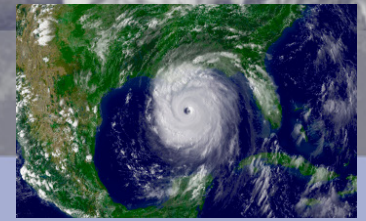


# U.S. Billion-Dollar Weather & Climate Disasters 1980-2016



<https://www.ncdc.noaa.gov/billions/>

The U.S. has sustained 200 weather and climate disasters since 1980 in which overall damages/costs reached or exceeded \$1 billion. Values in parentheses represent the 2016 Consumer Price Index (CPI) cost adjusted value (if different than original value). The total cost of these 200 events exceeds \$1.1 trillion.

■ Drought   
 ■ Flooding   
 ■ Freeze   
 ■ Severe Storm   
 ■ Tropical Cyclone   
 ■ Wildfire   
 ■ Winter Storm

## 2016

- **Louisiana Flooding** - *August 2016*: A historic flood devastated a large area of southern Louisiana resulting from 20 to 30 inches of rainfall over several days. Watson, Louisiana received an astounding 31.39 inches of rain from the storm. Two-day rainfall totals in the hardest hit areas have a 0.2% chance of occurring in any given year: a 1 in 500 year event. More than 30,000 people were rescued from the floodwaters that damaged or destroyed over 50,000 homes, 100,000 vehicles and 20,000 businesses. This is the most damaging U.S. flood event since Superstorm Sandy impacted the Northeast in 2012. *Total Estimated Costs: \$10.0 Billion; 13 Deaths*
- **Rockies and Northeast Severe Weather** - *July 2016*: 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. *Total Estimated Costs: \$1.1 Billion; 0 Deaths*
- **West Virginia Flooding and Ohio Valley Tornadoes** - *June 2016*: Torrential rainfall caused destructive flooding through many West Virginia towns, damaging thousands of homes and businesses and causing considerable loss of life. Over 1,500 roads and bridges were damaged or destroyed making the impact on infrastructure comparable to the historic 2013 Colorado flood. The storm system also produced numerous tornadoes causing damage across several Ohio Valley states. *Total Estimated Costs: \$1.0 Billion; 23 Deaths*
- **Rockies/Central Tornadoes and Severe Weather** - *May 2016*: Sustained period of severe thunderstorms and tornadoes affecting several states including Montana, Colorado, Kansas, Missouri and Texas. The most concentrated days for tornado development were on May 22 and 24. Additional damage was created by straight-line high wind and hail damage. *Total Estimated Costs: \$1.1 Billion; 0 Deaths*
- **Plains Tornadoes and Central Severe Weather** - *May 2016*: Tornadoes and severe storms cause widespread damage across the Plains and Central states (NE, MO, TX, OK, KS, CO, IL, KY, TN) over a multi-day period. The damage from tornadoes and high wind was most costly in Nebraska and Missouri. *Total Estimated Costs: \$1.6 Billion; 2 Deaths*
- **South/Southeast Tornadoes** - *April 2016*: 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. *Total Estimated Costs: \$1.8 Billion; 6 Deaths*
- **Houston Flooding** - *April 2016*: A period of extreme rainfall up to 17 inches created widespread urban flooding in Houston and surrounding suburbs. Over 1,000 homes and businesses were damaged in addition to more than 1,800 high water rescues. This represents the most widespread flooding event to affect Houston since Tropical Storm Allison in 2001. *Total Estimated Costs: \$1.2 Billion; 8 Deaths*
- **North/Central Texas Hail Storm** - *April 2016*: Widespread severe hail damage across north and central Texas including the cities of Plano, Wylie, Frisco, Allen and San Antonio. The damage in San Antonio was particularly severe as the National Weather Service verified reports of hail size reaching 4.5 inches in diameter. This will rank as one of the most costly hail events to affect the United States. *Total Estimated Costs: \$3.5 Billion; 0 Deaths*
- **North Texas Hail Storm** - *March 2016*: Large hail and strong winds caused considerable damage in heavily populated areas of north Texas. This damage was most notable in the cities of Dallas, Fort Worth and Plano. *Total Estimated Costs: \$2.1 Billion; 0 Deaths*
- **Southern Severe Weather** - *March 2016*: Severe hail impacts the Fort Worth and Arlington metro region in Texas. Additional large hail and high wind damage occurred in other locations of Texas, Louisiana and Mississippi. *Total Estimated Costs: \$1.2 Billion; 1 Death*
- **Texas and Louisiana Flooding** - *March 2016*: Multiple days of heavy rainfall averaging 15 to 20 inches led to widespread flooding along the Sabine River basin on the Texas and Louisiana border. This prompted numerous evacuations, high-water rescues and destruction, as more than 1,000 homes and businesses were damaged or destroyed. *Total Estimated Costs: \$1.3 Billion; 5 Deaths*
- **Southeast and Eastern Tornadoes** - *February 2016*: 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. *Total Estimated Costs: \$1.0 Billion; 10 Deaths*

## 2015

- **Western Drought** - *2015*: Drought conditions were present across numerous western states (CA, NV, OR, WA, ID, MT, UT, AZ) with the most severe conditions continuing to plague California for all of 2015. The agriculture sector was again impacted by a lack of rainfall resulting in hundreds of thousands of acres of farmland remaining fallow and requiring excess groundwater pumping to irrigate existing agriculture interests. Wildfire conditions were further enhanced by the ongoing drought. California experienced extensive damage from both drought and wildfire impacts. Drought conditions did improve dramatically across Texas and Oklahoma, in the form of several major flood events. *Total Estimated Costs: \$4.5 (\$4.6) Billion; 0 Deaths*



<https://www.ncdc.noaa.gov/billions/events.pdf>

■ **Texas Tornadoes and Midwest Flooding - December 2015:** A powerful storm system packing unseasonably strong tornadoes caused widespread destruction in the Dallas metropolitan region, damaging well over 1,000 homes and businesses. This same potent system also produced intense rainfall over several Midwestern states triggering historic flooding that has approached or broken records at river gauges in several states (MO, IL, AR, TN, MS, LA). The flooding has overtopped levees and caused damage in numerous areas. This historic storm also produced high wind, snow and ice impacts from New Mexico through the Midwest and into New England. Overall, the storm caused at least 50 deaths from the combined impact of tornadoes, flooding and winter weather. *Total Estimated Costs: \$2.0 Billion; 50 Deaths*

■ **Western and Alaskan Wildfires - Summer-Fall 2015:** Wildfires burned over 10.1 million acres across the U.S. in 2015, surpassing 2006 for the highest annual total of U.S. acreage burned since record-keeping began in 1960. The most costly wildfires occurred in California where over 2,500 structures were destroyed due to the Valley and Butte wildfires with the insured losses alone exceeding \$1.0 billion. The most extensive wildfires occurred in Alaska where over 5 million acres burned within the state. There was extensive burnt acreage across other western states, most notably (OR, WA, ID, MT, ND, CO, WY, TX). *Total Estimated Costs: \$3.0 (\$3.1) Billion; 12 Deaths*

■ **South Carolina and East Coast Flooding - October 2015:** Historic levels of flooding impacted South Carolina causing widespread damage to many homes, businesses, public buildings and infrastructure. This interrupted commerce and closed major transportation corridors (such as I-95) for weeks as rivers slowly receded. Locally extreme rainfall totals exceeding 20-inches were common resulting from the convergence of a powerful low pressure system / frontal boundary and copious moisture from Hurricane Joaquin in the Atlantic. *Total Estimated Costs: \$2.0 Billion; 25 Deaths*

■ **Central and Northeast Severe Weather - June 2015:** 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. *Total Estimated Costs: \$1.2 Billion; 1 Death*

■ **Texas and Oklahoma Flooding and Severe Weather - May 2015:** A slow-moving system caused tremendous rainfall and subsequent flooding to occur in Texas and Oklahoma. The Blanco river in Texas swelled from 5 feet to a crest of more than 40 feet over several hours causing considerable property damage and loss of life. The city of Houston also experienced flooding which resulted in hundreds of high-water rescues. The damage in Texas alone exceeded \$1.0 billion. There was also damage in other states (KS, CO, AR, OH, LA, GA, SC) from associated severe storms. *Total Estimated Costs: \$2.5 (\$2.6) Billion; 31 Deaths*

■ **Southern Plains Tornadoes - May 2015:** Tornado outbreak across the Southern Plain states (IA, KS, NE, OK, CO, SD, TX) with 122 tornadoes. The most costly damage occurred across Texas and Oklahoma. *Total Estimated Costs: \$1.3 Billion; 4 Deaths*

■ **South/Southeast Severe Weather - April 2015:** 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. *Total Estimated Costs: \$1.3 Billion; 0 Deaths*

■ **Midwest/Ohio Valley Severe Weather - April 2015:** 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. *Total Estimated Costs: \$1.6 Billion; 2 Deaths*

■ **Central and Eastern Winter storm, Cold Wave - February 2015:** 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). The city of Boston was particularly impacted as feet of snow continued to accumulate causing load-stress on buildings and clogging transportation corridors. Total, direct losses in Massachusetts alone exceed \$1.0 billion for this event, with considerable damage in many other states. *Total Estimated Costs: \$3.0 (\$3.1) Billion; 30 Deaths*

## 2014

■ **Western Drought - 2014:** Historic drought conditions affected the majority of California for all of 2014 making it the worst drought on record for the state. Surrounding states and parts of Texas, Oklahoma and Kansas also experienced continued severe drought conditions. This is a continuation of drought conditions that have persisted for several years. *Total Estimated Costs: \$4.0 (\$4.1) Billion; 0 Deaths*

■ **Rockies/Plains Severe Weather - September 2014:** Severe storms across the Rockies and Plains states (CO, TX, KS). Large hail and high winds created significant damage across eastern Colorado and Texas, particularly in the Dallas metro area. *Total Estimated Costs: \$1.4 Billion; 0 Deaths*

■ **Michigan and Northeast Flooding - August 2014:** Heavy rainfall in excess of 5 inches caused significant flooding in cities across Michigan damaging thousands of cars, business, homes and other infrastructure. Flooding also occurred across Maryland and New York's Long Island, as the slow-moving storm system delivered 24-hour rainfall exceeding 6 and 12 inches, respectively, creating more flood damage. Islip, NY received 13.57 inches of rain over a 24-hour period on Aug 12-13 setting a new 24-hour precipitation record for New York. *Total Estimated Costs: \$1.0 Billion; 2 Deaths*

■ **Rockies/Central Plains Severe Weather - June 2014:** Severe storms across the Rockies and Central Plains states (NE, KS, WY, IA, AR). Wind gusts exceeding 90 mph and baseball to softball sized hail caused severe damage to structures and vehicles in central and eastern Nebraska. *Total Estimated Costs: \$1.8 Billion; 2 Deaths*

■ **Rockies/Midwest/Eastern Severe Weather - May 2014:** 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. *Total Estimated Costs: \$3.7 (\$3.8) Billion; 0 Deaths*

■ **Midwest/Southeast/Northeast Tornadoes and Flooding - April 2014:** 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. Mississippi had its 3rd greatest number of tornadoes reported for any day since 1950. Torrential rainfall in the Florida panhandle also caused major flooding, as Pensacola set new 1-day and 2-day precipitation records of 15.55 and 20.47 inches, respectively. Flooding rains were also reported in coastal Alabama, as Mobile received 11.24 inches of rain, the third greatest calendar day rainfall total for the city. *Total Estimated Costs: \$1.6 Billion; 33 Deaths*

■ **Plains Severe Weather - April 2014:** Severe storms across the Plains states (IL, KS, MO, TX) causing considerable hail and wind damage in Texas. *Total Estimated Costs: \$1.4 Billion; 0 Deaths*



■ **Midwest/Southeast/Northeast Winter Storm - January 2014:** 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). *Total Estimated Costs: \$2.2 Billion; 16 Deaths*

## 2013

■ **Western/Plains Drought/Heatwave - Spring-Fall 2013:** The 2013 drought slowly dissipated from the historic levels of the 2012 drought, as conditions improved across many Midwestern and Plains states. However, moderate to extreme drought did remain or expand into western states (AZ, CA, CO, IA, ID, IL, KS, MI, MN, MO, ND, NE, NM, NV, OK, OR, SD, TX, UT, WA, WI, WY). In comparison to 2011 and 2012 drought conditions the US experienced only moderate crop losses across the central agriculture states. *Total Estimated Costs: \$10.4 (\$10.7) Billion; 53 Deaths*

■ **Ohio Valley Tornadoes - November 17, 2013:** Late-season outbreak of tornadoes and severe weather over the Ohio Valley (IL, IN, MO, OH, KY, MI) with 70 confirmed tornadoes. Most severe impacts occurred across Illinois and Indiana. *Total Estimated Costs: \$1.1 Billion; 8 Deaths*

■ **Colorado Flooding - September 10-16 2013:** A stalled frontal boundary over Colorado led to record rainfall, as some areas received > 15 inches over several days. This resulted in historic flooding across numerous cities and towns. Destruction of residences, businesses and transportation infrastructure was widespread. *Total Estimated Costs: \$1.5 Billion; 9 Deaths*

■ **Midwest Severe Weather - August 6-7 2013:** Severe weather and large hail causes considerable damage across Minnesota and Wisconsin. *Total Estimated Costs: \$1.0 Billion; 0 Deaths*

■ **Midwest/Plains/Northeast Tornadoes - May 27-31 2013:** Outbreak of tornadoes and severe weather over the Midwest, Plains and Northeast (OK, TX, KS, MO, IL, IN, NY) with 92 confirmed tornadoes including the deadly tornado that struck El Reno, OK. There was also significant damage resulting from hail and straight-line wind. *Total Estimated Costs: \$1.7 (\$1.8) Billion; 10 Deaths*

■ **Midwest/Plains/East Tornadoes - May 18-22 2013:** Outbreak of tornadoes and severe weather over the Midwest, Plains and Eastern states (OK, TX, IL, KS, MO, IA, GA, NY) with 59 confirmed tornadoes including the deadly tornado that impacted Moore, OK. Many destructive tornadoes remained on the ground for an extended time. *Total Estimated Costs: \$2.4 (\$2.5) Billion; 27 Deaths*

■ **Illinois Flooding and Severe Weather - April 16-19 2013:** A slow-moving storm system created rainfall totals of 5 to 10 inches across northern and central Illinois including the Chicago metro. This resulted in damage to many homes and businesses. There was also severe weather damage from wind and hail across Indiana and Missouri. *Total Estimated Costs: \$1.1 Billion; 4 Deaths*

■ **Midwest/Plains Severe Weather - April 7-11, 2013:** Severe weather across the Midwest and Plains states (KS, NE, MO, IN) with a total of 26 confirmed tornadoes. Considerable damage resulting from hail and straight-line wind. *Total Estimated Costs: \$1.4 Billion; 1 Death*

■ **Southeast Severe Weather - March 18, 2013:** Severe weather over the Southeast (MS, AL, GA, TN) with 10 confirmed tornadoes. Considerable damage resulting from large hail and straight-line wind. *Total Estimated Costs: \$2.0 (\$2.1) Billion; 1 Death*

## 2012

■ **U.S. Drought/Heatwave - 2012:** 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. *Total Estimated Costs: \$30.0 (\$31.5) Billion; 123 Deaths*

■ **Western Wildfires - Summer-Fall 2012:** Wildfires burned over 9.2 million acres across the U.S. in 2012. This is the 3rd highest annual total since the year 2000. The most damaging wildfires occurred in the western states (CO, ID, WY, MT, CA, NV, OR, WA). Colorado experienced the most costly wildfires (e.g., Waldo Canyon fire) where several hundred residences were destroyed. *Total Estimated Costs: \$1.7 (\$1.8) Billion; 8 Deaths*

■ **Sandy - October 2012:** 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. Sandy's impact on major population centers caused widespread interruption to critical water / electrical services and also caused 159 deaths (72 direct, 87 indirect). Sandy also caused the New York Stock Exchange to close for two consecutive business days, which last happened in 1888 due to a major winter storm. *Total Estimated Costs: \$65.0 (\$68.3) Billion; 159 Deaths*

■ **Hurricane Isaac - August 2012:** Category 1 hurricane made landfall over Louisiana. Isaac's slow motion and large size led to a large storm surge and flooding rains. This created damage across several southeastern states (LA, MS, AL, FL) including 9 deaths (5 direct, 4 indirect). *Total Estimated Costs: \$2.8 (\$2.9) Billion; 9 Deaths*

■ **Plains/East/Northeast Severe Weather - June 29-July 2 2012:** 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). *Total Estimated Costs: \$2.9 (\$3.0) Billion; 28 Deaths*

■ **Rockies/Southwest Severe Weather - June 6-12 2012:** Severe storms and damaging hail over several states (CO, NM, TX) with 25 confirmed tornadoes. Colorado experienced over \$1.0 (1.1) billion in damage due to hail. *Total Estimated Costs: \$2.6 (\$2.7) Billion; 0 Deaths*

■ **Southern Plains/Midwest/Northeast Severe Weather - May 25-30 2012:** 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. *Total Estimated Costs: \$2.3 (\$2.4) Billion; 1 Death*

■ **Midwest/Ohio Valley Severe Weather - April 28-May 1 2012:** Severe weather over the midwest and Ohio Valley (TX, OK, KS, MO, IL, IN, KY) with 38 confirmed tornadoes. Considerable damage resulting from hail. *Total Estimated Costs: \$3.3 (\$3.5) Billion; 1 Death*



■ **Midwest Tornadoes** - April 13-14 2012: Outbreak of tornadoes and severe weather over the midwest (OK, KS, NE, IA) with 98 confirmed tornadoes including many tornadoes that remained on the ground for an extended time - traveling tens of miles. *Total Estimated Costs: \$1.1 (\$1.2) Billion; 6 Deaths*

■ **Texas Tornadoes** - April 2-3 2012: Outbreak of tornadoes across the greater Dallas-Ft. Worth metropolitan area. Several moderate strength tornadoes (EF-2 and EF-3) affected towns in this area with a total of 22 confirmed tornadoes. *Total Estimated Costs: \$1.0 (\$1.1) Billion; 0 Deaths*

■ **Southeast/Ohio Valley Tornadoes** - March 2-3 2012: Outbreak of tornadoes and severe weather over the southeast and Ohio Valley (AL, GA, IN, OH, KY, TN) with 75 confirmed tornadoes. *Total Estimated Costs: \$3.1 (\$3.3) Billion; 42 Deaths*

## 2011

■ **Texas, New Mexico, Arizona Wildfires** - Summer-Fall 2011: Continued drought conditions and periods of extreme heat provided conditions favorable for a series of historic wildfires across Texas, New Mexico and Arizona. The Bastrop Fire in Texas was the most destructive fire in Texas history destroying over 1,500 homes. The Wallow Fire consumed over 500,000 acres in Arizona making it the largest on record in Arizona. The Las Conchas Fire in New Mexico was also the state's largest wildfire on record scorching over 150,000 acres while threatening the Los Alamos National Laboratory. Over 3 million acres have burned across Texas this wildfire season. *Total Estimated Costs: \$1.4 (\$1.5) Billion; 5 Deaths*

■ **Tropical Storm Lee** - September 2011: 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. *Total Estimated Costs: \$2.5 (\$2.7) Billion; 21 Deaths*

■ **Southern Plains/Southwest Drought & Heat Wave** - Spring-Summer 2011: Drought and heat wave conditions created major impacts across Texas, Oklahoma, New Mexico, Arizona, southern Kansas, and western Louisiana. In Texas and Oklahoma, a majority of range and pastures were classified in "very poor" condition for much of the 2011 crop growing season. *Total Estimated Costs: \$12.0 (\$12.8) Billion; 95 Deaths*

■ **Hurricane Irene** - August 2011: 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. 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. *Total Estimated Costs: \$13.5 (\$14.4) Billion; 45 Deaths*

■ **Midwest/Southeast Severe Weather** - August 2011: Severe weather impacts the states IA, KS, MO, NE, SD across the Midwest and Southeast. *Total Estimated Costs: \$1.1 (\$1.2) Billion; 0 Deaths*

■ **Rockies and Midwest Severe Weather** - July 10-14, 2011: An outbreak of tornadoes, hail, and high wind caused damage east of the Rockies and across the central plains (CO, WY, IA, IL, MI, MN, OH). *Total Estimated Costs: \$1.0 (\$1.1) Billion; 2 Deaths*

■ **Missouri River flooding** - May-June 2011: Melting of an above-average snow pack across the Northern Rocky Mountains combined with above-average precipitation caused the Missouri and Souris Rivers to swell beyond their banks across the Upper Midwest (MT, ND, SD, NE, IA, KS, MO). An estimated 11,000 people were forced to evacuate Minot, North Dakota due to the record high water level of the Souris River, where 4,000 homes were flooded. Numerous levees were breached along the Missouri River, flooding thousands of acres of farmland. *Total Estimated Costs: \$2.0 (\$2.1) Billion; 5 Deaths*

■ **Midwest/Southeast Tornadoes and Severe Weather** - June 18-22, 2011: 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). *Total Estimated Costs: \$1.3 (\$1.4) Billion; 3 Deaths*

■ **Mississippi River flooding** - April-May 2011: Persistent rainfall (nearly 300 percent normal precipitation amounts in the Ohio Valley) combined with melting snowpack caused historical flooding along the Mississippi River and its tributaries. Examples of economic damage include: \$500 (535.0) million to agriculture in Arkansas; \$320 (342.4) million in damage to Memphis, Tennessee; \$800 (856.0) million to agriculture in Mississippi; \$317 (339.2) million to agriculture and property in Missouri's Birds Point-New Madrid Spillway; \$80 (85.6) million for the first 30 days of flood fighting efforts in Louisiana. *Total Estimated Costs: \$3.0 (\$3.2) Billion; 7 Deaths*

■ **Midwest/Southeast Tornadoes** - May 22-27, 2011: 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. *Total Estimated Costs: \$9.1 (\$9.7) Billion; 177 Deaths*

■ **Southeast/Ohio Valley/Midwest Tornadoes** - April 25-28, 2011: Outbreak of tornadoes over central and southern states (AL, AR, LA, MS, GA, TN, VA, KY, IL, MO, OH, TX, OK) with an estimated 343 tornadoes. The deadliest tornado of the outbreak, an EF-5, hit northern Alabama, killing 78 people. Several major metropolitan areas were directly impacted by strong tornadoes including Tuscaloosa, Birmingham, and Huntsville in Alabama and Chattanooga, Tennessee, causing the estimated damage costs to soar. *Total Estimated Costs: \$10.2 (\$10.9) Billion; 321 Deaths*

■ **Ohio Valley/South Tornadoes** - April 2011: Dozens of tornadoes and severe storms affect the states AR, IL, IN, KY, MO, OH, TN, TX across the Ohio Valley and South. *Total Estimated Costs: \$1.0 (\$1.1) Billion; 0 Deaths*

■ **Midwest/Southeast Tornadoes** - April 14-16, 2011: Outbreak of tornadoes over central and southern states (OK, TX, AR, MS, AL, GA, NC, SC, VA, PA) with an estimated 177 tornadoes. *Total Estimated Costs: \$2.1 (\$2.2) Billion; 38 Deaths*

■ **Southeast/Midwest Tornadoes** - April 8-11, 2011: Outbreak of tornadoes over central and southern states (NC, SC, TN, AL, TX, OK, KS, IA, WI) with an estimated 59 tornadoes. *Total Estimated Costs: \$2.2 (\$2.4) Billion; 0 Deaths*

■ **Midwest/Southeast Tornadoes** - April 4-5, 2011: Outbreak of tornadoes over central and southern states (KS, MO, IA, IL, WI, KY, GA, TN, NC, SC) with an estimated 46 tornadoes. *Total Estimated Costs: \$2.8 (\$3.0) Billion; 9 Deaths*



■ **Groundhog Day Blizzard** - February 1-3, 2011: A large winter storm impacted many central, eastern and northeastern states. The city of Chicago was brought to a virtual standstill as between 1 and 2 feet of snow fell over the area. *Total Estimated Costs: \$1.8 (\$1.9) Billion; 36 Deaths*

## 2010

■ **Arizona Severe Weather** - October 2010: An unusual series of severe thunderstorms across Arizona produced numerous tornadoes and widespread, severe hail damage. Over one-hundred buildings were damaged or destroyed by tornadoes while thousands of automobiles and buildings were damaged by large hail across Phoenix and surrounding cities. *Total Estimated Costs: \$3.8 (\$4.2) Billion; 0 Deaths*

■ **Midwest/Northeast Severe Storms and Flooding** - July 2010: Severe storms and flooding affect the states IA, IL, MD, NY, PA, WI across the Midwest and Northeast. *Total Estimated Costs: (\$1.0) Billion\*; 0 Deaths*

■ **Oklahoma, Kansas, and Texas Tornadoes and Severe Weather** - May 2010: An outbreak of tornadoes, hail, and severe thunderstorms occurred across Oklahoma, Kansas, and Texas in mid-May. Oklahoma was hardest hit with > \$1.5 (1.7) billion in damages. *Total Estimated Costs: \$3.3 (\$3.6) Billion; 3 Deaths*

■ **East/South Flooding and Severe Weather** - May 2010: Flooding, hail, tornadoes, and severe thunderstorms occurred across many Southern states (TN, AR, AL, KY, MS, GA) on April 30-May 2. Flooding in the Nashville, TN area alone contributed > \$1.0 (1.1) billion in damages. Western and Middle Tennessee were hardest hit with local rainfall amounts of 18-20 inches to the south and west of Greater Nashville. *Total Estimated Costs: \$2.3 (\$2.5) Billion; 32 Deaths*

■ **Northeast Flooding** - March 2010: Heavy rainfall over portions of the Northeast in late March caused extensive flooding across several states (RI, CT, MA, NJ, NY, PA). The event caused the worst flooding in Rhode Island's history. *Total Estimated Costs: \$1.5 (\$1.7) Billion; 11 Deaths*

## 2009

■ **Southwest/Great Plains Drought** - 2009: 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). The largest agriculture losses occurred in TX and CA. *Total Estimated Costs: \$3.5 (\$3.9) Billion; 0 Deaths*

■ **Western Wildfires** - Summer-Fall 2009: Residual and sustained drought conditions across western and south-central states resulted in thousands of wildfires. Most affected states include CA, AZ, NM, TX, OK, and UT. National acreage burned exceeding 5.9 million. Over 200 homes and structures destroyed in the California "Station" fire alone. *Total Estimated Costs: \$1.0 (\$1.1) Billion; 10 Deaths*

■ **Colorado Hail Storm** - July 2009: Severe hail impacts Colorado. Jefferson County was most affected with hail at least 8 inches deep. The hail damage from this storm was comparable to the July 11, 1990 Colorado hail storm. *Total Estimated Costs: \$1.0 (\$1.1) Billion; 0 Deaths*

■ **Midwest, South and East Severe Weather** - June 2009: 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). *Total Estimated Costs: \$1.3 (\$1.5) Billion; 0 Deaths*

■ **South/Southeast Severe Weather & Tornadoes** - April 2009: Outbreak of tornadoes, hail and severe thunderstorms over the south and southeastern states (AL, AR, GA, KY, MO, SC, TN) with 85 confirmed tornadoes. *Total Estimated Costs: \$1.4 (\$1.6) Billion; 6 Deaths*

■ **Midwest/Southeast Tornadoes** - March 2009: Outbreak of tornadoes over central and southern states (NE, KS, OK, IA, TX, LA, MS, AL, GA, TN, KY) with 56 tornadoes confirmed. *Total Estimated Costs: \$1.6 (\$1.8) Billion; 0 Deaths*

■ **Southeast/Ohio Valley Severe Weather** - February 2009: Complex of severe thunderstorms and high winds across the region (TN, KY, OK, OH, VA, WV, PA). *Total Estimated Costs: \$1.7 (\$1.9) Billion; 10 Deaths*

## 2008

■ **U.S. Drought** - 2008: Severe drought and heat caused agricultural losses across a large portion of the U.S. Record low lake levels also occurred in areas of the southeast. *Total Estimated Costs: \$7.0 (\$7.8) Billion; 0 Deaths*

■ **U.S. Wildfires** - Fall 2008: Drought conditions across numerous western, central and southeastern states (AK, AZ, CA, NM, ID, UT, MT, NV, OR, WA, CO, TX, OK, NC, FL) resulted in thousands of wildfires; national acreage burned exceeding 5.2 million acres (mainly in the west) and over 1,000 homes and structures destroyed in California fires alone. *Total Estimated Costs: \$1.2 (\$1.3) Billion; 16 Deaths*

■ **Hurricane Ike** - September 2008: Category 2 hurricane makes landfall in Texas, as the largest (in size) Atlantic hurricane on record, causing considerable storm surge in coastal TX and significant wind and flooding damage in TX, LA, AR, TN, IL, IN, KY, MO, OH, MI and PA. Severe gasoline shortages occurred in the southeast U.S. due to damaged oil platforms, storage tanks, pipelines and off-line refineries. *Total Estimated Costs: \$30.0 (\$33.6) Billion; 112 Deaths*

■ **Hurricane Gustav** - September 2008: Category 2 hurricane makes landfall in Louisiana causing significant wind, storm surge, and flooding damage in AL, AR, LA, and MS. *Total Estimated Costs: \$6.0 (\$6.7) Billion; 53 Deaths*

■ **Hurricane Dolly** - July 2008: Category 2 hurricane makes landfall in southern Texas causing considerable wind and flooding damage in TX and NM. *Total Estimated Costs: \$1.3 (\$1.5) Billion; 3 Deaths*

■ **Midwest Flooding** - Summer 2008: Heavy rain and flooding caused significant agricultural loss and property damage in IA, IL, IN, MO, MN, NE, and WI with IA being hardest hit with widespread rainfall totals ranging from 4 to over 16 inches. *Total Estimated Costs: \$10.0 (\$11.2) Billion; 24 Deaths*



■ **Midwest/Mid-Atlantic Severe Weather** - June 2008: An outbreak of tornadoes and thunderstorms over the Midwest/Mid-Atlantic states (IA, IL, IN, KS, NE, MI, MN, MO, OK, WI, MD, VA, WV). *Total Estimated Costs: \$1.4 (\$1.6) Billion; 18 Deaths*

■ **Midwest Tornadoes and Severe Weather** - May 2008: Outbreak of tornadoes over the Midwest/Ohio Valley regions (IL, IN, IA, KS, MN, NE, OK, WY, CO) with 235 tornadoes confirmed. *Total Estimated Costs: \$3.0 (\$3.4) Billion; 13 Deaths*

■ **Southern Severe Weather** - April 2008: Severe storms affect Arkansas, Oklahoma and Texas across the South. *Total Estimated Costs: \$1.0 (\$1.1) Billion; 2 Deaths*

■ **Southeast Tornadoes** - March 2008: Tornadoes and severe weather across Georgia and South Carolina. This includes an EF-2 tornado causing damage to numerous buildings in downtown Atlanta. *Total Estimated Costs: \$1.1 (\$1.2) Billion; 5 Deaths*

■ **Southeast Tornadoes and Severe Weather** - February 2008: Series of tornadoes and severe thunderstorms across the Southeast and Midwest states (AL, AR, IN, KY, MS, OH, TN, TX) with 87 tornadoes confirmed. *Total Estimated Costs: \$1.2 (\$1.3) Billion; 57 Deaths*

## 2007

■ **Western/Eastern Drought/Heatwave** - Summer-Fall 2007: Severe drought with periods of extreme heat over most of the southeast and portions of the Great Plains, Ohio Valley, and Great Lakes area, resulting in major reductions in crop yields, along with very low stream-flows and lake levels. Includes states of ND, SD, NE, KS, OK, TX, MN, WI, IA, MO, AR, LA, MS, AL, GA, NC, SC, FL, TN, VA, WV, KY, IN, IL, OH, MI, PA, NY. *Total Estimated Costs: \$3.5 (\$4.1) Billion; 15 Deaths*

■ **Western Wildfires** - Summer 2007: Continued drought conditions and high winds over much of the western U.S. (AK, AZ, CA, ID, UT, MT, NV, OR, WA) resulting in numerous wildfires; with national acreage burned exceeding 8.9 million acres (mainly in the west) and over 3,000 homes and structures destroyed in southern California alone. *Total Estimated Costs: \$2.7 (\$3.1) Billion; 12 Deaths*

■ **East/South Severe Weather and Flooding** - April 2007: Flooding, hail, tornadoes, and severe thunderstorms across numerous states (CT, DE, GA, LA, ME, MD, MA, MS, NH, NJ, NY, NC, PA, RI, SC, TX, VT, VA) in mid-April, including 3 "killer" tornadoes. *Total Estimated Costs: \$2.5 (\$2.9) Billion; 9 Deaths*

■ **Spring Freeze** - April 2007: Widespread severe freeze over much of the east and midwest (AL, AR, GA, IL, IN, IA, KS, KY, MS, MO, NE, NC, OH, OK, SC, TN, VA, WV), causing significant losses in fruit crops, field crops (especially wheat), and the ornamental industry. Temperatures in the teens/20s accompanied by rather high winds nullified typical crop-protection systems. *Total Estimated Costs: \$2.0 (\$2.3) Billion; 0 Deaths*

■ **California Freeze** - January 2007: Widespread agricultural freeze -- for nearly two weeks in January, overnight temperatures over a good portion of California dipped into the 20s, destroying numerous agricultural crops; with citrus, berry, and vegetable crops most affected. *Total Estimated Costs: \$1.4 (\$1.6) Billion; 1 Death*

## 2006

■ **Numerous Wildfires** - 2006: Numerous wildfires driven by dry weather and high winds burned over 9.8 million acres, across the western half of the country including Alaska. This is the second highest annual total behind the 10.1 million acres burned in 2015 since record-keeping began in 1960. The most affected states were AK, AZ, CA, CO, FL, ID, MT, NM, NV, OK, OR, TX, WA, WY. *Total Estimated Costs: \$1.5 (\$1.8) Billion; 28 Deaths*

■ **Midwest/Plains/Southeast Drought** - Spring-Summer 2006: Rather severe drought affected crops especially during the spring-summer, centered over the Great Plains region with other areas affected across portions of the south -- including states of ND, SD, NE, KS, OK, TX, MN, IA, MO, AR, LA, MS, AL, GA, FL, MT, WY, CO, NM. *Total Estimated Costs: \$6.0 (\$7.1) Billion; 0 Deaths*

■ **Northeast Flooding** - June 2006: Severe flooding over portions of the northeast due to several weeks of heavy rainfall, affecting the states of NY, PA, DE, MD, NJ, and VA. *Total Estimated Costs: \$1.5 (\$1.8) Billion; 20 Deaths*

■ **Midwest Tornadoes** - April 2006: Tornadoes and severe weather cause significant damage in the states of IA, IL, IN, and WI. The state of Indiana was most affected with over one billion dollars in damage. *Total Estimated Costs: \$2.4 (\$2.9) Billion; 27 Deaths*

■ **Midwest/Southeast Tornadoes** - April 6-8, 2006: Severe weather and numerous tornadoes affecting the states of OK, KS, MO, NE, KY, OH, TN, IN, MS, GA, and AL on April 6-8 with 3 "killer" tornadoes in TN. *Total Estimated Costs: \$1.6 (\$1.9) Billion; 10 Deaths*

■ **Severe Storms and Tornadoes** - March 2006: Outbreak of tornadoes over portions of the midwest and south during a week-long period-affecting the states of AL, AR, KY, MS, TN, TX, IN, KS, MO, and OK. *Total Estimated Costs: \$1.3 (\$1.5) Billion; 10 Deaths*

## 2005

■ **Hurricane Wilma** - October 2005: Category 3 hurricane hits SW Florida resulting in strong damaging winds and major flooding across southeastern Florida. Prior to landfall, Wilma as a Category 5 recorded the lowest pressure (882 mb) ever recorded in the Atlantic basin. *Total Estimated Costs: \$19.0 (\$23.4) Billion; 35 Deaths*

■ **Hurricane Rita** - September 2005: Category 3 hurricane hits Texas-Louisiana border coastal region, creating significant storm surge and wind damage along the coast, and some inland flooding in the FL panhandle, AL, MS, LA, AR, and TX. Prior to landfall, Rita reached the third lowest pressure (897 mb) ever recorded in the Atlantic basin. *Total Estimated Costs: \$18.5 (\$22.8) Billion; 119 Deaths*

■ **Midwest Drought** - Spring-Summer 2005: Rather severe localized drought causes significant crop losses (especially for corn and soybeans) in the states of AR, IL, IN, MO, OH, and WI. *Total Estimated Costs: \$1.5 (\$1.8) Billion; 0 Deaths*



■ **Hurricane Katrina** - August 2005: Category 3 hurricane initially impacts the U.S. as a Category 1 near Miami, FL, then as a strong Category 3 along the eastern LA-western MS coastlines, resulting in severe storm surge damage (maximum surge probably exceeded 30 feet) along the LA-MS-AL coasts, wind damage, and the failure of parts of the levee system in New Orleans. Inland effects included high winds and some flooding in the states of AL, MS, FL, TN, KY, IN, OH, and GA. *Total Estimated Costs: \$125.0 (\$153.8) Billion; 1833 Deaths*

■ **Hurricane Dennis** - July 2005: Category 3 hurricane makes landfall in western Florida panhandle resulting in storm surge and wind damage along the FL and AL coasts, along with scattered wind and flood damage in GA and MS. *Total Estimated Costs: \$2.5 (\$3.1) Billion; 15 Deaths*

## 2004

■ **Hurricane Jeanne** - September 2004: Category 3 hurricane makes landfall in east-central Florida, causing considerable wind, storm surge, and flooding damage in FL, with some flood damage also in the states of GA, SC, NC, VA, MD, DE, NJ, PA, and NY. Puerto Rico also affected. *Total Estimated Costs: \$7.5 (\$9.6) Billion; 28 Deaths*

■ **Hurricane Ivan** - September 2004: Category 3 hurricane makes landfall on Gulf coast of Alabama, with significant wind, storm surge, and flooding damage in coastal AL and FL panhandle, along with wind/flood damage in the states of GA, MS, LA, SC, NC, VA, WV, MD, TN, KY, OH, DE, NJ, PA, and NY. *Total Estimated Costs: \$20.5 (\$26.2) Billion; 57 Deaths*

■ **Hurricane Frances** - September 2004: Category 2 hurricane makes landfall in east-central Florida, causing significant wind, storm surge, and flooding damage in FL, along with considerable flood damage in the states of GA, SC, NC, and NY due to 5-15 inch rains. *Total Estimated Costs: \$9.8 (\$12.5) Billion; 48 Deaths*

■ **Hurricane Charley** - August 2004: Category 4 hurricane makes landfall in southwest Florida, resulting in major wind and some storm surge damage in FL, along with some damage in the states of SC and NC. *Total Estimated Costs: \$16.5 (\$21.1) Billion; 35 Deaths*

■ **Severe Storms, Hail, Tornadoes** - May 2004: Midwest, South, Southeast, North, Northeast hit by severe weather and tornadoes; *Total Estimated Costs: \$1.0 (\$1.3) Billion; 4 Deaths*

## 2003

■ **California Wildfires** - Fall 2003: Dry weather, high winds, and resulting wildfires in Southern California burned over 3,700 homes. Nearly 4.0 million acres burned across numerous western states including Alaska. *Total Estimated Costs: \$3.9 (\$5.1) Billion; 22 Deaths*

■ **Western/Central Drought/Heatwave** - Spring-Fall 2003: 2003 drought across western and central portions of the U.S. with losses to agriculture; *Total Estimated Costs: \$5.0 (\$6.6) Billion; 35 Deaths*

■ **Hurricane Isabel** - September 2003: Category 2 hurricane makes landfall in eastern North Carolina, causing considerable storm surge damage along the coasts of NC, VA, and MD, with wind damage and some flooding due to 4-12 inch rains in NC, VA, MD, DE, WV, NJ, NY, and PA. *Total Estimated Costs: \$5.5 (\$7.2) Billion; 55 Deaths*

■ **Severe Weather** - July 2003: Severe storms move across the South, Southeast, Midwest, North, Northeast; *Total Estimated Costs: \$1.0 (\$1.3) Billion; 7 Deaths*

■ **Midwest/Plains Severe Weather** - July 2003: Severe storms affect the states IA, IL, IN, MI, MN, OH, WV, VA across the Midwest and Plains. *Total Estimated Costs: (\$1.1) Billion\*; 7 Deaths*

■ **Severe Storms/Tornadoes** - May 2003: Numerous tornadoes over the midwest, Mississippi valley, OH/TN valleys, and portions of the southeast, with a modern record one-week total of approximately 400 tornadoes reported; *Total Estimated Costs: \$4.1 (\$5.4) Billion; 51 Deaths*

■ **Severe Storms/Hail** - April 2003: Severe storms and large hail over the southern plains and lower MS valley, with Texas hardest hit, and much of the monetary losses due to hail. *Total Estimated Costs: \$2.0 (\$2.6) Billion; 3 Deaths*

## 2002

■ **Western Fire Season** - Fall 2002: Major wildfires over 11 western states from the Rockies to the west coast due to drought and periodic high winds, with over 7.1 million acres burned. *Total Estimated Costs: \$1.1 (\$1.5) Billion; 21 Deaths*

■ **U.S. Drought** - Spring-Fall 2002: Moderate to extreme drought over large portions of 30 states, including the western states, the Great Plains, and much of the eastern U.S. *Total Estimated Costs: \$9.0 (\$12.1) Billion; 0 Deaths*

■ **Hurricane Lili** - October 2002: Category 1 hurricane makes landfall in Louisiana after causing damage across Saint Lucia, Jamaica, Haiti and Cuba. *Total Estimated Costs: \$1.1 (\$1.5) Billion; 2 Deaths*

■ **Severe Storms and Tornadoes** - April 2002: Numerous tornadoes and widespread hail damage over the Central and Eastern states including NC,GA,VA,TX,AR,MO,MS,TN,IL,IN,KY,PA,MD,NY,OH,WV, and KS. *Total Estimated Costs: \$2.1 (\$2.8) Billion; 7 Deaths*

## 2001

■ **Tropical Storm Allison** - June 2001: The persistent remnants of Tropical Storm Allison produce rainfall amounts of 30-40 inches in portions of coastal Texas and Louisiana, causing severe flooding especially in the Houston area, then moves slowly northeastward; fatalities and significant damage reported in TX, LA, MS, FL, VA, and PA *Total Estimated Costs: \$8.5 (\$11.6) Billion; 43 Deaths*



■ **Midwest/Ohio Valley Hail and Tornadoes** - April 2001: Storms, tornadoes, and hail in the states of TX, OK, KS, NE, IA, MO, IL, IN, WI, MI, OH, KY, WV, and PA, over a 6-day period. *Total Estimated Costs: \$3.1 (\$4.2) Billion; 3 Deaths*

## 2000

■ **Western/Central/Southeast Drought/Heatwave** - Spring-Fall 2000: Western/Central/Southeast Drought/Heatwave; *Total Estimated Costs: \$5.0 (\$7.0) Billion; 140 Deaths*

■ **Western Fire Season** - Spring-Summer 2000: Severe wildfire season in the western states due to drought and frequent winds, with nearly 7 million acres burned. *Total Estimated Costs: \$1.1 (\$1.5) Billion; 0 Deaths*

## 1999

■ **Hurricane Floyd** - September 1999: Large, category 2 hurricane makes landfall in eastern NC, causing 10-20 inch rains in 2 days, with severe flooding in NC and some flooding in SC, VA, MD, PA, NY, NJ, DE, RI, CT, MA, NH, and VT. *Total Estimated Costs: \$6.5 (\$9.4) Billion; 77 Deaths*

■ **Eastern Drought/Heatwave** - Summer 1999: Very dry summer and high temperatures, mainly in eastern U.S., with extensive agricultural losses. *Total Estimated Costs: \$2.5 (\$3.6) Billion; 502 Deaths*

■ **Oklahoma and Kansas Tornadoes** - May 1999: Outbreak of F4-F5 tornadoes hit the states of Oklahoma and Kansas, along with Texas and Tennessee, Oklahoma City area hardest hit. *Total Estimated Costs: \$2.0 (\$2.9) Billion; 55 Deaths*

■ **Central and Eastern Winter Storm** - mid-January 1999: Winter storm affecting the Central and Eastern states including IL, IN, OH, MI, WV, VA, MD, PA, NJ, NY, MA, CT, VT, NH and ME. *Total Estimated Costs: (\$1.2) Billion\*; 0 Deaths*

■ **Central and Eastern Winter Storm** - January 1999: South, Southeast, Midwest, Northeast affected by damaging winter storm; *Total Estimated Costs: \$1.0 (\$1.4) Billion; 25 Deaths*

## 1998

■ **California Freeze** - December 1998: A severe freeze damaged fruit and vegetable crops in the Central and Southern San Joaquin Valley. Extended intervals of sub 27&deg; F temperatures occurred over an 8-day period. *Total Estimated Costs: \$2.5 (\$3.7) Billion; 0 Deaths*

■ **Texas Flooding** - October 1998: Severe flooding in southeast Texas from 2 heavy rain events, with 10-20 inch rainfall totals; *Total Estimated Costs: \$1.0 (\$1.4) Billion; 31 Deaths*

■ **Hurricane Georges** - September 1998: Category 2 hurricane strikes Puerto Rico, Virgin Islands, Florida Keys, and Gulf coasts of Louisiana, Mississippi, Alabama, and Florida panhandle, 15-30 inch 2-day rain totals in parts of Alabama and Florida; *Total Estimated Costs: \$6.0 (\$8.9) Billion; 16 Deaths*

■ **Southern Drought/Heat Wave** - Summer 1998: Severe drought and heat wave from Texas/Oklahoma eastward to the Carolinas; *Total Estimated Costs: \$3.5 (\$5.2) Billion; 200 Deaths*

■ **Hurricane Bonnie** - August 1998: Category 3 hurricane strikes eastern North Carolina and Virginia, extensive agricultural damage due to winds and flooding, with 10-inch rains in 2 days in some locations. *Total Estimated Costs: \$1.0 (\$1.5) Billion; 3 Deaths*

■ **Severe Storms, Tornadoes** - June 1998: Severe storms in late May through early June hit the Midwest, North, Northeast, and Southeast; *Total Estimated Costs: \$1.1 (\$1.6) Billion; 20 Deaths*

■ **Minnesota Severe Storms/Hail** - May 1998: Very damaging severe thunderstorms with large hail over wide areas of Minnesota; *Total Estimated Costs: \$1.6 (\$2.4) Billion; 1 Death*

■ **Western/Eastern Severe Weather and Flooding** - Winter-Spring 1998: Tornadoes and flooding in southeastern states; *Total Estimated Costs: \$1.0 (\$1.5) Billion; 132 Deaths*

■ **Northeast Ice Storm** - January 1998: Intense ice storm hits Maine, New Hampshire, Vermont, and New York, with extensive forestry losses; *Total Estimated Costs: \$1.4 (\$2.1) Billion; 16 Deaths*

## 1997

■ **Northern Plains Flooding** - Spring 1997: Severe flooding in Dakotas and Minnesota due to heavy spring snowmelt; *Total Estimated Costs: \$3.7 (\$5.6) Billion; 11 Deaths*

■ **Mississippi and Ohio Valley Severe Weather and Flooding** - March 1997: Tornadoes and severe flooding hit the states of AR, MO, MS, TN, IL, IN, KY, OH, and WV, with over 10 inches of rain in 24 hours in Louisville. *Total Estimated Costs: \$1.0 (\$1.5) Billion; 67 Deaths*

■ **West Coast Flooding** - December 1996-January 1997: Torrential rains (10-40 inches in 2 weeks) and snowmelt produce severe flooding over portions of CA, WA, OR, ID, NV, and MT. *Total Estimated Costs: \$3.0 (\$4.5) Billion; 36 Deaths*

## 1996

■ **Hurricane Fran** - September 1996: Category 3 hurricane strikes North Carolina and Virginia, over 10-inch 24-hour rains in some locations and extensive agricultural and other losses. *Total Estimated Costs: \$5.0 (\$7.7) Billion; 37 Deaths*





■ **Southern Plains Drought** - *Spring-Summer 1996*: Severe drought in agricultural regions of southern plains--Texas and Oklahoma most severely affected; *Total Estimated Costs: \$1.8 (\$2.8) Billion; 0 Deaths*

■ **Pacific Northwest Severe Flooding** - *February 1996*: Very heavy, persistent rains (10-30 inches) and melting snow over OR, WA, ID, and western MT. *Total Estimated Costs: \$1.0 (\$1.5) Billion; 9 Deaths*

■ **Blizzard/Floods** - *January 1996*: Very heavy snowstorm (1-4 feet) over Appalachians, Mid-Atlantic, and Northeast; followed by severe flooding in parts of same area due to rain and snowmelt. *Total Estimated Costs: \$3.0 (\$4.6) Billion; 187 Deaths*

## 1995

■ **Hurricane Opal** - *October 1995*: Category 3 hurricane strikes Florida panhandle, Alabama, western Georgia, eastern Tennessee, and the western Carolinas, causing storm surge, wind, and flooding damage. *Total Estimated Costs: \$3.5 (\$5.5) Billion; 27 Deaths*

■ **Hurricane Marilyn** - *September 1995*: Category 2 hurricane impacts U.S. Virgin Islands and Puerto Rico; *Total Estimated Costs: \$2.1 (\$3.3) Billion ; 13 Deaths*

■ **South Plains Severe Weather** - *May 1995*: Torrential rains, hail, and tornadoes across Texas-Oklahoma and southeast Louisiana-southern Mississippi, with Dallas and New Orleans areas (10-25 inch rains in 5 days) hardest hit. *Total Estimated Costs: \$5.5 (\$8.7) Billion; 32 Deaths*

■ **California Flooding** - *January-March 1995*: Frequent winter storms cause 20-70 inch rainfall and periodic flooding across much of California; *Total Estimated Costs: \$2.5 (\$4.0) Billion; 27 Deaths*

## 1994

■ **Western Fire Season** - *Summer-Fall 1994*: Severe wildfire season in the western states due to dry weather conditions. *Total Estimated Costs: (\$1.1) Billion\*; 0 Deaths*

■ **Texas Flooding** - *October 1994*: Torrential rain (10-25 inches in 5 days) and thunderstorms cause flooding across much of southeast Texas; *Total Estimated Costs: \$1.0 (\$1.6) Billion; 19 Deaths*

■ **Tropical Storm Alberto** - *July 1994*: Remnants of slow-moving Alberto bring torrential 10-25 inch rains in 3 days, widespread flooding and agricultural damage in parts of Georgia, Alabama, and panhandle of Florida. *Total Estimated Costs: \$1.0 (\$1.6) Billion; 32 Deaths*

■ **Midwest/Plains Tornadoes** - *April 1994*: South, Southwest, Southeast, Midwest hit by tornadoes. *Total Estimated Costs: \$1.0 (\$1.6) Billion; 3 Deaths*

■ **Southeast Ice Storm** - *February 1994*: Intense ice storm with extensive damage in portions of TX, OK, AR, LA, MS, AL, TN, GA, SC, NC, and VA. *Total Estimated Costs: \$3.0 (\$4.9) Billion; 9 Deaths*

■ **Winter Storm, Cold Wave** - *January 1994*: Winter storm affects Southeast and Northeast; *Total Estimated Costs: \$1.0 (\$1.6) Billion; 70 Deaths*

## 1993

■ **California Wildfires** - *Fall 1993*: Dry weather, high winds and wildfires in Southern California; *Total Estimated Costs: \$1.4 (\$2.3) Billion; 4 Deaths*

■ **Southeast Drought/Heat Wave** - *Summer 1993*: Drought and heat wave across Southeastern U.S. *Total Estimated Costs: \$1.3 (\$2.2) Billion; 16 Deaths*

■ **Midwest Flooding** - *Summer 1993*: Severe, widespread flooding in central U.S. due to persistent heavy rains and thunderstorms. *Total Estimated Costs: \$21.0 (\$35.1) Billion; 48 Deaths*

■ **East Coast Blizzard and Severe Weather** - *March 1993*: Storm of the Century hits entire eastern seaboard with tornadoes (FL), high winds, and heavy snows (2-4 feet). *Total Estimated Costs: \$5.5 (\$9.2) Billion; 270 Deaths*

## 1992

■ **Northeast Winter Storm** - *December 1992*: Slow-moving storm batters northeast U.S. coast, New England hardest hit. *Total Estimated Costs: \$2.5 (\$4.3) Billion; 19 Deaths*

■ **Hurricane Iniki** - *September 1992*: Category 4 hurricane hits Hawaiian island of Kauai; *Total Estimated Costs: \$3.1 (\$5.3) Billion; 7 Deaths*

■ **Hurricane Andrew** - *August 1992*: Category 4 hurricane hits Florida and Louisiana, high winds damage or destroy over 125,000 homes; *Total Estimated Costs: \$27.0 (\$46.4) Billion; 61 Deaths*

■ **Severe Storms, Hail** - *June 1992*: Severe storms with hail hit Kansas and Oklahoma; *Total Estimated Costs: (\$1.2) Billion\*; 0 Deaths*

■ **Hail, Tornadoes** - *April 1992*: Severe Storms hit Oklahoma and Texas with tornadoes and hail; *Total Estimated Costs: \$1.0 (\$1.6) Billion; 0 Deaths*

■ **Severe Storms** - *March 1992*: Severe storms affect the South, Southeast; *Total Estimated Costs: (\$1.3) Billion\*; 0 Deaths*



## 1991

■ **Oakland Firestorm** - October 1991: Oakland, California firestorm due to low humidities and high winds burned over 3,000 homes. *Total Estimated Costs: \$3.3 (\$5.8) Billion; 25 Deaths*

■ **U.S. Drought** - Spring-Summer 1991: Drought conditions over parts of the West, Central and eastern U.S. most affected the states IL, IN, KS, MN, OH, OR, PA, SD, and WA. *Total Estimated Costs: \$3.0 (\$5.3) Billion; 0 Deaths*

■ **Hurricane Bob** - August 1991: Hurricane affecting coastal North Carolina, Long Island, and New England. *Total Estimated Costs: \$1.5 (\$2.7) Billion; 18 Deaths*

■ **Severe Storms, Tornadoes** - March 1991: Severe storms hit the Midwest, Southeast, Northeast; *Total Estimated Costs: (\$1.1) Billion\*; 0 Deaths*

## 1990

■ **California Freeze** - December 1990: Severe freeze in the Central and Southern San Joaquin Valley caused the loss of citrus, avocado trees, and other crops in many areas. Several days of subfreezing temperatures occurred, with some valley locations in the teens. *Total Estimated Costs: \$3.4 (\$6.3) Billion; 0 Deaths*

■ **Colorado Hail Storm** - July 1990: Denver, CO (including airport) hit by hail storm; *Total Estimated Costs: (\$1.4) Billion\*; 0 Deaths*

■ **Southern Flooding** - May 1990: Torrential rains cause flooding along the Trinity, Red, and Arkansas Rivers in TX, OK, LA, and AR; *Total Estimated Costs: \$1.0 (\$1.8) Billion; 13 Deaths*

## 1989

■ **Winter Storm, Cold Wave** - December 1989: Northeast, Southeast hit by winter storms. *Total Estimated Costs: (\$1.4) Billion\*; 100 Deaths*

■ **Florida Freeze** - December 1989: Severe freeze damages citrus crops across central/northern Florida. *Total Estimated Costs: \$2.0 (\$3.9) Billion; 10 Deaths*

■ **Northern Plains Drought** - Summer-Fall 1989: Severe summer drought over much of the northern plains with significant losses to agriculture; *Total Estimated Costs: \$3.0 (\$5.8) Billion; 0 Deaths*

■ **Hurricane Hugo** - September 1989: Category 4 hurricane devastates South and North Carolina with ~20 foot storm surge and severe wind damage after hitting Puerto Rico and the U.S. Virgin Islands; *Total Estimated Costs: \$9.0 (\$17.5) Billion; 86 Deaths*

■ **Severe Storms** - May 1989: South, Southeast damaged by severe storms; *Total Estimated Costs: (\$1.1) Billion\*; 21 Deaths*

## 1988

■ **U.S. Drought/Heatwave** - Summer 1988: 1988 drought across a large portion of the U.S. with very severe losses to agriculture and related industries. Combined direct and indirect deaths (i.e., excess mortality) due to heat stress estimated at 5,000. *Total Estimated Costs: \$20.0 (\$40.8) Billion; 454 Deaths*

## 1987

No billion-dollar weather or climate disaster events were recorded for 1987.

## 1986

■ **Southeast Drought/Heatwave** - Summer 1986: Severe summer drought in parts of the southeastern U.S. with severe losses to agriculture; *Total Estimated Costs: \$1.8 (\$4.0) Billion; 100 Deaths*

■ **Western Severe Storms and Flooding** - February 1986: Severe storms and flooding affect the states CA, NV, OR, CO, WY across the West. *Total Estimated Costs: (\$1.1) Billion\*; 13 Deaths*

## 1985

■ **Hurricane Juan** - October 1985: Category 1 hurricane--Louisiana and Southeast U.S.-- severe flooding; *Total Estimated Costs: \$1.5 (\$3.4) Billion; 63 Deaths*

■ **Hurricane Gloria** - September 1985: Hurricane Gloria moved along the eastern seaboard affecting states from North Carolina to Maine. *Total Estimated Costs: (\$2.0) Billion\*; 11 Deaths*

■ **Hurricane Elena** - September 1985: Category 3 hurricane--Florida to Louisiana; *Total Estimated Costs: \$1.3 (\$2.9) Billion; 4 Deaths*



■ **Florida Freeze** - January 1985: Severe freeze over central/northern Florida damages citrus crops. *Total Estimated Costs: \$1.2 (\$2.7) Billion; 0 Deaths*

■ **Winter Storm, Cold Wave** - January 1985: Extreme cold and winter storms in the Southeast, South, Southwest, Northeast, Midwest, and North; *Total Estimated Costs: (\$1.8) Billion\*; 150 Deaths*

## 1984

■ **Severe Storms and Hail** - June 1984: Severe storms and hail impact Colorado, South Dakota and Nebraska. *Total Estimated Costs: (\$1.2) Billion\* ; 1 Death*

■ **Tornadoes, Severe Storms, Floods** - Spring 1984: Southeast, Northeast hit by tornadoes, severe storms, and floods; *Total Estimated Costs: (\$1.1) Billion\*; 80 Deaths*

## 1983

■ **Freeze, Cold Wave** - December 1983: Severe freeze damages citrus crops across central/northern Florida. Associated cold wave over much of the U.S. causes over 100 deaths and additional damages. *Total Estimated Costs: \$2.0 (\$4.8) Billion; 151 Deaths*

■ **Southeast Drought** - Summer 1983: 1983 flash drought in the southeastern U.S. with losses to agriculture, most notably corn and soybeans. *Total Estimated Costs: \$3.0 (\$7.3) Billion; 0 Deaths*

■ **Hurricane Alicia** - August 1983: Category 3 hurricane--Texas; *Total Estimated Costs: \$3.0 (\$7.3) Billion; 21 Deaths*

■ **Western Storms & Flooding** - December 1982-March 1983: Severe storms and flooding, especially in the states of WA, OR, CA, AZ, NV, ID, UT, and MT; *Total Estimated Costs: \$1.5 (\$3.6) Billion; 50 Deaths*

■ **Gulf States Storms and Flooding** - December 1982-January 1983: Severe storms and flooding, especially in the states of TX, AR, LA, MS, AL, GA, and FL; *Total Estimated Costs: \$1.5 (\$3.6) Billion; 45 Deaths*

## 1982

■ **Severe storms** - June 1982: South, Midwest, Southeast and Northeast affected by severe storms; *Total Estimated Costs: (\$1.2) Billion\*; 30 Deaths*

■ **Midwest/Plains/Southeast Tornadoes** - April 1982: Tornadoes and severe weather affect the states (NE, KS, OK, TX, MN, IA, MS, AL, WV, PA, MO, AR, LA, WI, IL, MI, IN, OH, KY, TN) across the Midwest, Plains and Southeast. *Total Estimated Costs: (\$1.2) Billion\*; 33 Deaths*

■ **Midwest/Southeast/Northeast Winter Storm, Cold Wave** - January 1982: Winter storm and coldwave affect numerous states (AL, AR, CT, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, ND, NH, NJ, NY, OH, OK, PA, RI, SC, TN, TX, VA, VT, WI, WV) across the Midwest, Southeast and Northeast. *Total Estimated Costs: (\$1.6) Billion\*; 85 Deaths*

## 1981

■ **Severe Storms, Flash Floods, Hail, Tornadoes** - May 1981: Severe storms in the Midwest and South; *Total Estimated Costs: (\$1.1) Billion\*; 20 Deaths*

## 1980

■ **Central/Eastern Drought/Heatwave** - Summer-Fall 1980: Central and eastern U.S. drought/heat wave caused damage to agriculture and other related industries. Combined direct and indirect deaths (i.e., excess mortality) due to heat stress estimated at 10,000. *Total Estimated Costs: \$10.0 (\$29.2) Billion; 1260 Deaths*

■ **Hurricane Allen** - August 1980: Hurricane Allen hits Louisiana and Texas; *Total Estimated Costs: (\$1.8) Billion\*; 13 Deaths*

■ **Southern Severe storms and Flooding** - April 1980: Severe storms and flooding affect several states (LA, MS, AR) across the South. *Total Estimated Costs: (\$1.3) Billion\*; 7 Deaths*

*\*Exceeds one-billion dollar threshold after 2016 Consumer Price Index adjustment*

### Caveat for economic loss estimates:

These statistics were taken from a wide variety of sources and represent, to the best of our ability, the estimated total costs of these events -- that is, the costs in terms of dollars that would not have been incurred had the event not taken place. Insured and uninsured losses are included in damage estimates. These estimates are likely to change as damage assessments become more complete. Estimates are periodically updated as more data/information become available. Sources include the National Weather Service, the Federal Emergency Management Agency, US Department of Agriculture, other U.S. government agencies, individual state emergency management agencies, state and regional climate centers, media reports, and insurance industry estimates including Property Claim Services and Munich Re. This report is also available at <https://www.ncdc.noaa.gov/billions/> and includes links to detailed technical reports on many of these events.

A research article "U.S. Billion-dollar Weather and Climate Disasters: Data Sources, Trends, Accuracy and Biases" (Smith and Katz, 2013) regarding the loss data we use, our methods and any potential bias was published in 2013. This was followed by the research article "Quantifying Uncertainty and Variable Sensitivity within the U.S. Billion-dollar Weather and Climate Disaster Cost Estimates" (Smith and Matthews, 2015) as a next step to enhance the value and usability of estimated disaster costs given data limitations and inherent complexities.

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