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# Hottest summer? Snowiest winter? Data show weather is getting more extreme

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**Cedric Arthur, 5, of Hopedale enthusiastically leapt through fountains at the spray deck on Boston's Esplanade Aug. 14 after visiting the Museum of Science. The heat index hit 100 degrees that day.**

**By Matt Rocheleau**

GLOBE STAFF SEPTEMBER 06, 2016

Boston just sweated through the [driest summer and hottest August ever recorded](#). And it was only several months ago that the city was basking in the [warmest December ever](#) measured here.

But a year ago, records were falling in the opposite direction. The winter of 2014-2015 was the [snowiest ever recorded](#), and featured the [second-coldest February](#).

It's not your imagination — there has been a pattern of increasingly extreme weather in recent years not just in our region, but across the country, according to data collected by meteorologists.

It's not just some wacky coincidence, either. It fits with what experts say is the expected result of human-caused global warming.

According to the [U.S. Climate Extremes Index](#), which considers both the frequency of extreme weather and how much land area is affected by such conditions nationwide, 2015 ranked as the second-most extreme year on record, trailing only [2012](#). Records date to 1910.

The first half of 2016 ranked as the seventh most-extreme when compared with the same period in other years.

The index is based on data on several key indicators: maximum and minimum temperatures that are much above or much below normal; how much of the country has either a severe drought or moisture surplus; single-day events with unusually high precipitation; and abnormalities in the number of days with, and without, precipitation.

The index is used to calculate a single figure, a percentage, that essentially represents how much of the United States endured extreme weather, said Jake Crouch, a climate scientist at NOAA's National Centers for Environmental Information.

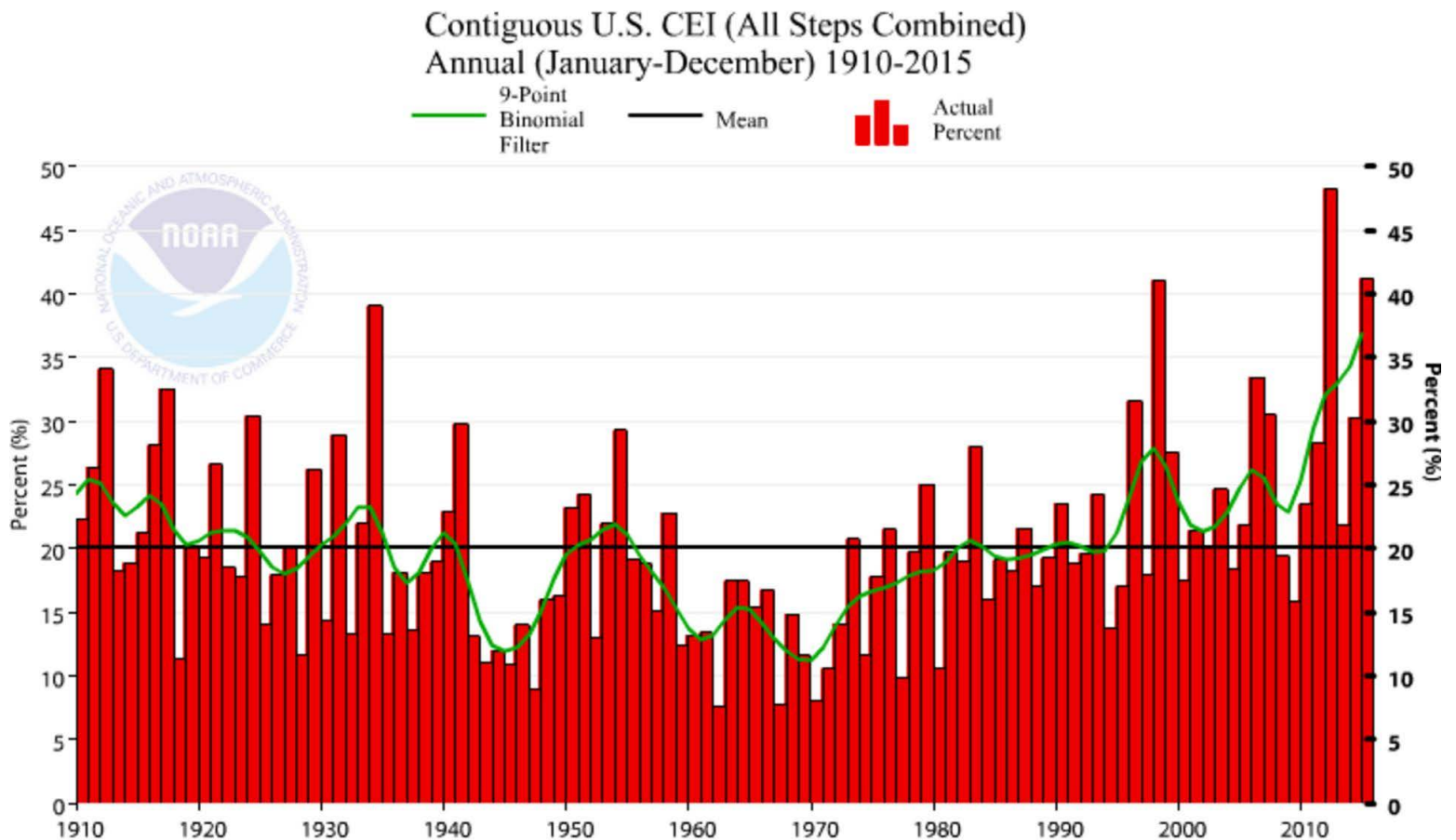


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# Hottest summer?

# Snowiest winter? Data

The historical average dating back to 1910 is about 20 percent. By comparison, the percentages were 48 and 41 percent in 2012 and 2015, respectively. So far this year, it is 33 percent.

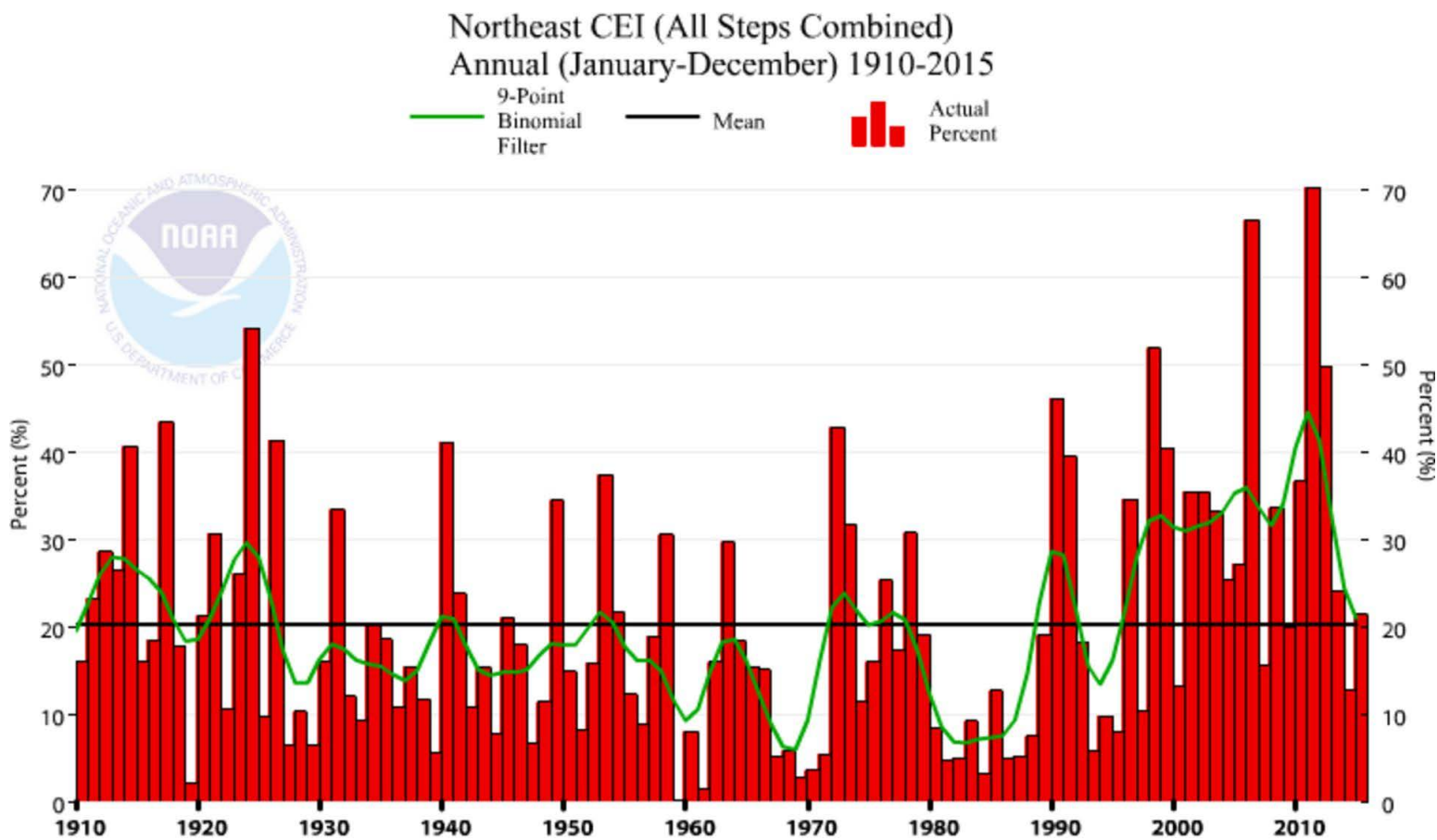


NOAA

**This graphic shows the nationwide trend in extreme weather as measured by the U.S. Climate Extremes Index.**

The index can also be used to measure extremes on a regional level. The northeastern section of the United States, for example, hasn't always stayed in line with national trends.

The most extreme year in that region was 2011 at 70 percent, while nationally it was 28 percent that year. On the other hand, while 2015 had a high percentage nationally, the percentage for the region that year was only slightly above average (despite the snowy winter and warm December in Boston).



NOAA

**This graphic shows the Northeast's trend in extreme weather as measured by the U.S. Climate Extremes Index.**

(The percentages referenced above do not account for another factor the index can consider: the wind velocity of tropical storms and hurricanes that make landfall; including that data in the index is considered experimental.)

“It’s a complicated tool, but it’s the best we have that describes the temperature and precipitation data we’re observing and how the extremes are changing over time,” Crouch said.

He said that in recent years, while there have been extremes on the cold and dry ends of the spectrum, most of the increase in the frequency of extreme weather has been driven by unusually warm temperatures and unusually high levels of precipitation,

“As the climate warms, there’s an expectation that we’ll continue to see more extremes in warm temperatures and more extremes in heavy single precipitation events,” said Crouch.

NOAA’s extreme index is focused on anomalies in the United States. But, across the rest of the world, there have been plenty of other signs of shifting weather patterns — namely [record-setting warmth](#) —

that have been attributed to human-caused climate change.


Scientists say that while efforts in recent years to curb greenhouse gas emissions may help prevent worst-case scenarios, many effects of global warming — [rising seas](#), [stronger storms](#), and more species dying off — are already happening.

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