CLIMATE DISASTERS IN GEORGIA

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

TL/DR:

Trump has failed to prepare us for disasters caused by climate change. What does this mean for Georgia?

- Research shows climate change is , threatening Georgians and costing the state billions of dollars:
    - An "above-normal" Atlantic hurricane season is expected in 2020.
    - In the past decade, Georgia experienced 5 hurricanes, totaling $115 billion in damages and 258 deaths.
- In addition to hurricanes, Georgians 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 past decade, Georgia has experienced 2 floods costing a total of $4.7 billion in damages and resulting in 64 deaths.
    - In the past decade, Georgia has experienced 16 severe storms costing a total of $31.3 billion in damages and resulting in 185 deaths.
- In Georgia, climate change is also increasing the the severity, frequency and extent of wildfires increases, and spurring an increase in drought conditions:
    - In the last decade Georgia experienced one wildfire that caused a total of $2.6 billion in damages and 21 deaths.
    - In the last decade, Georgia experienced three droughts that caused a total of $52 billion in damages and 218 deaths.

HERE'S WHAT'S HAPPENING:

With Trump gutting FEMA and fighting with state governments, Georgians 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 Georgia.

Five hurricanes have hit Georgia in the past 4 years, totaling $115 billion in damages and 258 deaths. Studies show climate change is making hurricanes stronger, and the science connecting climate change to hurricanes like Dorian is strong. This year, an "above-normal" Atlantic hurricane season is expected, putting Georgia at risk once again.

Georgia is threatened by other types of severe storms linked to climate change as well. 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, Georgia has seen 16 severe storms that caused a total of $31.3 billion in damages and 185 deaths. The combined effect of these storms, the hurricanes, and emissions-driven sea level rise has been two floods costing a total of $4.7 billion in damages and resulting in 64 deaths.

Georgia is also at risk from climate-related wildfires, which studies showed increase in severity, frequency and extent due to rising temperatures. In 2016, wildfires across the Southeast caused $2.6 billion in damages and 21 deaths. Setting the stage for these fires were the 3 droughts that Georgia experienced over the past decade, which caused a total of $52 billion in damages and 218 deaths, and represent a trend that has been linked to increasing greenhouse gas emissions.

RESEARCH

CONTENTS

DAMAGES FROM CLIMATE-RELATED DISASTERS IMPACTING GEORGIA

In The Past Decade, Georgia Has Experienced 37 Climate-Related Disasters Responsible For Over A Billion Dollars' Worth Of Damages. According to NOAA's National Centers for Environmental Information, Georgia experienced 37 climate-related disasters that were responsible for over ten billion dollars' worth of damages. These 37 disasters that occurred between 2009 and 2019, including 21 severe storms, six tropical cyclones, three winter storms, one freeze, one wildfire, three droughts and two floods. [ndcd.noaa.gov, Accessed 5/12/20]

Since Trump Assumed The Office Of The Presidency, Georgia Has Experienced 13 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, Georgia has experienced 13 climate-related disasters responsible for over a billion dollars' worth of damages. These 13 disasters include seven severe storms, four tropical cyclones, one winter storms, and one freeze event. [ndcd.noaa.gov, Accessed 5/12/20]

RECENT FEMA SPENDING IN GEORGIA

2019: FEMA Obligated No Public Funds To Georgia. According to data from the Federal Emergency Management Agency, Georgia was obligated no public funds for disaster relief in 2019. [FEMA.Gov, Accessed 5/21/2020]

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]

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 caused an ocean surge to hit Georgia in August and September of 2019, caused $1.6 billion in damages and resulted in 10 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Dorian Was A Category 1 Hurricane That Caused Significant Flood, Severe Storm, And Tornado Damage On Georgia's Outer Banks.** According to NOAA's National Centers for

Environmental Information, "Category 1 hurricane makes landfall on the Outer Banks of Georgia, 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 Georgia 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 Georgia." [ncdc.noaa.gov, Accessed 5/12/2020]

- **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, Accessed 4/30/2020]

2018: 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 Georgia in October 2018, caused $25.5 billion in damages and 49 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **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 5/12/2020]

- **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 5/12/2020]

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 Georgia in September 2018, caused $24.5 billion in damages and 53 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

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 Georgia in September 2017, caused $52.5 billion in damages and 97 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **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, Accessed 5/12/2020]

- **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, Accessed 5/12/2020]

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

Georgia in October 2016, caused $10.9 billion in damages and 49 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **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, Accessed 5/12/2020]

- **Hurricane Matthew Caused Damage From Wind, Storm Surge And Inland Flooding.** 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, Accessed 5/12/2020]

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]

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]

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]

National Weather Service Predicted Higher than normal precipitation in Georgia through Summer 2020. According to the National Weather Service, precipitation in Georgia has a 40-50% chance of being higher than normal from June-August 2020, placing it in the 'likely to be above normal' category for precipitation. [National Weather Service, accessed 5/23/20]

Heavy Precipitation Events Projected To Increase In The Midwest. According to the 2014 National Climate Assessment, "Projections of future climate over the U.S. suggest that the recent trend towards increased heavy precipitation events will continue. This is projected to occur even in regions where total precipitation is projected to decrease, such as the Southwest." [National Climate Assessment, 2014]

2020 Severe Storms

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, severe weather in the South and Southeast United States, which hit Georgia in April 2019, caused $1.3 billion in damages and resulted in 7 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Tornadoes And Damaging Hail 'widespread,' over 25 tornadoes strike eastern states.** 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 Eastern states.

[ncdc.noaa.gov, Accessed 5/12/2020]

2018 Severe Storms

July 2018: Central And Eastern Tornadoes And Severe Weather Caused $1.6 Billion In Damages And 0 Deaths. According to NOAA's National Centers for Environmental Information, Central and Eastern Tornadoes and Severe Weather that hit Georgia in July 2018 caused $1.6 billion in damages and zero deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Georgia 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, Accessed 5/12/2020]

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 Georgia in April 2018 caused $1.4 billion in damages and 3 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Georgia 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, Accessed 5/12/2020]

March 2018: Southeastern Tornadoes and Severe Weather Caused $1.5 Billion In Damages And 0 Deaths. According to NOAA's National Centers for Environmental Information, Northeast Winter Storms that hit Georgia in March 2018 caused $1.5 billion in damages and 0 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **A Potent Storm System Caused Widespread Damage Across the Southeast.** According to NOAA's National Centers for Environmental Information, "A potent severe storm system caused over 20 tornadoes across Alabama and also widespread hail damage from Texas to Florida. Most notably this system produced an EF-3 tornado that caused extensive damage in Jacksonville, Alabama and across the campus of Jacksonville State University." [ncdc.noaa.gov, Accessed 5/12/2020]

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 Georgia in January 2018 caused $1.1 billion in damages and 22 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Georgia 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 5/12/2020]

2017 Severe Storms

March 2017: Southeast Freeze Caused $1.1 Billion In Damages And Zero Deaths. According to NOAA's National Centers for Environmental Information, a Southeast Freeze that hit Georgia in March 2017 caused $1.1 billion in damages and zero deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **The Severe Freeze Heavily Damaged Fruit Crops In Georgia.** According to NOAA's National Centers for Environmental Information, "Severe freeze heavily damaged fruit crops across several southeastern states (SC, GA, NC, TN, AL, MS, FL, KY, VA). Mid-March freezes are not climatologically unusual in the Southeast, however many crops were blooming 3+ weeks early due to unusually warm temperatures during the preceding weeks. Damage was most severe in Georgia and South Carolina. Crops most impacted include peaches, blueberries, strawberries and apples, among others." [ncdc.noaa.gov, Accessed 5/12/2020]

2015 Severe Storms

April 2015: South/Southeast Severe Weather Caused $1.4 Billion In Damages And 0 Deaths. According to NOAA's National Centers for Environmental Information, South/Southeast Severe Weather that hit Georgia in April 2015 caused $1.4 billion in damages and zero deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Georgia 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 5/12/2020]

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 Georgia in February 2015 caused $3.3 billion in damages and 30 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Georgia 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 5/12/2020]

2014 Severe 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 Georgia in January 2014 caused $2.4 billion in damages and 16 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Georgia 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 5/12/2020]

2013 Severe Storms

March 2013: Severe Weather Caused $2.3 Billion in Damages and 1 Death. According to NOAA's National Centers for Environmental Information, severe weather across the Southeast caused $2.3 Billion in Damages and one death in March 2013. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Severe Weather Caused "Considerable Damage" Across the Southeast.** According to NOAA's National Centers for Environmental Information, "Severe weather over the Southeast (MS, AL, GA, TN) with 10 confirmed tornadoes. Considerable damage resulting from large hail and straight-line wind." [ncdc.noaa.gov, Accessed 5/12/2020]

2012 Severe Storms

March 2012: Severe Weather Across the Southeast Caused $3.6 Billion and 42 Deaths. According to NOAA's National Centers for Environmental Information, Severe Weather, including tornadoes, hit Georgia in March 2012 and caused $3.6 Billion in damages and forty-two deaths [ncdc.noaa.gov, Accessed 5/12/2020]

2011 Severe Storms

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 caused wind and flood damage across the East coast, totaling $2.9 Billion and twenty-one deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

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 Georgia in June 2011, caused $1.8 billion in damages and three deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Georgia 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, Accessed 5/12/2020]

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 Georgia, caused $1.1 billion in damages and two deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **Georgia 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, Accessed 5/12/2020]

April 2010: Severe Weather Across the East Coast Caused $2.7 Billion in Damages And 32 Deaths. According to NOAA's National Centers for Environmental Information, severe weather and flooding across the East Coast and South hit Georgia in April 2010, causing $2.7 Billion in Damages and 32 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

2009 Severe Storms

April 2009: Severe Weather and Tornadoes Caused $1.8 Billion in Damages and Six Deaths. According to NOAA's National Centers for Environmental Information, severe weather and flooding across the Southeast hit Georgia in April 2009, causing $2.7 Billion in damages and six deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

WILDFIRES

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]

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

National Interagency Fire Center Predicts 'Normal' Risk of Wildland Fire In Michigan Through the End of Summer 2020. According to data from the National Interagency Fire Center, Michigan is forecast to have a 'normal' risk of wildland fire through August 2020. [National Interagency Fire Center, accessed 5/25/20]

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]

2016 Wildfires

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 Georgia through the Summer and Fall of 2016 caused $2.6 billion in damages and 21 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

DROUGHT & EXTREME HEAT

Link to Climate Change

Scientists Have Linked Prolonged Heat Waves To Climate Change. According to the 2014 National Climate Assessment Report: "Analyses show that human-induced climate change has generally increased the probability of heat waves." [National Climate Assessment, Extreme Weather, 2014]

Recent Heat Waves "Unprecedented" Since Records Began Over One Hundred Years Ago. According to the 2014 National Climate Assessment Report: "prolonged (multi-month) extreme heat has been unprecedented since the start of reliable instrumental records in 1895." [National Climate Assessment, Extreme Weather, 2014]

National Climate Assessment Showed That Climate Change Is Affecting Us Now, Not Just In The Future. According to CNN, "An analysis by the environmental advocacy group the Sierra Club, released Monday, found nine instances in which Wheeler's statements about the delayed impact of climate change were directly contradicted in the National Climate Assessment, a government-sponsored climate analysis authored by scientists from 13 federal agencies that was released in November. (there is no link to this analysis because they gave it to us exclusively)" [CNN, 4/22/19]

- **Higher Temperatures**. According to CNN, "Between 1901 and 2016, the global average temperatures 'have increased by 1.8 degrees Fahrenheit,' and there is no evidence that the rise in temperature has been caused by any 'natural explanation,' according to the report. 'The evidence consistently points to human activities, especially emissions of greenhouse or heat-trapping gases, as the dominant cause,' the report states." [CNN, 4/22/19]

- **Hotter Years**. According to CNN, "Each decade has been the hottest on record in succession over the past 30 years. Seventeen of the 18 hottest years on record have occurred since 2001, according to the report." [CNN, 4/22/19]

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]

2020 Season Outlook

National Weather Service Outlook Predicted Georgia Would Not Experience Seasonal Drought In The Summer Of 2020. According to data from the National Weather Service's Drought Outlook, Georgia is not expected to experience seasonal drought in the summer of 2020. [National Weather Service, accessed 5/26/20]

National Weather Service Outlook Forecasts 50-60% Chance Of Higher Than Average Temperatures In Georgia June-August 2020. According to data from the National Weather Service, Georgia is likely to have higher than average temperatures between June and August 2020, with odds of higher than average temperatures at 50-60%. [National Weather Service, accessed 5/23/20]

National Weather Service Outlook Forecasts 40-50% Chance Of Higher Than Average Temperatures In Georgia September-November 2020. According to data from the National Weather Service, Georgia is likely to have higher than average temperatures between September and November 2020, with odds of higher than average temperatures at 40-50%. [National Weather Service, accessed 5/23/20]

2016 Drought

2016: West/Northeast/Southeast Drought Caused $3.8 Billion In Damages And 0 Deaths. According to NOAA's National Centers for Environmental Information, droughts across the Western, Northeastern and Southeastern States including Georgia in 2016 caused $3.8 billion in damages and zero deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

2012 Drought

Throughout 2012, Drought Caused $34.2 Billion in Damages and 123 Deaths. According to NOAA's National Centers for Environmental Information, drought and heat waves across the Southern Plains and Southwest, which impacted Georgia in throughout 2012, caused $34.2 Billion in damages and one hundred and twenty-three deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

- **This Drought Was the "Worst Since the 1930's."** 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." [ncdc.noaa.gov, Accessed 5/12/2020]

2011 Drought & Extreme Heat

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 Georgia in the Spring and Summer of 2011, caused $14 billion in damages and 95 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

FLOODING

Link to Climate Change

Scientists Have Linked Increases in Flooding to Climate Change. According to the National Climate Assessment, "Floods are caused or amplified by both weather- and human-related factors. Major weather factors include heavy or prolonged precipitation, snowmelt, thunderstorms, storm surges from hurricanes, and ice or debris jams [...] Increasingly, humanity is also adding to weather-related factors, as human-induced warming increases heavy downpours, causes more extensive storm surges due to sea level rise, and leads to more rapid spring snowmelt [...] The risks from future floods are significant, given expanded development in coastal areas and floodplains, unabated urbanization, land-use changes, and human-induced climate change" [National Climate Assessment, Extreme Weather, 2014]

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]

2015 Flooding

May 2015: Texas and Oklahoma Flooding and Severe Weather Caused $2.8 Billion in Damages and 31 Deaths. According to NOAA's National Centers for Environmental Information, storms associated with those affecting Texas and Oklahoma hit Georgia in May 2015, causing $2.8 Billion in damages and 31 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]

2014 Flooding

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 Georgia in April 2014 caused $1.9 billion in damages and 33 deaths. [ncdc.noaa.gov, Accessed 5/12/2020]