

CLIMATE DISASTERS IN NORTH CAROLINA

With Trump gutting FEMA and fighting with state governments, what is in store for the rest of 2020 for North Carolina?

TL/DR:

Trump has [failed to prepare us](#) for disasters caused by climate change. What does this mean for North Carolina?

- Research shows climate change is making hurricanes stronger and in North Carolina, this extreme weather is fatal and costing the state billions of dollars:
 - An ["above-normal"](#) Atlantic hurricane season is expected in 2020.
 - In 2019, [FEMA obligated](#) \$30,680,261 to North Carolina following Hurricane Dorian, which [caused record flooding](#) on the state's Outer Banks. [North Carolina has seen eight hurricanes](#) in the past decade that caused a total of \$336.2 billion in damages and 551 deaths.
- In addition to hurricanes, North Carolinians also face other severe storms and flooding due to climate change:
 - [Severe storms have been linked to climate change](#), as hotter air carries more moisture, leading to more frequent and more intense storms.
 - Studies show one-third of the lower 48 states [face flooding risks](#) due to severe storms. AccuWeather also [forecasts an above average](#) number of tornadoes in 2020.
 - In the last decade, [North Carolina has seen 19 severe storms](#) that caused a total of \$35.6 billion in damages and 182 deaths.
 - [Scientists have linked](#) increases in heavy snowfall events to climate change. In the past decade, [North Carolina experienced four winter storms](#) that caused \$9.1 billion in damages and 77 deaths.
- In North Carolina, climate change is also [spurring an increase](#) in drought conditions:
 - In the last decade, [North Carolina has seen three droughts](#) that caused a total of \$22.1 billion in damages and 95 deaths.

HERE'S WHAT'S HAPPENING:

With Trump gutting FEMA and fighting with state governments, North Carolinians should be asking [how ready the federal government is](#) to provide aid in a disaster at a time when climate change is already fueling major disasters that impact North Carolina.

In 2019, [FEMA obligated](#) \$30,680,261 to North Carolina following Hurricane Dorian, which caused \$1.6 billion in damages, 10 deaths, and record flooding along the state's Outer Banks. Studies show climate change is [making hurricanes stronger](#), and [the science connecting climate change to hurricanes](#) like Dorian is strong. In the past decade, [North Carolina has seen eight hurricanes](#), including Dorian, that have caused a total of \$336.2 billion in damages and 551 deaths. This year, an ["above-normal"](#) Atlantic hurricane season is expected, putting North Carolina at risk once again.

In addition to hurricanes, North Carolina is at risk from other types of severe storms that [have been linked to climate change](#). This year, one-third of the lower 48 states [face flooding risks](#) due to severe storms and an [above average number of tornadoes are forecasted](#). In the past decade, [North Carolina has seen 19 severe storms](#) that caused a total of \$35.6 billion in damages and 182 deaths. The state has also experienced heavy snowfall events, with [four winter storms](#) causing a total of \$9.1 billion in damages and 77 deaths in the past decade.

North Carolina is also at risk from climate-related wildfires, which studies showed increase in [severity, frequency and extent](#) due to rising temperatures. In 2016, [wildfires in North Carolina](#), which were [heightened by dry weather conditions](#), caused \$2.6 billion in damages and 21 deaths. Alongside the threat of wildfires, [North Carolina has experienced severe droughts](#) that have caused a total of \$22.1 billion in damages and 95 deaths. Such severe drought events have been [linked to increasing](#) greenhouse gas emissions.

RESEARCH

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DAMAGES FROM CLIMATE-RELATED DISASTERS IMPACTING NORTH CAROLINA

In The Past Decade, North Carolina Has Experienced 35 Climate-Related Disasters Responsible For Over A Billion Dollars' Worth Of Damages. According to NOAA's National Centers for Environmental Information, North Carolina experienced 35 climate-related disasters that were responsible for over a billion dollars' worth of damages. These 35 disasters that occurred between 2009 and 2019 include 17 severe storms, eight tropical cyclones, four winter storms, one freeze, one wildfire, three droughts and one flooding. [ndcd.noaa.gov, Accessed 4/30/2020]

Since Trump Assumed The Office Of The Presidency, North Carolina Has Experienced 14 Climate-Related Disasters Responsible For Over A Billion Dollars' Worth Of Damages. According to NOAA's National Centers for Environmental Information, since President Trump assumed office in 2017, North Carolina has experienced 14 climate-related disasters responsible for over a billion dollars' worth of damages. These 14 disasters include six severe storms, five tropical cyclones, two winter storms, and one freeze event. [ndcd.noaa.gov, Accessed 4/30/2020]

RECENT FEMA SPENDING IN NORTH CAROLINA

2019: FEMA Obligated \$30,680,261 To North Carolina Following Hurricanes And Coastal Storms. According to data from the Federal Emergency Management Agency, North Carolina was obligated \$30,680,261 in 2019 following severe storms. [[FEMA.Gov, Accessed 5/21/2020](#)]

SEVERE STORMS

Link To Climate Change

Heavy Rainstorms Have Become Heavier And More Frequent In The U.S. In The Past Three To Five Decades. According to the National Climate Assessment, “Heavy downpours are increasing nationally, especially over the last three to five decades. The heaviest rainfall events have become heavier and more frequent, and the amount of rain falling on the heaviest rain days has also increased.” [National Climate Assessment, Extreme Weather, [2014](#)]

- **The Midwest And Northeast Have Seen A 30% Increase In Very Heavy Precipitation Over The 1901-1960 Average - The Largest Increase In The Nation.** According to the National Climate Assessment, “Since 1991, the amount of rain falling in very heavy precipitation events has been significantly above average. This increase has been greatest in the Northeast, Midwest, and upper Great Plains – more than 30% above the 1901-1960 average. There has also been an increase in flooding events in the Midwest and Northeast, where the largest increases in heavy rain amounts have occurred.” [National Climate Assessment, Extreme Weather, [2014](#)]

Scientists Have Linked An Increase in Heavy Downpours To Climate Change. According to the National Climate Assessment, “Global analyses show that the amount of water vapor in the atmosphere has in fact increased due to human-caused warming. This extra moisture is available to storm systems, resulting in heavier rainfalls.” [National Climate Assessment, Extreme Weather, [2014](#)]

National Climate Assessment: “Heavy Downpours Are Increasing Nationally...The Mechanism Driving These Changes Is Well Understood.” According to the 2014 National Climate Assessment: “Heavy downpours are increasing nationally, especially over the last three to five decades. The heaviest rainfall events have become heavier and more frequent, and the amount of rain falling on the heaviest rain days has also increased. Since 1991, the amount of rain falling in very heavy precipitation events has been significantly above average. This increase has been greatest in the Northeast, Midwest, and upper Great Plains – more than 30% above the 1901-1960 average. There has also been an increase in flooding events in the Midwest and Northeast, where the largest increases in heavy rain amounts have occurred. The mechanism driving these changes is well understood. Warmer air can contain more water vapor than cooler air. Global analyses show that the amount of water vapor in the atmosphere has in fact increased due to human-caused warming.,,, This extra moisture is available to storm systems,

resulting in heavier rainfalls. Climate change also alters characteristics of the atmosphere that affect weather patterns and storms.” [[2014 National Climate Assessment: Extreme Weather](#)]

2020 Season Outlook

Washington Post Headline: “One-Third Of The Lower 48 Faces Risk Of Flooding This Spring, Weather Service Says.” On March 19, 2020, the Washington Post reported: “A third of the United States is at risk of flooding this spring, including 23 states and 128 million Americans. That’s according to the spring flood outlook released by the National Weather Service on Thursday. The forecast for significant spring flooding comes a year after one of the worst seasons on record in 2019. But this year, the flooding isn’t expected to be quite as severe.” [[Washington Post, 3/19/2020](#)]

AccuWeather Forecasts An Above Average Number Of Tornadoes In 2020. According to AccuWeather, “For all of 2020, AccuWeather predicts a normal to slightly above-normal number of tornadoes, with a range of 1,350 to 1,450. That range would cover what occurred in 2019 (1,422) and is 5 to 15 percent more than the United States annual average (between 1,253 and 1,297 tornadoes occur annually in the U.S.).” [[AccuWeather, 4/6/2020](#)]

2020 Severe Storms

January 2020: Southeastern Tornadoes And Northern Storms And Flooding Caused \$1.1 Billion In Damages And 10 Deaths. According to NOAA’s National Centers for Environmental Information, Southeastern Tornadoes and Northern Storms and Flooding, which hit North Carolina in January 2020, caused \$1.1 billion in damages and resulted in 10 deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

- **North Carolina Was One Of 16 States That Experienced Damage From More Than 80 Tornadoes And Severe Storms Across The Southeast.** According to NOAA’s National Centers for Environmental Information, “More than 80 tornadoes and severe storms caused damage across many southeastern states (AL, AR, GA, IL, IN, KY, LA, MS, MO, NC, OH, SC, TN, TX, VA, WI). Storms and severe flooding also impacted northern states including Michigan, Wisconsin and New York.” [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

2019 Severe Storms

May 2019: South And Southeast Severe Weather Caused \$1.5 Billion In Damages And Resulted In Zero Deaths. According to NOAA’s National Centers for Environmental Information, severe weather in the South and Southeast United States, which hit North Carolina in May 2019, caused \$1.5 billion in damages and resulted in 0 deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

- **Tornadoes And Damaging Hail Particularly Impacted North Carolina's Raleigh Metro Area.** According to NOAA's National Centers for Environmental Information, "Persistent severe storms impacted numerous states from Texas to North Carolina (TX, OK, KS, AR, LA, MS, AL, NC). Tornadoes and damaging hail particularly affected Texas, Louisiana and North Carolina focused across the Raleigh metro region." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

April 2019: Southern And Eastern Tornadoes And Severe Weather Caused \$1.3 Billion In Damages And Resulted In 7 Deaths. According to NOAA's National Centers for Environmental Information, Southern and Eastern Tornadoes and Severe Weather that hit North Carolina in April 2019 caused \$1.3 billion in damages and resulted in 7 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Was One Of Eight States Impacted By Tornadoes And Severe Storms That Caused Damaging Hail And High Wind Damage.** According to NOAA's National Centers for Environmental Information, "Tornado outbreak and severe storms impacted many states (TX, LA, MS, AL, GA, NC, OH and PA). More than 50 tornadoes occurred across central Mississippi and Alabama causing damage to vehicles, homes and businesses. More than 25 additional tornadoes also caused damage across several eastern states from Georgia to Pennsylvania. These severe storms also delivered damaging hail and high wind damage that was widespread across many Southern and and [sic] Eastern states." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2018 Severe Storms

July 2018: Central And Eastern Tornadoes And Severe Weather Caused \$1.6 Billion In Damages And Zero Deaths. According to NOAA's National Centers for Environmental Information, Central and Eastern Tornadoes and Severe Weather that hit North Carolina in July 2018 caused \$1.6 billion in damages and zero deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Was One Of Fifteen States Impacted By At Least 41 Tornadoes And High Wind Damage From Thunderstorms.** According to NOAA's Centers for Environmental Information, "At least 41 tornadoes and high wind damage from thunderstorms impact numerous Central and Eastern states (MO, IA, IL, IN, KS, KY, AL, AR, GA, TN, NC, SC, VA, MD, PA) over a multi-day event. The tornado damage was most severe across Iowa." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

April 2018: Southern And Eastern Tornadoes And Severe Weather Caused \$1.4 Billion In Damages And Three Deaths. According to NOAA's National Centers for Environmental Information, Southern and Eastern Tornadoes and Severe Weather that hit North Carolina in April 2018 caused \$1.4 billion in damages and 3 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Was One Of Fifteen States That Experienced Damage From Tornadoes And Severe Storms With Large Hail.** According to NOAA's National Centers for Environmental Information, "Tornadoes and severe storms with large hail cause widespread damage across many Southern and Eastern states (AR, FL, GA, LA, MD, MI, MS, MO, NJ, NY, NC, PA, SC, TX, VA) over a multi-day period." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]
- **Over 70 Tornadoes Were Largely Clustered In Louisiana, Mississippi, North Carolina And Virginia.** According to NOAA's National Centers for Environmental Information, "There were over 70 confirmed tornadoes largely clustered in Louisiana, Mississippi, North Carolina and Virginia. This same system also caused winter storm impacts of high wind and ice accumulation in northeastern states." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2017 Severe Storms

March 2017: Central/Southeast Tornado Outbreak Caused \$1.9 Billion In Damages And 6 Deaths. According to NOAA's National Centers for Environmental Information, a Central/Southeast Tornado Outbreak that hit North Carolina in March 2017 caused \$1.9 billion in damages and six deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Over 70 Tornadoes Caused Significant Damage Across Many Central And Southern States.** According to NOAA's National Centers for Environmental Information, "Over 70 tornadoes developed during a widespread outbreak across many central and southern states causing significant damage. There was also widespread straight-line wind and hail damage. This was the second largest tornado outbreak to occur early in 2017." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2016 Severe Storms

April 2016: South/Southeast Tornadoes Caused \$2.6 Billion In Damages And Six Deaths. According to NOAA's National Centers for Environmental Information, South/Southeast Tornadoes that hit North Carolina in April 2016 caused \$2.6 billion in damages and six deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **A Large Outbreak Of Tornadoes And Hail Storms Caused Damage Across States In The South And Southeastern U.S.** According to NOAA's National Centers for Environmental Information, "Large outbreak of tornadoes affects numerous states across the South and Southeast. Additional damage also from large hail and straight-line wind during the multi-day thunderstorm event." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

February 2016: Southeast And Eastern Tornadoes Caused \$1.1 Billion In Damages And 10 Deaths. According to NOAA's National Centers for Environmental Information, South and

Eastern Tornadoes that hit North Carolina in February 2016 caused \$1.1 billion in damages and 10 deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

- **At Least 50 Tornadoes Caused Widespread Damage Across Fifteen States Including North Carolina.** According to NOAA's National Centers for Environmental Information, "Early outbreak of tornadoes and severe weather across many southern and eastern states including (AL, CT, FL, GA, LA, MA, MD, MS, NC, NJ, NY, PA, SC, TX, VA). There were at least 50 confirmed tornadoes causing widespread damage." [ncdc.noaa.gov, Accessed 4/30/2020]

2015 Severe Storms

October 2015: South Carolina And East Coast Flooding Caused \$2.2 Billion In Damages And 25 Deaths. According to NOAA's National Centers for Environmental Information, South Carolina and East Coast Flooding that hit North Carolina in October 2015 caused \$2.2 billion in damages and 25 deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

April 2015: South/Southeast Severe Weather Caused \$1.4 Billion In Damages And 0ZeriDeaths. According to NOAA's National Centers for Environmental Information, South/Southeast Severe Weather that hit North Carolina in April 2015 caused \$1.4 billion in damages and zero deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

- **North Carolina Was One Of Twelve States Impacted By High Winds And Severe Hail From The Storms.** According to NOAA's National Centers for Environmental Information, "Severe storms across the South and Southeastern states (AL, AR, FL, GA, KS, LA, MS, NC, OK, SC, TN, TX). High winds and severe hail created the most significant damage in Texas." [ncdc.noaa.gov, Accessed 4/30/2020]

April 2015: Midwest/Ohio Valley Severe Weather Caused \$1.7 Billion In Damages And Two Deaths. According to NOAA's National Centers for Environmental Information, Midwest/Ohio Valley Severe Weather that hit North Carolina in April 2015 caused \$1.7 billion in damages and two deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

- **North Carolina Was One Of Several States Impacted By Severe Storms Across The Midwest And Ohio Valley.** According to NOAA's National Centers for Environmental Information, "Severe storms across the Midwest and Ohio Valley including the states (AR, IA, IL, IN, KS, KY, MI, MO, NC, OH, OK, PA, TN, TX, WI, WV). Large hail and high winds created the most damage across Missouri and Illinois." [ncdc.noaa.gov, Accessed 4/30/2020]

2014 Severe Storms

April 2014: Tornadoes And Flooding Caused \$1.9 Billion In Damages And 33 Deaths. According to NOAA's National Centers for Environmental Information, tornadoes and flooding across the Midwest, Southeast and Northeast which hit North Carolina in April 2014 caused \$1.9 billion in damages and 33 deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

- **83 Confirmed Tornadoes Impacted Across Fifteen States Including North Carolina.** According to NOAA's National Centers for Environmental Information, "Tornado outbreak across the Midwest, Southeast and Northeast states (AL, AR, DE, FL, GA, KS, MD, MO, MS, NC, NJ, NY, PA, TN, VA) with 83 confirmed tornadoes." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2012 Severe Storms

June - July 2012: Severe Weather Caused \$3.3 Billion In Damages And 28 Deaths. According to NOAA's National Centers for Environmental Information, Severe Weather across the Plains, East and Northeast, which hit North Carolina in June and July 2012, caused \$3.3 billion in damages and 28 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Was One Of 11 States Impacted By A Sustained Outbreak Of Thunderstorms And High Winds Across Central, Eastern And Northeastern States.** According to NOAA's National Centers for Environmental Information, "Sustained outbreak of thunderstorms / high winds from a strong derecho event over the central, eastern, and northeastern states (IL, IN, KY, OH, WV, SC, NC, VA, MD, DC, NJ)." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2011 Severe Storms

June 2011: Tornadoes And Severe Weather Across The Midwest And Southeast Caused \$1.8 Billion In Damages And Three Deaths. According to NOAA's National Centers for Environmental Information, tornadoes and severe weather across the midwest and southeast United States, which hit North Carolina in June 2011, caused \$1.8 billion in damages and three deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Experienced Additional Wind And Hail Damage .** According to NOAA's National Centers for Environmental Information, "Outbreak of tornadoes over central states (OK, TX, KS, NE, MO, IA, IL) with an estimated 81 tornadoes. Additional wind and hail damage across the Southeast (TN, GA, NC, SC)." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

April 2011: Tornadoes Across The Midwest And Southeast Caused \$2.4 Billion In Damages And 38 Deaths. According to NOAA's National Centers for Environmental Information, in April 2011, tornadoes that spread across the midwest and southeast, including North Carolina, caused \$2.4 billion in damages and 38 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **An Estimated 177 Tornadoes Broke Out Across Ten States, Including North Carolina.** According to NOAA's National Centers for Environmental Information, "Outbreak of

tornadoes over central and southern states (OK, TX, AR, MS, AL, GA, NC, SC, VA, PA) with an estimated 177 tornadoes." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

April 2011: Tornadoes Across The Southeast And Midwest Caused \$2.5 Billion In Damages And Zero Deaths. According to NOAA's National Centers for Environmental Information, in April 2011, tornadoes that spread across the Midwest and Southeast, including North Carolina, caused \$2.5 billion in damages and zero deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **An Estimated 59 Tornadoes Broke Out Across Nine States, Including North Carolina.** According to NOAA's National Centers for Environmental Information, "Outbreak of tornadoes over central and southern states (NC, SC, TN, AL, TX, OK, KS, IA, WI) with an estimated 59 tornadoes." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

April 2011: Tornadoes Across The Midwest And Southeast Caused \$3.2 Billion In Damages And Nine Deaths. According to NOAA's National Centers for Environmental Information, in April 2011, tornadoes that spread across the Midwest and Southeast, including North Carolina, caused \$3.2 billion in damages and nine deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **An Estimated 46 Tornadoes Broke Out Across Ten States, Including North Carolina.** According to NOAA's National Centers for Environmental Information, "Outbreak of tornadoes over central and southern states (KS, MO, IA, IL, WI, KY, GA, TN, NC, SC) with an estimated 46 tornadoes." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2010 Severe Storms

June 2010: Severe Weather Across The Rockies, Central And East United States Caused \$1.1 Billion In Damages And Two Deaths. According to NOAA's National Centers for Environmental Information, severe storms across the Rockies, Central and Eastern states, including North Carolina, caused \$1.1 billion in damages and two deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Was One Of Nine States Impacted By Wind And Hail Damage Caused By Severe Storms.** According to NOAA's National Centers for Environmental Information, "Severe storms cause high wind and hail damage across numerous states including CO, NM, KS, OK, IL, IN, GA, SC and NC." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2009 Severe Storms

June 2009: Severe Weather Across The Midwest, South And East Caused \$1.6 Billion In Damages And Zero Deaths. According to NOAA's National Centers for Environmental Information, severe weather across the Midwest, Southern and Eastern states, including North Carolina, caused \$1.6 billion in damages and two deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Was One Of Thirteen States Impacted By High Winds And A Sustained Outbreak Of Thunderstorms.** According to NOAA's National Centers for Environmental

Information, "Sustained outbreak of thunderstorms and high winds from a strong derecho event over the central, southern, and eastern states (TX, OK, MO, NE, KS, AR, AL, MS, TN, NC, SC, KY, PA)." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

HURRICANES

Link To Climate Change

New York Times Headline: "Climate Change Is Making Hurricanes Stronger, Researchers Find."

On May 18, 2020, the New York Times reported: "Hurricanes have become stronger worldwide during the past four decades, an analysis of observational data shows, supporting what theory and computer models have long suggested: climate change is making these storms more intense and destructive. The analysis, of satellite images dating to 1979, shows that warming has increased the likelihood of a hurricane developing into a major one of Category 3 or higher, with sustained winds greater than 110 miles an hour, by about 8 percent a decade."

[[New York Times, 5/18/2020](https://www.nytimes.com/2020/05/18/climate/hurricanes-stronger.html)]

NOAA: Human Activities May Have Already Made Changes To Atlantic Hurricanes. According to the Geophysical Fluid Dynamics Laboratory, "It is premature to conclude that human activities—and particularly greenhouse gas emissions that cause global warming—have already had a detectable impact on Atlantic hurricane or global tropical cyclone activity. That said, human activities may have already caused changes that are not yet detectable due to the small magnitude of the changes or observational limitations, or are not yet confidently modeled (e.g., aerosol effects on regional climate)." [NOAA, Geophysical Fluid Dynamics Laboratory, accessed [8/29/17](#)]

Anthropogenic Warming Is Likely To Increase Intensity Of Hurricanes By As Much As 11%.

According to the Geophysical Fluid Dynamics Laboratory, "Anthropogenic warming by the end of the 21st century will likely cause tropical cyclones globally to be more intense on average (by 2 to 11% according to model projections for an IPCC A1B scenario). This change would imply an even larger percentage increase in the destructive potential per storm, assuming no reduction in storm size." [NOAA, Geophysical Fluid Dynamics Laboratory, accessed [8/29/17](#)]

Increased Hurricane Activity Is Linked To Higher Surface Temperatures Caused By Man Made Carbon Emissions.

According to the National Climate Assessment, "The recent increases in activity are linked, in part, to higher sea surface temperatures in the region that Atlantic hurricanes form in and move through. Numerous factors have been shown to influence these local sea surface temperatures, including natural variability, human-induced emissions of heat-trapping gases, and particulate pollution. Quantifying the relative contributions of natural

and human-caused factors is an active focus of research.” [National Climate Assessment, Extreme Weather, [2014](#)]

Warming Water Would Provide Fuel For More Intense Hurricanes. According to NASA, “The one way in which global warming could impact hurricanes is by making them more intense. More heat and water in the atmosphere and warmer sea surface temperatures could provide more fuel to increase the wind speeds of tropical storms.” [NASA, Earth Observatory, accessed [8/28/17](#)]

2020 Season Outlook

NOAA Report: “An Above-Normal 2020 Atlantic Hurricane Season Is Expected.” According to the National Oceanographic and Atmospheric Administration: “An above-normal 2020 Atlantic hurricane season is expected, according to forecasters with NOAA’s Climate Prediction Center, a division of the National Weather Service. The outlook predicts a 60% chance of an above-normal season, a 30% chance of a near-normal season and only a 10% chance of a below-normal season. The Atlantic hurricane season runs from June 1 through November 30.” [[NOAA press release, 5/21/2020](#)]

Accuweather Forecasted 14-20 Tropical Storms For the 2020 Atlantic Hurricane Season With 7-11 Becoming Hurricanes. Based on the newest forecasting models, AccuWeather forecasters have extended the upper range of hurricanes predicted for the Atlantic hurricane season. The hurricane team, led by Dan Kottlowski, the company’s top hurricane expert, is now predicting 14 to 20 tropical storms, with additions also to the number of storms that become hurricanes: seven to 11 this season.” [[Accuweather, 5/7/2020](#)]

CNN Headline: “Experts Agree This Hurricane Season Will Be Above-Average, Maybe Even Extremely Active.” On May 8, 2020, CNN reported: “Hurricane season is fast approaching and it is likely to be active -- maybe even an extremely active -- season. ‘Nearly all seasonal projections that have been issued by various agencies, institutions and private forecasting companies call for this season to be quite busy,’ CNN meteorologist Taylor Ward says. Almost all of which are forecasting an above-average -- more than six -- hurricanes this season, which begins June 1. Some are even calling for an ‘extremely active’ season -- more than nine hurricanes. There are over a dozen forecasts published. And even though the official forecast from the National Oceanic and Atmospheric Administration won’t come until May 21, a strong consensus in the forecasts across the industry indicates the US is in for an active season.” [[CNN 5/8/2020](#)]

2019: Hurricane Dorian

August – September 2019: Hurricane Dorian Caused \$1.6 Billion In Damages And Resulted In 10 Deaths. According to NOAA’s National Centers for Environmental Information, Hurricane

Dorian, which hit North Carolina in August and September of 2019, caused \$1.6 billion in damages and resulted in 10 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Dorian Was A Category 1 Hurricane That Caused Significant Flood, Severe Storm, And Tornado Damage On North Carolina's Outer Banks.** According to NOAA's National Centers for Environmental Information, "Category 1 hurricane makes landfall on the Outer Banks of North Carolina, after devastating the northern Bahama Islands as a historically-powerful and slow-moving hurricane. Dorian tracked offshore parallel to the Florida, Georgia and South Carolina coastline before making a North Carolina landfall, bringing a destructive sound-side surge that inundated many coastal properties and isolated residents who did not evacuate. Significant flood, severe storm, and tornado damage to many homes and businesses occurred on the Outer Banks of North Carolina." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]
- **Dorian Reached A Maximum Sustained Wind Speed At Landfall At 185 Miles Per Hour, The Highest Since The 1935 Labor Day Hurricane.** According to NOAA's National Center for Environmental Information, "Dorian's intensification to a category 5 storm marks the fourth consecutive year, in which a maximum category 5 storm developed in the Atlantic basin - a new record. Dorian also tied the record for maximum sustained wind speed for a landfalling hurricane (185 mph) in the Atlantic, a record shared with the historic 1935 Labor Day Hurricane." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

Washington Post: The Science Connecting Climate Change To Hurricanes Like Dorian Is Strong. On September 4, 2019, the Washington Post reported: "The science connecting climate change to hurricanes like Dorian is strong. Warmer oceans fuel more extreme storms; rising sea levels bolster storm surges and lead to worse floods. Just this summer, after analyzing more than 70 years of Atlantic hurricane data, NASA scientist Tim Hall reported that storms have become much more likely to 'stall' over land, prolonging the time when a community is subjected to devastating winds and drenching rain. But none of the numbers in his spreadsheets could prepare Hall for the image on his computer screen this week: Dorian swirling as a Category 5 storm, monstrous and nearly motionless, above the islands of Great Abaco and Grand Bahama." [[Washington Post](https://www.washingtonpost.com), 9/4/2019]

Hurricane Dorian Caused Record Flooding On North Carolina's Outer Banks. In February of 2020, the Associated Press reported: "More than 9,000 dump truck loads of debris have been hauled away from Ocracoke Island after it was battered by Hurricane Dorian five months ago, according to numbers released this week. All of the lingering storm debris is set to be cleared from the island by the end of February, Hyde County emergency management director Justin Gibbs told The Virginian-Pilot. Crews have already disposed of about 6,650 tons of waste, including thousands of damaged trees, parts of hundreds of ruined homes and even household appliances like refrigerators and washing machines, Gibbs added. The September storm inundated the Outer Banks island with waters surging to a record 7 feet in some places, news outlets reported at the time. The storm heavily damaged homes, businesses and other infrastructure, and the recovery effort has been ongoing. Hyde County crews have been filling trucks with debris for months, dumping waste in a trash mound two stories tall on a parking lot

near the Cape Hatteras National Seashore, the newspaper said. The estimated cost of the debris removal was \$26 million two months ago, but the most recent numbers weren't immediately available, according to Gibbs." [[Associated Press, 2/7/2020](#)]

2019: Hurricane Michael

October 2018: Hurricane Michael Caused \$25.5 Billion In Damages And Resulted In 49 Deaths. According to NOAA's National Centers for Environmental Information, Hurricane Michael, which hit North Carolina in October 2018, caused \$25.5 billion in damages and 49 deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

- **Hurricane Michael Was A Category 5 Hurricane That Reached Wind Speeds Of 160 Miles Per Hour.** According to NOAA's National Centers for Environmental Information, "Powerful category 5 hurricane made landfall at Mexico Beach, Florida with devastating winds of 160 mph and storm surge in excess of 15 feet. [...] Michael's intense winds also reached well inland causing billions in damage costs to agriculture and forestry, as high winds hit during harvest season for numerous crops across several states. [...] Michael was initially rated as a category 4 with 155 winds but upgraded to a category 5 with 160 mph winds upon further analysis." [[ncdc.noaa.gov, Accessed 4/30/2020](#)]
- **Hurricane Michael Was The Third Category 4 Or Higher Storm To Make Landfall In The U.S. Since 2017.** According to NOAA's National Centers for Environmental Information, "Michael is the third category 4 or higher storm to make landfall in the U.S. since 2017. Michael is the first category 5 to strike the U.S. mainland since Hurricane Andrew in 1992 and is only the fourth on record. The others are the Labor Day Hurricane (1935) and Hurricane Camille (1969)." [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

CBS News: "Sometimes Connecting Climate Change To A Specific Weather Event Is Difficult. With Hurricane Michael, It's Not." In October of 2018, CBS News reported: "Sometimes connecting climate change to a specific weather event is difficult. With Hurricane Michael, it's not. The science is easy: Earth's waters are getting warmer due to an increasing global temperature, and warmer waters fuel hurricanes. Water temperatures in the far northern Gulf of Mexico were 3 to 5 degrees Fahrenheit higher than normal for this time of year. Instead of water temperatures being near 80, they were in the mid-80s as Michael moved over the Gulf and approached the Florida coast. That's a huge difference. Even a small temperature bump in the ocean causes a tremendous addition of energetic heat and water vapor to a storm, meaning higher wind speeds and more storm surge. All other things being equal, a storm hovering above 85-degree water will become much stronger than a storm hovering above 80-degree water." [[CBS News, 10/13/2018](#)]

2018: Hurricane Florence

September 2018: Hurricane Florence Caused \$24.5 Billion In Damages And Resulted In 53 Deaths. According to NOAA's National Centers for Environmental Information, Hurricane Florence, which hit North Carolina in September 2018, caused \$24.5 billion in damages and 53 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Hurricane Florence Produced Extreme Rainfall Reaching Almost 36 Inches In North Carolina.** According to NOAA's National Centers for Environmental Information, "Hurricane Florence was a large and very slow moving hurricane that produced extreme rainfall across eastern North Carolina (up to 35.93") and South Carolina (up to 23.81"), as prodigious amounts of rainfall were common in many locations." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]
- **Hurricane Florence Made Landfall As A Category 1 Hurricane At Wrightsville Beach In North Carolina With A Storm Surge Of Up To 10 Feet And Winds Gusts At Over 100 Miles Per Hour.** According to NOAA's National Centers for Environmental Information, "Florence made landfall as a category 1, at Wrightsville Beach, NC with damaging storm surge up to 10 feet and wind gusts reported over 100 mph. However, the majority of the damage caused by Florence was due to the rainfall inland, which caused many rivers to surpass previous record flood heights." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]
- **U.S. Marine Base Camp Lejeune In North Carolina Suffered Extensive Damage Costing Billions To Repair.** According to NOAA's National Centers for Environmental Information, "U.S. Marine base Camp Lejeune in North Carolina suffered extensive damage that will cost billions to repair." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]
- **The Total Damage North Carolina Saw From Hurricane Florence Was More Than The Damage From Both Hurricane Matthew In 2016 And Hurricane Floyd In 1999 Combined.** According to NOAA's National Centers for Environmental Information, "The total damage from Florence in North Carolina is more than the cost experienced during Hurricane Matthew (2016) and Hurricane Floyd (1999) combined." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

Hurricane Florence Was Described As One Of The Worst Hurricanes To Hit The Carolinas Since Hugo In 1989. In September of 2018, National Geographic reported: "The slow-moving storm pushed storm surges as high as 10 feet onto the shore when it makes landfall Friday morning. It was described as one of the worst hurricanes to hit the coastal Carolinas since Hurricane Hugo battered Charleston in September 1989. But it is the potential for days of drenching rainfall, already causing flooding, that has officials most worried." [[National Geographic](https://www.nationalgeographic.com), 9/13/2018]

2017: Hurricane Irma

September 2017: Hurricane Irma Caused \$52.5 Billion In Damages And 97 Deaths. According to NOAA's National Centers for Environmental Information, Hurricane Irma, which hit North Carolina in September 2017, caused \$52.5 billion in damages and 97 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Hurricane Irma Was A Category 4 Hurricane And A Category 5 Storm.** According to NOAA's National Centers for Environmental Information, "Category 4 hurricane made landfall at Cudjoe Key, Florida after devastating the U.S. Virgin Islands - St John and St Thomas - as a category 5 storm." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]
- **Hurricane Irma Sustained Winds Of 185 Miles Per Hour For Longer Than 37 Hours, The Longest Recorded In The Satellite Era.** According to NOAA's National Centers for Environmental Information, "Category 4 hurricane made landfall at Cudjoe Key, Florida after devastating the U.S. Virgin Islands - St John and St Thomas - as a category 5 storm. [...] Irma maintained a maximum sustained wind of 185 mph for 37 hours, the longest in the satellite era. Irma also was a category 5 storm for longer than all other Atlantic hurricanes except Ivan in 2004." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

Scientists Say Climate Change Made Hurricane Irma Much Stronger. In September of 2017, BloombergNEF reported: "Climate change didn't cause Hurricane Irma, the most powerful storm to form in the open Atlantic Ocean, but did make it much stronger, scientists in Germany and the U.K. said. Irma made landfall in the Caribbean early Wednesday and barreled toward Puerto Rico on a path that may bring it ashore in Florida and destroy so much property that damages surpass Hurricane Katrina. 'Unfortunately, the physicality is very clear: Hurricanes get their destructive energy from the warmth of the ocean, and the region's water temperatures are super elevated,' said Anders Levermann, a climate scientist at the Potsdam Institute for Climate Impact Research, in an emailed statement on Wednesday." [[BloombergNEF](https://www.bloombergnef.com), 9/6/2017]

2017: Hurricane Harvey

August 2017: Hurricane Harvey Caused \$131.3 Billion In Damages And 89 Deaths. According to NOAA's National Centers for Environmental Information, Hurricane Harvey, which hit North Carolina in August 2017, caused \$131.3 billion in damages and 89 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

NYT Op-Ed: "The Severity Of Harvey, In Other Words, Is Almost Certainly Related To Climate Change." According to an op-ed in the New York Times, "The severity of Harvey, in other words, is almost certainly related to climate change. Yes, I know the sober warning that's issued whenever an extreme weather disaster occurs: No individual storm can be definitively blamed on climate change. It's true, too. Some version of Harvey probably would have happened without climate change, and we'll never know the hypothetical truth." [New York Times, [8/29/17](https://www.nytimes.com)]

- **“Add Up The Evidence, And It Overwhelmingly Suggests That Human Activity Has Helped Create The Ferocity Of Harvey.”** According to an op-ed in the New York Times, “Add up the evidence, and it overwhelmingly suggests that human activity has helped create the ferocity of Harvey. That message may be hard to hear — harder to hear, certainly, than stories of human kindness that is now mitigating the storm’s toll. But it’s the truth.” [New York Times, [8/29/17](#)]

Politico: “Harvey Is What Climate Change Looks Like In A World That Has Decided, Over And Over, That It Doesn’t Want To Take Climate Change Seriously.” According to Politico, “But there’s an uncomfortable point that, so far, everyone is skating around: We knew this would happen, decades ago. We knew this would happen, and we didn’t care. Now is the time to say it as loudly as possible: Harvey is what climate change looks like. More specifically, Harvey is what climate change looks like in a world that has decided, over and over, that it doesn’t want to take climate change seriously.” [Politico, [2/28/17](#)]

- **“If We Don’t Talk About The Climate Context Of Harvey, We Won’t Be Able To Prevent Future Disasters And Get To Work On That Better Future.”** According to Politico, “If we don’t talk about the climate context of Harvey, we won’t be able to prevent future disasters and get to work on that better future. Those of us who know this need to say it loudly. As long as our leaders, in words, and the rest of us, in actions, are OK with incremental solutions to a civilization-defining, global-scale problem, we will continue to stumble toward future catastrophes. Climate change requires us to rethink old systems that we’ve assumed will last forever. Putting off radical change—what futurist Alex Steffen calls “predatory delay”—just adds inevitable risk to the system. It’s up to the rest of us to identify this behavior and make it morally repugnant.” [Politico, [2/28/17](#)]

Human Contribution Responsible For Up To 30% Of Rainfall From Hurricane Harvey. According to the Atlantic, “But [Kevin Trenberth, a senior scientist at the U.S. National Center for Atmospheric Research] says that the extra heat could make the storm more costly and more powerful, overpowering and eventually breaking local drainage systems. ‘The human contribution can be up to 30 percent or so of the total rainfall coming out of the storm,’ he said. ‘It may have been a strong storm, and it may have caused a lot of problems anyway—but [human-caused climate change] amplifies the damage considerably.’” [Atlantic, [8/27/17](#)]

2016: Hurricane Matthew

October 2016: Hurricane Matthew Caused \$10.9 Billion In Damages And 49 Deaths. According to NOAA’s National Centers for Environmental Information, Hurricane Matthew, which hit North Carolina in October 2016, caused \$10.9 billion in damages and 49 deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

- **Hurricane Matthew Made Landfall In North Carolina As A Category 1 Hurricane.** According to NOAA’s National Centers for Environmental Information, “Category 1 hurricane made landfall in North Carolina, after it paralleled the Southeast coast along

Florida, Georgia and the Carolinas causing widespread damage from wind, storm surge and inland flooding.” [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Hurricane Matthew Caused Damage From Wind, Storm Surge And Inland Flooding, With The Most Costly Impacts Stemming From Historic Levels Of River Flooding In Eastern North Carolina.** According to NOAA’s National Centers for Environmental Information, “Category 1 hurricane made landfall in North Carolina, after it paralleled the Southeast coast along Florida, Georgia and the Carolinas causing widespread damage from wind, storm surge and inland flooding. The most costly impacts were due to historic levels of river flooding in eastern North Carolina where 100,000 homes, businesses and other structures were damaged.” [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]
- **100,000 Homes, Businesses And Other Structures Were Damaged By River Flooding That Reached Levels Comparable To Hurricane Floyd In 1999.** According to NOAA’s National Centers for Environmental Information, “The most costly impacts were due to historic levels of river flooding in eastern North Carolina where 100,000 homes, businesses and other structures were damaged. This inland flooding was comparable to Hurricane Floyd (1999) that also impacted eastern North Carolina.” [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2012: Hurricane Sandy

October 2012: Hurricane Sandy Caused \$74.1 Billion In Damages And 159 Deaths. According to NOAA’s National Centers for Environmental Information, Hurricane Sandy, which hit North Carolina in October 2012, caused \$74.1 billion in damages and 159 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Damage From Wind, Rain And Heavy Snow Impacted North Carolina As Hurricane Sandy Merged With A Developing Nor'easter Storm.** According to NOAA’s National Centers for Environmental Information, “Extensive damage across several northeastern states (MD, DE, NJ, NY, CT, MA, RI) due to high wind and coastal storm surge, particularly NY and NJ. Damage from wind, rain and heavy snow also extended more broadly to other states (NC, VA, WV, OH, PA, NH), as Sandy merged with a developing Nor'easter.” [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2011: Hurricane Irene

August 2011: Hurricane Irene Caused \$15.8 Billion In Damages And 45 Deaths. According to NOAA’s National Centers for Environmental Information, Hurricane Irene, which hit North Carolina in August 2011, caused \$15.8 billion in damages and 45 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Hurricane Irene Was A Category 1 Hurricane That Made Landfall Over Coastal North Carolina.** According to NOAA's National Centers for Environmental Information, "Category 1 hurricane made landfall over coastal NC and moved northward along the Mid-Atlantic Coast (NC, VA, MD, NJ, NY, CT, RI, MA, VT) causing torrential rainfall and flooding across the Northeast." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]
- **North Carolina Experienced Considerable Wind Damage.** According to NOAA's National Centers for Environmental Information, "Wind damage in coastal NC, VA, and MD was moderate with considerable damage resulting from falling trees and power lines, while flooding caused extensive flood damage across NJ, NY, and VT. Over seven million homes and businesses lost power during the storm. Numerous tornadoes were also reported in several states further adding to the damage." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

SNOW AND ICE STORMS

Link To Climate Change

Winter Storms Have Increased In Frequency And Intensity Since 1950. According to the National Climate Assessment, "Winter storms have increased in frequency and intensity since the 1950s, and their tracks have shifted northward over the United States." [National Climate Assessment, Extreme Weather, [2014](#)]

Scientists Have Linked Increases In Heavy Snowfall Events to Climate Change. According to Climate Signals (a project of the nonprofit Climate Nexus), climate change is responsible for "increasing the frequency of extreme snowfall events." [Climate Signals, [accessed 5/21/20](#)]

2018 Winter Storms

March 2018: Northeast Winter Storms Caused \$2.3 Billion In Damages And 9 Deaths.

According to NOAA's National Centers for Environmental Information, Northeast Winter Storms that hit North Carolina in March 2018 caused \$2.3 billion in damages and 9 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Many North Eastern States Witnessed Widespread Damage Caused By High Winds, Heavy Snow And Heavy Coastal Erosion.** According to NOAA's National Centers for Environmental Information, "Powerful Nor'easter impacted many Northeastern states including MD, MA, NH, NJ, NY, PA, CT, DE, RA and VA. Widespread damage resulted from the combination of high winds, heavy snow and heavy coastal erosion." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

January 2018: Central And Eastern Winter Storms Caused \$1.1 Billion In Damages And 22 Deaths. According to NOAA's National Centers for Environmental Information, Central and Eastern Winter Storms that hit North Carolina in January 2018 caused \$1.1 billion in damages and 22 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Was One Of Several States Along The East Coast To Witness Extreme Damage From The Nor'easter Storm.** According to NOAA's National Centers for Environmental Information, "A Nor'easter caused damage across many Northeastern states including MA, NJ, NY, CT, ME, NH, PA, MD, RI, SC, TN, VA, NC and GA." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2015 Winter Storms

February 2015: Central And Eastern Winter Storms And A Cold Wave Caused \$3.3 Billion In Damages And 30 Deaths. According to NOAA's National Centers for Environmental Information, Central and Eastern Winter Storms and an associated cold wave that hit North Carolina in February 2015 caused \$3.3 billion in damages and 30 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Was One Of Nineteen States Impacted By A Large Winter Storm And Associated Wave Of Cold Weather.** According to NOAA's National Centers for Environmental Information, "A large winter storm and associated cold wave impacted many central, eastern and northeastern states (CT, DE, GA, IL, KY, MA, MD, ME, MI, NC, NH, NJ, NY, OH, PA, RI, SC, TN, VA)." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2014 Winter Storms

January 2014: Winter Storms Caused \$2.4 Billion In Damages And 16 Deaths. According to NOAA's National Centers for Environmental Information, a winter storm across the Midwest, Southeast and Northeast which hit North Carolina in January 2014 caused \$2.4 billion in damages and 16 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **North Carolina Was One Of 17 States Impacted By Winter Storms That Caused Widespread Damage.** According to NOAA's National Centers for Environmental Information, "Winter storm caused widespread damage across numerous Midwest, Southeast and Northeastern states (AL, GA, IL, IN, KY, MD, MI, MO, MS, NC, NJ, NY, OH, PA, SC, TN, VA)." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

WILDFIRE

Link To Climate Change

Climate Change Is Increasing The Severity, Frequency, And Extent Of Wildfires. According to a report from the EPA: “Higher temperatures and drought are likely to increase the severity, frequency, and extent of wildfires in Colorado, which could harm property, livelihoods, and human health. In 2013, the Black Forest Fire burned 14,000 acres and destroyed over 500 homes. Wildfire smoke can reduce air quality and increase medical visits for chest pains, respiratory problems, and heart problems. The size and number of western forest fires have increased substantially since 1985.” [[Environmental Protection Agency, “What Climate Change Means for Colorado” August 2016](#)]

The National Climate Assessment Has Found That The Number Of Wildfires Is Likely To Increase As The Climate Warms And Could Induce “Profound Changes To Certain Ecosystems.” In August of 2018, The Atlantic reported: “As if there wasn’t enough evidence of that. Last year, the National Climate Assessment—written by a panel of scientists in the military, federal civilian agencies, and private universities—reviewed the complete scientific literature on climate change and wildfires. They concluded that the number of large blazes had increased since the early 1980s. They also said the number of wildfires ‘is projected to further increase in those regions as the climate warms.’ They warned this could induce ‘profound changes to certain ecosystems.’” [The Atlantic, [8/10/18](#)]

Acres Burned By Wildfire Doubled In Recent Decades Due To Climate Change. According to the 2018 National Climate Assessment Report: “Wildfire is a natural part of many ecosystems in the Southwest, facilitating germination of new seedlings and killing pests. Although many ecosystems require fire, excessive wildfire can permanently alter ecosystem integrity. Climate change has led to an increase in the area burned by wildfire in the western United States. Analyses estimate that the area burned by wildfire from 1984 to 2015 was twice what would have burned had climate change not occurred. Furthermore, the area burned from 1916 to 2003 was more closely related to climate factors than to fire suppression, local fire management, or other non-climate factors.” [[National Climate Assessment, Chapter 25, 2018](#)]

2020 Season Outlook

More Than 4.8 Million People, Or Half Of North Carolina’s Population, Currently Live In Areas At Elevated Risk Of Wildfires. According to States At Risk, “More than 4.8 million people in North Carolina, or 50 percent of North Carolina’s population, are living in areas at elevated risk of wildfire.” [[StatesAtRisk.Org, Accessed 4/29/2020](#)]

2019 Fire Season

In 2019, 14,548 Acres Of Land Were Burned Due To Wildfire In North Carolina. According to the National Interagency Fire Center’s 2019 report, 14,548 acres of land were burned in 3,872

fires across North Carolina in 2019. [[National Interagency Fire Center, National Report of Wildland Fires and Acres Burned by State, 2019 Report](#)]

2018 Fire Season

In 2018, 18,058 Acres Of Land Were Burned Due To Wildfire In North Carolina. According to the National Interagency Fire Center's 2018 report, 18,058 acres of land were burned in 3,625 fires across North Carolina in 2018. [[National Interagency Fire Center, National Report of Wildland Fires and Acres Burned by State, 2018 Report](#)]

2017 Fire Season

In 2017, 46,507 Acres Of Land Were Burned Due To Wildfire In North Carolina. According to the National Interagency Fire Center's 2017 report, 46,507 acres of land were burned in 5,125 fires across North Carolina in 2017. [[National Interagency Fire Center, National Report of Wildland Fires and Acres Burned by State, 2017 Report](#)]

2016 Fire Season

Summer – Fall 2016: Western/Southeastern Wildfires Caused \$2.6 Billion In Damages And 21 Deaths. According to NOAA's National Centers for Environmental Information, Western/Southeastern Wildfires that sparked in North Carolina through the Summer and Fall of 2016 caused \$2.6 billion in damages and 21 deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

The Wildfires Were Exacerbated By Historic Dry Weather Across Western North Carolina. According to WCNC, "'We're in a historically dry fall here,' said Catherine Hibbard with the U.S. Forest Service. It's fifth-driest season in the past 104 years for Western North Carolina. Dry weather and no rainfall combined with high wind gusts and low humidity levels have led to difficulties to contain the blaze. Additionally, dry leaves scatter the forest floor and firefighters are battling 3- to 4-foot flames on steep, rugged terrain." [[WCNC, 11/15/2016](#)]

In 2019, Forest Officials Warned That Ripe Conditions Could Result In Wildfires On The Scale Seen By The State In 2016. According to Fox8, "Fire officials are having flashbacks to the fall of 2016 when wildfires burned nearly 60,000 acres across North Carolina. Sam Griffith, with North Carolina Forest Service's District 10 office, says this year could be just as bad, if not worse. The N.C. Forest Service uses readiness plans to determine its daily staffing levels for emergency response resources. They range from 1 to 5. On Oct. 8, the district was at a level 3. They say high winds, low humidity and the recent dry spell are a dangerous combination." [[Fox8, 10/8/2019](#)]

DROUGHT

Link To Climate Change

NASA Research Showed Human Activity Has Been Influencing Global Patterns Of Drought, With Increased Drought Occurring In Response To Greenhouse Gas Emissions. According to NASA, “Warming temperatures and changing precipitation patterns can lead to droughts, and NASA research shows that humans have been influencing global patterns of drought for nearly a century. Kate Marvel and Ben Cook, researchers at NASA’s Goddard Institute for Space Studies and Columbia University in New York City, investigated humans’ influence on 20th-century drought patterns using historical weather data and drought maps calculated from tree rings. They found that a data ‘fingerprint’ – a drying and wetting pattern predicted to occur in response to greenhouse gas emissions – was visible as far back as the early 1900s.” [climate.nasa.gov, 6/13/2019]

Climate Change Is Already Affecting Global Patterns Of Drought, And Such Trends Are Expected To Continue. According to NASA, “Demonstrating that humans influenced global drought patterns in the past is an important part of understanding how we may influence them in the future, said Cook. ‘Climate change is not just a future problem,’ he said. ‘This shows it’s already affecting global patterns of drought, hydroclimate, trends, variability — it’s happening now. And we expect these trends to continue, as long as we keep warming the world.’” [climate.nasa.gov, 6/13/2019]

Longer And More Intense Droughts Are Expected In The Future Due To Climate Change. According to NASA, “Demonstrating climate models’ ability to accurately depict past droughts, helps to confirm their ability to model future droughts as well. Other research of Cook’s shows that if greenhouse gas emissions continue to increase along current trajectories, the U.S. Southwest could see ‘megadroughts’ lasting more than three decades. Cook and his team ran 17 different climate models, and all of them agree that there are likely to be longer and more intense droughts in the future.” [climate.nasa.gov, 6/13/2019]

2016 Drought Impacts

2016: West/Northeast/Southeast Drought Caused \$3.8 Billion In Damages And Zero Deaths. According to NOAA’s National Centers for Environmental Information, droughts across the Western, Northeastern and Southeastern States including North Carolina in 2016 caused \$3.8 billion in damages and zero deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

2011 Drought Impacts

Spring - Summer 2011: Drought And Heat Waves Across The Southern Plains And Southwest Caused \$14 Billion In Damages And 95 Deaths. According to NOAA’s National Centers for Environmental Information, drought and heat waves across the Southern Plains and

Southwest, which impacted North Carolina in the Spring and Summer of 2011, caused \$14 billion in damages and 95 deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

2009 Drought Impacts

2009: Drought Across The Southwest And Great Plains Caused \$4.3 Billion In Damages And Zero Deaths. According to NOAA's National Centers for Environmental Information, drought across the Southwest and Great Plains caused \$4.3 billion in damages and zero deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

- **Drought Conditions Caused Agriculture Losses In Numerous States.** According to NOAA's National Centers for Environmental Information, "Drought conditions occurred during much of the year across parts of the Southwest, Great Plains, and southern Texas causing agricultural losses in numerous states (TX, OK, KS, CA, NM, AZ)." [ncdc.noaa.gov, Accessed 4/30/2020]