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**ATLANTIC TROPICAL STORMS AND HURRICANES AFFECTING THE UNITED  
STATES: 1899-1999**

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## **1. Introduction**

Tropical storms and hurricanes have affected every coastal state along the Atlantic and Gulf of Mexico from Texas to Maine. Even some inland states, such as Arkansas and Tennessee, have adversely experienced the effects of such storms. Anyone living in the eastern half of the U.S. should be aware of the effects of tropical storms and hurricanes, and how they could affect their lives and businesses.

This study was initiated for the purpose of addressing such concerns and others like them. By using a large part of the work done by Neumann, et al. (1993), several statistics are revealed, including frequency and return period of tropical storms and/or hurricanes which have affected the various coastal and inland states. The distance between landfalls for hurricanes is introduced to show which coastal state has the most concentration of landfalls over time, rather than just looking at which state has the highest number of landfalls.

## **2. Data Collection**

The majority of the information used for this study came from Neumann, et al. (1993). The Atlantic track file (Jarvinen, et al. 1984) was used to complement this publication. Additional data for the years 1993 through 1999, as well as an updated Atlantic track file through 1999, were obtained from the National Hurricane Center Web site. Tropical depressions were excluded from this study due to the absence of data for these weak tropical systems.

Information on coastline length was obtained from Famighetti (1996). During the process of measuring the coastline, Connecticut was eliminated and had no measurement of a coastline. A CD-ROM mapping program, DeLorme (1997), was used to estimate a coastline length for Connecticut.

## **3. Analysis and Results**

Hurricanes are ranked according to strength and by the amount of damage they cause. Table 1 is a brief description of the Saffir/Simpson hurricane intensity scale. The weakest hurricane is designated a Category One with a maximum sustained wind from 74 to 95 mph and an average storm surge of 4 to 5 ft above sea level. In contrast, a Category Five hurricane has a maximum sustained wind greater than 155 mph and a storm surge of greater than 18 ft. Storm depends on many factors such as the shape of the continental shelf just offshore, whether the hurricane makes landfall at high or low tide, and the location of the onshore and offshore winds relative to the eye of the hurricane.

Appendix A is a chronological list of hurricanes of various intensities which have struck from Texas to Maine for the years 1899-1999. In this study, a storm affects a state only once. For example, Hurricane Erin of 1995 made landfall on the east coast of Florida, moved over the peninsula, and struck the Florida panhandle two days later. Such situations are counted once for simplicity since it was the same storm. Table 2 further divides these direct hits according to category using the Saffir/Simpson scale. As one would expect, Category One hurricanes have struck most frequently with 62 landfalls, and Category Five storms are rare with only two landfalls. Notice the secondary maximum of Category Three landfalls.

The Glossary of Meteorology (Huschke 1959) and Elsner and Kara (1999) define frequency as the number of times a specified event occurs in a given series of observations, or period of time. In Table 2, the landfall frequency is represented by dividing the number of storms which made a landfall or direct hit by time. In this case, the time is 101 years. With the exception of the total for the United States, the results for each state are smaller than one, since no state averages a hurricane landfall or direct hit every year. The frequency of 1.65 for the United States signifies an average of one to two hurricane landfalls per year, somewhere along the Gulf or Atlantic coastline.

The above references define return period as the average time interval between the occurrence of a given quantity and that of an equal or greater quantity. This would represent the reciprocal of frequency, or the average number of years between each hurricane landfall. Table 2 shows, for example, that the average number of years between a hurricane landfall for Louisiana is 3.9. In contrast, the average number of years between landfalls in Georgia is 20.2. This gives an idea of the climatological average.

Table 2 also gives information on the coastline length of each state and the distance between each hurricane landfall. We assume storms are, on average, distributed randomly along the coast, and we obtain this figure by dividing the state's coastline length by the number of hurricanes which have affected that state. This value is introduced to show the concentration of landfalling hurricanes for each state. The smaller the number, the smaller the distance between each landfall resulting in a greater concentration of landfalls over time. For example, the total coastline length for Texas is 367 mi. Dividing this figure by the total number of hurricane landfalls, in this case 37, gives the distance between landfalls of 9.9 mi. Alabama, on the other hand, only had 11 hurricane landfalls during this time period. Since its coastline is only 53 mi, the resulting distance between landfalls is 4.8 mi, a higher concentration than Texas. The relative numbers for states should be used with some caution, however, because the assumption of random distribution may not be valid. Portions of the Atlantic and Gulf coasts of Florida, for instance, may have significantly different landfall frequencies.

A tropical storm has maximum sustained winds of 39 to 73 mph. In this analysis, a tropical storm is considered to have affected a state if the center of the storm intersected any portion of the state while the storm was at tropical storm intensity. This does not include periphery effects from storms affecting adjacent states or countries. To obtain these data, a very detailed analysis of each track was performed using the yearly track charts (Neumann, et al. 1993) in conjunction with the Atlantic track file (Jarvinen, et al. 1984). The results are shown in Appendix B.

Using the results in Appendix B, Table 3 was constructed to represent the total number of tropical storms which have affected each state, along with the frequency and return period. The methodology for computing frequency and return period is the same as Table 2, except each hit represents a tropical storm passing through any part of the state, and not just a coastal landfall. Table 4 shows the number of landfalling hurricanes and tropical storms which have affected each coastal state, along with the frequency and return period. Once again, the methodology for computing frequency and return period is the same as Tables 2 and 3.

#### 4. Summary

The main purpose for this study is to show which states are more susceptible to tropical storms and hurricanes by using frequency of occurrence and the return period. The distance between landfalling hurricanes was introduced to compare which states have the most concentration of landfalls, or in other words, the smallest average distance between landfalls over the 101-year data span. I emphasize again, however, that the length of a state's coastline plays a significant role in the likelihood of a land-falling storm (i.e., exposure), and a longer coastline decreases the possibility that land-falling storms will strike with equal likelihood along all parts of the coast. The latter is especially true for Florida and Texas (Elsner and Kara 1999).

Over the years, certain cycles and patterns of tropical cyclones affecting coastal states can be observed. Such patterns include periods when most of the storms made landfall along the east coast of the U.S. versus the Gulf coast, during El Niño/La Niña events, etc. Such distinctions were not attempted in this paper, as many NWS offices within the studied area have performed local studies to address these issues. The subject is also well covered in many published papers and texts, see for example Elsner and Kara (1999) and its references.

Results presented in this study represent averages, and are not intended for use as a forecast of when the next tropical storm or hurricane will affect a state. Instead, they may serve as a general tropical cyclone climatology for coastal states as well as some inland states as noted in this analysis.

#### 5. Acknowledgments

The author would like to thank the many authors and editors of the various publications used in this study, especially Neumann, et al. (1993), without which this analysis would have been close to impossible to complete. Many thanks also go to Lee Harrison (MIC) and Ken Falk (SOO) of WFO Shreveport, as well as Steve Rinard (MIC) of WFO Lake Charles for allowing time to complete this project and reviewing the format and content of this paper.

#### 6. References

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**Table 1. The Saffir/Simpson hurricane scale.**

Category Number	Maximum Sustained Winds (miles per hour)	Storm Surge (feet above normal)
1	74 to 95	4 to 5
2	96 to 110	6 to 8
3	111 to 130	9 to 12
4	131 to 155	13 to 18
5	Greater than 155	Greater than 18

Note: Information for this table was taken from the NOAA publication *Tropical Cyclones of the North Atlantic Ocean, 1871-1992* (Neumann, et al. 1993).

**Table 2. Hurricanes (direct hits) affecting the United States and individual coastal states, 1899- 1999.**

Area	Number of Hurricanes: Saffir/Simpson Category Number						Landfall Frequency (storms per year)	Return Period (years)	Coastline Length (in st. mi.)	Distance Between Landfalls (in st. mi.)
	1	2	3	4	5	Total				
United States:										
(TX to ME)	62	39	49	15	2	167	1.65	0.6	3700	22.2
Alabama (AL)	5	1	5	0	0	11	0.11	9.2	53	4.8
Connecticut (CT)	2	3*	3*	0	0	8	0.08	12.6	97+	12.1
Delaware (DE)	0	0	0	0	0	0	-	-	28	-
Florida (FL)	19	17	17	6	1	60	0.59	1.7	1350	22.5
Georgia (GA)	1	4	0	0	0	5	0.05	20.2	100	20.0
Louisiana (LA)	9	5	8	3	1	26	0.26	3.9	397	15.3
Massachusetts (MA)	2	2*	2*	0	0	6	0.06	16.8	192	32.0
Maryland (MD)	0	1*	0	0	0	1*	0.01	101.0	31	31.0
Maine (ME)	5*	0	0	0	0	5*	0.05	20.2	228	45.6
Mississippi (MS)	1	2	5	0	1	9	0.09	11.2	44	4.9
North Carolina (NC)	11	6	11	1*	0	29	0.29	3.5	301	10.8
New Hampshire (NH)	1*	1*	0	0	0	2*	0.02	50.5	13	6.5
New Jersey (NJ)	1*	0	0	0	0	1*	0.01	101.0	130	130.0
New York (NY)	3	1*	5*	0	0	9	0.09	11.2	127	14.1
Rhode Island (RI)	0	2*	3*	0	0	5*	0.05	20.2	40	8.0
South Carolina (SC)	7	4	2	2	0	15	0.15	6.7	187	12.5
Texas (TX)	12	9	10	6	0	37	0.37	2.7	367	9.9
Virginia (VA)	2	1	1*	0	0	4	0.04	25.3	112	28.0

Notes:

Asterisks (\*) indicate that all hurricanes in this category were moving in excess of 30 mph. The hurricane (direct hits) portion of this table is taken from the NOAA publication *Tropical Cyclones of the North Atlantic Ocean, 1871-1992* (Neumann, et al. 1993). Additional data for the years 1993 through 1999 were obtained from the National Hurricane Center's web site using the updated Atlantic track file (Jarvinen, et al. 1984) through 1999.

Coastline lengths were obtained from NOAA/Department of Commerce by using *The World Almanac and Book of Facts* (Famighetti, 1996). The measurements were made with a unit measure of 30 minutes of latitude on charts with a scale of 1:1,200,000. The coastline of sounds and bays was included to a point where they narrow to the width of unit measure, and included the distance across such a point. The plus sign (+) indicates that this coastline was estimated by using the CD-ROM software package (DeLorme, 1997).

The distance between landfalls was obtained by dividing the area's coastline by the number of hurricanes to affect that area.

**Table 3. Tropical storms affecting the individual states, 1899-1999.**

Area	Total	Frequency (storms per year)	Return Period (years)
<b>Coastal States:</b>			
Alabama (AL)	26	0.26	3.9
Connecticut (CT)	5	0.05	20.2
Delaware (DE)	7	0.07	14.4
Florida (FL)	74	0.73	1.4
Georgia (GA)	45	0.45	2.2
Louisiana (LA)	35	0.35	2.9
Massachusetts (MA)	8	0.08	12.6
Maryland (MD)	15	0.15	6.7
Maine (ME)	11	0.11	9.2
Mississippi (MS)	24	0.24	4.2
North Carolina (NC)	33	0.33	3.1
New Hampshire (NH)	4	0.04	25.3
New Jersey (NJ)	7	0.07	14.4
New York (NY)	11	0.11	9.2
Rhode Island (RI)	0	-	-
South Carolina (SC)	24	0.24	4.2
Texas (TX)	32	0.32	3.2
Virginia (VA)	17	0.17	5.9
<b>Inland States:</b>			
Arkansas (AR)	7	0.07	14.4
Kansas (KS)	1	0.01	101.0
Kentucky (KY)	4	0.04	25.3
Missouri (MO)	2	0.02	50.5
Ohio (OH)	1	0.01	101.0
Oklahoma (OK)	2	0.02	50.5
Pennsylvania (PA)	10	0.10	10.1
Tennessee (TN)	5	0.05	20.2
Vermont (VT)	1	0.01	101.0
West Virginia (WV)	4	0.04	25.3

Note: In this table, a tropical storm is considered to have affected a state if the center of the storm intersected any portion of the state while the storm was at tropical storm intensity.

**Table 4. Total tropical storms and hurricanes affecting the individual coastal states, 1899-1999.**

Area	Total	Frequency (storms per year)	Return Period (years)
Alabama (AL)	37	0.37	2.7
Connecticut (CT)	13	0.13	7.8
Delaware (DE)	7	0.07	14.4
Florida (FL)	134	1.33	0.8
Georgia (GA)	50	0.50	2.0
Louisiana (LA)	61	0.60	1.7
Massachusetts (MA)	14	0.14	7.2
Maryland (MD)	16	0.16	6.3
Maine (ME)	16	0.16	6.3
Mississippi (MS)	33	0.33	3.1
North Carolina (NC)	62	0.61	1.6
New Hampshire (NH)	6	0.06	16.8
New Jersey (NJ)	8	0.08	12.6
New York (NY)	20	0.20	5.1
Rhode Island (RI)	5	0.05	20.2
South Carolina (SC)	39	0.39	2.6
Texas (TX)	69	0.68	1.5
Virginia (VA)	21	0.21	4.8

Note: The hurricane information used for this table came from the NOAA publication *Tropical Cyclones of the North Atlantic Ocean, 1871-1992* (Neumann, et al. 1993). Additional data for the years 1993 through 1999 were obtained from the National Hurricane Center's web site using the updated Atlantic track file (Jarvinen, et al. 1984) through 1999.

*Appendix A. Chronological listing of all category 1 through 5 hurricanes affecting the individual states, 1899-1999.*

Storm Number	Year	Month	Name	Highest U.S. Category	States affected with category by each state
2	1899	AUG	-	3	NC 3
6	1899	OCT	-	1	SC 1, NC 1
1	1900	SEP	-	4	TX 4
3	1901	JUL	-	1	NC 1
4	1901	AUG	-	2	LA 2, MS 2
3	1903	SEP	-	2	FL 2
4	1903	SEP	-	1	NJ 1, NY 1, CT 1
2	1904	SEP	-	1	SC 1
2	1906	JUN	-	1	FL 1
4	1906	SEP	-	3	SC 3, NC 3
5	1906	SEP	-	3	MS 3, AL 3
8	1906	OCT	-	2	FL 2
2	1908	JUL	-	1	NC 1
3	1909	JUL	-	3	TX 3
5	1909	AUG	-	2	TX 2
7	1909	SEP	-	4	LA 4
9	1909	OCT	-	3	FL 3
2	1910	SEP	-	2	TX 2
4	1910	OCT	-	3	FL 3
1	1911	AUG	-	1	FL 1, AL 1
2	1911	AUG	-	2	GA 2, SC 2
3	1912	SEP	-	1	AL 1
5	1912	OCT	-	1	TX 1
1	1913	JUN	-	1	TX 1
2	1913	SEP	-	1	NC 1
2	1915	AUG	-	4	TX 4
4	1915	SEP	-	1	FL 1
5	1915	SEP	-	4	LA 4
1	1916	JUL	-	3	MS 3, AL 3
2	1916	JUL	-	1	MA 1
3	1916	JUL	-	1	SC 1
4	1916	AUG	-	3	TX 3
13	1916	OCT	-	2	AL 2, FL 2
14	1916	NOV	-	1	FL 1
3	1917	SEP	-	3	FL 3
1	1918	AUG	-	3	LA 3
2	1919	SEP	-	4	FL 4, TX 4
2	1920	SEP	-	2	LA 2
3	1920	SEP	-	1	NC 1
1	1921	JUN	-	2	TX 2
6	1921	OCT	-	3	FL 3
3	1923	OCT	-	1	LA 1
4	1924	SEP	-	1	FL 1
7	1924	OCT	-	1	FL 1
2	1925	NOV	-	1	FL 1
1	1926	JUL	-	2	FL 2
3	1926	AUG	-	3	LA 3

**Appendix A. Chronological listing of all category 1 through 5 hurricanes affecting the individual states, 1899-1999 (continued).**

Storm Number	Year	Month	Name	Highest U.S. Category	States affected with category by each state
6	1926	SEP	-	4	FL 4, AL 3
1	1928	AUG	-	2	FL 2
4	1928	SEP	-	4	FL 4, GA 1, SC 1
1	1929	JUN	-	1	TX 1
2	1929	SEP	-	3	FL 3
2	1932	AUG	-	4	TX 4
3	1932	SEP	-	1	AL 1
5	1933	JUL/AUG	-	2	FL 1, TX 2
8	1933	AUG	-	2	NC 2, VA 2
11	1933	SEP	-	3	TX 3
12	1933	SEP	-	3	FL 3
13	1933	SEP	-	3	NC 3
2	1934	JUN	-	3	LA 3
3	1934	JUL	-	2	TX 2
2	1935	SEP	-	5	FL 5
6	1935	NOV	-	2	FL 2
3	1936	JUN	-	1	TX 1
5	1936	JUL	-	3	FL 3
13	1936	SEP	-	2	NC 2
2	1938	AUG	-	1	LA 1
4	1938	SEP	-	3*	NY 3*, CT 3*, RI 3*, MA 3*
2	1939	AUG	-	1	FL 1
2	1940	AUG	-	2	TX 2, LA 2
3	1940	AUG	-	2	GA 2, SC 2
2	1941	SEP	-	3	TX 3
5	1941	OCT	-	2	FL 2
1	1942	AUG	-	1	TX 1
2	1942	AUG	-	3	TX 3
1	1943	JUL	-	2	TX 2
3	1944	AUG	-	1	NC 1
7	1944	SEP	-	3*	NC 3*, VA 3*, NY 3*, CT 3*, RI 3*, MA 2*
11	1944	OCT	-	3	FL 3
1	1945	JUN	-	1	FL 1
5	1945	AUG	-	2	TX 2
9	1945	SEP	-	3	FL 3
5	1946	OCT	-	1	FL 1
3	1947	AUG	-	1	TX 1
4	1947	SEP	-	4	FL 4, LA 3, MS 3
8	1947	OCT	-	2	FL 1, GA 2, SC 2
5	1948	SEP	-	1	LA 1
7	1948	SEP	-	3	FL 3
8	1948	OCT	-	2	FL 2
1	1949	AUG	-	1	NC 1
2	1949	AUG	-	3	FL 3
10	1949	OCT	-	2	TX 2
2	1950	AUG	Baker	1	AL 1
5	1950	SEP	Easy	3	FL 3

*Appendix A. Chronological listing of all category 1 through 5 hurricanes affecting the individual states, 1899-1999 (continued).*

Storm Number	Year	Month	Name	Highest U.S. Category	States affected with category by each state
11	1950	OCT	King	3	FL 3
2	1952	AUG	Able	1	SC 1
2	1953	AUG	Barbara	1	NC 1
4	1953	SEP	Carol	1*	ME 1*
8	1953	SEP	Florence	1	FL 1
3	1954	AUG	Carol	3*	NC 2, NY 3*, CT 3*, RI 3*
5	1954	SEP	Edna	3*	MA 3*, ME 1*
9	1954	OCT	Hazel	4*	SC 4*, NC 4*, MD 2*
2	1955	AUG	Connie	3	NC 3, VA 1
3	1955	AUG	Diane	1	NC 1
9	1955	SEP	Ione	3	NC 3
7	1956	SEP	Flossy	2	LA 2, FL 1
2	1957	JUN	Audrey	4	TX 4, LA 4
4	1959	JUL	Cindy	1	SC 1
5	1959	JUL	Debra	1	TX 1
8	1959	SEP	Gracie	3	SC 3
5	1960	SEP	Donna	4	FL 4, NC 3*, NY 3*, CT 2*, RI 2*, MA 1*, NH 1*, ME 1*
6	1960	SEP	Ethel	1	MS 1
3	1961	SEP	Carla	4	TX 4
4	1963	SEP	Cindy	1	TX 1
5	1964	AUG	Cleo	2	FL 2
6	1964	SEP	Dora	2	FL 2
10	1964	OCT	Hilda	3	LA 3
11	1964	OCT	Isbell	2	FL 2
3	1965	SEP	Betsy	3	FL 3, LA 3
1	1966	JUN	Alma	2	FL 2
9	1966	OCT	Inez	1	FL 1
2	1967	SEP	Beulah	3	TX 3
8	1968	OCT	Gladys	2	FL 2
3	1969	AUG	Camille	5	LA 5, MS 5
7	1969	SEP	Gerda	1	ME 1*
3	1970	AUG	Celia	3	TX 3
6	1971	SEP	Edith	2	LA 2
7	1971	SEP	Fern	1	TX 1
8	1971	SEP	Ginger	1	NC 1
2	1972	JUN	Agnes	1	FL 1, NY 1, CT 1
6	1974	SEP	Carmen	3	LA 3
5	1975	SEP	Eloise	3	FL 3
3	1976	AUG	Belle	1	NY 1
2	1977	SEP	Babe	1	LA 1
2	1979	JUL	Bob	1	LA 1
4	1979	SEP	David	2	FL 2, GA 2, SC 2
6	1979	SEP	Frederic	3	AL 3, MS 3
1	1980	AUG	Allen	3	TX 3
1	1983	AUG	Alicia	3	TX 3
5	1984	SEP	Diana	3	NC 3

**Appendix A. Chronological listing of all category 1 through 5 hurricanes affecting the individual states, 1899-1999 (continued).**

Storm Number	Year	Month	Name	Highest U.S. Category	States affected with category by each state
2	1985	JUL	Bob	1	SC 1
4	1985	AUG	Danny	1	LA 1
5	1985	SEP	Elena	3	AL 3, MS 3
7	1985	SEP	Gloria	3	NC 3, NY 3*, CT 2*, NH 2*, ME 1*
10	1985	OCT	Juan	1	LA 1
11	1985	NOV	Kate	2	FL 2
2	1986	JUN	Bonnie	1	TX 1
3	1986	AUG	Charley	1	NC 1, VA 1
7	1987	OCT	Floyd	1	FL 1
6	1988	SEP	Florence	1	LA 1
3	1989	AUG	Chantal	1	TX 1
8	1989	SEP	Hugo	4	SC 4
10	1989	OCT	Jerry	1	TX 1
2	1991	AUG	Bob	2	RI 2, MA 2, NY 2, CT 2
2	1992	AUG	Andrew	4	FL 4, LA 3
5	1993	AUG	Emily	3	NC 3
5	1995	AUG	Erin	2	FL 2
15	1995	OCT	Opal	3	FL 3
2	1996	JUL	Bertha	2	NC 2
6	1996	SEP	Fran	3	NC 3
4	1997	JUL	Danny	1	LA 1, AL 1
2	1998	AUG	Bonnie	2	NC 2
5	1998	SEP	Earl	1	FL 1
7	1998	SEP	Georges	2	FL 2, MS 2
2	1999	AUG	Bret	3	TX 3
6	1999	SEP	Floyd	2	NC 2
9	1999	OCT	Irene	1	FL 1

Notes: Asterisks (\*) indicate that all hurricanes in this category were moving in excess of 30 mph. The state abbreviations legend can be found in table 2. The information used for this appendix came from table 6 of the NOAA publication *Tropical Cyclones of the North Atlantic Ocean, 1871-1992* (Neumann, et al. 1993). Additional data for the years 1993 through 1999 were obtained from the National Hurricane Center's web site using the updated Atlantic track file (Jarvinen, et al. 1984) through 1999.



*Appendix B. Chronological listing of tropical storms affecting the individual states, 1899-1999.*

Storm Number	Year	Month	Name	Highest U.S. Category (at hurricane stage)	States affected
1	1899	AUG	-		FL
5	1899	OCT	-		FL
1	1900	SEP	-	4	KS, MO, OK
3	1900	SEP	-		AL, LA, MS
6	1900	OCT	-		FL
1	1901	JUN	-		AL
2	1901	JUL	-		TX
3	1901	JUL	-	1	SC
4	1901	AUG	-	2	FL
6	1901	SEP	-		AL, FL, GA
8	1901	SEP	-		FL, GA
1	1902	JUN	-		FL, GA, SC
2	1902	JUN	-		TX
4	1902	OCT	-		AL, LA, MS
3	1903	SEP	-	2	AL, GA
4	1903	SEP	-	1	PA
2	1904	SEP	-	1	NC
3	1904	OCT	-		FL
5	1904	NOV	-		AL, GA, LA, MS, SC
3	1905	SEP	-		LA, MS, AR
5	1905	OCT	-		LA
1	1906	JUN	-		AL, FL
5	1906	SEP	-	3	AR, MO
9	1906	OCT	-		FL
1	1907	JUN	-		FL, GA
2	1907	SEP	-		AL, LA, MS
3	1907	SEP	-		FL, GA, SC
8	1908	OCT	-		SC
1	1909	JUN	-		TX
2	1909	JUN	-		FL
6	1909	AUG	-		FL
7	1909	SEP	-	4	MS, AR
8	1909	SEP	-		FL
4	1910	OCT	-	3	GA, NC, SC
1	1911	AUG	-	1	MS
1	1912	JUN	-		AL, GA, LA, MS, NC, SC
2	1912	JUL	-		GA
3	1912	SEP	-	1	MS
4	1913	OCT	-		SC
1	1914	SEP	-		AL, FL, GA, LA
1	1915	AUG	-		FL, GA, SC
4	1915	SEP	-	1	AL, GA
5	1915	SEP	-	4	MS
2	1916	JUL	-	1	ME
3	1916	JUL	-	1	NC
7	1916	SEP	-		NC
8	1916	SEP	-		FL

*Appendix B. Chronological listing of tropical storms affecting the individual states, 1899-1999  
(continued).*

Storm Number	Year	Month	Name	Highest U.S. Category (at hurricane stage)	States affected
13	1916	OCT	-	2	KY, TN
3	1917	SEP	-	3	AL
1	1918	AUG	-	3	TX
3	1918	AUG	-		NC
1	1919	JUL	-		AL, FL
2	1920	SEP	-	2	AR
4	1920	SEP	-		FL
1	1921	JUN	-	2	OK
3	1922	OCT	-		AL
3	1923	OCT	-	1	MS, AR
5	1923	OCT	-		MA
6	1923	OCT	-		MS
4	1924	SEP	-	1	GA
1	1925	SEP	-		TX
2	1925	DEC	-	1	NC
1	1926	JUL	-	2	GA
6	1926	SEP	-	4	LA, MS
5	1927	OCT	-		GA, SC, NC
1	1928	AUG	-	2	GA
2	1928	AUG	-		AL, FL
4	1928	SEP	-	4	MD, NC, VA, PA
2	1929	SEP/OCT	-	3	GA
2	1930	SEP	-		FL
1	1931	JUN	-		TX
2	1931	JUL	-		LA
3	1932	SEP	-	1	FL, MS
5	1932	SEP	-		FL
6	1932	SEP	-		LA
8	1932	OCT	-		LA, MS
4	1933	JUL	-		TX
6	1933	AUG	-		FL
8	1933	AUG	-	2	MD, NY, PA
12	1933	SEP	-	3	GA
1	1934	MAY	-		FL, SC
2	1934	JUN	-	3	MS, KY, TN, WV
3	1934	JUL	-	2	FL
9	1934	OCT	-		AL
2	1935	SEP	-	5	GA, NC, SC, VA
1	1936	JUN	-		FL
4	1936	JUL	-		LA
9	1936	AUG	-		FL
1	1937	JUL	-		FL
3	1937	AUG	-		FL
6	1937	SEP	-		FL
9	1937	OCT	-		LA
2	1938	AUG	-	1	TX

*Appendix B. Chronological listing of tropical storms affecting the individual states, 1899-1999  
(continued).*

Storm Number	Year	Month	Name	Highest U.S. Category (at hurricane stage)	States affected
5	1938	OCT	-		TX
7	1938	OCT	-		FL, GA
1	1939	JUN	-		AL
3	1939	SEP	-		LA
2	1940	AUG	-	2	FL
3	1940	AUG	-	2	KY, TN
6	1940	SEP	-		LA
1	1941	SEP	-		TX
2	1941	SEP	-	3	LA, AR
5	1941	OCT	-	2	GA, SC
6	1941	OCT	-		FL
8	1942	OCT	-		NC
6	1943	SEP	-		LA
7	1943	SEP/OCT	-		DE, MD
3	1944	AUG	-	1	DE, MD, NJ, VA
6	1944	SEP	-		LA, MS
7	1944	SEP	-	3	ME
11	1944	OCT	-	3	NC, SC
1	1945	JUN	-	1	NC
7	1945	SEP	-		FL
9	1945	SEP	-	3	GA, NC, SC, VA
1	1946	JUN	-		LA, TX
2	1946	JUL	-		NC
5	1946	OCT	-	1	GA, NC, SC
6	1946	NOV	-		FL
1	1947	AUG	-		TX
4	1947	SEP	-	4	TX
5	1947	SEP	-		AL, MS
6	1947	SEP	-		FL, GA
7	1947	OCT	-		FL, GA
2	1948	JUL	-		FL
5	1948	SEP	-	1	MS
2	1949	AUG	-	3	GA, MD, NC, NY, SC, VA, PA, VT
5	1949	SEP	-		LA, MS
10	1949	OCT	-	2	LA, AR
2	1950	AUG	Baker	1	FL
5	1950	SEP	Easy	3	GA
11	1950	OCT	King	3	GA
13	1950	OCT	Love		FL
8	1951	OCT	How		FL
1	1952	FEB	-		FL
2	1952	AUG/SEP	Able	1	MD, NC, VA, PA
1	1953	JUN	Alice		FL
3	1953	AUG/SEP	-		FL, GA
7	1953	SEP	-		FL
12	1953	OCT	Hazel		FL

*Appendix B. Chronological listing of tropical storms affecting the individual states, 1899-1999  
(continued).*

Storm Number	Year	Month	Name	Highest U.S. Category (at hurricane stage)	States affected
2	1954	JUL	Barbara		LA
1	1955	AUG	Brenda		LA
2	1955	AUG	Connie	3	MD, PA
3	1955	AUG	Diane	1	MD, NJ, NY, VA, PA
5	1955	AUG	-		LA, TX
1	1956	JUN	-		LA
7	1956	SEP	Flossy	2	GA
1	1957	JUN	-		FL, GA, SC
3	1957	AUG	Bertha		LA, TX
5	1957	SEP	Debbie		FL
6	1957	SEP	Esther		LA
5	1958	SEP	Ella		TX
1	1959	MAY	Arlene		LA
8	1959	SEP	Gracie	3	NC
10	1959	OCT	Irene		AL, FL
11	1959	OCT	Judith		FL
1	1960	JUN	-		TX
3	1960	JUL	Brenda		CT, DE, GA, MA, MD, ME, NC, NH, NJ, NY, SC, VA
5	1961	SEP	Esther		MA, ME
6	1961	SEP	-		DE, MA, MD, ME, NC, NH, NJ, NY, VA
1	1962	AUG	Alma		NC
3	1964	AUG	Abby		TX
5	1964	AUG	Cleo	2	GA
6	1964	SEP	Dora	2	GA, NC, SC
1	1965	JUN	-		FL, GA
1	1966	JUN	Alma	2	GA
4	1967	SEP	Dora		NC
1	1968	JUN	Abby		FL, GA
3	1968	JUN	Candy		TX
13	1969	OCT	Jenny		FL
2	1970	JUL	Becky		FL
7	1970	SEP	Felice		TX
5	1971	AUG	Doria		CT, DE, MA, MD, ME, NC, NH, NJ, NY
6	1971	SEP	Edith	2	MS
9	1971	SEP	Heidi		ME
2	1972	JUN	Agnes	1	NC
5	1973	SEP	Delia		TX
5	1975	SEP	Eloise	3	AL, GA, TN
3	1976	AUG	Belle	1	CT, MA, ME, NH
5	1976	AUG	Dottie		FL, SC
2	1978	JUL	Amelia		TX
5	1978	AUG	Debra		LA
2	1979	JUL	Bob	1	MS
3	1979	JUL	Claudette		LA, TX
4	1979	SEP	David	2	MD, NC, NY, VA, PA, WV

*Appendix B. Chronological listing of tropical storms affecting the individual states, 1899-1999  
(continued).*

Storm Number	Year	Month	Name	Highest U.S. Category (at hurricane stage)	States affected
5	1979	SEP	Elena		TX
6	1979	SEP	Frederic	3	NY, KY, PA, TN, WV
4	1980	SEP	Danielle		TX
2	1981	JUN/JUL	Bret		VA
4	1981	AUG	Dennis		FL, NC, SC
4	1982	SEP	Chris		LA, TX
2	1983	AUG	Barry		FL
4	1983	SEP	Dean		VA
10	1984	SEP	Isidore		FL
2	1985	JUL	Bob	1	FL, NC
5	1985	SEP	Elena	3	LA
8	1985	SEP	Henri		NY
9	1985	OCT	Isabel		FL, GA
10	1985	OCT/NOV	Juan	1	AL, FL
11	1985	NOV	Kate	2	GA, NC, SC
1	1987	AUG	-		TX
2	1988	AUG	Beryl		LA
3	1988	AUG	Chris		GA, SC
12	1988	NOV	Keith		FL
1	1989	JUN	Allison		TX
8	1989	SEP	Hugo	4	NC, VA, OH, WV
13	1990	OCT	Marco		FL
2	1991	AUG	Bob	2	ME
2	1992	AUG	Andrew	4	MS
5	1992	SEP	Danielle		DE, MD, VA, PA
1	1993	JUN	Arlene		TX
1	1994	JUL	Alberto		AL, FL
2	1994	AUG	Beryl		AL, FL, GA
7	1994	NOV	Gordon		FL
1	1995	JUN	Allison		FL, GA
4	1995	JUL	Dean		TX
5	1995	AUG	Erin	2	AL, MS
10	1995	AUG	Jerry		FL
15	1995	OCT	Opal	3	AL
1	1996	JUN	Arthur		NC
2	1996	JUL	Bertha	2	CT, DE, MA, MD, ME, NJ, NY, VA
6	1996	SEP	Fran	3	VA
10	1996	OCT	Josephine		FL
4	1997	JUL	Danny	1	FL
3	1998	AUG	Charley		TX
5	1998	SEP	Earl	1	GA
6	1998	SEP	Frances		TX
7	1998	SEP	Georges	2	AL
8	1998	SEP	Hermine		LA
13	1998	NOV	Mitch		FL

**Appendix B. Chronological listing of tropical storms affecting the individual states, 1899-1999  
(continued).**

Storm Number	Year	Month	Name	Highest U.S. Category (at hurricane stage)	States affected
4	1999	SEP	Dennis		NC
6	1999	SEP	Floyd	2	CT, MA, MD, ME, NJ, NY, VA
8	1999	SEP	Harvey		FL

Notes: In this table, a tropical storm is considered to have affected a state if the center of the storm intersected any portion of the state while the storm was at tropical storm intensity. The hurricane (highest U.S. category) portion of this table is taken from the NOAA publication *Tropical Cyclones of the North Atlantic Ocean, 1871-1992* (Neumann, et al. 1993). Additional data for the years 1993 through 1998 were obtained from the National Hurricane Center's web site using the updated Atlantic track file (Jarvinen, et al. 1984) through 1999.

