

Billion Dollar U.S. Disasters¹

B. Wayne Blanchard, PhD, CEM

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Part 1: Ranked approximately by Economic Loss:

(Part 2: Listed in Chronological Order – Follows)

Bibliographical Listing of Sources Used at the end

1. **Great Miami Hurricane** (18-21Sep1926). Cat.4-3, FL, AL; Death toll uncertain; more than 800 missing. ARC report lists 373 deaths and 6,381 injuries. (NOAA Hurricane History).

\$160.0 billion (Normalized to 2005 dollars; AIR model modified, in Pielke, et al, 2008)

\$157.0 billion (Normalized to 2005 dollars using Pielke/Landsea model; Pielke, et al, 2008)

\$139.5 billion (Normalized to 2005 dollars using Collins/Lowe model; Pielke, et al, 2008)

\$102.0 billion. (Pielke 2005)

\$ 90.0 billion disaster had it occurred in recent times” (NOAA Hurricane History).

\$ 72.3 billion (normalized to 1995 dollars; Pielke et al., 2008)

2. **Hurricane Katrina** (August 2005). Category 3, LA, MS; ~1833 deaths - highest U.S. total since 1928 hurricane in southern Florida. (NCDC 2007).

\$125 billion (At the time; NCDC 2007)

\$ 82 billion (Normalized to 2005 dollars; AIR model modified, in Pielke, et al, 2008)

\$ 81 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$ 81 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$ 43.6 billion (Insured loss (2007 dollars). (III, *Catastrophes: Insurance Issues*, Jan 2008)

\$ 41.1 billion (Insurance claims paid. (Treaster, *NYT*, October 25, 2007; III *CII*, Jan 2008)

\$ 39.3 billion (Private insurer losses in 2006 dollars (GAO 2007, p. 14)

\$ 31.3 billion (Federal outlays (Woolsey, 2007)

\$ 2.4 billion (Obligated in FEMA Public Assistance (PA) in Miss. (FEMA 27Feb2008)

3. **9/11 Terrorist Attacks** (Sep 11, 2001). NY, DC, PA

\$ 80.0 billion estimated damages.” (Gould/IBM Global Business Services, 2007, p.4-5)

\$ 35.5 billion (indexed to 2006; Kunreuther, 2007, p. 4.)

\$ 27.2 billion (Total direct cost; Looney 2002).

\$ 22.9 billion (insured losses in 2007 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)

\$ 18.8 billion (insured loss when occurred; III, *Catastrophes: Insurance Issues*, Jan 2008)

\$ 14.0 billion (Private business physical assets estimated loss; Looney 2002)

\$ 1.5 billion (State and local government enterprise estimated loss; Looney 2002)

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.

\$ 0.7 billion (Federal enterprises estimated loss; Looney 2002)

4. **Galveston Hurricane** (1900). Category 4; TX

\$78.0 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$71.9 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$66.0 billion (Normalized to 2005 dollars; AIR model modified, in Pielke, et al, 2008)

\$38.0 billion (Pielke 2005)

5. **Galveston Hurricane** (1915) TX

\$61.7 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$57.1 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$32.0 billion (Pielke 2005)

6. **Hurricane Andrew** (Aug 1992). Category 5; FL, LA, 61 deaths (NCDC 2007).

\$84.0 billion (Normalized to 2005 dollars; AIR model modified, in Pielke, et al, 2008)

\$57.7 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$54.3 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$27.0 (35.6) billion (NCDC 2007).

\$22.3 billion (2006 dollars; GAO 2007, p. 14)

\$22.9 billion (Insured loss in 2007 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)

\$15.5 billion (Insured loss when occurred; III, *Catastrophes: Insurance Issues*, Jan 2008)

7. **New England Hurricane (Long Island Express)** Cat 3 (Sep 21-22, 1938) CT, MA, NY, RI

\$70.0 billion (Normalized to 2005 dollars; AIR model modified, in Pielke, et al, 2008)

\$39.2 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$37.3 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$ 3.5 billion (2005 dollars; Powell).

\$308 million (1938 dollars) 600 deaths. (NOAA, Hurricane History)

8. **Northridge Earthquake** (January 17, 1994). Magnitude 6.7; over 60 deaths, over 5,000 injuries, over 25,000 left homeless. (GAO, *Natural Hazard Mitigation*, 2007, p. 16)

\$59.8 billion (Estimated direct economic loss; GAO, *Natural Hazard Mitigation*, 2007, 16)

\$41.0 billion (Insurance Journal 2006)

\$25.0 billion (FEMA 2006).

\$19.0 billion (Kunreuther 2007, 3)

\$17.4 billion (Insured loss in 2007 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)

\$12.5 billion (Insured loss when occurred; III, *Catastrophes: Insurance Issues*, Jan 2008)

9. **1928 Great Okeechobee Hurricane, So. FL.** 1928, Category 4. (Pielke and Landsea 1998)

\$66.0 billion (Normalized to 2005 dollars; AIR model modified, in Pielke, et al, 2008)

\$33.6 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$31.8 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$ 3.5 billion (1992 dollars; Pielke and Landsea 1998)

10. **Drought/Heat Wave** (Summer 1988, central/eastern U.S.; estimated 5,000 to 10,000 deaths (includes heat stress-related); severe losses to agriculture, related industries; NCDC 2007)

\$61.6 (\$40.0) billion estimated damage/costs; NCDC 2007)

11. **Hurricane Donna** (Aug 29-Sep 14, 1960). Cat 4, Sombrero Key, FL. (Pielke/Landsea, 1998)

\$52.0 billion (Normalized to 2005 dollars; AIR model modified, in Pielke, et al, 2008)
\$31.9 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$29.6 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$10.0 billion (1992 dollars; Pielke and Landsea, 1998)

12. **1944 Unnamed FL Hurricane** (1944) Category 3; FL.

\$38.7 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$35.6 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

13. **Drought/Heat Wave** (June-Sept.1980). Central/Eastern U.S.; estimated 10,000 deaths (includes heat stress-related; NCDC 2007)

\$48.4 (\$20.0) billion (Estimated damage/costs, agriculture, related industries; NCDC 2007)

14. **Midwest Flooding** (Sum. 1993). Flooding central US; heavy rains; 48 deaths; NCDC 2007)

\$26.7 (\$21.0) billion (Approximate damage/costs; NCDC 2007)

15. **Hurricane Camille** (1969). Cat 5 Gulf Coast, 256 deaths (Pielke, Simonpietri, Oxelson 1999)

\$24.0 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$21.2 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$ 1.4 billion (NOAA *Hurricane History*)

16. **Hurricane Betsy** (1962). Category 3, So. FL, LA

\$68.0 billion (Normalized to 2005 dollars; AIR model modified, in Pielke, et al, 2008)
\$23.0 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$20.7 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$15.0 billion (1992 dollars; Pielke and Landsea, 1998)

17. **Hurricane Wilma** (Oct 2005) Florida; estimated 35 deaths (NCDC 2007).

\$20.6 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$16.0 billion (Approximate damage/costs; NCDC 2007)
\$12.9 billion (Indexed to 2006). (Kunreuther 2007, 3)
\$10.9 billion (Insured loss in 2007 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)
\$10.3 billion (Insured loss when occurred; III, *Catastrophes: Insurance Issues*, Jan 2008)

18. **Hurricane Agnes** (19-25Jun1972) Cat 1, FL, VA, NY, some NE States; (NOAA, Hur. Hist.)

\$18.4 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$17.5 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$ 2.1 billion (NOAA, Hurricane History)

19. **Hurricane Diane** (1955). (NC, PA, NJ, NY, CN, RI) 20K destroyed/damaged structures; 200 deaths. (Rozario 2007)

\$17.8 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$17.2 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
~\$1.0 billion (At the time; Rozario 2007)

20. **1947 Unnamed Hurricane** (1947) Cat. 4-3, Pompano Beach, FL. (Pielke and Landsea 1998)

\$48.0 billion (Normalized to 2005 dollars; AIR model modified, in Pielke, et al, 2008)
\$16.8 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$14.8 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$ 9.0 billion (1992 dollars; Pielke and Landsea 1998)

21. **Hurricane Hazel** 1954). Category 4, NC, SC. (Pielke, et al, 2008)

\$23.2 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$16.5 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

22. **Hurricane Charley** (August 2004). Category 4, FL; at least 35 deaths (NCDC 2007).

\$16.3 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$16.3 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$15.0 billion (Estimate in damage/costs; NCDC 2007)
\$ 8.6 billion (Indexed to 2006; Kunreuther 2007, p. 3)
\$ 8.2 billion (Insured loss in 2007 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)
\$ 7.5 billion (Insured loss when occurred; III, *Catastrophes: Insurance Issues*, Jan 2008)

23. **Hurricane Carol** (1954). Category 3, Ct, NY, RI; Pielke, et al, 2008)

\$16.1 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$15.1 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

24. **Hurricane Rita** (Sep 2005). Category 3; TX, LA; 119 reported deaths; NCDC 2007)

\$16.0 billion (Preliminary estimate in damage/costs, NCDC 2007)
\$10.4 billion (Indexed to 2006; Kunreuther 2007, p. 3)
\$10.0 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$10.0 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$ 5.9 billion (Insured loss in 2007 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)
\$ 5.8 billion (Property insurance claims in TX and LA. (KWTX-TV Online, 24 Sep 2007)
\$ 5.6 billion (Insured loss when occurred; III, *Catastrophes: Insurance Issues*, Jan 2008)
\$ 4.0 billion (For FL residents displaced by Hurricane Rita; Woolsey, 2007)
\$ 2.0 billion (FEMA expenditures by 24Sep2007; FEMA Sep 24, 2007 Press Release)

25. **Hurricane Ivan** (Sep 2004). Category 3; FL, AL; at least 57 deaths; wind/flood damage in GA, SC, NC, VA, LA, MS, WV, MD, TN, KY, OH, DE, NJ, PA, and NY. (NCDC 2007).

\$15.5 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$15.5 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$14.0 billion (Damage/costs; NCDC 2007)
\$13.6 billion (Indexed to 2006; Kunreuther 2007, p. 3)
\$ 7.8 billion (Insured loss in 2007 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)
\$ 7.1 billion (Insured loss when occurred; III, *Catastrophes: Insurance Issues*, Jan 2008)
\$ 2.6 billion (Damage in parts of Florida, Louisiana and Texas; Woolsey, 2007)

26. **Hurricane Hugo** (Sep1989). Cat. 4; SC, NC, PR, VI; 86 deaths (57, U.S. mainland, 29, PR, Virgin Islands; NCDC 2007).

\$17.5 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$15.3 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$13.9 billion (Damage/costs; NCDC 2007).
\$10.9 billion (Carolinas; NCDC 2007).
\$ 9.0 billion (Damage/costs; NCDC 2007).
\$ 7.4 billion (Indexed to 2006; Kunreuther 2007. p. 3)
\$~7.1 billion (Carolinas; NCDC 2007).
\$ 7.0 billion (Insured loss in 2007 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)
\$ 4.2 billion (Insured loss when occurred; III, *Catastrophes: Insurance Issues*, Jan 2008)

27. **1949 Unnamed FL Hurricane** (1949). Cat. 3; Palm Beach, FL; Pielke and Landsea 1998)

\$14.7 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$13.5 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$ 2.6 billion (1992 Dollars; Pielke and Landsea 1998)

28. **Hurricane Carla** (September 10, 1961). Category 4; TX Coast; 46 deaths; NOAA 1993)

\$14.2 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$13.5 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
~\$2.0 billion (1990 dollars, NOAA 1993)

29. **1944 Great Atlantic Hurricane** (Sep 9-16). Cat. 4; 390 deaths (340 at sea); Cotterly 2002); CT, NC, NY, RI, VA; Category 3; Pielke, et al, 2008)

\$13.2 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$12.1 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
~\$1.0 billion (1990 dollars, Cotterly 2002)

30. **1919 Unnamed Hurricane**. Category 4: FL, TX; Pielke, et al, 2008)

\$13.8 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$12.9 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

31. **1945 Unnamed FL Hurricane**. Category 3. Pielke, et al, 2008.

\$12.3 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$10.1 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

32. **Hurricane Frederic** (Sep 12, 1979). Cat. 3; Gulf Coast (AL, MS); (Pielke/Landsea 1998)

\$11.5 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$10.3 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$ 2.3 billion (Pielke/Landsea 1998)

33. **Drought** (Spring/early Fall 2002). 30 States (Western, Great Plains, Eastern) (NCDC 2007)

\$10.0 billion (Estimate in damages/costs; (NCDC 2007)

34. **Hurricane Frances** (Sep 5, 2004). Cat. 2; east-central FL; at least 48 deaths (NCDC 2007).

\$9.7 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$9.6 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$9.0 billion (Estimated damage/costs;. (NCDC 2007).
\$5.5 billion (Indexed to 2006; Kunreuther 2007, p. 3)
\$5.0 billion (Insured loss in 2007 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)
\$4.6 billion (Insured loss when occurred; III, *Catastrophes: Insurance Issues*, Jan 2008)

35. **Unnamed 1933 VA Hurricane**. Category 2 (Pielke, et al, 2008)

\$9.8 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$8.2 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

36. **San Francisco 1906 Earthquake** (1906).

\$ 8.2 billion (approximately, 2006 dollars). (Frantz 2005)
\$400 million (1906 dollars) (Frantz 2005)

37. **Hurricane Jeanne** (Sep 26, 2004). Cat. 3; east-central FL; at least 28 deaths (NCDC 2007).

\$7.5 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$7.5 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$7.0 billion (Estimated damage/costs; (NCDC 2007).

\$4.1 billion (indexed to 2006; Kunreuther 2007, p. 3)

\$4.0 billion (estimated insured loss in 2007 dollars; III, *Catastrophes*, Jan 2008)

\$3.6 billion (estimated insured loss when occurred; III, *Catastrophes*: Jan 2008)

38. **Northeast Blackout** (Aug 14, 2003).

\$6.8-\$10.3 billion. (ICF Consulting 2003)

“...roughly \$6 billion, White House, *National Strategy for Homeland Security*, 2007, 1:11)

\$4-\$10 billion (U.S.-Canada Power System Outage Task Force, 2004, p. 1)

39. **Loma Prieta Earthquake** (Oct 17, 1989). Magnitude 6.9; 63 people killed. (USGS 1999)

\$6 billion to \$10 billion (Estimated property loss; USGS 1999)

40. **Southern Drought/Heat Wave** (Sum.1998). TX/OK east to Carolinas; at least 200 deaths.

\$6.0-\$9.0 billion (6.6-9.9) (Damage/costs to agriculture and ranching; (NCDC 2007)

41. **Hurricane Alicia** (Aug 18-21, 1983). Category 3; TX; 21 deaths (NCDC 2007)

\$7.5 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$7.2 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$3.0 (5.9) billion (Damage/costs, (NCDC 2007)

42. **Hurricane Floyd** (Sep.1999). Large category 2; eastern NC; 77 deaths; some flooding in SC, VA, MD, PA, NY, NJ, DE, RI, CT, MA, NH, and VT; (NCDC 2007)

\$6.8 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$6.7 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$6.0 (6.5) billion (Estimated damage/costs; (NCDC 2007)

43. **Tropical Storm Allison** (June 2001). TX; at least 43 deaths; fatalities and significant damage reported in TX, LA, MS, FL, VA, and PA; (NCDC 2007).

\$6.6 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$6.4 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$5.0 (5.1) billion (Estimated damage/costs; (NCDC 2007).

\$4.1 billion (Indexed to 2006 dollars; Kunreuther 2007, p. 3)

44. **Unnamed 1935 FL Hurricane**. Category 2. Pielke, et al, 2008)

45. **Hurricane Opal** (Oct 1995). Cat 3; FL panhandle, AL, W. GA, E. TN, and Western Carolinas; 27 deaths; (NCDC 2007).

\$6.3 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$6.1 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$3.0 (3.6) billion (Damage/costs; (NCDC 2007).

46. **Drought** (Spring-Summer 2006).

Over \$6.0 billion preliminary estimate of damages/costs. (NCDC 07)

47. **Hurricane Georges** (September 1998). Category 2 Puerto Rico, Florida Keys, and Gulf coasts of LA, MS, AL, and FL panhandle; 16 deaths; (NCDC 2007).

\$5.9 (6.5) billion (Estimated damage/costs; (NCDC 2007). NCDC 2007).
\$4.4 billion (Indexed to 2006; Kunreuther 2007, p. 3)
\$3.8 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$3.758 billion (Estimated insured loss, 2007 dollars; III, *Catastrophes: Insurance* Jan 2008)
\$3.6 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$2.955 billion (Estimated insured loss when occurred; III, *Catastrophes: Insurance* Jan 2008)

48. **TX/OK/LA/MS Severe Weather and Flooding** (May 1995). Torrential rains, hail, and tornadoes across TX-OK and southeast LA- so. MS; Dallas. (NCDC 2007)

\$5.0-\$6.0 (6.5-7.1) billion (Damage/costs; (NCDC 2007)

49. **Storm/Blizzard** (March 1993). "Storm of the Century" hits entire eastern seaboard with tornadoes, high winds, and heavy snows (2-4 feet); approximately 270 deaths, (NCDC 2007)

\$5.0-\$6.0 (6.3-7.6) billion (Damage/costs; (NCDC 2007)

50. **Hurricane Fran** (Sep 1996). Category 3; NC and VA; 37 deaths; (NCDC 2007)

\$6.2 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$5.8 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
Over \$5.0 (5.8) billion (Damage/costs; (NCDC 2007)
\$2.11 billion (estimated insured loss, 2007 dollars; III, *Catastrophes: Insurance*, Jan 2008)
\$1.6 billion (estimated insured loss at occurrence; III, *Catastrophes: Insurance*, Jan 2008)

51. **Southern Plains Severe Drought** (Fall 1995/Sum.1996). TX and OK most severely affected

\$5.0 (6.0) billion (Approximate damage/costs; (NCDC 2007)

52. **Freeport Hurricane of 1932**. Category 4; TX; (Pielke, et al, 2008)

\$5.9 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$5.7 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

53. **Hurricane Celia** (1970). Category 3; TX. Pielke, et al, 2008)

\$5.7 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$5.6 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

54. **Unnamed Hurricane of 1916**. Category 3; AL, MS; Pielke, et al, 2008)

\$6.3 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$5.3 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

55. **Unnamed Hurricane of 1903**. Category 1; FL; (Pielke, et al, 2008)

\$5.2 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$4.2 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

56. **Hurricane Cleo** (1964). Cat. 2; Miami, FL; (Pielke/Landsea 1998)

\$5.2 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$4.7 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

\$2.7 billion (1992 dollars). (Pielke/Landsea 1998)

57. **Winter Storms – CA** (1955). 28 dead (NOAA, CA Top 15 Weather Events of 1900s, 2007)

\$5 billion (Est. indirect costs, costs to state's economy (Galloway, *A CA Challenge*, 2007, 1)²

\$1.841 billion (Calculated econ. losses. (NOAA, CA Top 15 Weather Events of 1900s, 2007)

58. **Unnamed 1941 Hurricane** (1941). Cat 3, Homestead, FL. (Pielke and Landsea 1998)..

\$5 billion (1992 dollars). (Pielke and Landsea 1998).

59. **Hurricane Isabel** (Sep 2003) Cat 2; eastern NC; storm surge NC, VA, MD; wind damage and flooding, NC, VA, MD, DE, WV, NJ, NY, and PA; at least 55 deaths. (NCDC 2007)

\$5.0 billion (Estimated damages/costs; (NCDC 2007)

\$4.0 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$4.0 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

60. **Hurricane King** (1950) Category 3; FL; \$3.7-\$4.4B (2008 dollars); (Pielke, et al, 2008)

\$4.4 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)

\$3.7 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)

² Cites: State of California, Department of Water Resources, *Alternatives for Increasing Flood Insurance Participation for Communities Behind Levees in California*. May 2006.

61. **Drought/Heat Wave** (Spring-Sum. 2000). SC and SE States; ~ 140 deaths; (NCDC 2007)
Over \$4.0 (4.2) billion in damage/costs; (NCDC 2007)
62. **Northern Plains Flooding** (April-May 1997). Flooding ND, SD, MN due to snowmelt; 11 deaths. (NCDC 2007)
~ \$3.7 (4.1) billion (Damage/costs; (NCDC 2007)
63. **Hurricane Beulah** (1967). Category 3; TX: (Pielke, et al, 2008)
\$4.0 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$4.0 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
64. **Hurricane Juan** (Oct-Nov 1985). Cat 1; LA, SE U.S; 63 deaths; (NCDC 2007)
\$4.2 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$3.9 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$1.5 (2.8) billion (Damage/costs; (NCDC 2007)
65. **Hurricane Audrey** (1957). Category 4; LA, TX; Pielke, et al, 2008)
\$4.1 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$3.8 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
66. **Hurricane Ione** (1955). Category 3, NC; Pielke, et al, 2008)
\$6.0 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
\$3.7 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
67. **Unnamed FL Hurricane of 1926** (Not Great Miami Hurricane). Cat 2. Pielke, et al, 2008)
\$3.7 billion (Normalized to 2005 dollars using Pielke & Landsea model; Pielke, et al, 2008)
\$3.6 billion (Normalized to 2005 dollars using Collins and Lowe model; Pielke, et al, 2008)
68. **Tornadoes and Severe Storms** (Early May 2003). Midwest, MS valley, OH/TN valleys and portions of southeast; modern record one-week total of ~ 400 tornadoes reported; 51 deaths; (NCDC 2007)
Over \$3.4 billion (Damages/costs; (NCDC 2007)
69. **California Freeze** (December 1990). **\$3.4 billion** “calculated damages in direct and indirect economic losses including damage to public buildings, utilities, crop damage, and residential burst pipes....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.” (NOAA. *California's Top 15 Weather Events of 1900s.*)

70. **Southeast Ice Storm** (Feb 1994). ~**\$3.0 (3.7) billion** damage/costs; 9 deaths. Intense ice storm with extensive damage in portions of TX, OK, AR, LA, MS, AL, TN, GA, SC, NC, and VA; (NCDC 2007)
71. **California Flooding** (Jan-March 1995). Over **\$3.0 (3.6) billion** damage/costs; 27 deaths. (Frequent winter storms cause 20-70 in. rainfall and periodic flooding across much of CA. (NCDC 2007)
72. **Blizzard of '96 Followed by Flooding** (Jan 1996). ~**\$3.0 (3.5) billion** damage/costs; 187 deaths. (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. (NCDC 2007)
73. **Flooding--West Coast** (Dec 1996-Jan 1997). ~ **\$3.0 (3.4) billion** damage/costs; 36 deaths
Torrential rains (10-40 inches in 2 weeks) and snowmelt produce severe flooding over portions of CA, WA, OR, Idaho, Nevada, and Montana;. (NCDC 2007)
74. **Oakland Firestorm** (Oct 1991). 25 deaths; low humidity/high winds;. (NCDC 2007)

~ \$2.5 (3.5) billion (Damage/costs; (NCDC 2007)
\$2.516 billion (2006 dollars; III, *Catastrophes: Insurance Issues*, Jan 2008)
\$1.7 billion (At occurrence; III, *Catastrophes: Insurance Issues*, Jan 2008)
75. **Wildfires Southern California** (Late Oct early Nov 2003). Over **\$2.5 billion** damage/costs; 22 deaths. Dry weather, high winds, and resulting wildfires in So. CA. More than 743,000 acres of brush/timber burned, over 3700 homes destroyed;. (NCDC 2007)
76. **Hurricane Marilyn** (Sep 1995). Cat 2, U.S. Virgin Islands; 13 deaths. (NCDC 2007)

\$2.1 (2.5) billion (Estimated damage/costs; (NCDC 2007)
\$1.19 billion (estimated insured loss, 2007 dollars; III, *Catastrophes: Insurance*, Jan 2008)
\$.875 billion (estimated insured at occurrence; III, *Catastrophes: Insurance*, Jan 2008)
77. **Hurricane Inez** (1966). **\$2.2 billion** (1992 dollars). Cat.1, S. FL (Pielke/Landsea 1998)
78. **So. CA Wildfires** (Oct 2007). Nearly **\$2.1 billion**. “...well over 1 billion in destroyed and damaged property, and nearly \$900 million in lost business and productivity.” (San Diego Foundation, Dec 5, 2007, p. 8.) ~**\$1 billion**. (Treaster, NYT, October 25, 2007)
79. **Florida Freeze** (Dec 1983). About **\$2.0 (4.0) billion** damage to citrus industry; no deaths. Severe freeze central/northern Florida; (NCDC 2007)

80. **Wildfires Western Fire Season** (Spring-Sum 2000). Over **\$2.0 (2.1) billion** estimated damage/costs (includes fire suppression). Severe fire season due to drought and frequent winds, nearly 7 million acres burned; (NCDC 2007)
81. **Hurricane Dennis** (July 2005). Over **\$2 billion** preliminary estimate, damage/costs; at least 15 deaths. Cat 3; landfall in western FL panhandle resulting in storm surge and wind damage along FL-AL coasts, with scattered wind and flood damage in GA, MS, TN. (NCDC 2007)
82. **Wildfire Western Fire Season** (Spring - Fall 2002). Over **\$ 2.0 billion** in damages/costs; 21 deaths. 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;. (NCDC 2007)
83. **Hail and Tornadoes Midwest and Ohio Valley** (April 2001). Over **\$1.9 billion** in damage/costs, with the most significant losses due to hail; at least 3 deaths. Storms, tornadoes, hail in states of TX, OK, KS, NE, IA, MO, IL, IN, WI, MI, OH, KY, WV, and PA, over 6-day period; (NCDC 2007)
84. **California New Year's Flood** (1996/1997). “**\$1.8 billion** economic losses including 23,000 homes and 2,000 businesses damaged or destroyed.” “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...” (NOAA. *California's Top 15 Weather Events of 1900s.*)
85. **Hurricane Iniki** (Sep 1992). About **\$1.8 (2.4) billion** damage/costs; 7 deaths. Cat 4; Hawaiian island of Kauai; (NCDC 2007)
- \$2.3 billion** (estimated insured loss in 2007 dollars; III, *Catastrophes: Insurance*, Jan 2008)
\$1.6 billion (estimated insured loss at occurrence; III, *Catastrophes: Insurance*, Jan 2008)
86. **1964 Alaskan Earthquake** (March 27,1964). **\$1.6 billion.** (USGS 2001)
87. **Hurricane Bob** (Aug 1991). **\$1.5 (2.1) billion** damage/costs; 18 deaths. Cat 2; mainly coastal North Carolina, Long Island, and New England; (NCDC 2007)
88. **Tornadoes Oklahoma-Kansas** (May 1999). Over **\$1.6 (1.7) billion** damage/costs; 55 deaths. Outbreak of F4-F5 tornadoes hit the states of OK and Kansas, along with Texas and Tennessee, Oklahoma City area hardest hit; (NCDC 2007)

89. **Hail and Storms** (Early April 2003). Over **\$ 1.6 billion** in damages/costs; 3 deaths. 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. (NCDC 2007)
90. **Minnesota Severe Storms/Hail** (May 1998). Over **\$1.5 (1.7) billion** damage/costs; 1 death. Very damaging severe thunderstorms, large hail over wide areas of MN. (NCDC 2007)
91. **Northeast Ice Storm** (Jan 1998). Over **\$1.4 (1.5) billion** damage/costs; 16 deaths. Intense ice storm hits Maine, NH, VT, and NY, with extensive forestry losses. (NCDC 2007)
92. **Hurricane Elena** (Aug-Sep 1985). **\$1.3 (2.4) billion** damage/costs; 4 deaths. Cat 3, Florida to Louisiana; (NCDC 2007)
93. **Tornadoes Arkansas-Tennessee** (Jan 1999). ~ **\$1.3 (1.4) billion** damage/costs; 17 deaths. Two outbreaks of tornadoes in 6-day period strike Arkansas and Tennessee; (NCDC 2007)
94. **California El Niño Storms** (1982-83). **\$1.209 billion** economic losses including 6,661 homes and 1,330 businesses damaged or destroyed. 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 (NOAA. *California's Top 15 Weather Events of 1900s.*)
95. **Gulf States Storms and Flooding** (1982-Early 1983). ~ **\$1.1 (2.2) billion** in damage/costs; at least 50 deaths. Storms and flooding related to El Nino, especially in the states of TX, AR, LA, MS, AL, GA, FL. (NCDC 2007)
96. **Florida Freeze** (Jan 1985). ~ **\$1.2 (2.2) billion** damage to the citrus industry; no deaths. Severe freeze central/northern Florida. (NCDC 2007)
97. **Western Storms and Flooding** (1982-Early 1983). ~ **\$1.1 (2.2) billion** in damage/costs; at least 45 deaths. Storms and flooding related to **El Nino**, especially in the states of WA, OR, CA, AZ, NV, ID, UT, MT; (NCDC 2007)
98. **California El Nino Storms** (1997-1998). “Actual storm losses...were **\$1.1 billion...**” California “emergency management agencies and FEMA spent an estimated \$165 million preparing for storms and heavy rain.” (NOAA Magazine 2002)
99. **Nor'easter of 1992** (Dec 1992). **\$1.0-\$2.0 (1.3-2.6) billion** damage/costs; 19 deaths. Slow-moving storm batters northeast U.S. coast, New England hardest hit. (NCDC 2007)
100. **Drought/Heat Wave, Southeast** (Sum 1986). **\$1.0-\$1.5 (1.8-2.6) billion** in damage/costs; estimated 100 deaths. Severe summer drought in parts of the southeastern U.S. with severe losses to agriculture. (NCDC 2007)

101. **Drought -- Northern Plains** (Sum 1989). At least **\$1.0 (1.5) billion** in damage/costs; no deaths reported. Severe summer drought over much of the northern plains with significant losses to agriculture. (NCDC 2007)
102. **Flooding** (May 1990). Over **\$1.0 (1.4) billion** damage/costs; 13 deaths. Torrential rains cause flooding along the Trinity, Red, Arkansas Rivers in TX, OK, LA, AR. (NCDC 2007)
103. **Drought/Heat Wave** (Sum 1993, Southeastern U.S). About **\$1.0 (1.3) billion** damage/costs to agriculture; at least 16 deaths. (NCDC 2007)
104. **California Wildfires** (Fall 1993). ~ **\$1.0 (1.3) billion** damage/costs; 4 deaths. Dry weather, high winds, and wildfires in southern California. (NCDC 2007)
105. **Tropical Storm Alberto** (July 1994). ~ **\$1.0 (1.2) billion** damage/costs; 32 deaths. Remnants of slow-moving Alberto brought torrential 10-25 inch rains in 3 days, widespread flooding, and agricultural damage in parts of GA, AL, and FL panhandle. (NCDC 2007)
106. **Pacific Northwest Severe Flooding** (Feb 1996). ~ **\$1.0 (1.2) billion** damage/costs; 9 deaths. Very heavy, persistent rains (10-30 inches) and melting snow over OR, WA, ID, West MT. (NCDC 2007)
107. **Texas Flooding** (Oct 1994). ~ **\$1.0 (1.2) billion** damage/costs; 19 deaths. Torrential rain (10-25 in. in 5 days), thunderstorms cause flooding across much of SE Texas; (NCDC 2007)
108. **Western Fire Season** (Sum-Fall 1994). ~ **\$1.0 (1.2) billion** damage/costs; death toll undetermined. Severe fire season; western states; dry weather; (NCDC 2007)
109. **Eastern Drought/Heat Wave** (Sum 1999). Over **\$1.0 (1.1) billion** damage/costs; estimated 502 deaths. Very dry summer and high temperatures, mainly in eastern U.S., with extensive agricultural losses; (NCDC 2007)
110. **Southeast Severe Weather** (Winter-Spring 1998). Over **\$1.0 (1.1) billion** damage/costs; at least 132 deaths. El Nino related tornadoes, flooding in southeastern states; (NCDC 2007)
111. **Flooding, Tornadoes MS and OH Valleys** (March 1997). ~ **\$1.0 (1.1) billion** damage/costs; 67 deaths. 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; (NCDC 2007)
112. **Hurricane Bonnie** (Aug 1998). ~ **\$1.0 (1.1) billion** damage/costs; 3 deaths. Cat 3, strikes eastern North Carolina and Virginia, extensive agricultural damage due to winds and flooding, with 10-inch rains in 2 days in some locations; (NCDC 2007)
113. **Wildfires** (2006). **Well over \$1.0 billion** in overall damages/costs. At least 28 fatalities, including 20 firefighters. (NCDC 2007)

114. **California Firestorms** (Oct 1993). “**\$1 billion** economic losses in property alone and 194,000 acres were destroyed.” 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...” (NOAA. *California's Top 15 Weather Events of 1900s*)
115. **Tornadoes and Severe Storms** (March 2006). **Over \$1.0 billion** damage/costs. At least 10 deaths. 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. (NCDC 2007)
116. **Flooding Texas** (Oct-Nov 1998). ~ **\$1.0 (1.1) billion** damage/costs; 31 deaths. Severe flooding in SE TX from 2 heavy rain events, with 10-20 inch rainfall totals; (NCDC 2007)
117. **Drought** (Spring-Sum 2005). Over **\$1.0 billion** in damage/costs. Rather severe localized drought causes significant crop losses (especially for corn and soybeans) in the states of AR, IL, IN, MO, OH, and WI. (NCDC 2007)
118. **Washington State Flooding** (Early Dec 2007). “**At least \$1 billion** in damage, killed a half-dozen people, displaced hundreds from their homes, and hurt businesses.” (Ammons, *Seattle Times*, 29Jan08)

Monthly averaged insured disaster losses in the U.S. 1980-2006. \$1billion. (GAO, *Climate Change*, May 2007, p. 4)

Ongoing: Weekly averaged total disaster losses 1989 to the present -- **\$1 billion.** (Mileti, 5)

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

- 2007 Washington State Flooding** (Early Dec). (Ammons, *Seattle Times*, 29Jan08)
- 2007 Southern California Wildfires, October.** Approximately \$2.1 billion. (San Diego Foundation, 2007). **\$1 billion.** (Treater, NYT, October 25, 2007)
- 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)
- 2005 Hurricane Wilma** (October 2005). Approximately **\$16 billion** in damage/costs; estimated 35 deaths (NCDC 2007).
- \$12.9 billion** (indexed to 2006; Kunreuther 2007, 3)
- 2005 Hurricane Rita** (September 2005). Category 3; 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)
- \$10.4 billion** (indexed to 2006; Kunreuther 2007, p. 3)
- Property insurance claims in TX and LA amounted to **\$5.8 billion** (KWTX-TV Online, Sep 24, 2007).
- In 2005, Florida residents displaced by Hurricane Rita required a **\$4 billion** government bailout. (**Woolsey**, 2007)
- 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 2004). Cat 3; AL 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. Over **\$14 billion** in damage/costs; at least 57 deaths (NCDC 2007).
\$13.6 billion (indexed to 2006; Kunreuther 2007, p. 3)
“...**\$2.6 billion** in damage in parts of Florida, Louisiana and Texas.” (Woolsey, 2007)
- 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)
“...roughly **\$6 billion**, White House, *National Strategy for Homeland Security*, 2007, 1:11)

- 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). 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.** 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). **\$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** (Oct-Nov). Cat. 1; LA and Southeast U.S., (NCDC 2007)

1985 Hurricane Elena (August-September 1985). Cat. 3; Florida to Louisiana; (NCDC 2007)

1985 Florida Freeze (January 1985). (NCDC 2007)

1983 Hurricane Alicia (August 18-21, 1983). Category 3 hurricane--Texas (NCDC 2007)

1983 Florida Freeze (December 1983). (NCDC 2007)

1982/3 Western Storms and Flooding (1982 - Early 1983). (NCDC 2007)

1982/3 California El Niño Storms (1982-83). (NOAA. *CA Top 15 Weather Events of 1900s.*)

1982/3 Gulf States Storms and Flooding (1982 - Early 1983). El Nino (NCDC 2007)

1980 Drought/Heat Wave (June-Sept.1980). Central/Eastern U.S.; (NCDC 2007)

1979 Hurricane Frederic (12 Sep 1979). Gulf Coast; **\$2.3 billion.** (Pielke/Landsea 1998)

1972 Hurricane Agnes (June 19-25). Cat 1, FL, VA, NY, NE States; (NOAA, Hurr. History)

1970 Hurricane Celia (1970). Category 3; TX. Pielke, et al, 2008)

1969 Hurricane Camille. Cat. 5, Gulf Coast, (Pielke, et al. 1999; NOAA Hurricane History)

1967 Hurricane Beulah (1967). Category 3; TX: \$4B (2008 dollars); (Pielke, et al, 2008)

1966 Hurricane Inez (Sep 21-Oct 10). Category 1, South Florida (Pielke and Landsea 1998)

1964 1964 Alaskan Earthquake (March 27, 1964). **\$1.6 billion.** (USGS 2001)

1964 Hurricane Cleo (Aug 20-Sep 5). Category 2, Miami, FL. (Pielke and Landsea 1998)

1962 Hurricane Betsy (Aug 27-Sep 13). Cat. 3, Southern FL. (Pielke and Landsea, 1998)

1961 Hurricane Carla (September 10, 1961). Texas Coast; (NOAA 1993)

1960 Hurricane Donna (Aug 29-Sep 14). Cat.4, Sombrero Key, FL. (Pielke/Landsea, 1998)

1957 Hurricane Audrey. Category 4; LA, TX; \$3.8-\$4.1B (2005 dollars) Pielke, et al, 2008)

1955 Hurricane Diane. Northeast (PA, NJ, NY, CN, RI, MA) (Rozario 2007)

1955 Hurricane Ione (1955). Category 3, NC; \$3.7B-\$6.0B (2005 dollars) Pielke, et al, 2008)

1950 Hurricane King. Category 3; FL; \$3.7-\$4.4B (2008 dollars); (Pielke, et al, 2008)

- 1949 Unnamed 1949 Hurricane** (1949). Category 3, Palm Beach. (Pielke and Landsea 1998)
- 1947 Unnamed 1947 Hurricane** (1947). Cat. 4, Pompano Beach, FL. (Pielke/Landsea 1998)
- 1945 Unnamed FL Hurricane.** Category 3. Pielke, et al, 2008.
- 1944 Great Atlantic Hurricane of 1944** (September 9-16, 1944). Category 4; (Cotterly 2002)
- 1944 Unnamed Florida Hurricane** (Pielke, et al, 2008)
- 1941 Unnamed 1941 Hurricane** (1941). Cat. 3, Homestead, FL. (Pielke and Landsea 1998)
- 1938 New England Hurricane (Long Island Express)** (NOAA, Hurricane History) (Powell).
- 1935 Unnamed FL Hurricane.** Category 2. Pielke, et al, 2008)
- 1932 Freeport Hurricane of 1932.** Category 4; TX; (Pielke, et al, 2008)
- 1928 1928 Southern Florida Hurricane (Great Okeechobee Hurricane)** (1928).
- 1926 Miami Hurricane** (September 18-21, 1926). (NOAA Hurricane History).
- 1926 Unnamed FL Hurricane of 1926.** Cat 2 \$3.6-\$3.7B (2005 dollars) (Pielke, et al, 2008)
- 1919 Unnamed Hurricane.** Category 4: FL, TX; \$12.9-\$13.8B (2005 \$) (Pielke, et al, 2008)
- 1916 Unnamed Hurricane of 1916.** Category 3; AL, MS; Pielke, et al, 2008)
- 1915 Galveston Hurricane** (1915), **\$32 billion.** (Pielke 2005)
- 1906 San Francisco 1906 Earthquake** (1906). \$8.2B 2006 dollars. (Frantz 2005)
- 1903 Unnamed Hurricane of 1903.** Category 1; FL; (Pielke, et al, 2008)
- 1900 Galveston Hurricane** (1900). **\$38 billion.** (Pielke 2005)

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