

Billion Dollar U.S. Disasters¹

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October 3, 2007

Part 1: Ranked by Economic Loss:

1. **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. Preliminary estimate of approximately **\$125 billion** in damage/costs, making this the most expensive natural disaster in U.S. history; approximately 1833 deaths - the highest U.S. total since the 1928 major hurricane in southern Florida (NCDC 2007). **\$39.3 billion** in private insurer losses in 2006 dollars (GAO 2007, p. 14)
2. **Miami Hurricane** (September 18-21, 1926). Category 4; **\$102 billion**. (Pielke 2005) “With a highly transient population across southeastern Florida during the 1920s, the death toll is uncertain since more than 800 people were missing in the aftermath of the cyclone. A Red Cross report lists 373 deaths and 6,381 injuries as a result of the hurricane... would be a \$90 billion disaster had it occurred in recent times” (NOAA Hurricane History).
3. **Northridge Earthquake** (January 17, 1994). Magnitude 6.7. Over 60 deaths, more than 5,000 injuries, and over 25,000 people left homeless. Direct economic losses from the Northridge earthquake are estimated at about **\$59.8 billion** in direct losses (in 2006 dollars). (GAO, Natural Hazard Mitigation, 2007, p. 16) Two other estimates are **\$41 billion**. (Insurance Journal 2006) and **\$25 billion**. (FEMA 2006). \$19 billion (Kunreuther 2007, 3)
4. **Drought/Heat Wave** (Summer 1988). 1988 drought in central and eastern U.S. with very severe losses to agriculture and related industries; estimated **\$40.0 (61.6) billion** damage/costs; estimated 5,000 to 10,000 deaths (includes heat stress-related). (NCDC 2007)
5. **Galveston Hurricane** (1900). **\$38 billion**. (Pielke 2005)
6. **9/11 Terrorist Attacks** (September 2001). The destruction of physical assets was estimated in the national accounts to amount to \$14 billion for private businesses, \$1.5 billion for state and local government enterprises and \$0.7 billion for federal enterprises. Rescue, cleanup and related costs have been estimated to amount to at least \$11 billion for a total direct cost of \$27.2 billion (Looney 2002). **\$35.5 billion** (indexed 20 2006). (Kunreuther, 2007, p. 4.)
7. **Galveston Hurricane** (1915), **\$32 billion**. (Pielke 2005)

¹ This document is an expansion of the May 2006 National Climate Data Center document *Billion Dollar U.S. Weather Disasters*, which includes 70 weather-related U.S. billion dollar disasters. This document expands upon that work in three ways (1) adding weather related billion dollar disasters prior to 1980, (2) adding other than weather-related U.S. billion dollar disasters – such as the Northridge Earthquake and the 9/11 Terrorist Attacks -- and (3) adding other at-hand statistics on the same disasters treated by the NCDC.

8. **Hurricane Andrew** (August 1992). Category 5 hurricane hits Florida and Louisiana, high winds damage or destroy over 125,000 homes; approximately **\$27.0 (35.6) billion** damage/costs; 61 deaths (NCDC 2007). **\$22.3 billion** in 2006 dollars (GAO 2007, p. 14).
9. **Midwest Flooding** (Summer 1993). Severe, widespread flooding in central U.S. due to persistent heavy rains and thunderstorms; approximately **\$21.0 (26.7) billion** damage/costs; 48 deaths. (NCDC 2007)
10. **Drought/Heat Wave** (June-Sept.1980). Central/Eastern U.S.; estimated **\$20.0 (48.4) billion** damage/costs to agriculture and related industries; estimated 10,000 deaths (includes heat stress-related). (NCDC 2007)
11. **Hurricane Rita** (September 2005). Category 3; hits Texas-Louisiana border coastal region, creating significant storm surge and wind damage along the coast. Rita reached the third lowest pressure (897 mb) ever recorded in the Atlantic basin. Preliminary estimate of approximately **\$16 billion** in damage/costs; 119 deaths reported - most being indirect (many related to evacuations). (NCDC 2007) Property insurance claims in TX and LA amounted to **\$5.8 billion** (KWTV-TV Online, September 24, 2007). **FEMA** expenditures by September 24, 2007 topped **\$2 billion** (FEMA Sep 24, 2007 Press Release). **\$10.4 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
12. **Hurricane Wilma** (October 2005). Approximately **\$16 billion** in damage/costs; estimated 35 deaths (NCDC 2007). **\$12.9 billion** (indexed to 2006). (Kunreuther 2007, 3)
13. **Hurricane Betsy** (1962). Category 3, Southern FL. **\$15 billion (1992 dollars)**. (Pielke and Landsea, 1998)
14. **Hurricane Charley** August 2004. Category 4; 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. Estimate of over **\$15 billion** in damage/costs; at least 35 deaths (NCDC 2007). **\$8.6 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
15. **Hurricane Ivan** (September 2004). Category 3; Alabama Gulf Coast landfall; significant wind, storm surge, flooding damage in coastal AL and FL panhandle, along with wind/flood damage in the states of GA, SC, NC, VA, LA, MS, WV, MD, TN, KY, OH, DE, NJ, PA, and NY. Estimate of over **\$14 billion** in damage/costs; at least 57 deaths (NCDC 2007). **\$13.6 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
16. **Hurricane Donna** (August 29-September 14, 1960). Category 4, Sombrero Key, FL. **\$10 billion (1992 dollars)**. (Pielke and Landsea, 1998)
17. **Drought Widespread** (Spring through early 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.; estimate of over **\$10.0 billion** in damages/costs; no deaths. (NCDC 2007)

18. **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; over **\$9.0 (13.9) billion** damage/costs (about **\$7.1 (10.9) billion** in Carolinas); 86 deaths (57--U.S. mainland, 29--U.S. Islands) (NCDC 2007). **\$7.4 billion** (indexed to 2006). Kunreuther 2007. p. 3)
19. **Unnamed 1947 Hurricane** (1947). Category 4, Pompano Beach, FL. **\$9 billion (1992 dollars)**. (Pielke and Landsea 1998)
20. **Hurricane Frances** (September 5, 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. Estimate of over **\$9 billion** in damage/costs; at least 48 deaths (NCDC 2007). **\$5.5 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
21. **San Francisco 1906 Earthquake** (1906). \$400 million in 1906 dollars (approximately **\$8.2 billion** 2006 dollars). (Frantz 2005)
22. **Northeast Blackout** (August 14, 2003). \$6.8-\$10.3 billion. (ICF Consulting 2003)
23. **Loma Prieta Earthquake** (October 17, 1989). Magnitude 6.9. Killed 63 people, caused an estimated **\$6 billion to \$10 billion** in property loss. (USGS 1999)
24. **Texas/Oklahoma/Louisiana/Mississippi Severe Weather and Flooding** May 1995. Torrential rains, hail, and tornadoes across Texas - Oklahoma and southeast Louisiana - southern Mississippi, with Dallas and New Orleans areas (10-25 inches in 5 days) hardest hit; **\$5.0-\$6.0 (6.5-7.1) billion** damage/costs; 32 deaths. (NCDC 2007)
25. **Hurricane Jeanne** (September 26, 2004). Category 3; makes landfall in east-central Florida. Estimate of over **\$7 billion** in damage/costs; at least 28 deaths (NCDC 2007). **\$4.1 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
26. **Southern Drought/Heat Wave** (Summer 1998). Severe drought and heat wave from Texas/Oklahoma eastward to the Carolinas; **\$6.0-\$9.0 billion** (6.6-9.9) damage/costs to agriculture and ranching; at least 200 deaths. (NCDC 2007)
27. **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; estimate of at least **\$6.0 (6.5) billion** damage/costs; 77 deaths. (NCDC 2007)
28. **Storm/Blizzard** (March 1993). "Storm of the Century" hits entire eastern seaboard with tornadoes, high winds, and heavy snows (2-4 feet); **\$5.0-\$6.0 (6.3-7.6) billion** damage/costs; approximately 270 deaths. (NCDC 2007)

29. **Hurricane Georges** (September 1998). Category 2 hurricane strikes Puerto Rico, Florida Keys, and Gulf coasts of Louisiana, Mississippi, Alabama, and Florida panhandle, 15-30 inch 2-day rain totals in parts of AL/FL; estimated **\$5.9 (6.5) billion** damage/costs; 16 deaths (NCDC 2007). **\$4.4 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
30. **Drought** (Spring-Summer 2006). Preliminary estimate of over **\$6.0 billion** damages/costs. (NCDC 2007)
31. **Southern Plains Severe Drought** (Fall 1995 through Summer 1996). Severe drought in agricultural regions of southern plains--Texas and Oklahoma most severely affected; approximately **\$5.0 (6.0) billion** damage/costs; no deaths. (NCDC 2007)
32. **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; over **\$5.0 (5.8) billion** damage/costs; 37 deaths. (NCDC 2007)
33. **Tropical Storm Allison** (June 2001). The persistent remnants of Tropical Storm Allison produces 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; estimate of approximately **\$5.0 (5.1) billion** in damage/costs; at least 43 deaths (NCDC 2007). **\$4.1 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
34. **Unnamed 1941 Hurricane** (1941). Category 3, Homestead, FL. **\$5 billion (1992 dollars)**. (Pielke and Landsea 1998)
35. **Hurricane Isabel** September 2003. Category 2; 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; estimate of approximately **\$5 billion** in damages/costs; at least 55 deaths. (NCDC 2007)
36. **Drought/Heat Wave** (Spring-Summer 2000). Severe drought, persistent heat over south-central and southeastern states; significant losses to agriculture and related industries; estimate of over **\$4.0 (4.2) billion** in damage/costs; ~ 140 deaths nationwide. (NCDC 2007)
37. **Northern Plains Flooding** (April-May 1997). Severe flooding in Dakotas and MN due to heavy spring snowmelt; ~ **\$3.7 (4.1) billion** damage/costs; 11 deaths. (NCDC 2007)
38. **1928 Southern Florida Hurricane (Great Okeechobee Hurricane)** (1928). Category 4. **\$3.5 billion (1992 dollars)**. (Pielke and Landsea 1998)
39. **New England Hurricane (Long Island Express)** (September 21-22, 1938). Category 3; 600 deaths. \$308 million (1938 dollars) (NOAA, Hurricane History) **\$3.5 billion** (2005 dollars (Powell)).

40. **Tornadoes and Severe Storms** (Early May 2003). Numerous tornadoes over the Midwest, MS valley, OH/TN valleys and portions of the southeast, with a modern record one-week total of approximately 400 tornadoes reported; over **\$3.4 billion** in damages/costs; 51 deaths. (NCDC 2007)
41. **California Freeze** (December 1990). Record-setting low temperatures for extended period during critical growing period. Temperatures not above 25 degrees in parts of San Joaquin Valley for three to five days and all time record low temperatures were set at Sacramento, Stockton, and Bakersfield. Many records were set for duration of freezing temperatures. The agricultural industry was devastated as acres of trees-not just fruit-were destroyed. Thirty-three counties were disaster-declared. Long-term Strategic Impact: Changed the way crop protection measures were implemented. Calculated damages: **\$3.4 billion** in direct and indirect economic losses including damage to public buildings, utilities, crop damage, and residential burst pipes.” (NOAA. *California's Top 15 Weather Events of 1900s.*)
42. **Hurricane Alicia** (August 18-21, 1983). Category 3 hurricane--Texas; **\$3.0 (5.9) billion** damage/costs; 21 deaths. (NCDC 2007)
43. **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; approximately **\$3.0 (3.7) billion** damage/costs; 9 deaths. (NCDC 2007)
44. **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; over **\$3.0 (3.6) billion** damage/costs; 27 deaths. (NCDC 2007)
45. **California Flooding** (January-March 1995). Frequent winter storms cause 20-70 inches rainfall and periodic flooding across much of California; over **\$3.0 (3.6) billion** damage/costs; 27 deaths. (NCDC 2007)
46. **Blizzard of '96 Followed by Flooding** (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; approximately **\$3.0 (3.5) billion** damage/costs; 187 deaths. (NCDC 2007)
47. **Flooding -- West Coast** (December 1996-January 1997). Torrential rains (10-40 inches in 2 weeks) and snowmelt produce severe flooding over portions of CA, WA, OR, Idaho, Nevada, and Montana; approximately **\$3.0 (3.4) billion** damage/costs; 36 deaths. (NCDC 2007)
48. **Hurricane Cleo** (1964). Cat. 2, Miami, FL. **\$2.7 billion (1992 \$)**. (Pielke/Landsea 1998)
49. **Unnamed 1949 Hurricane** (1949). Category 3, Palm Beach. **\$2.6 billion (1992 dollars)**. (Pielke and Landsea 1998)
50. **Hurricane Frederic** (September 12, 1979). Gulf Coast; **\$2.3 billion**. (Pielke/Landsea 1998)

51. **Oakland Firestorm** (October 1991). Oakland, California firestorm due to low humidities and high winds; approximately **\$2.5 (3.5) billion** damage/costs; 25 deaths. (NCDC 2007)
52. **Wildfires Southern California** (Late October to early November 2003). Dry weather, high winds, and resulting wildfires in So. CA. More than 743,000 acres of brush/timber burned, over 3700 homes destroyed; over **\$2.5 billion** damage/costs; 22 deaths. (NCDC 2007)
53. **Hurricane Marilyn** (September 1995). Category 2 hurricane devastates U.S. Virgin Islands; estimated **\$2.1 (2.5) billion** damage/costs; 13 deaths. (NCDC 2007)
54. **Hurricane Inez** (1966). Cat. 1, South Florida. **\$2.2 billion (1992 \$)**. (Pielke/Landsea 1998)
55. **Hurricane Agnes** (June 19-25, 1972). Category 1, FL, VA, NY and northeastern states; 122 deaths; **\$2.1 billion**. (NOAA, Hurricane History)
56. **Florida Freeze** (December 1983). Severe freeze central/northern Florida; about **\$2.0 (4.0) billion** damage to citrus industry; no deaths. (NCDC 2007)
57. **Wildfires Western Fire Season** (Spring-Summer 2000). Severe fire season due to drought and frequent winds, nearly 7 million acres burned; estimate over **\$2.0 (2.1) billion** in damage/costs (includes fire suppression); no deaths reported. (NCDC 2007)
58. **Hurricane Dennis** (July 2005). Category 3 hurricane makes landfall in western Florida panhandle resulting in storm surge and wind damage along the FL-AL coasts, along with scattered wind and flood damage in GA, MS, TN. Preliminary estimate of **over \$2 billion** in damage/costs; at least 15 deaths. (NCDC 2007)
59. **Wildfire Western Fire Season** (Spring through Fall 2002). Major fires 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; over **\$ 2.0 billion** in damages/costs; 21 deaths. (NCDC 2007)
60. **Hurricane Carla** (September 10, 1961). Texas Coast; 46 deaths; about \$2 billion (1990 dollars). (NOAA 1993)
61. **Hail and Tornadoes Midwest and Ohio Valley** (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; over **\$1.9 billion** in damage/costs, with the most significant losses due to hail; at least 3 deaths. (NCDC 2007)
62. **Winter Storms – California, 1995**. “Significant and extended heavy rain and wind. Flooding in coastal regions was particularly notable. The Salinas River exceeded its previous measured record crest by more than four feet...which was within a foot or two of the reputed crest of the legendary 1862 flood. The Monterey Peninsula was effectively cut off from the "mainland". The Napa River set a new peak record and the Russian and Pajaro Rivers approached their record peaks. Extensive flooding from small streams particularly in Placer

County suburbs. Calculated Damages: 28 dead, **\$1.841 billion** economic losses.” (NOAA, California's Top 15 Weather Events of 1900s, 2007)

63. **California New Year's Flood** (1996/1997). Significant rainfall fell throughout central and northern California from December 26, 1996 through January 3, 1997, with the heaviest and warmest rains on New Year's Eve/Day. Snow levels were above 10,000 feet. Several towns were inundated. Three-hundred square miles were flooded, including the Yosemite Valley, which flooded for the first time since 1861-62. For weeks after the rains stopped rivers continued to flow out of their banks and major roads remained impassable due to flood damage and mudslides. Along I-80...rainfall recorded for the event totaled 3.71 inches at Sacramento...9.57 inches at Auburn...and 29.73 inches at Blue Canyon. Forty-eight counties were disaster-declared, including all 46 counties in northern California. Calculated damages: 8 dead, **\$1.8 billion** economic losses including 23,000 homes and 2,000 businesses damaged or destroyed.” (NOAA. *California's Top 15 Weather Events of 1900s.*)
64. **Hurricane Iniki** (September 1992). Category 4 hurricane hits Hawaiian island of Kauai; about **\$1.8 (2.4) billion** damage/costs; 7 deaths. (NCDC 2007)
65. **1964 Alaskan Earthquake** (March 27,1964). **\$1.6 billion.** (USGS 2001)
66. **Hurricane Juan** (October-November 1985). Category 1 hurricane--Louisiana and Southeast U.S.--severe flooding; **\$1.5 (2.8) billion** damage/costs; 63 deaths. (NCDC 2007)
67. **Hurricane Bob** (August 1991). Category 2 hurricane--Mainly coastal North Carolina, Long Island, and New England; **\$1.5 (2.1) billion** damage/costs; 18 deaths. (NCDC 2007)
68. **Hail and Storms** (Early 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; over **\$ 1.6 billion** in damages/costs: 3 deaths. (NCDC 2007)
69. **Tornadoes Oklahoma-Kansas** (May 1999). Outbreak of F4-F5 tornadoes hit the states of Oklahoma and Kansas, along with Texas and Tennessee, Oklahoma City area hardest hit; over **\$1.6 (1.7) billion** damage/costs; 55 deaths. (NCDC 2007)
70. **Minnesota Severe Storms/Hail** (May 1998). Very damaging severe thunderstorms, large hail over wide areas of MN; over **\$1.5 (1.7) billion** damage/costs; 1 death. (NCDC 2007)
71. **Northeast Ice Storm** (January 1998). Intense ice storm hits Maine, NH, VT, and NY, with extensive forestry losses; **over \$1.4 (1.5) billion** damage/costs; 16 deaths. (NCDC 2007)
72. **Hurricane Camille** (1969). Category 5, Gulf Coast, 256 deaths. **\$1.4 billion.** (Pielke, Simonpietri, and Oxelson 1999; NOAA Hurricane History)
73. **Hurricane Elena** (August-September 1985). Category 3 hurricane--Florida to Louisiana; **\$1.3 (2.4) billion** damage/costs; 4 deaths. (NCDC 2007)

74. **Tornadoes Arkansas-Tennessee** (January 1999). Two outbreaks of tornadoes in 6-day period strike Arkansas and Tennessee; approximately **\$1.3 (1.4) billion** damage/costs; 17 deaths. (NCDC 2007)
75. **California El Niño Storms** (1982-83). Multiple strong storms; high wind, heavy rain and heavy snowfall across CA; led to direct wind damage, higher tides, immediate flooding to coastal and valley locations, mudslides in coastal mountain areas, record snowfall in the Sierra Mountains, and resulting spring snowmelt river flooding. In one 36-hour period, 25 inches of rain fell in the Santa Cruz (coastal) mountains while 8.5 feet of snow fell in the Lake Tahoe region. Forty-six counties were disaster-declared. Calculated Damages: 36 dead, 481 injured, **\$1.209 billion** economic losses including 6,661 homes and 1,330 businesses damaged or destroyed. (NOAA. *California's Top 15 Weather Events of 1900s.*)
76. **Gulf States Storms and Flooding** (1982 - Early 1983). Storms and flooding related to El Nino, especially in the states of TX, AR, LA, MS, AL, GA, FL; about **\$1.1 (2.2) billion** in damage/costs; at least 50 deaths. (NCDC 2007)
77. **Florida Freeze** (January 1985). Severe freeze central/northern Florida; about **\$1.2 (2.2) billion** damage to citrus industry; no deaths. (NCDC 2007)
78. **Western Storms and Flooding** (1982 - Early 1983). Storms and flooding related to **El Nino**, especially in the states of WA, OR, CA, AZ, NV, ID, UT, MT; about **\$1.1 (2.2) billion** in damage/costs; at least 45 deaths. (NCDC 2007)
79. **California El Nino Storms** (1997-1998). California “emergency management agencies and FEMA spent an estimated \$165 million preparing for storms and heavy rain. Actual storm losses in the 1997-1998 El Niño were **\$1.1 billion...**” (*NOAA Magazine* 2002)
80. **Nor'easter of 1992** (December 1992). Slow-moving storm batters northeast U.S. coast, New England hardest hit; **\$1.0-\$2.0 (1.3-2.6) billion** damage/costs; 19 deaths. (NCDC 2007)
81. **Drought/Heat Wave -- Southeast** (Summer 1986). Severe summer drought in parts of the southeastern U.S. with severe losses to agriculture; **\$1.0-\$1.5 (1.8-2.6) billion** in damage/costs; estimated 100 deaths. (NCDC 2007)
82. **Drought -- Northern Plains** (Summer 1989). Severe summer drought over much of the northern plains with significant losses to agriculture; at least **\$1.0 (1.5) billion** in damage/costs; no deaths reported. (NCDC 2007)
83. **Flooding** (May 1990). Torrential rains cause flooding along the Trinity, Red, Arkansas Rivers in TX, OK, LA, AR; over **\$1.0 (1.4) billion** damage/costs; 13 deaths. (NCDC 2007)
84. **Drought/Heat Wave** (Summer 1993). Southeastern U.S.; about **\$1.0 (1.3) billion** damage/costs to agriculture; at least 16 deaths. (NCDC 2007)

85. **California Wildfires** (Fall 1993). Dry weather, high winds, and wildfires in southern California; approximately **\$1.0 (1.3) billion** damage/costs; 4 deaths. (NCDC 2007)
86. **Tropical Storm Alberto** (July 1994). Remnants of slow-moving Alberto brought torrential 10-25 inch rains in 3 days, widespread flooding, and agricultural damage in parts of Georgia, Alabama, and panhandle of Florida; approximately **\$1.0 (1.2) billion** damage/costs; 32 deaths. (NCDC 2007)
87. **Pacific Northwest Severe Flooding** (February 1996). Very heavy, persistent rains (10-30 inches) and melting snow over Oregon, Washington, Idaho, and western Montana; approximately **\$1.0 (1.2) billion** damage/costs; 9 deaths. (NCDC 2007)
88. **Texas Flooding** (October 1994). Torrential rain (10-25 inches in 5 days) and thunderstorms cause flooding across much of southeast Texas; approximately **\$1.0 (1.2) billion** damage/costs; 19 deaths. (NCDC 2007)
89. **Western Fire Season** (Summer-Fall 1994). Severe fire season; western states; dry weather; approximately **\$1.0 (1.2) billion** damage/costs; death toll undetermined. (NCDC 2007)
90. **Eastern Drought/Heat Wave** (Summer 1999). Very dry summer and high temperatures, mainly in eastern U.S., with extensive agricultural losses; over **\$1.0 (1.1) billion** damage/costs; estimated 502 deaths. (NCDC 2007)
91. **Southeast Severe Weather** (Winter-Spring 1998). El Nino related tornadoes, flooding in southeastern states; over **\$1.0 (1.1) billion** damage/costs; at least 132 deaths. (NCDC 2007)
92. **Flooding and Tornadoes MS and OH Valleys** (March 1997). Tornadoes and severe flooding hit the states of AR, MO, MS, TN, IL, IN, KY, OH, and WV, with over 10 inches in 24 hours in Louisville; **estimated \$1.0 (1.1) billion** damage/costs; 67 deaths. (NCDC 2007)
93. **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; **approx. \$1.0 (1.1) billion** damage/costs; 3 deaths. (NCDC 2007)
94. **Wildfires** (2006). **Well over \$1.0 billion** in overall damages/costs. At least 28 fatalities, including 20 firefighters. (NCDC 2007)
95. **California Firestorms** (October 1993). Multiple SO. CA fires; extended period of time; fueled by very dry vegetation and extreme Santa Ana winds. Initial fires ignited by campfires. As winds and fires continued unabated, additional fires ignited by arsonists and downed power lines. Of the twenty identified fires, the initial two were caused by campfires, six by downed power lines, and twelve by arsonists. Calculated Damages: 4 dead, 162 injured, **\$1 billion** economic losses in property alone and 194,000 acres were destroyed.” (NOAA. *California's Top 15 Weather Events of 1900s*)

96. **Tornadoes and Severe Storms** (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, OK. **Over \$1.0 billion** damage/costs. At least 10 deaths. (NCDC 2007)
97. **Flooding Texas** (October-November 1998). Severe flooding in southeast Texas from 2 heavy rain events, with 10-20 inch rainfall totals; approximately **\$1.0 (1.1) billion** damage/costs; 31 deaths. (NCDC 2007)
98. **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. Preliminary estimate of over **\$1.0 billion** in damage/costs; no reported deaths. (NCDC 2007)
99. **Hurricane Diane** (1955). Northeast (PA, NJ, NY, CN, RI, MA) 20,000 destroyed or damaged, 200 deaths. **\$1 billion.** (Rozario 2007)
100. **Great Atlantic Hurricane of 1944** (September 9-16, 1944). Category 4; 390 deaths (340 at sea); approximately **\$1 billion** (1990 dollars). (Cotterly 2002)
101. **Monthly averaged insured disaster losses in the U.S. 1980-2006. \$1billion.** (GAO, *Climate Change*, May 2007, p. 4)
102. **Ongoing: Weekly averaged total disaster losses** 1989 to the present -- **\$1 billion.** (Mileti, 5)

Part 2:
Billion Dollar U.S. Disasters – Chronologically Listed

- Ongoing: Monthly** averaged **insured disaster losses** in the U.S. from 1980 to approximately the present -- **\$1 billion** (GAO, *Climate Change*, May 2007, p. 4)
- Ongoing: Weekly** averaged **total disaster losses** 1989 to the present -- **\$1 billion**. (Mileti, 5)
- 2006 Wildfires** (2006). **Well over \$1.0 billion** in overall damages/costs. At least 28 fatalities, including 20 firefighters. (NCDC 2007)
- 2006 Drought** (Spring-Summer). Estimate of over **\$6.0 billion** damages/costs. (NCDC 2007)
- 2006 Tornadoes/Severe Storms** (March 2006). 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, OK. **Over \$1.0 billion** damage/costs. At least 10 deaths. (NCDC 2007)
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- 2005 Hurricane Rita** (September 2005). Category 3; hits Texas-Louisiana border coastal region, creating significant storm surge and wind damage along the coast. Rita reached the third lowest pressure (897 mb) ever recorded in the Atlantic basin. Preliminary estimate of approximately **\$16 billion** in damage/costs; 119 deaths reported - most being indirect (many related to evacuations). (NCDC 2007) Property insurance claims in TX and LA amounted to **\$5.8 billion** (KWTX-TV Online, September 24, 2007). FEMA expenditures by September 24, 2007 topped **\$2 billion** (FEMA Sep 24, 2007 Press Release). **\$10.4 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
- 2005 Hurricane Katrina** (August 2005). Category 3; 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. Preliminary estimate of approximately **\$125 billion** in damage/costs, making this the most expensive natural disaster in U.S. history; approximately 1833 deaths - the highest U.S. total since the 1928 major hurricane in southern Florida. (NCDC 2007)
- 2005 Hurricane Dennis** (July 2005). Category 3 hurricane makes landfall in western Florida panhandle resulting in storm surge and wind damage along the FL-AL coasts, along with scattered wind and flood damage in GA, MS, TN. Preliminary estimate of **over \$2 billion** in damage/costs; at least 15 deaths. (NCDC 2007)
- 2005 Drought** (Spring-Summer 2005). Rather severe localized drought causes significant crop losses in the states of AR, IL, IN, MO, OH, and WI. Preliminary estimate of over **\$1.0 billion** in damage/costs; no reported deaths. (NCDC 2007)

- 2004 Hurricane Jeanne** (September 26, 2004). Category 3; makes landfall in east-central Florida. Estimate of over **\$7 billion** in damage/costs; at least 28 deaths (NCDC 2007). **\$4.1 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
- 2004 Hurricane Ivan** (September 2-24, 2004). Category 3; landfall on Gulf coast of Alabama; significant wind, storm surge, flooding damage in coastal AL and FL panhandle; wind & flood damage in GA, SC, NC, VA, LA, MS, WV, MD, TN, KY, OH, DE, NJ, PA, and NY. Estimate of over **\$14 billion** in damage/costs; at least 57 deaths (NCDC 2007). **\$13.6 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
- 2004 Hurricane Frances** (September 5, 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. Estimate of over **\$9 billion** in damage/costs; at least 48 deaths (NCDC 2007). **\$5.5 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
- 2004 Hurricane Charley** August 2004. Category 4; landfall in SW Florida, resulting in major wind and some storm surge damage in FL, along with some damage in the states of SC and NC. Estimate of over **\$15 billion** in damage/costs; at least 35 deaths (NCDC 2007). **\$8.6 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
- 2003 Wildfires So. California** (Late October/early November 2003). Dry weather, high winds, and resulting wildfires in So. CA. More than 743,000 acres of brush/timber burned, over 3700 homes destroyed; over **\$2.5 billion** damage/costs; 22 deaths. (NCDC 2007)
- 2003 Hurricane Isabel** September 2003. Category 2; landfall in eastern NC; 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; estimate of approximately **\$5 billion** in damages/costs; at least 55 deaths. (NCDC 2007)
- 2003 Northeast Blackout** (August 14, 2003). \$6.8-\$10.3 billion. (ICF Consulting 2003)
- 2003 Tornadoes and Severe Storms** (Early May 2003). Numerous tornadoes over the Midwest, MS valley, OH/TN valleys and portions of the southeast, with a modern record one-week total of approximately 400 tornadoes reported; over **\$3.4 billion** in damages/costs; 51 deaths. (NCDC 2007)
- 2003 Hail and Storms** (Early 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; over **\$ 1.6 billion** in damages/costs; 3 deaths. (NCDC 2007)
- 2002 Drought Widespread** (Spring through early Fall 2002). Moderate to Extreme drought over large portions of 30 states, including the western states, the Great Plains, and much of eastern U.S.; estimate over **\$10.0 billion** in damages/costs; no deaths. (NCDC 2007)

- 2002 Wildfire Western Fire Season** (Spring through Fall 2002). Major fires in 11 western states from Rockies to the west coast, due to drought and periodic high winds, with over 7.1 million acres burned; over **\$ 2.0 billion** in damages/costs; 21 deaths. (NCDC 2007)
- 2001 9/11 Terrorist Attacks** (September 2001). The destruction of physical assets was estimated in the national accounts to amount to \$14 billion for private businesses, \$1.5 billion for state and local government enterprises and \$0.7 billion for federal enterprises. Rescue, cleanup and related costs have been estimated to amount to at least \$11 billion for a total direct cost of \$27.2 billion (Looney 2002). **\$35.5 billion** (indexed 20 2006). (Kunreuther, 2007, p. 4.)
- 2001 Tropical Storm Allison** (June 2001). The persistent remnants of Tropical Storm Allison produces 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; estimate of approximately **\$5.0 (5.1) billion** in damage/costs; at least 43 deaths (NCDC 2007). **\$4.1 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
- 2001 Hail and Tornadoes Midwest and Ohio Valley** (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; over **\$1.9 billion** in damage/costs, with the most significant losses due to hail; at least 3 deaths. (NCDC 2007)
- 2000 Drought/Heat Wave** (Spring-Summer 2000). Severe drought/persistent heat over south-central and southeastern states; significant losses to agriculture and related industries; estimate of over **\$4.0 (4.2) billion** in damage/costs; estimated 140 deaths. (NCDC 2007)
- 2000 Wildfires Western Fire Season** (Spring-Summer 2000). Severe fire season due to drought and frequent winds, nearly 7 million acres burned; estimate over **\$2.0 (2.1) billion** in damage/costs (includes fire suppression); no deaths reported. (NCDC 2007)
- 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; estimate of at least **\$6.0 (6.5) billion** damage/costs; 77 deaths. (NCDC 2007)
- 1999 Eastern Drought/Heat Wave** (Summer 1999). Very dry summer and high temperatures, mainly in eastern U.S., with extensive agricultural losses; over **\$1.0 (1.1) billion** damage/costs; estimated 502 deaths. (NCDC 2007)
- 1999 Tornadoes Oklahoma-Kansas** (May 1999). Outbreak of F4-F5 tornadoes hit the states of Oklahoma and Kansas, along with Texas and Tennessee, Oklahoma City area hardest hit; over **\$1.6 (1.7) billion** damage/costs; 55 deaths. (NCDC 2007)
- 1999 Tornadoes Arkansas-Tennessee** (January 1999). Two tornado outbreaks in 6-day period strike AK and TN; ~ **\$1.3 (1.4) billion** damage/costs; 17 deaths. (NCDC 2007)

- 1998 Flooding Texas** (October-November 1998). Severe flooding in southeast Texas from 2 heavy rain events, with 10-20 inch rainfall totals; approximately **\$1.0 (1.1) billion** damage/costs; 31 deaths. (NCDC 2007)
- 1998 Hurricane Georges** (September 1998). Category 2; strikes Puerto Rico, Florida Keys, and Gulf coasts of LA, MS, AL, and FL panhandle, 15-30 inch 2-day rain totals in parts of AL/FL; estimated **\$5.9 (6.5) billion** damage/costs; 16 deaths (NCDC 2007). **\$4.4 billion** (indexed to 2006). (Kunreuther 2007, p. 3)
- 1998 Hurricane Bonnie** (August 1998). Category 3; eastern North Carolina and Virginia, extensive agricultural damage due to winds and flooding, with 10-inch rains in 2 days in some locations; **approx. \$1.0 (1.1) billion** damage/costs; 3 deaths. (NCDC 2007)
- 1998 Minnesota Severe Storms/Hail** (May 1998). Severe thunderstorms with large hail over wide areas of Minnesota; over **\$1.5 (1.7) billion** damage/costs; 1 death. (NCDC 2007)
- 1998 Southeast Severe Weather** (Winter-Spring 1998). El Nino related tornadoes, flooding; So.East states; over **\$1.0 (1.1) billion** damage/costs; at least 132 deaths. (NCDC 2007)
- 1998 Northeast Ice Storm** (January 1998). Intense ice storm hits Maine, New Hampshire, Vermont, and New York, with extensive forestry losses; **over \$1.4 (1.5) billion** damage/costs; 16 deaths. (NCDC 2007)
- 1997/8 California El Nino Storms** (1997-1998). California “emergency management agencies and FEMA spent an estimated \$165 million preparing for storms and heavy rain. Actual storm losses in the 1997-1998 El Niño were **\$1.1 billion...**” (*NOAA Magazine* 2002)
- 1997 Northern Plains Flooding** (April-May 1997). Dakotas and MN due to heavy spring snowmelt; approximately **\$3.7 (4.1) billion** damage/costs; 11 deaths. (NCDC 2007)
- 1997 Flooding and Tornadoes MS and OH Valleys** (March 1997). Tornadoes, severe flooding hit AR, MO, MS, TN, IL, IN, KY, OH, and WV, with over 10 inches in 24 hours in Louisville; **estimated \$1.0 (1.1) billion** damage/costs; 67 deaths. (NCDC 2007)
- 1996/7 Flooding -- West Coast** (December 1996-January 1997). Torrential rains (10-40 inches in 2 weeks) and snowmelt produce severe flooding over portions of California, Washington, Oregon, Idaho, Nevada, and Montana; approximately **\$3.0 (3.4) billion** damage/costs; 36 deaths. (NCDC 2007)
- 1996/7 California New Year's Flood** (1996/1997). Significant rainfall throughout central and northern California from December 26, 1996 through January 3, 1997; heaviest rains on New Year's Eve/Day. Several towns were inundated. Three-hundred square miles flooded, including Yosemite Valley (for first time since 1861-62). Rivers continued to flow out of their banks for weeks and major roads remained impassable due to flood damage and mudslides. Forty-eight counties were disaster-declared, including all 46

counties in northern California. Calculated damages: 8 dead, **\$1.8 billion** economic losses including 23,000 homes and 2,000 businesses damaged or destroyed.” (NOAA. *California's Top 15 Weather Events of 1900s.*)

- 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; over **\$5.0 (5.8) billion** damage/costs; 37 deaths. (NCDC 2007)
- 1996 Pacific Northwest Severe Flooding** (February 1996). Very heavy, persistent rains (10-30 inches) and melting snow over Oregon, Washington, Idaho, and western Montana; approximately **\$1.0 (1.2) billion** damage/costs; 9 deaths. (NCDC 2007)
- 1996 Blizzard of '96 Followed by Flooding** (January 1996). Very heavy snowstorm (1-4 feet) over Appalachians, Mid-Atlantic, and Northeast; followed by severe flooding due to rain and snowmelt; approximately **\$3.0 (3.5) billion** damage/costs; 187 deaths. (NCDC 2007)
- 1995/6 Southern Plains Severe Drought** (Fall 1995 through Summer 1996). Severe drought in agricultural regions of southern plains--Texas and Oklahoma most severely affected; approximately **\$5.0 (6.0) billion** damage/costs; no deaths. (NCDC 2007)
- 1995 Winter Storms – California, 1995.** “Significant and extended heavy rain and wind. Flooding in coastal regions was particularly notable. The Salinas River exceeded its previous measured record crest by more than four feet...which was within a foot or two of the reputed crest of the legendary 1862 flood. The Monterey Peninsula was effectively cut off from the "mainland". The Napa River set a new peak record and the Russian and Pajaro Rivers approached their record peaks. Extensive flooding from small streams particularly in Placer County suburbs. Calculated Damages: 28 dead, **\$1.841 billion** economic losses.” (NOAA, *California's Top 15 Weather Events of 1900s, 2007*)
- 1995 Hurricane Opal** (October 1995). Category 3; Florida panhandle, Alabama, western Georgia, eastern Tennessee, and the western Carolinas, causing storm surge, wind, and flooding damage; over **\$3.0 (3.6) billion** damage/costs; 27 deaths. (NCDC 2007)
- 1995 Hurricane Marilyn** (September 1995). Category 2 hurricane devastates U.S. Virgin Islands; estimated **\$2.1 (2.5) billion** damage/costs; 13 deaths. (NCDC 2007)
- 1995 Texas/Oklahoma/Louisiana/Mississippi Severe Weather and Flooding** May 1995. Torrential rains, hail, and tornadoes across Texas - Oklahoma and southeast Louisiana - southern Mississippi, with Dallas and New Orleans areas (10-25 inches in 5 days) hardest hit; **\$5.0-\$6.0 (6.5-7.1) billion** damage/costs; 32 deaths. (NCDC 2007)
- 1994 Northridge Earthquake** (January 17,1994). Magnitude 6.7. Over 60 deaths, more than 5,000 injuries, and over 25,000 people left homeless. Direct economic losses are estimated at about **\$25 billion**. (FEMA 2006) **\$41 billion** (Insurance Journal 2006). **\$19 billion** (indexed to 2006). (Kunreuther 2007, 3)

- 1994 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; approximately **\$3.0 (3.7) billion** damage/costs; 9 deaths. (NCDC 2007)
- 1994 Western Fire Season** (Summer-Fall 1994). Severe fire season in western states due to dry weather; approximately **\$1.0 (1.2) billion** damage/costs. (NCDC 2007)
- 1994 Texas Flooding** (October 1994). Torrential rain (10-25 inches in 5 days) and thunderstorms cause flooding across much of southeast Texas; approximately **\$1.0 (1.2) billion** damage/costs; 19 deaths. (NCDC 2007)
- 1994 Tropical Storm Alberto** (July 1994). Brought torrential 10-25 inch rains in 3 days; widespread flooding; agricultural damage in parts of Georgia, Alabama, and panhandle of Florida; approximately **\$1.0 (1.2) billion** damage/costs; 32 deaths. (NCDC 2007)
- 1993 California Firestorms** (October 1993). Multiple fires, So. California, extended period of time, fueled by very dry vegetation and extreme Santa Ana winds. Initial fires ignited by campfires. As winds and fires continued unabated, additional fires were ignited by arsonists and downed power lines. Of twenty identified fires, initial two were caused by campfires, six by downed power lines, and twelve by arsonists. Calculated Damages: 4 dead, 162 injured, **\$1 billion** economic losses in property alone and 194,000 acres were destroyed. (NOAA. *California's Top 15 Weather Events of 1900s*)
- 1993 California Wildfires** (Fall 1993). Dry weather, high winds, and wildfires in southern California; approximately **\$1.0 (1.3) billion** damage/costs; 4 deaths. (NCDC 2007)
- 1993 Midwest Flooding** (Summer 1993). Severe, widespread flooding in central U.S. due to persistent heavy rains and thunderstorms; approximately **\$21.0 (26.7) billion** damage/costs; 48 deaths. (NCDC 2007)
- 1993 Drought/Heat Wave** (Summer 1993). Southeastern U.S.; about **\$1.0 (1.3) billion** damage/costs to agriculture; at least 16 deaths. (NCDC 2007)
- 1993 Storm/Blizzard** (March 1993). "Storm of the Century" hits entire eastern seaboard with tornadoes, high winds, and heavy snows (2-4 feet); **\$5.0-\$6.0 (6.3-7.6) billion** damage/costs; approximately 270 deaths. (NCDC 2007)
- 1992 Nor'easter of 1992** (December 1992). Slow-moving storm hits northeast U.S. coast, New England hardest hit; **\$1.0-\$2.0 (1.3-2.6) billion** damage/costs; 19 deaths. (NCDC 2007)
- 1992 Hurricane Iniki** (September 1992). Category 4 hurricane hits Hawaiian island of Kauai; about **\$1.8 (2.4) billion** damage/costs; 7 deaths. (NCDC 2007)
- 1992 Hurricane Andrew** (August 1992). Category 5 hurricane hits Florida and Louisiana, high winds damage or destroy over 125,000 homes; approximately **\$27.0 (35.6) billion** damage/costs; 61 deaths. (NCDC 2007)

- 1991 Oakland Firestorm** (October 1991). Oakland, California firestorm due to low humidities and high winds; approximately **\$2.5 (3.5) billion** damage/costs; 25 deaths. (NCDC 2007)
- 1991 Hurricane Bob** (August 1991). Category 2; mainly coastal North Carolina, Long Island, and New England; **\$1.5 (2.1) billion** damage/costs; 18 deaths. (NCDC 2007)
- 1990 California Freeze** (December 1990). “Record-setting low temperatures for an extended period of time during a critical growing period. Temperatures did not get above 25 degrees in parts of the San Joaquin Valley for three to five days and all time record low temperatures were set at Sacramento, Stockton, and Bakersfield. Many records were set for duration of freezing temperatures. The agricultural industry was devastated as acres of trees-not just fruit-were destroyed. Thirty-three counties were disaster-declared.... Calculated damages: **\$3.4 billion** in direct and indirect economic losses including damage to public buildings, utilities, crop damage, and residential burst pipes.” (NOAA. *California's Top 15 Weather Events of 1900s.*)
- 1990 Flooding** (May 1990). Torrential rains; flooding along Trinity, Red, Arkansas Rivers in TX, OK, LA, AR; over **\$1.0 (1.4) billion** damage/costs; 13 deaths. (NCDC 2007)
- 1989 Loma Prieta Earthquake** (October 17, 1989). Magnitude 6.9. Killed 63 people, caused an estimated **\$6 billion to \$10 billion** in property loss. (USGS 1999)
- 1989 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; over **\$9.0 (13.9) billion** damage/costs (about **\$7.1 (10.9) billion** in Carolinas); 86 deaths (57--U.S. mainland, 29--U.S. Islands) (NCDC 2007). **\$7.4 billion** (indexed to 2006). Kunreuther 2007. p. 3)
- 1989 Drought -- Northern Plains** (Summer 1989). Severe summer drought over much of the northern plains with significant losses to agriculture; at least **\$1.0 (1.5) billion** in damage/costs; no deaths reported. (NCDC 2007)
- 1988 Southern Drought/Heat Wave** (Summer 1998). Severe drought and heat wave from Texas/Oklahoma eastward to the Carolinas; **\$6.0-\$9.0 billion** (6.6-9.9) damage/costs to agriculture and ranching; at least 200 deaths. (NCDC 2007)
- 1988 Drought/Heat Wave** (Summer 1988). Central and eastern U.S.; very severe losses to agriculture and related industries; estimated **\$40.0 (61.6) billion** damage/costs; estimated 5,000 to 10,000 deaths (includes heat stress-related). (NCDC 2007)
- 1986 Drought/Heat Wave -- Southeast** (Summer 1986). Severe summer drought in parts of the southeastern U.S. with severe losses to agriculture; **\$1.0-\$1.5 (1.8-2.6) billion** in damage/costs; estimated 100 deaths. (NCDC 2007)

- 1985 Hurricane Juan** (October-November 1985). Category 1; Louisiana and Southeast U.S.--severe flooding; **\$1.5 (2.8) billion** damage/costs; 63 deaths. (NCDC 2007)
- 1985 Hurricane Elena** (August-September 1985). Category 3 hurricane--Florida to Louisiana; **\$1.3 (2.4) billion** damage/costs; 4 deaths. (NCDC 2007)
- 1985 Florida Freeze** (January 1985). Severe freeze central/northern Florida; about **\$1.2 (2.2) billion** damage to citrus industry; no deaths. (NCDC 2007)
- 1983 Hurricane Alicia** (August 18-21, 1983). Category 3 hurricane--Texas; **\$3.0 (5.9) billion** damage/costs; 21 deaths. (NCDC 2007)
- 1983 Florida Freeze** (December 1983). Severe freeze central/northern Florida; about **\$2.0 (4.0) billion** damage to citrus industry; no deaths. (NCDC 2007)
- 1982/3 Western Storms and Flooding** (1982 - Early 1983). Storms and flooding related to **El Niño**, especially in the states of WA, OR, CA, AZ, NV, ID, UT, MT; about **\$1.1 (2.2) billion** in damage/costs; at least 45 deaths. (NCDC 2007)
- 1982/3 California El Niño Storms** (1982-83). "Multiple strong storms brought high wind, heavy rain, and heavy snowfall across all of California. This led to direct wind damage, higher tides, immediate flooding to coastal and valley locations, mudslides in coastal mountain areas, record snowfall in the Sierra Mountains, and resulting spring snowmelt river flooding. In one 36-hour period, 25 inches of rain fell in the Santa Cruz (coastal) mountains while 8.5 feet of snow fell in the Lake Tahoe region. Forty-six counties were disaster-declared.... Calculated Damages: 36 dead, 481 injured, **\$1.209 billion** economic losses including 6,661 homes and 1,330 businesses damaged or destroyed." (NOAA. *California's Top 15 Weather Events of 1900s.*)
- 1982/3 Gulf States Storms and Flooding** (1982 - Early 1983). Storms and flooding related to El Niño, especially in the states of TX, AR, LA, MS, AL, GA, FL; about **\$1.1 (2.2) billion** in damage/costs; at least 50 deaths. (NCDC 2007)
- 1980 Drought/Heat Wave** (June-Sept.1980). Central/Eastern U.S.; estimated **\$20.0 (48.4) billion** damage/costs to agriculture and related industries; estimated 10,000 deaths (includes heat stress-related). (NCDC 2007)
- 1979 Hurricane Frederic** (12 Sep 1979). Gulf Coast; **\$2.3 billion**. (Pielke/Landsea 1998)
- 1972 Hurricane Agnes** (June 19-25, 1972). Category 1, FL, VA, NY and northeastern states; 122 deaths; **\$2.1 billion**. (NOAA, Hurricane History)
- 1969 Hurricane Camille** (1969). Category 5, Gulf Coast, 256 deaths. **\$1.4 billion**. (Pielke, Simonpietri, and Oxelson 1999; NOAA Hurricane History)

- 1966 Hurricane Inez** (September 21-October 10, 1966). Category 1, South Florida. **\$2.2 billion (1992 dollars)**. (Pielke and Landsea 1998)
- 1964 1964 Alaskan Earthquake** (March 27, 1964). **\$1.6 billion**. (USGS 2001)
- 1964 Hurricane Cleo** (August 20-September 5, 1964). Category 2, Miami, FL. **\$2.7 billion (1992 dollars)**. (Pielke and Landsea 1998)
- 1962 Hurricane Betsy** (August 27-September 13, 1962). Category 3, Southern FL. **\$15 billion (1992 dollars)**. (Pielke and Landsea, 1998)
- 1961 Hurricane Carla** (September 10, 1961). Texas Coast; 46 deaths; about \$2 billion (1990 dollars). (NOAA 1993)
- 1960 Hurricane Donna** (August 29-September 14). Category 4, Sombrero Key, FL. **\$10 billion (1992 dollars)**. (Pielke and Landsea, 1998)
- 1955 Hurricane Diane** (1955). Northeast (PA, NJ, NY, CN, RI, MA) 20,000 destroyed or damaged, 200 deaths. **\$1 billion**. (Rozario 2007)
- 1949 Unnamed 1949 Hurricane** (1949). Category 3, Palm Beach. **\$2.6 billion (1992 dollars)**. (Pielke and Landsea 1998)
- 1947 Unnamed 1947 Hurricane** (1947). Category 4, Pompano Beach, FL. **\$9 billion (1992 dollars)**. (Pielke and Landsea 1998)
- 1944 Great Atlantic Hurricane of 1944** (September 9-16, 1944). Category 4; 390 deaths (340 at sea); approximately **\$1 billion** (1990 dollars). (Cotterly 2002)
- 1941 Unnamed 1941 Hurricane** (1941). Category 3, Homestead, FL. **\$5 billion (1992 dollars)**. (Pielke and Landsea 1998)
- 1938 New England Hurricane (Long Island Express)** (Sep 21-22). Cat. 3; 600 deaths. \$308 million (1938 dollars) (NOAA, Hurricane History) **\$3.5 billion** (2005 dollars (Powell)).
- 1928 1928 Southern Florida Hurricane (Great Okeechobee Hurricane)** (1928). Category 4. **\$3.5 billion (1992 dollars)**. (Pielke and Landsea 1998)
- 1926 Miami Hurricane** (September 18-21, 1926). Cat. 4; **\$102 billion**. (Pielke 2005) “With a highly transient population across southeastern Florida during the 1920s, the death toll is uncertain since more than 800 people were missing in the aftermath of the cyclone. A Red Cross report lists 373 deaths and 6,381 injuries as a result of the hurricane... would be a \$90 billion disaster had it occurred in recent times” (NOAA Hurricane History).
- 1915 Galveston Hurricane** (1915), **\$32 billion**. (Pielke 2005)

1906 San Francisco 1906 Earthquake (1906). \$400 million in 1906 dollars (approximately **\$8.2 billion** 2006 dollars). (Frantz 2005)

1900 Galveston Hurricane (1900). **\$38 billion**. (Pielke 2005)

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