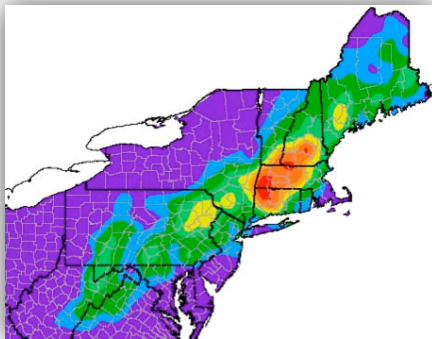


# EXTREME WEATHER AND CLIMATE CHANGE

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Devastating deluges, record floods and deadly heat waves have raised the question of whether there's a connection between these events and global warming. **The bottom line answer is yes:** Heat waves are longer and hotter than they used to be and some regions are suffering from catastrophic drought. Heavy rains are more frequent and can be more intense and rainfall records have been smashed. These events fit a pattern that climate scientists have long expected to appear as the result of increased greenhouse gases in our atmosphere. That doesn't mean global warming is the only culprit: extreme weather was happening before global warming began. But there's general scientific agreement that global warming has contributed to a trend toward more intense extremes of heat and precipitation around the world, is partly to blame for specific extreme weather events over the last decade and will continue to influence both in the future.



## WHAT WE KNOW

- On average, the US is 2 degrees F warmer than it was 40 years ago.
- This warmer world is increasing the odds of extreme precipitation,<sup>(20,21)</sup> in part because a warmer atmosphere can hold more moisture and release more of it during rainstorms and snowstorms.
- Heavy precipitation, both rain and snow, is happening more often than it used to.<sup>(10, 4)</sup>
- Heat-related extreme events are on the rise around the globe. Manmade climate change significantly increased the odds of some specific events, including the killer European heat wave of 2003<sup>(6)</sup> and the Russian heat wave of 2010.<sup>(12)</sup>
- Even small increases in average temperatures raise the risk of heat waves<sup>(6a, 6b)</sup>, droughts<sup>(7)</sup> and wildfires.<sup>(8)</sup>
- Twice as many record highs have been set in the past decade as record lows, in the US.<sup>(9)</sup>
- By 2050, record highs could outpace record lows by 20 to 1 in the U.S. By the end of the century, the ratio could jump to 100 to 1 if greenhouse gas emissions continue unabated.<sup>(9)</sup>

## THE NORTHEAST

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### Major Rainstorms and Floods of 2011

A quick summary of 2011 weather highlights would read approximately like this: Devastating snowstorm, devastating snowstorm, blizzard, heat wave, heat wave, torrential rains, hurricane (more torrential rains), floods, hurricane remnants (even more torrential rains), worse floods, even more devastating snowstorm—and that only takes you through October. The details follow.

- In late August, Hurricane Irene became the first hurricane to make landfall in New Jersey in more than 100 years, dumping 6 to 8 inches of rain in parts of New Jersey, New York, Massachusetts, Connecticut and Vermont. This was on top of the 6 to 8 inches that had already fallen in August.
- In early September, Irene was followed by more heavy rain due in part to the remnants of Tropical Storm Lee which caused several Mid-Atlantic and Northeastern states to experience historic flooding (Pennsylvania, New York and Virginia) and in Pennsylvania alone forced 75,000 people to evacuate and destroyed 2,000 homes.
- The September rains swelled the Susquehanna and Delaware Rivers to record-breaking levels in Binghamton and Owego, NY, and Waverly and Wilkes-Barre, PA, to name just a few.
- In Hershey PA, Swatara Creek crested at 26.8 feet, beating the previous record by more than 10 feet.
- Flood damage, which is estimated at around \$1 billion, was especially severe because the rains fell on a region that had already been saturated with drenching rainfall in the preceding weeks and months including from Hurricane Irene in late August.
- On September 8<sup>th</sup>, a whopping 7.03 inches of rain fell in Ft. Belvoir, VA., in just three hours. According to the National Weather Service (NWS), that amount of rain in that amount of time was “off the charts above a 1000-year rainfall (based on precipitation frequency from Quantico).” Largely due to Tropical Storm Lee, Pennsylvania recorded its rainiest September on record, according to the National Climatic Data Center.
- January through September was the rainiest such period on record in New Jersey, New York, Pennsylvania and Vermont.

**RECORD SMASHING RAIN  
2011**

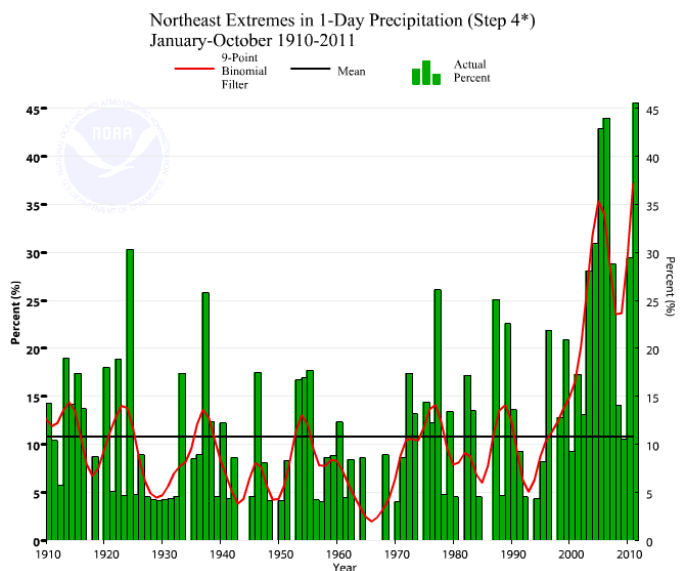
**All-Time Rainiest Month:**  
**August 2011**  
Central Park, NY (18.95")  
La Guardia, NY (17.32")  
JFK, NY (17.24")  
Newark, NJ (18.79")  
Philadelphia, PA (19.31")

**Rainiest August of All Time**  
Binghamton, NY, (8.90")  
Trenton, NJ, (16.10")  
Allentown, PA (13.47")

**Rainiest September of All Time**  
Dayton, OH (10.84")  
Baltimore, MD, (13.32")  
Binghamton, NY, (16.58")

**Rainiest August-September of All-Time**  
Philadelphia, PA (29.58")  
Wilmington, NJ (20.63")  
Baltimore (26.46")

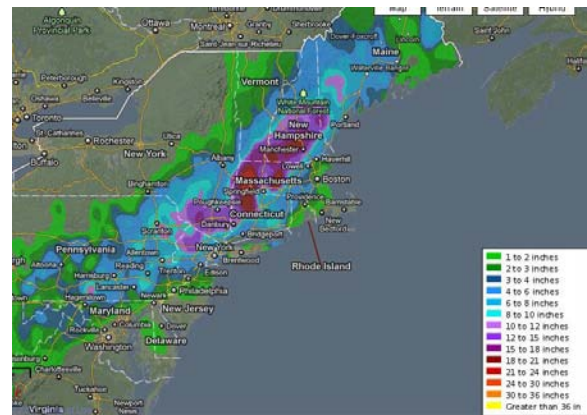
**Rainiest Year Ever \*  
(and it's not over yet!)**  
Cleveland, OH (53.84")  
Scranton, PA (54.02")  
Binghamton, NY (52.70")  
Harrisburg, PA (61.82")  
\*January through September 2011



Northeast extremes in 1-Day precipitation January-October, 1910-2011.  
Credit: NOAA/National Climatic Data Center.  
<http://www.ncdc.noaa.gov/extremes/cei/graph/ne/4/ytld>

## Major Snowstorms of 2011

- The blizzard that paralyzed New York City shortly after Christmas 2010 was followed by record-breaking snowstorms in the Northeast and Midwest during January and February.
- Six cities saw their snowiest January on record: Hartford, CT (57.0 inches), Bridgeport, CT (42.0 inches); Newark, NJ (37.4 inches); Central Park, NY (36.0 inches); Islip, NY (34.3 inches); and LaGuardia Airport, NY (32.6 inches).
- Hartford's 57 inches of snow in January made it the city's all-time snowiest month on record.
- Thanks to reduced sea ice in the Arctic Ocean in summer and fall, the Arctic has been unusually warm. Recent research suggests this may have changed air circulation patterns in winter, pushing colder than normal air down toward North America and Europe <sup>(22, 23, 24)</sup>.
- An unusually early major winter storm that struck the Mid-Atlantic and Northeast in late October, 2011 caused widespread tree damage and power outages and contributed to 22 deaths. The storm, nicknamed "Snowtober", knocked out power to more than three million customers from West Virginia to Maine and resulted in the largest power outage in Connecticut's history. Dropping up to 32 inches of snow, it was the most severe early-season snowstorm in New England since before the Civil War.
- According to one insurance company estimate, Snowtober resulted in upwards of \$3 billion in damage.



Snowfall totals in the Northeast from Snowtober  
<http://blogs.fox11online.com/files/2011/10/Northeast-Snow-Totals.jpg>

## 2011 Heat Records

- April 2011 was the warmest April on record for Portland, ME, New York, NY and Atlantic City, NJ.
- June 2011 was the warmest June on record for Philadelphia, PA
- Philadelphia, PA, Trenton, NJ and Atlantic City NJ, all set records for the most days ever above 90°F.
- Summer 2011 was the hottest summer on record for Boston, MA and Windsor, CT.

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