# 2012 another record-setter, fits climate forecasts

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WASHINGTON (AP) -- As 2012 began, winter in the U.S. went AWOL. Spring and summer arrived early with wildfires, blistering heat and drought. And fall hit the eastern third of the country with the ferocity of Superstorm Sandy.

This past year's weather was deadly, costly and record-breaking everywhere - but especially in the United States.

If that sounds familiar, it should. The previous year also was one for the record books.

"We've had two years now of some angry events," said Deke Arndt, U.S. National Climatic Data Center monitoring chief. "I'm hoping that 2013 is really boring."

In 2012 many of the warnings scientists have made about global warming went from dry studies in scientific journals to real-life video played before our eyes: Record melting of the ice in the Arctic Ocean. U.S. cities baking at 95 degrees or hotter. Widespread drought. Flooding. Storm surge inundating swaths of New York City.

All of that was predicted years ago by climate scientists and all of that happened in 2012.

"What was predicted was there would be more of these things," said Michel Jarraud, secretary general for the World Meteorological Organization.

Globally, five countries this year set heat records, but none set cold records. 2012 is on track to be the warmest year on record in the United States. Worldwide, the average through November suggests it will be the eighth warmest since global record-keeping began in 1880.

July was the hottest month in record-keeping U.S. history, averaging 77.6 degrees. Over the year, more than 69,000 local heat records were set - including 356 locations in 34 states that hit their highest-ever temperature mark.

America's heartland lurched from one extreme to the other without stopping at "normal." Historic flooding in 2011 gave way to devastating drought in 2012.

"The normal has changed, I guess," said U.S. National Weather Service acting director Laura Furgione. "The normal is extreme."

While much of the U.S. struggled with drought that conjured memories of the Dust

Bowl, parts of Africa, Russia, Pakistan, Colombia, Australia and China dealt with the other extreme: deadly and expensive flooding.

But the most troubling climate development this year was the melting at the top of the world, Jarraud said. Summer sea ice in the Arctic shrank to 18 percent below the previous record low. The normally ice-packed Arctic passages were open to shipping much of the summer, more than ever before, and a giant Russian tanker carrying liquefied natural gas made a delivery that way to prove how valuable this route has become, said Mark Serreze, director of the National Snow and Ice Data Center.

Also in Greenland, 97 percent of the surface ice sheet had some melting. Changes in the Arctic alter the rest of the world's weather and "melting of the ice means an amplifying of the warming," Jarraud said.

There were other weather extremes no one predicted: A European winter cold snap that killed more than 800 people. A bizarre summer windstorm called a derecho in the U.S. mid-Atlantic that left millions without power. Antarctic sea ice that inched to a record high. More than a foot of post-Thanksgiving rain in the western U.S. Super Typhoon Bopha, which killed hundreds of people in the Philippines and was the southernmost storm of its kind.

The United States has had "some quiet years while the rest of the world was quite wild," but that's not the case this year, Arndt said. Insurance giant Munich Re in a report this fall concluded: "Nowhere in the world is the rising number of annual natural catastrophes more evident than in North America."

In 2011, the United States set a record with 14 billion-dollar weather disasters. The National Oceanic and Atmospheric Administration has a preliminary count of 11 such disasters this year. And NOAA's official climate extreme index, which tallies disasters and rare events like super-hot days, is on pace to set its own record.

Arndt points to the geographic heart of America, the Mississippi River, as emblematic.

On May 6, 2011, the Mississippi River at New Madrid, Mo., crested at its highest point on record. Less than 16 months later on Aug. 30, 2012, the same spot on the river was more than 53 feet lower, hitting an all-time low water mark.

The U.S. went through the same lurching extremes on tornadoes. Those storms killed 553 people last year, Furgione said. This year began with many tornadoes, then in April they just stopped. April to November, normal tornado season, saw the fewest F1 or stronger tornadoes in the U.S. ever.

"Every year is bringing different types of extreme weather and climate events," NOAA chief Jane Lubchenco said. "All storms today are happening in a climate-altered world."

Not everything is connected to man-made global warming, climate scientists say. Some, like tornadoes, have no scientifically discernible connection. Others, like the

East Coast superstorm, will be studied to see if climate change is a cause, although scientists say rising sea levels clearly worsened flooding. They are more convinced that the heat waves of last summer are connected to global warming.

These are "clearly not freak events," but "systemic changes," said climate scientist Stefan Rahmstorf of the Potsdam Institute in Germany. "With all the extremes that, really, every year in the last 10 years have struck different parts of the globe, more and more people absolutely realize that climate change is here and already hitting us."

In 1988, NASA scientist James Hansen, sometimes called the godfather of global warming science, ran computer models that predicted the decade of the 2010s would see many more 95-degree or hotter days and much fewer subfreezing days. This year made Hansen's predictions seemed like underestimates. For example, he predicted that in the 2010s Memphis would have on average 26 days of more than 95 degrees. This year there were 47.

Scientists - both those studying global warming and those studying hurricanes - have warned for more than a decade about a hurricane with big storm surge hitting New York City and flooding the subways. That happened with Sandy. Though it was never a major hurricane, it stretched across nearly 1,000 miles in the U.S., bringing storm surges, power outages to millions and even snow. Sandy killed more than 125 people in the United States and at least 70 in the Caribbean.

For decades, scientists have predicted extensive droughts from global warming. This year, the drought of 2012 was so extensive that nearly 2,300 counties - in almost every state - were declared agriculture disasters. At one point this summer more than 65 percent of the Lower 48 was suffering from drought.

And with lack of water, came fire, something also mentioned as more likely in scientific reports about global warming. Fire season in the United States came earlier than normal and lasted longer, officials said. Nearly 9.2 million acres - an area bigger than the state of Maryland - have been burned by wildfire, the third most since accurate recordkeeping began in 1960.

"Take any one of these events in isolation, it might be possible to yell `fluke!' Take them collectively, it provides confirmation of precisely what climate scientists predicted would happen decades ago if we proceeded with business-as-usual fossil fuel burning, as we have," Pennsylvania State University climate scientist Michael Mann said in an email. "And this year especially is a cautionary tale. What we view today as unprecedented extreme weather will become the new normal in a matter of decades if we proceed with business-as-usual.

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