



Field Notes: **Extreme Weather and Community Resilience**

Evidence Grows—Extreme Weather More Frequent and Intense

From April through September of 2011, the attention of nearly half the country was focused on the latest regional damage from extraordinary extremes of weather. The year is over and damage assessments are being completed. Now we have to determine what to do.

National Overview

The NOAA National Climatic Data Center (NCDC) report “[Spring 2011 U.S. Climate Extremes](#)” summarized March-May of 2011, capturing just the beginning of a year for the record book:

Tornadoes, flooding, drought and wildfires ravaged many parts of the country during the period, and each of these extremes broke long-standing records and have been compared to the ‘worst such cases’ in history. While similar extremes have occurred throughout modern American history, never before have they occurred in a single month.

These disasters highlighted, yet again, the continuing struggles and hurdles as communities work to reduce their vulnerability to extreme weather damage. Two of the top ten weather disasters of 2011 included:

Missouri River Flooding

Nearly twice the normal amount of snow fell in winter 2010/11 in the Missouri River headwaters. That huge snowmelt, added to almost a full year’s rainfall that poured down over the Missouri basin in the last two weeks of May 2011, created a flood of historic scale.

The huge Missouri flood reservoirs topped to capacity, one after another, and threatened the system of aging Missouri River flood-control dams. Corps of Engineers’ efforts to bring the unprecedented flooding under control lasted from June through August, 2011, with continuing high, but manageable flows.

Floodwaters particularly impacted the economic transport of the region, with large practical impacts. They shut down [railroad lines including Amtrac, Inter-state highways, and damaged state and county highways](#) in a number of states. At one point, for safety, all road bridges crossing the Missouri River were closed over both a 100-mile stretch between Sioux City and Omaha, Nebraska and a [112-mile stretch](#) from just south of Omaha to St. Joseph, Missouri.

Texas Drought

The NOAA, NCDC “[Top Ten U.S. Weather/Climate Events of 2011](#)” report:

Texas, Oklahoma, New Mexico and Louisiana had their warmest summer on record in 2011.

The Spring-Fall wildfire season across the southern U.S. broke numerous records. Texas had the most destructive fire of the modern record...while Arizona and New Mexico had their largest.

The NOAA, NCDC "[State of the Climate National Overview Annual 2011](#)" added:

At the end of August, 81 percent of Texas was in the worst category of drought (D4, 'Exceptional' Drought), and analysis of tree-ring records dating back to 1550 indicated that the summer of 2011 drought is matched by only one summer (1789) in the 429-year tree-ring record.

The [Texas Department of Forestry](#) recently estimated that over 5.6 million urban street trees died as the result of this drought. For a region where summertime shade is a valued quality in daily life, the loss of these trees will echo for decades. According to the report, the estimated loss of economic and environmental benefits provided by these trees is roughly \$280 million per year

The U.S. Is Not Alone

Over recent decades, scientists and major international re-insurance companies, such as Munich Re, have been tracking the global increase in economic damage and loss of life due to extreme weather. The U.S. is not alone in its experience of weather extremes. The U.S. National Oceanic and Atmospheric Administration (NOAA) reported in its August 2010 "[Global Hazards](#)" on the very extreme weather experienced in Russia:

...the Russian Meteorological Service said that the country experienced "the longest unprecedented heat wave for at least 1,000 years". Unofficial estimates placed the death toll near 15,000 people across Russia, with 7,000 in Moscow alone. At the beginning of August, 676 square miles (1,740 square km) were burning with over 600 active fires. Outside Moscow, Russia's most deadly wildfire since 1972 charred homes and farmland.

A major impact from the fires and heat were [sic] the loss of wheat crops. Russia is the world's third-largest exporter of wheat and had recently slashed its harvest forecast from 90 million metric tons to 60 million metric tons. Due to the shortage, the 18 million metric tons that were to be exported would no longer leave the country—threatening wheat prices worldwide.

Economists predicted the heat and fire would cause over \$15 billion in loss of economic growth this year.

New Patterns of Extreme Weather=New Risks

In the United States, 2011 was clearly a terrible year for dozens of states and hundreds of communities. Taking the year as a whole, the sum of tornadoes, floods, drought and wildfires was so far outside the historical record that it should serve as a warning flag. In 2011 this country experienced such measurable damage that it puts us on notice of a new risk.

Americans have not experienced fundamental, long-term changes in weather or climate for over 2 centuries. The resulting practical risk is that we may be entering a period of weather damage so extreme as to be outside our experience as a densely-settled, complex society.

One year doesn't make a trend. But a year of such extremes in intensity illustrates an extreme weather risk that Dr. James Hansen discussed in a recent report "[Public Perception of Climate Change and the New Climate Dice](#)." His research indicates a new pattern of extremely hot summertime weather events has developed in the northern hemisphere over the last 3 decades. The reports' examples include the extreme summer heat and weather in Texas in 2011 and around Moscow, Western Asia and the Middle East in 2010. The report stated, with a high degree of confidence, that these increases in extremely hot summers are a consequence of global warming. The report concluded that, due to the intensity and huge area affected, those and future heat disasters could have "...large practical impacts".

For those of us in the United States, the prospect that we may be facing increasing risks of "large practical impacts" further underscores the need to focus on and mitigate damage from extreme weather. We have already experienced the general types of extreme weather likely in the next decades. So the uncertainty and risk of "large practical impacts" arise instead from not knowing how intense and frequent they will be, where they may occur and how long they may last. What we do know is that the 2011 weather extremes broke many U.S. weather records over much of the country. They are now not something projected to happen only in the future—20 or 50 years from now. They happened last year in the United States. If these events are being driven by increasing atmospheric temperature, they could re-occur next year, or in any year.

Extreme weather and climate are dynamic. They are always changing—at different rates of intensity, frequency, location, and duration. One difficulty for humans in understanding weather and climate is that our lives cover such a short period of observations. Our brief experience can lead to unrealistic expectations about future weather.

One property owner in the Dakota Dunes, S. D. community flooded by the 2011 Missouri River, reflected this nearly universal perspective to a [New York Times](#) interviewer. "This community has been here over 20 years and never had a problem," he said. "I didn't think it was an issue." He could have spoken for many Americans.

We Have The Tools To Protect and Adapt

Because our limited experience biases us, formal community risk analyses are designed to incorporate and plan for the dynamic quality of weather hazards. Failure to periodically and formally check weather trends can leave a community always one step behind a potentially-devastating hazard.

Basic steps to adapt to extreme weather in the near to intermediate future, should a weather trend be confirmed, have to be crafted for each community. Fortunately, there are many useful examples of prior work and resources (e.g., FEMA Multi-hazard Mitigation plans or the [ICLEI Local Governments for Sustainability](#) format) to assist communities tackling these issues.

Cities around the country have extensive experience in planning for and recovering from natural disasters. That experience clearly shows that effective actions are most successful if they involve the whole community. Understanding the views and needs of all elements of the community helps ensure widespread support for making any changes work. Many communities have done just that and they are stronger and more resilient for their efforts.

How to Get Involved

RRI would like to hear from you. If you have questions, comments, or concerns, please contact us at:

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