

Heavy Rainfall and Increased Flooding Risk: Global Warming's Wake-Up Call for the Central United States

NATIONAL WILDLIFE FEDERATION

2008



Mississippi River at Clarksville, MO (FEMA)

People in the Central United States are not imagining things. The last few decades have brought more heavy summer rainfall events along with increased likelihood of devastating floods. While no single storm or flood can be attributed directly to global warming, changing climate conditions are at least partly responsible for past trends. Because warmer air can hold more moisture, global warming is expected to bring more and heavier precipitation in the years to come. At the same time, the losses from major floods have been compounded by over-reliance on levees and other strategies for taming rivers, which in turn encourage development in flood-prone areas.

The increased frequency of extreme weather events across the country forces us to confront the realities of global warming and look toward a cleaner energy future. We must discourage development in flood-prone areas and protect the natural systems that help to buffer against floods, both for people and for the wildlife that depend upon them. And, we must aggressively move to reduce global warming pollution to ensure that we avoid the worst impacts.



CONFRONTING GLOBAL WARMING

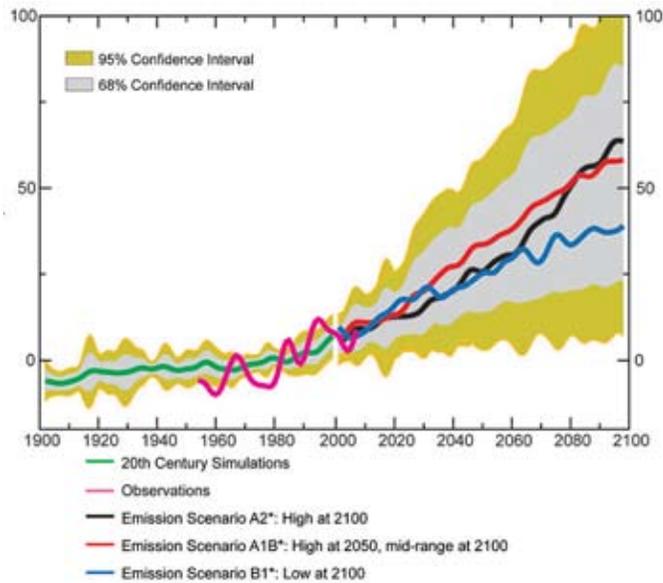
Report

Increasing Frequency of Heavy Rainfall Events

Global warming is bringing more heavy rainfall to the Central United States. In the upper Midwest, the frequency of the most intense rainfall events has increased by 20 percent since the late 1960s.¹ The number of days each year with precipitation greater than 4 inches has increased by 50 percent over the last century.² These increases are correlated with a corresponding increase in days with heavy streamflow in the medium and large river basins of the Eastern United States.³

Major flooding—like the Great Floods of 1993 and 2008—requires prolonged periods of higher-than-normal precipitation. Across North America, we are having more 90-day intervals with precipitation totals in the top 5 percent of the historical average. The last 25 years have seen 20 percent more of these episodes than any other 25-year window over the 20th century.⁴

As the climate continues to warm,



Daily precipitation over North America that falls in heavy events (the top 5 percent) has increased over the 20th Century and is projected to continue increasing under a variety of emissions scenarios. SOURCE: CCSP (2008)

the atmosphere will be able to hold more water. With more moisture in the air, the trend towards increasingly intense precipitation events will continue. In the Midwest, big storms that historically would only be seen once every 20 years are projected to happen as much as

every 4 to 6 years by the end of the 21st century.⁵

Communities on the Frontlines

Floods and severe storms are among the most costly kind of weather and climate disaster in the United States, together costing the country more than \$115 billion from 1960-2005 in direct damages.⁶ The Midwest is hit disproportionately more, suffering about a quarter of these losses.⁷

In the Central United States, severe weather and flooding can be especially devastating for crops, both during the storm and because excessively wet soil can create anoxic conditions, foster the spread of diseases and insects, and make it difficult to operate farm machinery needed to plant or harvest. One study estimates that flood-related losses to U.S. crops could double by

2030 due to increased frequency of excess soil moisture.⁸

Large floods that overwhelm water treatment facilities can cause outbreaks of waterborne diseases. Such was the case in Milwaukee, Wisconsin, in 1993, when there were 403,000 cases of intestinal illness, resulting in 54 deaths, after a period of heavy rainfall. In fact, more than half of waterborne diseases reported nationwide between 1948 and 1994 were preceded by periods of heavy rainfall.⁹



Levee break near Elsberry, MO (FEMA)

Poor Management of Floodplains, Rivers, and Watersheds Can Exacerbate Severe Flooding

For decades Midwestern rivers and streams have been increasingly altered by dams, levees, and other projects intended to increase inland navigation and flood control. However, because these efforts do not work in harmony with natural systems, they have actually increased the risk of major floods and promoted extensive development and agriculture in wetlands, along rivers and streams, and throughout floodplains. Re-evaluating the hidden costs of these projects is necessary for reducing the risk of future major flood disasters.

In addition, several watershed management strategies have decreased the ability of the landscape to naturally respond to heavy rainfall events. Upstream practices, such as stream

straightening and channelization of meandering streams, allows water to flow more quickly downstream, resulting in more damages from severe flood events.¹⁰ Millions of miles of drain tiles have been placed under agricultural fields to speed drainage of stormwater into rivers and streams.¹¹ Furthermore, countless wetland areas have been drained in order to convert land for human

use, often adding a significant area of impervious surfaces right up to the edge of rivers and streams, while native grasslands and restored conservation reserve lands have been converted to row crops. These activities destroy the very buffers that help absorb the impacts of floods.¹²

Two 500-Year Floods in Just 15 Years

The Great Flood of 1993—devastating communities along the Mississippi River and its tributaries in nine Midwestern states—was one of the most costly disasters in the United States. Thousands of Americans were displaced from their homes and forced to leave their lives behind, hundreds of levees failed, and damages soared to an estimated \$12 to 16 billion.¹³

A mere 15 years later, history is repeating itself in the Midwest as the rain-swollen Cedar, Illinois, Missouri and Mississippi Rivers and their tributaries top their banks and levees, leaving hundreds of thousands of people displaced. With rainfall in May-June 2008 about two to three times greater than the long-term average, soybean planting is behind schedule and some crops may have to be replanted.¹⁴



Cedar Falls, IA, June 2008 (FEMA)

This remarkably quick return of such severe flooding is not anticipated by currently used out-of-date methodologies, but is what we should expect as global warming leads to more frequent and intense severe storms. Inadequate floodplain management is also responsible for the extent of damages from both floods, especially over-reliance on levees and the false sense of security they provide to those who live behind them. About 28 percent of the total new development in the seven states over the past 15 years has been in areas within the 1993 flood extent.¹⁵

Getting Ready for Stormy Weather Ahead: Reducing the Risk of Major Floods

We need to take these trends toward more frequent and intense storms into account when managing our floodplains and watersheds, especially by discouraging development in flood prone areas and protecting the natural systems that help to buffer against floods. In the Central United States and across the country, it is paramount that sensible and responsible steps are taken to change the way the Army Corps of Engineers and the Federal Emergency Management Agency (FEMA) look at floodplains. To achieve these goals, we must:

Realize that more levees are not the answer. The Army Corps of Engineers must adopt policies that restrict the construction of new levees, which not only encourage development in high risk and often environmentally sensitive areas, but most importantly convey a false sense of security to the people living behind them. The numerous levee failures of the 2008 floods make it apparent that the Corps' preferred structural solutions

are not sufficient to keep people and communities safe.

Discourage development in high risk areas such as floodplains.

With the National Flood Insurance Program (NFIP) more than \$17 billion dollars in debt,¹⁶ it is both fiscally and environmentally irresponsible to encourage development in flood prone areas. Instead, FEMA should recommit to a national hazard mitigation policy with emphasis on voluntary buyouts of high-risk flood prone properties and should dedicate high-risk flood-prone lands to open space uses or require increased building elevations, where practicable, to guide recovery and rebuilding.

Increase protection for wetlands, forests, and natural landscapes to provide natural buffers for flooding. During severe flood events, healthy wetlands and natural landscapes can act as sponges to rising waters, protecting communities and livelihoods, especially agriculture.

Significant investment in these natural resources as part of clean water, farm, or global warming legislation will help keep these habitats healthy. Important steps include fully funding restoration programs such as the Wetlands Reserve Program and enacting the federal Clean Water Restoration Act to restore protection for all wetlands and streams.

Strengthen NFIP community land-use and building standards and update flood hazard maps

to reduce unwise floodplain development, preserve open space and wildlife habitat, and improve public awareness of flooding risks. People living in floodplains—even low-risk floodplains—need to know they are at risk. Therefore, floodplain planning and maps must incorporate future conditions, including effects of urbanization and changing climate. Simply relying on past flooding histories is not enough.

Reduce Global Warming Pollution to Minimize Future Flooding

To limit the magnitude of changes to the climate and the impacts on communities and wildlife, we must curb global warming pollution. The National Wildlife Federation recommends that policy makers, industry, and individuals take steps to reduce global warming pollution from today's levels by 80 percent by 2050. That's a reduction of 20 percent per decade or just 2 percent per year. Science tells us that this is the only way to hold warming in the next century to no more than 2°F.¹⁷ This target is achievable with technologies either available or under development, but we need to start taking action now to avoid the worst impacts.

¹ Groisman, P.Ya., et al., 2005. Trends in intense precipitation in the climate record. *Journal of Climate*, 18(9), 1326-1350.

² Groisman, P.Ya. R.W. Knight, and T.R. Karl, 2001. Heavy precipitation and high streamflow in the contiguous United States: trends in the 20th century. *Bulletin of the American Meteorological Society*, 82(2), 219-246.

³ Groisman, P.Ya., et al., 2004. Contemporary changes of the hydrological cycle over the contiguous United States: trends derived from in situ observations. *Journal of Hydrometeorology*, 5(1), 64-85.

⁴ CCSP, 2008. *Weather and Climate Extremes in a Changing Climate. Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands.* A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [Thomas R. Karl, et al. (eds.)]. Department of Commerce, NOAA's National Climatic Data Center, Washington, D.C., USA, 164 pp.

⁵ CCSP, 2008.

⁶ CCSP, 2008.

⁷ Changon, S.A., 2008. Assessment of Flood Losses in the United States. *Journal of Contemporary Water Research & Education*, 138, 38-44.

⁸ Rosenzweig, C. et al., 2002. Increased crop damage in the US from excess precipitation under climate change. *Global Environmental Change*, 12, 197-202.

⁹ Curriero, F.C., et al., 2001. The Association Between Extreme Precipitation and Waterborne Disease Outbreaks in the United States, 1948-1994. *American Journal of Public Health*, 91(8), 1194-1199.

¹⁰ Meyer, J.L., et al., 2003. *Where Rivers are Born: The Scientific Imperative for Defending Small Streams and*

Wetlands. American Rivers and Sierra Club, 28 pp.

¹¹ www.landinstitute.org/vnews/display/v/ART/2003/09/09/3f5f527d008a9

¹² Meyer, J.L., et al., 2003.

¹³ Interagency Floodplain Management Review Committee (U.S.). 1994. *Science for floodplain management into the 21st century: preliminary report of the Scientific Assessment and Strategy Team.*

¹⁴ Midwest Regional Climate Center, 2008. *Midwest Weekly Highlights - June 10-16, 2008.* Available at: mrcc.sws.uiuc.edu/clwatch/0806/080616.htm.

¹⁵ Hipplea, J.D., B. Drazkowski, P.M. Thorsell, 2005.

Development in the Upper Mississippi Basin: 10 years after the Great Flood of 1993. *Landscape and Urban Planning*, 72, 313-323.

¹⁶ GAO, 2006. *Federal Emergency Management Agency: Challenges for the National Flood Insurance Program.* Testimony by D.M. Walker, Comptroller General of the United States before the Chairman, Committee on Banking, Housing and Urban Affairs, U.S. Senate (GAO-06-335T).

¹⁷ IPCC, 2007. *Climate Change 2007: Mitigation.* Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, et al. (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA., 851 pp.

For more information, please visit: www.nwf.org/globalwarming.