails and parks that are in the floodplain and fewer buildings."

Tulsa ramped up its maintenance drainage systems, which had been neglected due to a lack of funds. The city imposed a fee on utility bills to help keep up with the maintenance. It was all part of a balanced approach.

"One thing we learned was that in trying to address some of the problems on a spot basis, we actually made them worse," Patton said. "We realized that you have to look at floodwater management on a comprehensive basis. You can actually make your community better -- not only safer, but better by using the resource."

A Humble Approach

Tulsa's approach is to work with nature "with some humility," Patton said. And it's an appropriate concept, experts say. "Tulsa has a terribly balanced approach," Galloway said. "They're probably the poster child."

Tulsa's success story took decades and still isn't finished, Patton said. "When the wrong kind of rain comes -- and it could have been Hurricane Ike -- there will be more water over the land than we want, but hopefully it won't be as bad. We haven't fixed it; we've ameliorated it."

And that's the idea. "People have this idea of flooding as bad," Freitag said. "It's just change." He and the others said communities must learn to live with the flooding, and even benefit from it.

"Floods are natural events," Galloway said. "By leveeing off so much of the floodplain, we've prevented regeneration of the soils. And that's one of the major problems in coastal Louisiana. We've destroyed much of the wetlands by taking the sediment and dumping it in the Gulf of Mexico."

The sediment acts as nature's sponge, helping store the water and regenerate the soil, which perpetuates the process. In the Northwest, retaining water in the upper watersheds to continue that natural process is becoming more of a challenge. "What we're going to have here in the Northwest as we lose those snow storages, is streams that are going to peak earlier and summers that are drier and we're going to have to capture water everywhere."

Freitag said the Northwest is blessed with valleys filled with river sediment, which, along with depressions like detention ponds, can help keep water in the upper watersheds for a little longer. "If we can keep the water in the upper watersheds for just a couple of months between seasons, we can dampen a lot of the change that is forecast because of the climate," he said. The idea is to use the floodplain for storage as much as possible, and any depression -- ponds, beaver dams -- will aid that process.

It's just one part of a balanced approach that's necessary to living with nature's floods