

CLIMATE DISASTERS IN PENNSYLVANIA

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

TL/DR:

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

- Research shows climate change is [making hurricanes stronger, threatening lives and costing Pennsylvanians billions](#):
 - An ["above-normal"](#) Atlantic hurricane season is expected in 2020.
 - In the last decade, [Pennsylvania was hit by](#) Hurricane Sandy (2012) and Tropical Storm Lee (2011), which together caused a total of \$77 billion in damages and 180 deaths.
- In addition to hurricanes, Pennsylvanians face 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, [Pennsylvania has seen 25 severe storm events](#) which caused a total of \$57.6 billion in damages and 237 deaths.
- In Pennsylvania, climate change is also [spurring an increase](#) in drought conditions:
 - In the last decade, [Pennsylvania has witnessed two drought events](#) which caused a total of \$48.2 billion in damages and 218 deaths.

HERE'S WHAT'S HAPPENING:

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

Pennsylvania is impacted by a wide range of climate-related disasters, including severe storms, hurricanes and drought. In the past decade, Pennsylvania has seen [one hurricane \(Hurricane Sandy\) and one tropical storm \(Tropical Storm Lee\)](#) that caused a total of \$77 billion in damages and 180 deaths. Studies show climate change is [making hurricanes stronger](#), and this year, an [“above-normal”](#) Atlantic hurricane season is expected - putting Pennsylvania at risk once again.

In addition to hurricanes, Pennsylvania 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, [Pennsylvania has witnessed 25 severe storms](#) that caused a total of \$57.6 billion in damages and 237 deaths. The state has also experienced heavy snowfall events, with [three winter storms](#) causing a total of \$7.8 billion in damages and 82 deaths in the past decade.

Pennsylvania is also at risk from climate-related droughts, which have been [linked to increasing](#) greenhouse gas emissions. In 2011 and 2012, Pennsylvania was [impacted by droughts](#) which caused a total of \$48.2 billion in damages and 218 deaths.

RESEARCH

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DAMAGES FROM CLIMATE-RELATED DISASTERS IMPACTING PENNSYLVANIA

In The Past Decade, Pennsylvania Has Experienced 32 Climate-Related Disasters Responsible For Over A Billion Dollars' Worth Of Damages. According to NOAA's National Centers for Environmental Information, Pennsylvania experienced 32 climate-related disasters that were responsible for over a billion dollars' worth of damages. These 32 disasters that occurred between 2009 and 2019 include 22 severe storms, five winter storms, two droughts, two tropical cyclones and one flooding event. [ndcd.noaa.gov, Accessed 4/30/2020]

Since Trump Assumed The Office Of The Presidency, Pennsylvania Has Experienced 10 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, Pennsylvania has experienced 10 climate-related disasters responsible for over a billion dollars' worth of damages. [ndcd.noaa.gov, Accessed 4/30/2020]

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](#)]

2019 Severe Storms

May 2019: Rockies, Central And Northeast Tornadoes And Severe Weather Caused \$4.5 Billion In Damages And Three Deaths. According to NOAA’s National Centers for Environmental Information, tornadoes and severe weather events across the Rockies, Central and Northeastern states that hit Pennsylvania in May 2019 caused \$4.5 billion in damages and three deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

- **Pennsylvania Was One Of 12 States To Be Impacted By Damaging Hail, Thunderstorm Winds And 190 Tornadoes That Broke Out Across The Rockies, Central And Northeastern U.S.** According to NOAA’s National Centers for Environmental Information, “A four-day tornado outbreak impacts many states across the Rockies, Central and Northeast (CO, WY, NE, KS, OK, MO, IA, IL, IN, OH, PA and NJ). This outbreak produced 190 tornadoes in addition to hundreds of reports of damaging hail and straight-line thunderstorm winds. Of particular note was an EF-4 tornado that produced heavy damage near the city of Dayton, Ohio on May 27.” [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

April 2019: Southern And Eastern Tornadoes And Severe Weather Caused \$1.3 Billion In Damages And Seven Deaths. According to NOAA’s National Centers for Environmental Information, tornadoes and severe weather events across the Southern and Eastern United States that hit Pennsylvania in April 2019 caused \$1.3 billion in damages and seven deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

- **More Than 25 Tornadoes And Severe Storms Caused Damage Across Eastern States From Georgia To Pennsylvania.** 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]

February 2019: Southeast, Ohio Valley And Northeast Severe Weather Caused \$1.3 Billion In Damages And Two Deaths. According to NOAA's Centers for Environmental Information, severe weather across the Southeast, Ohio Valley and Northeast that hit Pennsylvania in February 2019 caused \$1.3 billion in damages and two deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **High-Wind Damage Impacted North Eastern States Including Pennsylvania.** According to NOAA's Centers for Environmental Information, "Tornadoes, severe weather and flooding in the south (MS, AL, TN) and high-wind damage across many Ohio Valley (IL, IN, OH) and Northeastern states (CT, MD, MA, NJ, NY, PA, VA, WV). This storm system produced heavy rain that caused major flooding along parts of the Ohio, Mississippi and Tennessee rivers." [[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 Pennsylvania in July 2018 caused \$1.6 billion in damages and zero deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Pennsylvania 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]

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

- **Pennsylvania Experienced Damage From A Derecho Event Across The Northeast And A Dozen Reported Tornadoes Over Pennsylvania, New York And Connecticut.** According to NOAA's National Centers for Environmental Information, "Severe storm damage across many Central states including TX, KS, CO, OK, MO, IL, IN, IA and OH. This was followed by a derecho event across the Northeastern states of MD, NJ, NY, PA, VA, WV, MA and CT that caused widespread high wind damage. Also, there were one dozen tornadoes reported across PA, NY and CT causing further damage." [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

May 2018: Central And Northeastern Severe Weather Caused \$1.4 Billion In Damages And Zero Deaths. According to NOAA's National Centers for Environmental Information, severe weather across Central and Northeastern U.S. that hit Pennsylvania in May 2018 caused \$1.4 billion in damages and zero deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](https://www.ncdc.noaa.gov)]

- **Pennsylvania Was Impacted By High Wind Damage From Severe Storms.** According to NOAA's National Centers for Environmental Information, "Numerous central states (KS, NE, OK, TX, NM, MO, IA, IL, IN, OH, WI) were impacted by large hail and tornadoes. Several northeastern states including NY, PA and VT were also impacted by high wind damage from severe storms." [[ncdc.noaa.gov, Accessed 4/30/2020](https://www.ncdc.noaa.gov)]

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

- **Pennsylvania 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 [...] This same system also caused winter storm impacts of high wind and ice accumulation in northeastern states." [[ncdc.noaa.gov, Accessed 4/30/2020](https://www.ncdc.noaa.gov)]

March 2018: Northeast Winter Storms Caused \$2.3 Billion In Damages And Nine Deaths. According to NOAA's National Centers for Environmental Information, Northeast Winter Storms that hit Pennsylvania in March 2018 caused \$2.3 billion in damages and nine deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](https://www.ncdc.noaa.gov)]

- **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, Accessed 4/30/2020](https://www.ncdc.noaa.gov)]

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 Pennsylvania in January 2018 caused \$1.1 billion in damages and 22 deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](https://www.ncdc.noaa.gov)]

- **Pennsylvania 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, Accessed 4/30/2020](https://www.ncdc.noaa.gov)]

2017 Severe Storms

June 2017: Midwest Severe Weather Caused \$1.6 Billion In Damages And Zero Deaths.

According to NOAA's National Centers for Environmental Information, severe weather across the Midwest that hit Pennsylvania in June 2017 caused \$1.6 billion in damages and zero deaths. [[ncdc.noaa.gov](https://www.ndbc.noaa.gov), Accessed 4/30/2020]

- **Pennsylvania Experienced Hail, High Winds And Numerous Tornadoes.** "Severe hail, high winds and numerous tornadoes impact many states over several days including WY, TX, NE, KS, MO, IA, IL, PA, VA, NY." [[ncdc.noaa.gov](https://www.ndbc.noaa.gov), Accessed 4/30/2020]

2016 Severe Storms

July 2016: Rockies And Northeast Severe Weather Caused \$1.6 Billion In Damages And Zero Deaths.

According to NOAA's National Centers for Environmental Information, severe weather across the Rockies and Northeast that hit Pennsylvania in July 2016 caused \$1.6 billion in damages and zero deaths. [[ncdc.noaa.gov](https://www.ndbc.noaa.gov), Accessed 4/30/2020]

- **Pennsylvania Was One Of Seven States To Be Impacted By Large Hail And High Wind Damage As A Result Of The Storms.** According to NOAA's National Centers for Environmental Information, "Severe storms across the Rockies and Northeastern states (CO, WY, VA, MD, PA, NJ, NY) caused large hail and high wind damage. Storm damage in Colorado was the most costly due to hail." [[ncdc.noaa.gov](https://www.ndbc.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 Pennsylvania in February 2016 caused \$1.1 billion in damages and 10 deaths. [[ncdc.noaa.gov](https://www.ndbc.noaa.gov), Accessed 4/30/2020]

- **At Least 50 Tornadoes Caused Widespread Damage Across Many Southern And Eastern States.** 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](https://www.ndbc.noaa.gov), Accessed 4/30/2020]

2015 Severe Storms

June 2015: Central And Northeast Severe Weather Caused \$1.3 Billion In Damages And One Death.

According to NOAA's National Centers for Environmental Information, Central and Northeast Severe Weather that hit Pennsylvania in June 2015 caused \$1.3 billion in damages and one death. [[ncdc.noaa.gov](https://www.ndbc.noaa.gov), Accessed 4/30/2020]

- **Pennsylvania Was One Of 12 Impacted By Severe Storms, Widespread Hail And High Wind Damage.** According to NOAA's National Centers for Environmental Information, "Severe storms across numerous Central and Northeast states (CO, CT, IA, IL, MD, MI,

NJ, NY, PA, SD, VA, WI) with widespread hail and high wind damage.” [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

April 2015: South/Southeast Severe Weather Caused \$1.4 Billion In Damages And Zero Deaths. According to NOAA’s National Centers for Environmental Information, severe weather across the South and Southeast that hit Pennsylvania in April 2015 caused \$1.4 billion in damages and zero deaths. [[ncdc.noaa.gov](https://www.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 Pennsylvania in April 2015 caused \$1.7 billion in damages and two deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Pennsylvania Was One Of Several States Impacted By 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](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

2014 Severe Storms

May 2014: Rockies/Midwest/Eastern Severe Weather Caused \$4.1 Billion In Damages And Zero Deaths. According to NOAA’s National Centers for Environmental Information, severe weather across the Rockies, Midwest and East, which hit Pennsylvania in May 2014, caused \$4.1 billion in damages and zero deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **Pennsylvania Experienced Severe Storms And Was One Of The Top Three States In Terms Of Costly Damages.** According to NOAA’s National Centers for Environmental Information, “Severe storms across the Rockies, Midwest and Eastern states (CO, MT, IA, IL, IN, OH, SC, VA, PA, DE, NY) with the most costly damage in Colorado, Illinois and Pennsylvania.” [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

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 Pennsylvania in April 2014 caused \$1.9 billion in damages and 33 deaths. [[ncdc.noaa.gov](https://www.ncdc.noaa.gov), Accessed 4/30/2020]

- **83 Confirmed Tornadoes Impacted Across Fifteen States Including Pennsylvania.** 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

May 2012: Southern Plains/Midwest/Northeast Severe Weather Caused \$2.6 Billion In Damages And One Death. According to NOAA’s National Centers for Environmental

Information, severe weather across the Southern Plains, Midwest and Northeast, which hit Pennsylvania in May 2012, caused \$2.6 billion in damages and one death. [ncdc.noaa.gov, Accessed 4/30/2020]

- **Pennsylvania Was One Of Six States Impacted By 27 Confirmed Tornadoes, Severe Hail And Straight-Line Winds.** According to NOAA's National Centers for Environmental Information, "Severe storms over the southern plains, midwest and northeast (TX, OK, KS, MN, PA, NY) with 27 confirmed tornadoes. Significant damage also from severe hail and straight-line winds." [ncdc.noaa.gov, Accessed 4/30/2020]

2011 Severe Storms

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 Pennsylvania, caused \$2.4 billion in damages and 38 deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

- **An Estimated 177 Tornadoes Broke Out Across Ten States, Including Pennsylvania.** 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, Accessed 4/30/2020]

May 2011: Midwest/Southeast Tornadoes Caused \$10.6 Billion In Damages And 177 Deaths. According to NOAA's National Centers for Environmental Information, tornadoes across the Midwest and Southeast caused \$10.6 billion in damages and 177 deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

- **An Estimated 180 Tornadoes Impacted 15 States Including Pennsylvania.** According to NOAA's National Centers for Environmental Information, "Outbreak of tornadoes over central and southern states (MO, TX, OK, KS, AR, GA, TN, VA, KY, IN, IL, OH, WI, MN, PA) with an estimated 180 tornadoes. Notably, an EF-5 tornado struck Joplin, MO resulting in at least 160 deaths, making it the deadliest single tornado to strike the U.S. since modern tornado record keeping began in 1950." [ncdc.noaa.gov, Accessed 4/30/2020]

2010 Severe Storms

July 2010: Midwest/Northeast Severe Storms And Flooding Caused \$1.1 Billion In Damages And Zero Deaths. According to NOAA's National Centers for Environmental Information, severe storms and flooding across the Midwest and Northeast that hit Pennsylvania in July 2010 caused \$1.1 billion in damages and zero deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

May 2010: Oklahoma, Kansas And Texas Tornadoes And Severe Weather Caused \$4 Billion In Damages And Three Deaths. According to NOAA's National Centers for Environmental Information, tornadoes and severe weather across Oklahoma, Kansas and Texas, which

impacted Pennsylvania in May 2010, caused \$4 billion in damages and three deaths.

[\[ncdc.noaa.gov, Accessed 4/30/2020\]](#)

March 2010: Northeast Flooding Caused \$2.2 Billion In Damages And 11 Deaths. According to NOAA's National Centers for Environmental Information, flooding across the Northeast that impacted Pennsylvania in March 2010 caused \$2.2 billion in damages and 11 deaths.

[\[ncdc.noaa.gov, Accessed 4/30/2020\]](#)

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 Pennsylvania, caused \$1.6 billion in damages and two deaths. [\[ncdc.noaa.gov, Accessed 4/30/2020\]](#)

- **Pennsylvania 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)." [\[ncdc.noaa.gov, Accessed 4/30/2020\]](#)

February 2009: Southeast/Ohio Valley Severe Weather Caused \$2.1 Billion In Damages And Ten Deaths. According to NOAA's National Centers for Environmental Information, severe weather across the Southeast and Ohio Valley that hit Pennsylvania in February 2009 caused \$2.1 billion in damages and ten deaths. [\[ncdc.noaa.gov, Accessed 4/30/2020\]](#)

- **Severe Thunderstorms And High Winds Impacted Seven States Including Pennsylvania.** According to NOAA's National Centers for Environmental Information, "Complex of severe thunderstorms and high winds across the region (TN, KY, OK, OH, VA, WV, PA)." [\[ncdc.noaa.gov, Accessed 4/30/2020\]](#)

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](#)]

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 Pennsylvania in February 2015 caused \$3.3 billion in damages and 30 deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

- **Pennsylvania 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, 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 Pennsylvania in January 2014 caused \$2.4 billion in damages and 16 deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

- **Pennsylvania 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, Accessed 4/30/2020](#)]

2011 Winter Storms

February 2011: Groundhog Day Blizzard Caused \$2.1 Billion In Damages And 36 Deaths. According to NOAA's National Centers for Environmental Information, a Groundhog Day blizzard that hit Pennsylvania in February 2011 caused \$2.1 billion in damages and 36 deaths. [[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](#)]

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](#)]

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 Pennsylvania in October 2012, caused \$74.1 billion in damages and 159 deaths. [[ncdc.noaa.gov, Accessed 4/30/2020](#)]

- **Damage From Wind, Rain And Heavy Snow Impacted Pennsylvania 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.”
[\[ncdc.noaa.gov, Accessed 4/30/2020\]](#)

2011: Tropical Storm Lee

September 2011: Tropical Storm Lee Caused \$2.9 Billion In Damages And 21 Deaths.

According to NOAA's National Centers for Environmental Information, Tropical Storm Lee, which hit Pennsylvania in September 2011, caused \$2.9 billion in damages and 21 deaths.
[\[ncdc.noaa.gov, Accessed 4/30/2020\]](#)

- **Pennsylvania And New York Were Most Affected By Flooding From Tropical Storm Lee.** According to NOAA's National Centers for Environmental Information, “Wind and flood damage across the southeast (LA, MS, AL, GA, TN) but considerably more damage from record flooding across the northeast (PA, NY, NJ, CT, VA, MD). Pennsylvania and New York were most affected.” [\[ncdc.noaa.gov, Accessed 4/30/2020\]](#)

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]

2012 Drought

2012: Nationwide Droughts And Heatwaves Caused \$34.2 Billion In Damages And 123 Deaths. According to NOAA's National Centers for Environmental Information, drought and heatwaves across the U.S. in 2012 caused \$34.2 billion in damages and 123 deaths. [ncdc.noaa.gov, Accessed 4/30/2020]

- **The 2012 Drought Impacted Over Half Of The U.S. And Was The Most Extensive Drought In America Since The 1930s.** According to NOAA's National Centers for Environmental Information, “The 2012 drought is the most extensive drought to affect the U.S. since the 1930s. Moderate to extreme drought conditions affected more than half the country for a majority of 2012. The following states were affected: CA, NV, ID, MT, WY, UT, CO, AZ, NM, TX, ND, SD, NE, KS, OK, AR, MO, IA, MN, IL, IN, GA. Costly drought impacts occurred across the central agriculture states resulting in widespread harvest failure for corn, sorghum and soybean crops, among others. The associated summer heatwave also caused 123 direct deaths, but an estimate of the excess mortality due to heat stress is still unknown.” [ncdc.noaa.gov, Accessed 4/30/2020]

2011 Drought

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