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Extreme Precipitation Depths for Texas, Excluding the Trans-Pecos Region

Water-Resources Investigations Report 98–4099

U.S. Department of the Interior
U.S. Geological Survey

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By Jennifer Lanning-Rush, William H. Asquith, and Raymond M. Slade, Jr.

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 98–4099

In cooperation with the Texas Department of Transportation

Austin, Texas
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U.S. DEPARTMENT OF THE INTERIOR

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Extreme Precipitation Depths for Texas, Excluding the Trans-Pecos Region

By Jennifer Lanning-Rush, William H. Asquith, *and* Raymond M. Slade, Jr.

Abstract

The U.S. Geological Survey, in cooperation with the Texas Department of Transportation, conducted a study of extreme precipitation depths for various durations and storm areas for Texas, excluding the Trans-Pecos region. The extreme precipitation depth is an estimate, from documented storms, of the largest precipitation depth expected to occur over a given area. The extreme precipitation depth exceeds the precipitation depth associated with recurrence intervals greater than 100 years.

Storm durations of 1, 2, 3, 4, 5, and 6 days were investigated for this report. The extreme precipitation depth for a particular area is estimated from an "extreme precipitation curve" (an upper limit or envelope curve developed from graphs of extreme precipitation depths for each climatic region). The extreme precipitation curves were determined using precipitation depth-duration information from a subset (24 "extreme" storms) of 213 "notable" storms documented throughout Texas. The extreme precipitation curves can be used to estimate extreme precipitation depth for a particular area. The extreme precipitation depth represents a limiting depth, which can provide useful comparative information for more quantitative analyses.

INTRODUCTION

The extreme precipitation depth is an estimate of the largest precipitation depth expected to occur over a given area. The extreme precipitation depth exceeds the precipitation depth associated with recurrence intervals greater than 100 years. In 1996, the U.S. Geological Survey (USGS), in cooperation with the Texas Department of Transportation, began a 3-year study of precipitation characteristics for Texas. The major objectives of this study are (1) to define the depth-duration frequency of precipitation in Texas, (2) to determine appropriate depth-area precipitation relations for Texas, and (3) to investigate extreme precipitation depths for regions of Texas. The focus of this report is on extreme precipitation depths.

Purpose and Scope

The purpose of this report is to present the extreme precipitation depths for Texas, excluding the Trans-Pecos region. The climatic regions of this report (fig. 1) are the same as or a combination of 2 or 3 of the 10 National Weather Service (NWS) climatic regions of Texas (Carr, 1967). Storm durations of 1, 2, 3, 4, 5, and 6 days were investigated, although the extreme precipitation depths for all of these durations are not available for each region. The extreme precipitation depth for a particular area is estimated from an "extreme precipitation curve" (an upper limit or envelope curve developed from graphs of extreme precipitation depth versus area for each climatic region). The extreme precipitation (EP) curves were developed from data for 24 "extreme" storms selected from a data base of "notable" storms in Texas compiled for the study. The precipitation depths for the 24 selected storms were so large that, for purposes of this report, they are referred to as extreme. The 24 extreme storms are identified along with 189 other notable storms in Texas (table 1 at end of report). The description and dates of occurrence for each identified storm are listed in the table. The temporal distribution of the notable and extreme storms by decade or period of occurrence is documented (table 2 at end of report). Discussion pertinent to the documentation of storms in Texas is presented in the "Extreme Precipitation Depths for Texas" section.

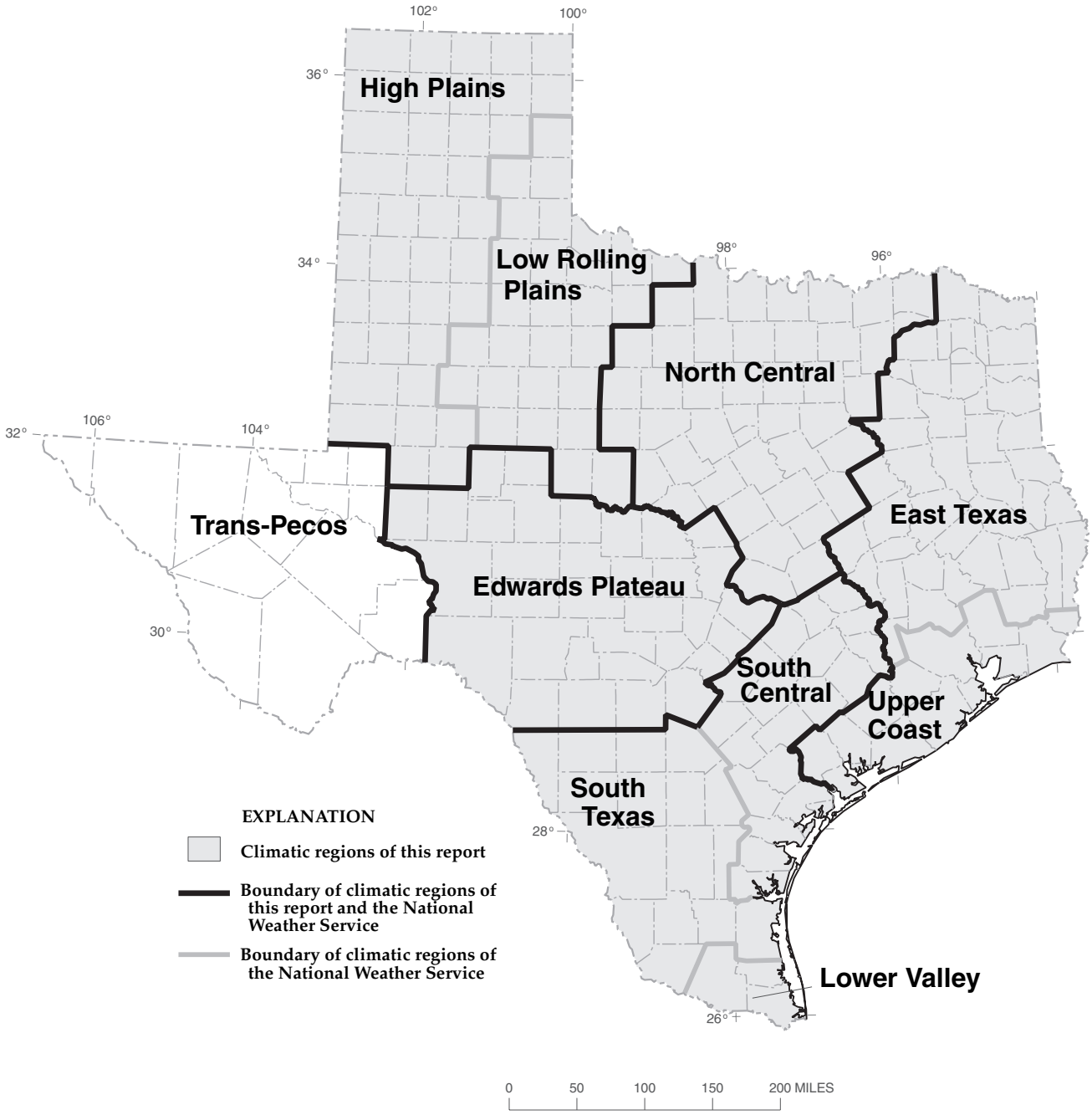

Figure 1. Climatic regions of this report and of the National Weather Service, Texas.

Previous Studies and Extreme Storm Data

Lowry (1934) classified and tabulated data for 33 storms to develop depth-area curves for durations of 3, 4, and 5 days in Texas. The analysis in Lowry is similar to that presented in this report. No other analyses of extreme precipitation in Texas are known to have been conducted. A study by Asquith and Slade (1995) presents the results of an investigation of extreme flood-peak discharges in Texas. In that study, the relations between large flood peaks and contributing drainage area were used to develop upper limit or envelope curves for extreme flood peaks. The analysis in this report is analogous to that presented by Asquith and Slade.

Data for this report are from past reports of documented storms that have precipitation contour maps for the storms. Texas storms have been documented in publications by the U.S. Army Corps of Engineers (Tulsa, Okla.); International Boundary and Water Commission (El Paso, Tex.); National Climatic Data Center (Asheville, N.C.); National Resources Conservation Service (formerly the Soil Conservation Service) (Temple, Tex.); NWS (Silver Spring, Md.); Office of the State Climatologist (College Station, Tex.); Texas Water Development Board (Austin, Tex.); USGS (Austin, Tex.); and others. Most of these publications used data from the NWS rain gage network, complemented with bucket surveys for precipitation-depth analyses. Characteristics of many early storms in Texas are unknown due to an inadequate network of rain gages. Currently (1998) in Texas, there are about 870 daily rain gages (about 1 gage for every 300 square miles) with at least 10 years of record.

Bucket surveys sometimes are conducted after large rainstorms; thus, they often provide historically meaningful data. Interviewers visit the area affected and collect information from the public on rainfall catches in private gages. Information also is collected on other catches in exposed containers, such as buckets, cans, troughs, wash pots, and oil drums. The interviewers record information on both depth and storm duration. These measurements might not be entirely accurate but can be used with confidence when several such measurements in the same locality are the same. The largest rainfall centers of many storms have been identified in this manner. For example, bucket surveys were used to determine an "unofficial" total of 38.2 inches in 1 day for the September 1921 storm in Thrall (about 30 miles northeast of Austin).

Daily precipitation data are not necessarily tied to a calendar day. A difference in observation times at rain gages can cause the same storm to appear to occur on different days. For example, a storm occurring at noon on January 1 would be recorded as January 1 by an observer who reads depths in the evening but as January 2 by a morning observer. Consequently, documented daily durations in this report might not coincide with the storm dates presented.

The temporal distribution of the storms in table 2 provides some useful insights into the occurrence and documentation of notable storms in Texas. First, a review of the distribution of the notable storms indicates that the occurrence of such storms is fairly evenly distributed in time. Second, review of the distribution of the extreme storms in Texas indicates that the occurrence of extreme storms also is fairly evenly distributed in time, with two exceptions—the 1931–40 decade with 9 extreme storms and the 1951–60 decade with 5 extreme storms. Supporting the evidence that the 1931–40 decade produced an unusually large number of extreme storms is the fact that some of the resulting floods during 1931–40 are the largest documented floods for their respective locations in the past 100 or so years.

EXTREME PRECIPITATION DEPTHS FOR TEXAS

The EP curves, shown in figures 2–13 at end of report, were developed from a subset of 24 extreme storms of the 213 notable storms in Texas (table 1). The 24 extreme storms were grouped by climatic region and by storm duration, and curves were developed to envelop the maximum depths of precipitation for each climatic region. EP curves were developed for each of the durations available for each region. The EP curves were developed using all identified storm data through 1996, but the curves are subject to change as larger depths for given areas are documented in the future. Recurrence intervals are not associated with extreme precipitation depths because recurrence intervals cannot be quantitatively defined. EP curves were not developed for the Trans-Pecos region because of a lack of data. The mountainous topography of this region makes EP curves difficult to develop because of changes in precipitation patterns as elevation changes.

The data points in figures 2–13 were generated by digitizing the areas (polygons) formed by storm-depth contour lines (from previous reports) and computing the mean depth within each area using a geographic information system. The variability in size and shape of the polygons allowed multiple storm centers, when present, to be identified. The digitized areas are represented on the x-axis of the figures. Depths for hundreds to thousands of regularly spaced points were determined within each polygon, and the mean was computed for the points. The mean depths are represented on the y-axis of the figures. (The mean depths might not necessarily be consistent with precipitation depths listed in table 1 because of the method used to generate the data points.)

The storms represented by figures 2–13 are the most extreme storms known for the selected climatic regions and durations. The accuracy of the storm-depth

contours decreases as area increases due to interpolation errors and to the lower density of data. The EP curves can be used to estimate the extreme precipitation depth for a particular area. The extreme precipitation depth represents a limiting depth, which can provide useful comparative information for more quantitative analyses. The basis for each of the EP curves of figures 2–13 follows:

High Plains and Low Rolling Plains climatic region (figs. 2–3)

The EP curve for the 1-day storm is based on the 1-day data and on the shape of the 3-day EP curve. The EP curve for the 3-day storm is based on the 3-day data.

North Central climatic region (figs. 4–5)

The EP curve for the 2-day storm is based on the 2-day data. The EP curve for the 4-day storm is based on the 4-day data and on the shape of the 2-day EP curve.

Edwards Plateau climatic region (figs. 6–8)

The EP curve for the 1-day storm is based on the 1-day data and on the shape of the 3-day EP curve. The EP curve for the 3-day storm is based on the 3-day data. The EP curve for the 5-day storm is based on the 5-day data and on the shape of the 3-day EP curve.

South Texas, South Central, and Lower Valley climatic region (figs. 9–11)

The EP curve for the 2-day storm is based on the 2-day data and the shape of the 6-day EP curve. The EP curve for the 4-day storm is based on a combination of the 2- and 6-day EP curves. The EP curve for the 6-day storm is based on the 6-day data.

East Texas and Upper Coast climatic region (figs. 12–13)

The EP curve for the 2-day storm is based on the 2-day data and on the shape of the 4-day EP curve. The EP curve for the 4-day storm is based on the 4-day data.

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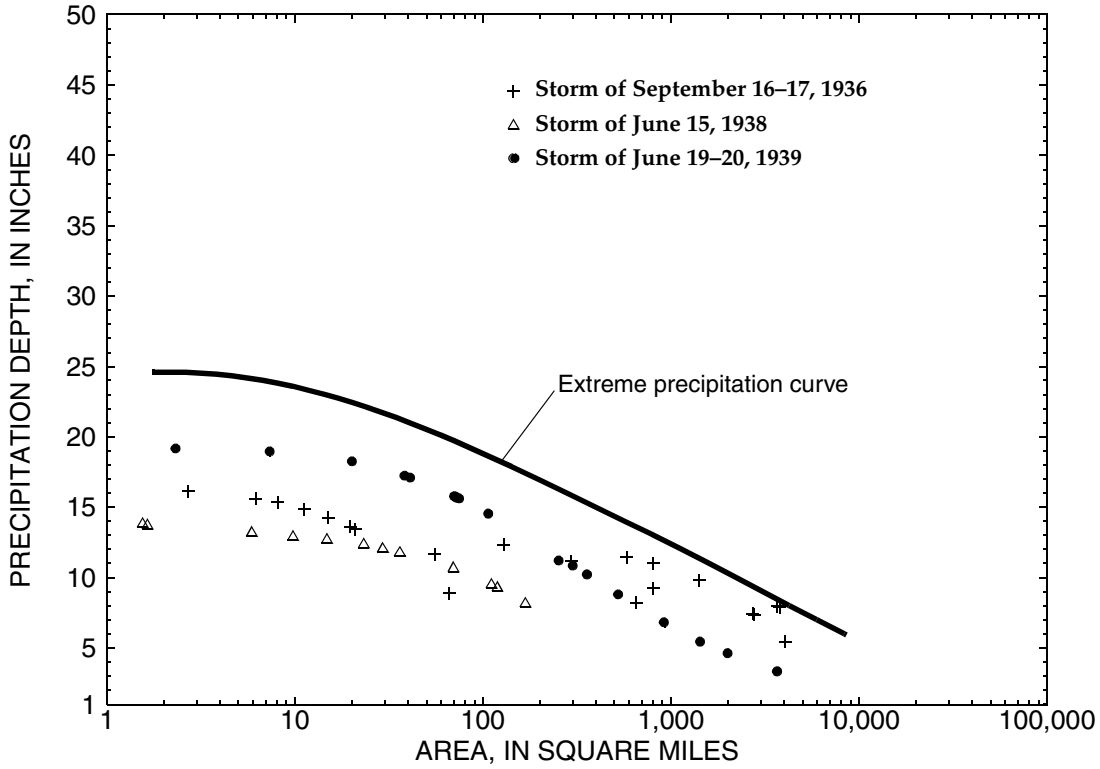

Figure 2. Extreme precipitation curve for the 1-day storm in the High Plains and Low Rolling Plains climatic region of Texas.

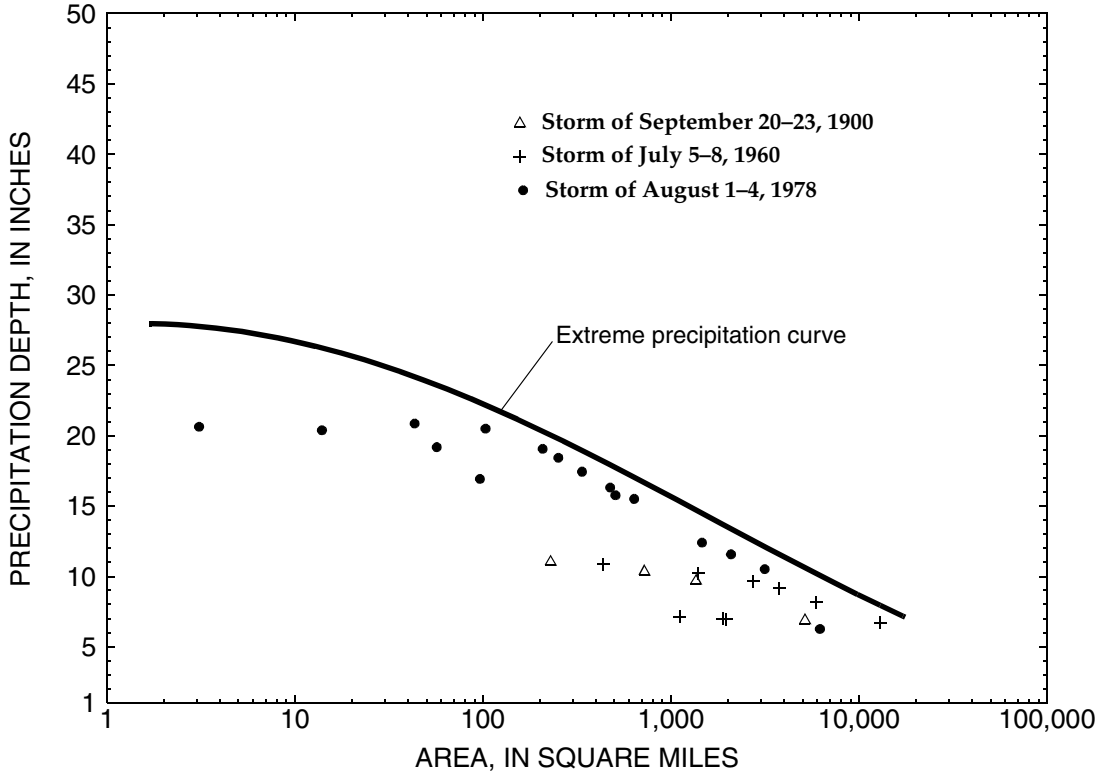

Figure 3. Extreme precipitation curve for the 3-day storm in the High Plains and Low Rolling Plains climatic region of Texas.

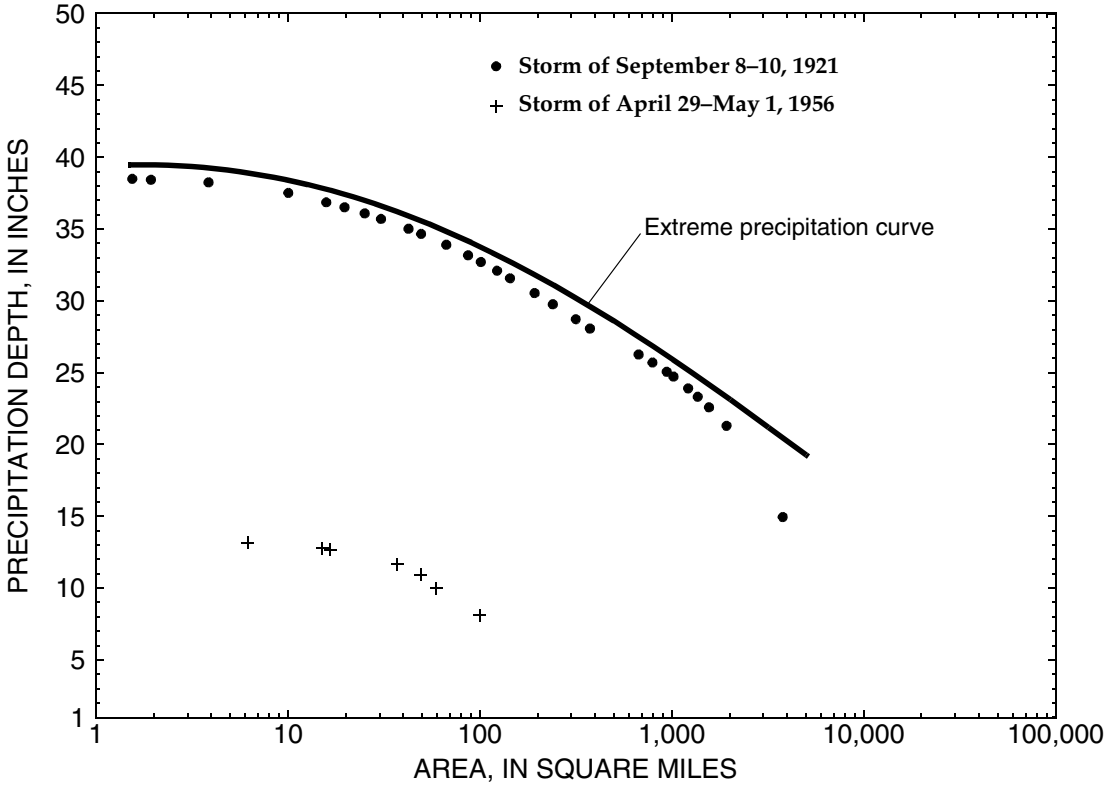

Figure 4. Extreme precipitation curve for the 2-day storm in the North Central climatic region of Texas.

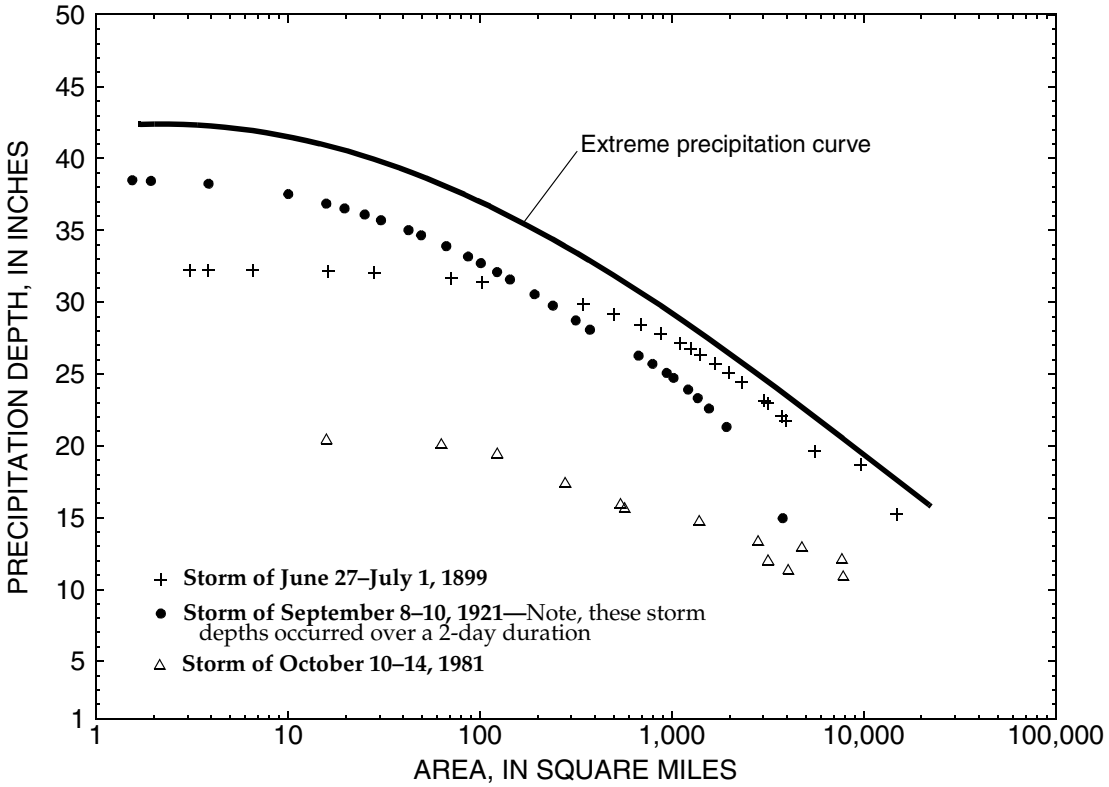

Figure 5. Extreme precipitation curve for the 4-day storm in the North Central climatic region of Texas.

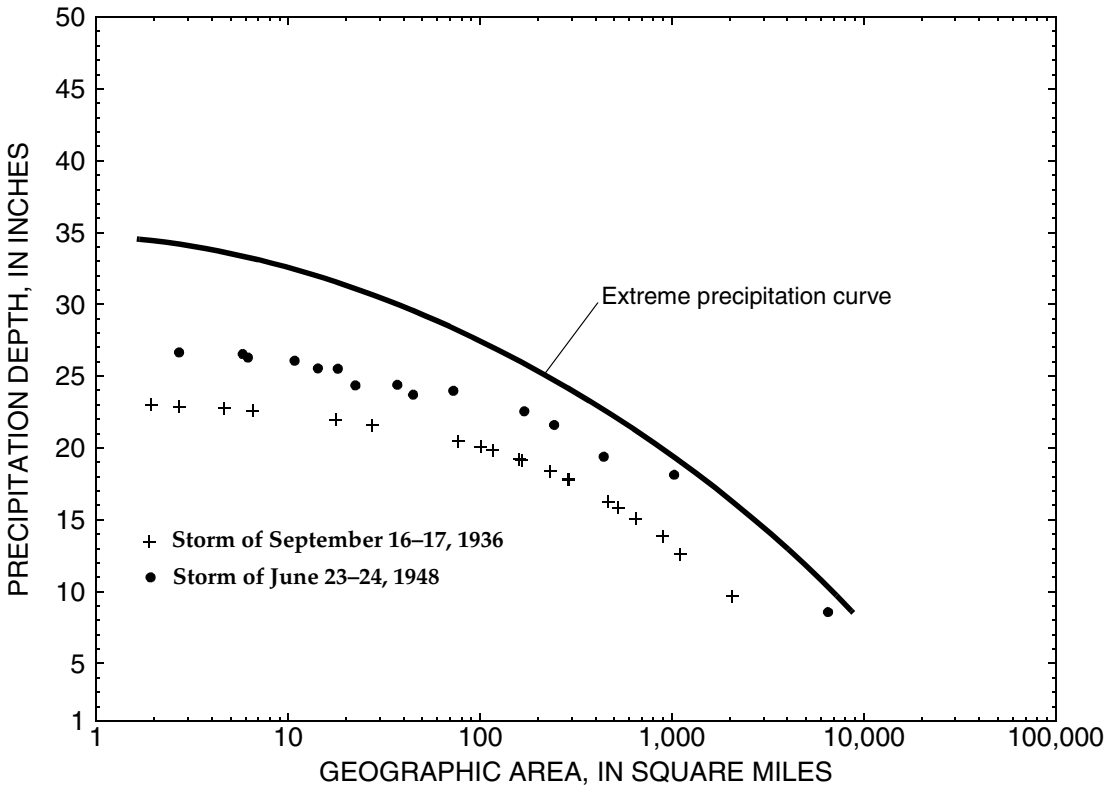

Figure 6. Extreme precipitation curve for the 1-day storm in the Edwards Plateau climatic region of Texas.

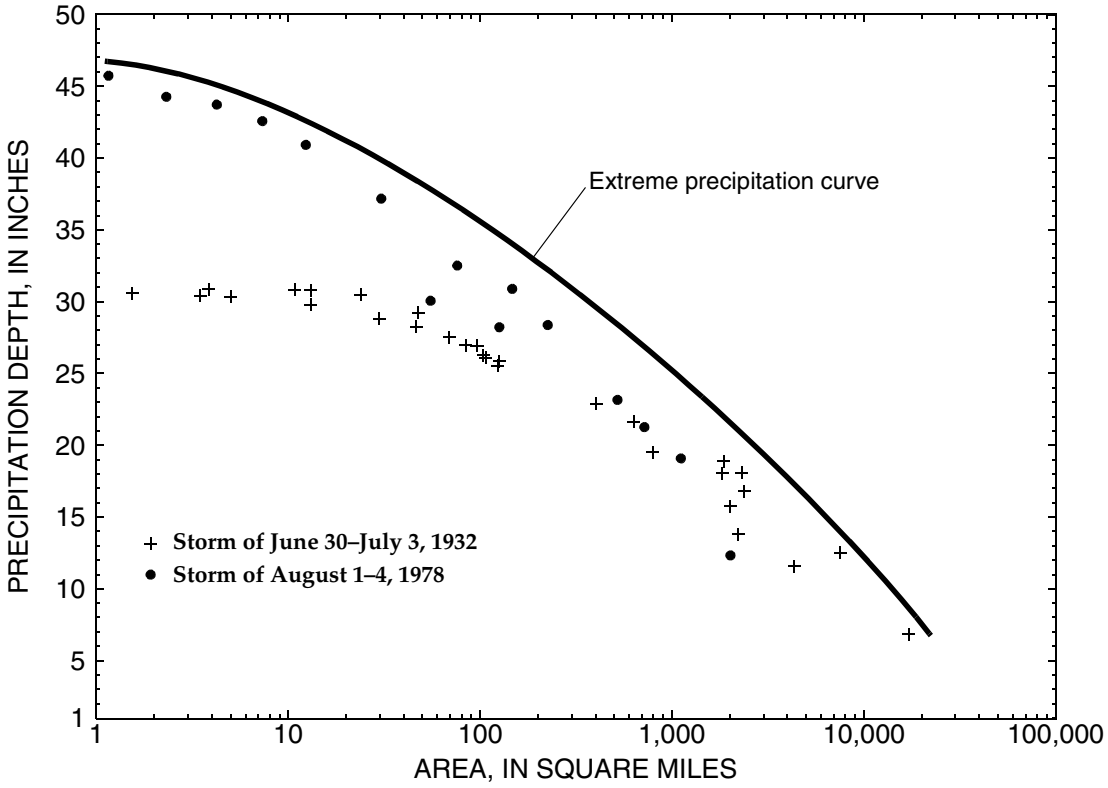

Figure 7. Extreme precipitation curve for the 3-day storm in the Edwards Plateau climatic region of Texas.

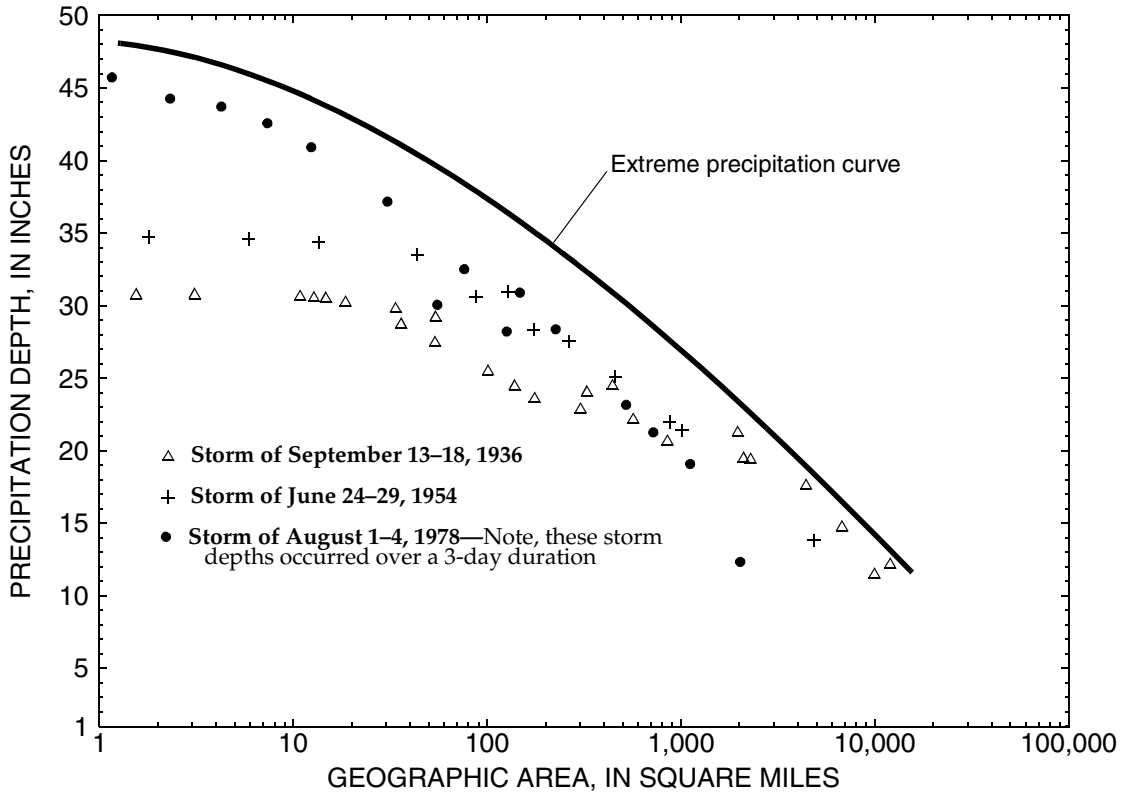

Figure 8. Extreme precipitation curve for the 5-day storm in the Edwards Plateau climatic region of Texas.

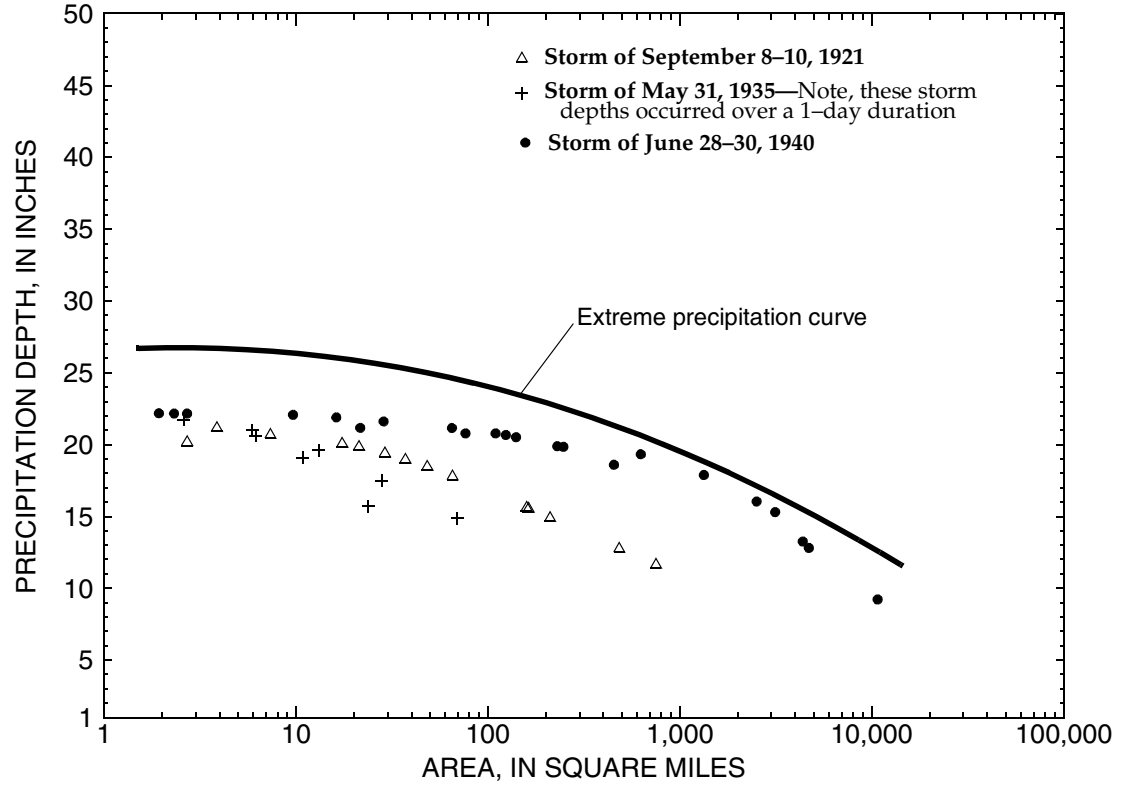

Figure 9. Extreme precipitation curve for the 2-day storm in the South Texas, South Central, and Lower Valley climatic region of Texas.

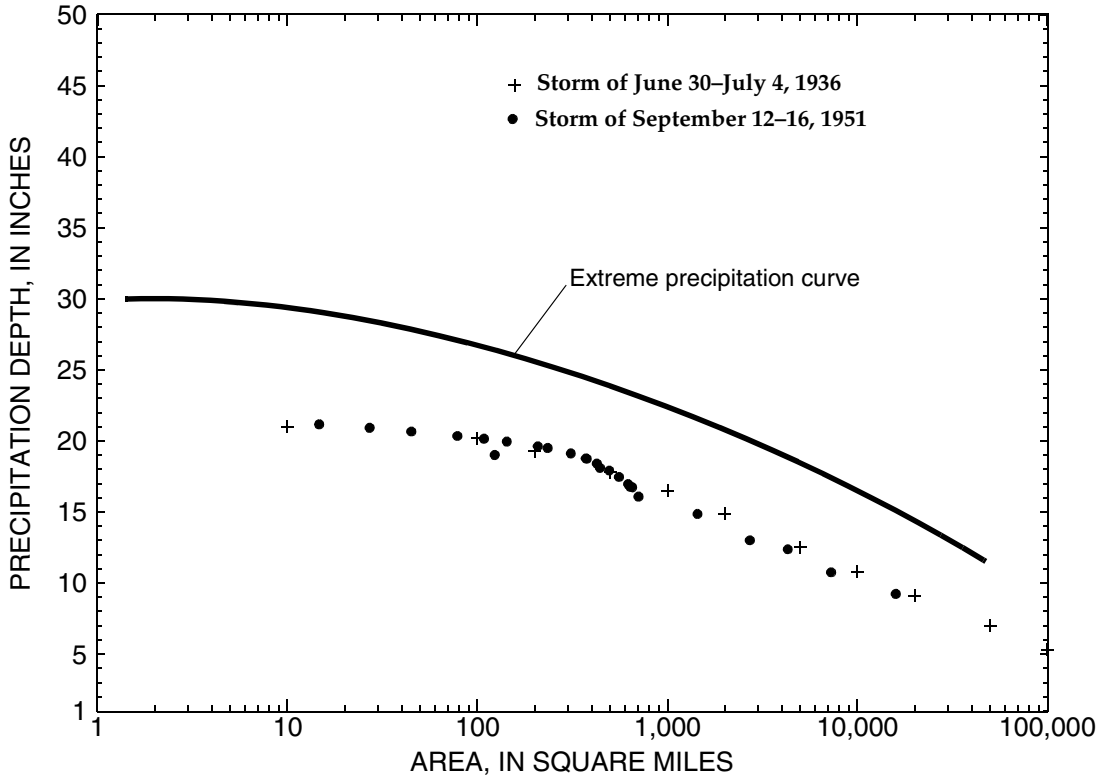

Figure 10. Extreme precipitation curve for the 4-day storm in the South Texas, South Central, and Lower Valley climatic region of Texas.

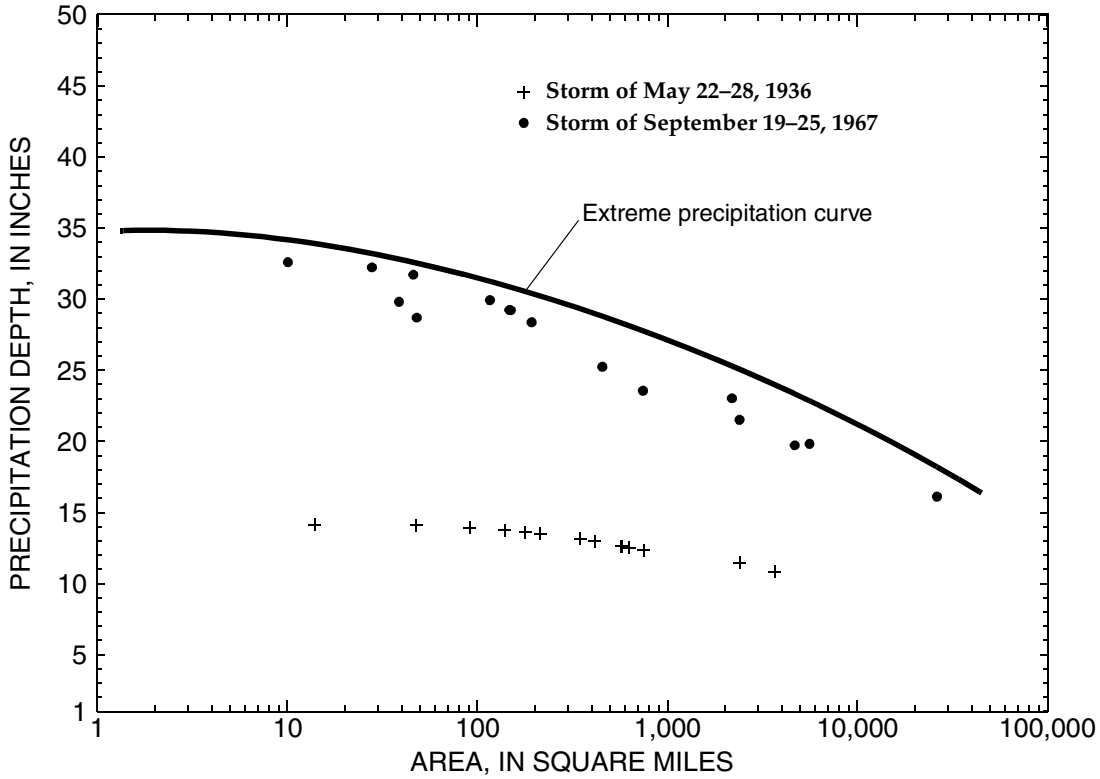

Figure 11. Extreme precipitation curve for the 6-day storm in the South Texas, South Central, and Lower Valley climatic region of Texas.

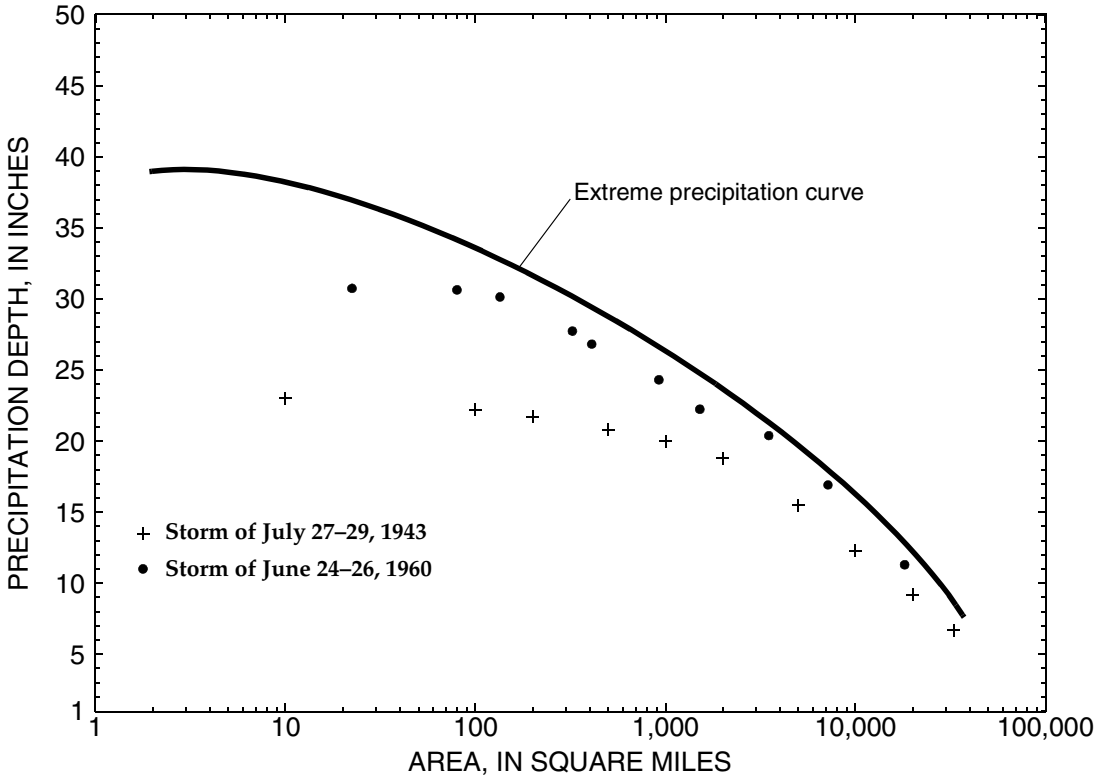

Figure 12. Extreme precipitation curve for the 2-day storm in the East Texas and Upper Coast climatic region of Texas.

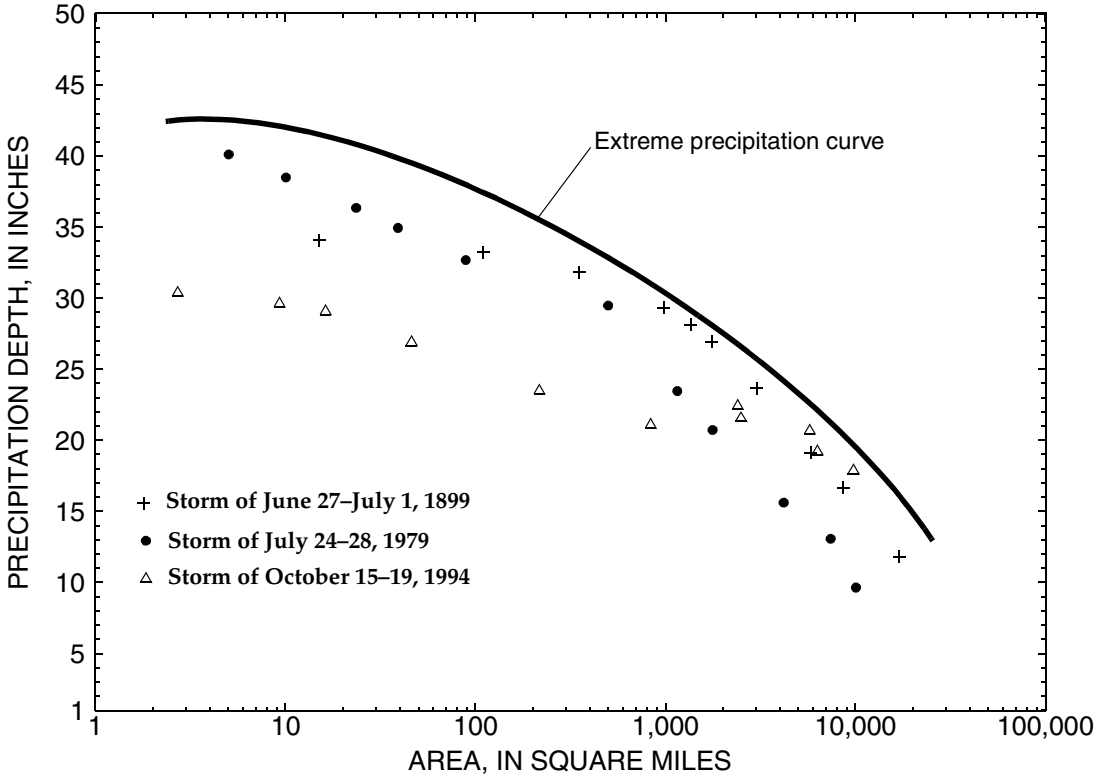

Figure 13. Extreme precipitation curve for the 4-day storm in the East Texas and Upper Coast climatic region of Texas.

Table 1. Descriptions of notable and extreme storms in Texas

[--, none or not applicable; X, indicates that a precipitation contour map is available from the reference; in., inches; E, identifies an extreme storm used to develop the extreme precipitation curves; mmHg, millimeters of mercury; max., maximum; XX, indicates that a precipitation contour map and depth-area-duration values are available from the reference; mi^2, square miles; mi, miles; ft, feet]

Event (chronological order)	Storm narrative	References	Remarks	
Storm of July 3, 1869, Austin vicinity	The greatest rain known in Austin (at least until 1921) began July 3 and lasted about 64 hours. Lower Austin was inundated, and several people drowned. The towns of Webberville and Bastrop were inundated.	Ellsworth, 1923, p. 50	--	
Storm of Apr. 29–May 1, 1894, Central Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of Jan. 29–Feb. 2, 1896, Central and East Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of Sept. 25–27, 1896, Central Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of June 26–30, 1899, Brazos River Basin	Rainfall amounts reported at Texas cities during the storm include Waco, 7.30 in.; Hewitt, 14.95 in.; Temple, 9.62 in.; Brenham, 20.08 in.; Sugarland, 12.30 in.; Columbia, 9.17 in.; and Brazoria, 8.68 in. As many as 35 people died, and damage was estimated at $9 million.	Ellsworth, 1923, p. 47	--	
Storm of June 27–July 1, 1899, Central and East Texas	One storm center was in Robertson County near the city of Hearne, and another was in Coryell County. Hearne reported 34 in. of rain, and Turnersville reported 33 in. Long-time residents in the area described the flood on the Brazos River as the worst in their lifetime.	Williams and Lowry, 1929; U.S. Army Corps of Engineers[1]	E	X
Storm of Apr. 5–8, 1900, Panhandle and Central Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of July 13–18, 1900, Central Texas	--	U.S. Army Corps of Engineers[1]		X
"West India Hurricane" of Sept. 8–10, 1900, Galveston area	As many as 6,000 people lost their lives in the hurricane. No buildings were left untouched, and more than one-half of the city was demolished. Barometric pressure measured 27.64 mmHg at 7:30 p.m. Sept. 8. All rain and wind gages in the Galveston area were swept away.	Schoner and Molansky, 1956		X
Storm of Sept. 20–23, 1900, parts of North Texas	Storm was centered in Coleman County near the city of Coleman where 11.25 in. of rain was recorded in 48 hours.	U.S. Army Corps of Engineers[1]	E	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of June 20–30, 1902, most of Texas	--	U.S. Army Corps of Engineers[1]	X
Tropical storm of Aug. 27–28, 1909, South Texas	A tropical disturbance moved inland south of Brownsville during the afternoon Aug. 27. Rainfall was moderate to heavy ahead and north of the disturbance as it moved to the northwest. Max. recorded rainfall was 7.8 in. at Falfurrias in Brooks County.	Schoner and Molansky, 1956	X
Storm of Oct. 18–20, 1909, south–central Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of May 4–7, 1912, South Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Aug. 8–11, 1912, East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Oct. 15–18, 1912, Texas coast	--	U.S. Army Corps of Engineers[1]	X
Tropical storm of Oct. 16–18, 1912, Gulf Coast	Rainfall was moderate to heavy in the immediate vicinity of the tropical disturbance as it moved inland over southern Texas. Rainfall amounts diminished rapidly as the disturbance moved northeast, with heaviest amounts from the afternoon Oct. 16 to the afternoon Oct. 17. Max. recorded rainfall was 6.3 in. at Brownsville in Cameron County.	Schoner and Molansky, 1956	X
Hurricane of June 27–30, 1913, Central Texas	Rainfall was light to moderate along the southern Texas coast June 27–28 as the hurricane moved inland. Max. recorded rainfall was 20.7 in. at Montell in Uvalde County where 20.05 in. fell during the 18.5-hour period 2:30 p.m. June 28 to 9:00 a.m. June 29.	Schoner and Molansky, 1956; U.S. Army Corps of Engineers[1]	X
Storm of Sept. 8–13, 1913, Central and East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Sept. 30–Oct. 5, 1913, south-central Texas	--	U.S. Army Corps of Engineers[1]	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of Dec. 1–6, 1913, Central and East Texas	Rainfall for last 10 days of November averaged 4.21 in., Guadalupe River Basin; 3.74 in., Colorado River Basin; 3.53 in., Brazos River Basin; 2.98 in., Trinity River Basin; and 4.05 in., San Antonio River Basin. These rains laid the foundation for floods greater than any known at that time. Rains for first few days of December were more or less continuous but were heaviest Dec. 2–4. Rainfall Dec. 1–6 averaged 4.78 in., Guadalupe River Basin; 3.95 in., Colorado River Basin; 5.37 in., Brazos River Basin; 5.30 in., Trinity River Basin; and 2.94 in., San Antonio River Basin. About 85 percent of the rain fell Dec. 2–4. Flooding resulted in 177 deaths, and losses exceeded $8.5 million.	Ellsworth, 1923, p. 46–47	--
Storm of May 26–June 1, 1914, East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Aug. 5–9, 1914, South Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Oct. 21–25, 1914, Panhandle and South Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Apr. 20–26, 1915, Central and East Texas	--	U.S. Army Corps of Engineers[1]	X
Hurricane of Aug. 16–21, 1915, East Texas	Rainfall was heavy ahead and east of the hurricane as it entered Texas. Rainfall continued to be moderate to heavy in the forward quadrants of the storm as it moved through eastern Texas June 18. Max. recorded rainfall was 19.8 in. at San Augustine in San Augustine County 7:00 p.m. Aug. 16 to 1:00 p.m. Aug. 19.	Schoner and Molansky, 1956	XX
Storm of Sept. 13–17, 1915, Edwards Plateau	--	U.S. Army Corps of Engineers[1]	X
Storm of Mar. 31–Apr. 2, 1916, south-central and southern Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of May 1–3, 1916, Central and East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Nov. 5–9, 1918, north-central Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of June 14–17, 1919, East Texas	--	U.S. Army Corps of Engineers[1]	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Storm of July 18–23, 1919, Central and East Texas	--	U.S. Army Corps of Engineers[1]		X
Hurricane of Sept. 14–15, 1919, Texas coast	The hurricane entered the Texas coast near Corpus Christi Sept. 14. Heavy rains accompanied the hurricane as it moved westward through southern Texas, then northward along the Pecos Valley Sept. 15, and finally northeastward toward the Texas-Oklahoma border. Max. recorded rainfall was 12.0 in. at George West in Live Oak County 7:00 a.m. Sept. 14 to 1:00 p.m. Sept. 15.	Schoner and Molansky, 1956		XX
Storm of Oct. 10–11, 1919, south-central and eastern Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of June 19–26, 1921, eastern and south-central Texas	--	U.S. Army Corps of Engineers[1]		X
Tropical storm of June 22–23, 1921, East Texas	The tropical storm entered the Gulf Coast between Houston and Corpus Christi June 22. Max. recorded rainfall was 10.0 in. at Matagorda in Matagorda County.	Schoner and Molansky, 1956		X
Storm of Sept. 8–10, 1921, Central Texas	Heavy rainfall over a large area in Central Texas Sept. 8–10 produced peak discharges at several streamflow-gaging stations. Taylor in Williamson County recorded 23.98 in. during 35 hours, with 23.11 in. during 24 hours. Bucket surveys determined that some areas of Taylor had 30 in. of rain during about 15 hours. Flooding caused the loss of at least 224 lives and resulted in property damages of more than $10 million.	Ellsworth, 1923, p. 1–13; Asquith and Slade, 1995[2]	E	XX
Storm of Mar. 25–31, 1922, East Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of Apr. 3–5, 1922, Central Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of Apr. 23–25, 1922, north-central Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of Apr. 24–27, 1922, Central and East Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of June 7–9, 1922, upper coast of Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of Sept. 15–17, 1922, south-central Texas	--	U.S. Army Corps of Engineers[1]		X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of Dec. 20–22, 1923, East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of May 29–31, 1924, East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of June 20–23, 1924, upper coast of Texas	--	U.S. Army Corps of Engineers[1]	X
Tropical storm of Sept. 6–7, 1925, South Texas	A weak tropical disturbance entered the Texas coast near Brownsville during the night Sept. 6. It moved northwestward, losing its identity by morning Sept. 7. Max. recorded rainfall was 10.7 in. at Brownsville in Cameron County.	Schoner and Molansky, 1956	X
Storm of Oct. 12–17, 1925, Central Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Nov. 3–7, 1925, Central and East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Apr. 20–24, 1926, South and East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Oct. 15, 1926, upper Brazos River Basin in Post and vicinity	Heavy rain fell on a small area around Post. Rainfall was 6.75 in. at Post Oct. 15. Unofficial reports indicate that as much as 7.5 in. fell in the area. The rains caused flooding on the Double Mountain Fork of the Brazos River near Aspermont.	U.S. Geological Survey[3]	--
Storm of Oct. 1–2, 1927, Central and East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Sept. 21–23, 1928, South Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Nov. 8–10, 1929, East Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of June 26–29, 1931, South Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Jan. 3–6, 1932, south-central and East Texas	--	U.S. Army Corps of Engineers[1]	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Storm of June 30–July 3, 1932, Central Texas	Heavy rains June 30–July 3 on parts of the Nueces and Guadalupe River Basins produced historically significant peak discharges at several streamflow-gaging stations. A very heavy rain fell on the upper Guadalupe River Basin, west of Kerrville, June 30–July 2. This rain amounted to more than 35 in. during about 36 hours at the State Fish Hatchery above Ingram. Heavy rainfall also was recorded in the Frio and Medina River Basins. Rainfall of 14 in. was measured at Bandera, Lima, and Medina in the Medina River Basin. Vanderpool, at the headwaters of the Medina River, measured 33.5 in. July 1–2. The floods in the Frio River were the highest known at that time. The heaviest rainfall on the Frio River Basin was at Rio Frio in Real County, where 24 in. was recorded July 1–2. Flash floods were responsible for seven deaths, and property losses exceeded $0.5 million.	Dalrymple and others, 1937, p. 119–123; Asquith and Slade, 1995[2]; U.S. Army Corps of Engineers[1]	E	X
Storm of Aug. 26–Sept. 8, 1932, Pecos River watershed below Carlsbad, N.Mex., and Rio Grande watershed below El Paso	A very heavy, general storm covered most of the Rio Grande Basin below El Paso and Carlsbad, starting first at the lower end of the basin. The rain produced large peak discharges at several streamflow-gaging stations. The first excessive rainfall was at Muzquiz, Coahuila, Mexico, Aug. 26, and at Fort Davis, Tex., Aug. 27 and 29. Sonora recorded 7.66 in. Aug. 31 and 6.08 in. Sept. 1. The heavy rainfall caused floods of unprecedented size. In the United States, flooding killed nine, and damages were estimated at $1 million.	International Boundary Commission, 1932; Asquith and Slade, 1995[2]		X
Storm of Aug. 30–Sept. 5, 1932, most of Texas	--	U.S. Army Corps of Engineers[1]		X
Tropical storm of July 22–27, 1933, East Texas	A weak tropical disturbance moved inland over the Texas coast and then interacted with a cold front during the night July 23. The max. storm rainfall of 21.3 in. was recorded at Logansport, La., 7:00 a.m. July 22 to 7:00 a.m. July 25.	Schoner and Molansky, 1956; U.S. Army Corps of Engineers[1]		XX
Hurricane of Sept. 4–6, 1933, South Texas	The hurricane moved across the Gulf and struck the southern Texas coast during the night Sept. 4. Rainfall was heavy immediately ahead and east of the hurricane as it moved inland over southern Texas during the night Sept. 4 and early morning Sept. 5. Max. recorded storm rainfall was 15.0 in. at Mercedes in Hidalgo County.	Schoner and Molansky, 1956		X
Storm of May 31, 1935, Seco Creek Basin in Medina County	A heavy rainfall over the Seco Creek drainage basin above D'Hanis in early morning May 31 caused the creek to rise rapidly and reach the historically highest stage for D'Hanis. There were no rainfall gages in the basin during the storm, and receptacles ordinarily used for measuring rainfall ran over or were washed away. Bucket surveys estimated that 22–24 in. of rain fell over a small area, and that 12–14 in. fell at other points during 3 hours or less. An average amount of more than 9 in. fell on the entire 80-mi^2 watershed. Four children and one woman drowned. Damage to railroad and highways was estimated at $48,500.	Dalrymple and others, 1939, p. 232–236	E	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Storm of June 9–15, 1935, Central Texas	Heavy rains over the Colorado and Nueces River drainage basins caused flooding greater than any known before. The Llano and West Nueces Rivers experienced extraordinary floods. There were few official rain gages in the area, but unofficial records were compiled from many sources. Heavy rains of 4–12 in. fell during 24 hours. Flooding caused damages of $20 million. No loss of life was reported.	Dalrymple and others, 1939, p. 236–240; Asquith and Slade, 1995[2]		X
Storm of Dec. 6–8, 1935, Harris County	Torrential rains in Harris County Dec. 6–8 caused large rises in Buffalo and Whiteoak Bayous. Houston reported 5.52 in., and Satsuma in northwestern Harris County reported 16.49 in. Property damage was estimated at $2.5 million, and eight people drowned in the flooding.	Dalrymple and others, 1939, p. 276–280; U.S. Army Corps of Engineers[1]		X
Storm of May 22–28, 1936, south-central and eastern Texas	The storm began at 7:00 a.m. May 22 on the Gulf Coast. Max. recorded storm rainfall was 14.9 in. at La Grange in Fayette County.	U.S. Army Corps of Engineers[1]	E	X
Storm of June 30–July 4, 1936, Texas	Rain fell June 30–July 4 on parts of the Rio Grande Basin and the Nueces, Guadalupe, Colorado, and Neches River Basins. The rains produced large peak discharges at several streamflow-gaging stations. Heavy rain, amounting to 17 in., was recorded at Eagle Pass in the Rio Grande Basin. Rainfall of more than 10 in. was recorded in the Neches River Basin at Rockland in Tyler County. The heaviest recorded rainfall was on central Guadalupe River Basin. Max. recorded storm rainfall was 21.0 in. at Bebe in Gonzales County 1:00 a.m. June 30 to 1:00 p.m. July 1. Severe flooding on central Guadalupe River Basin caused 26 deaths and estimated property damages of more than $2 million.	Dalrymple and others, 1937, p. 21–41; Asquith and Slade, 1995[2]; U.S. Army Corps of Engineers[1]	E	XX
Storm of Sept. 16–17, 1936, Sterling County	The storm was centered over Broome in Sterling County. Broome recorded 23.5 in. during the 18-hour period 9:00 p.m. Sept. 16 to 3:00 p.m. Sept. 17.	U.S. Army Corps of Engineers[1]	E	X
Storm of Sept. 13–18, 1936, Colorado River Basin	Rain of 6–10 in. fell on a relatively small area west of Marble Falls in Burnet County Sept. 14–15. Sandy and Walnut Creeks reached the highest stages known at the time. Rainfall exceeded 30 in. Sept. 13–18 at some locations in a large part of the Concho River Basin. In the vicinity of Fort McKavett in Menard County, more than 10 in. of rain fell Sept. 13–16. At the headwaters of Terrett Draw, about 10 mi south of Fort McKavett, 21–25 in. fell noon Sept. 15 to noon Sept. 16. A very heavy rain of 8–30 in., with 14 in. during about 2.5 hours at one location, fell on the North Llano River Basin Sept. 13–16. The max. storm rainfall of 30.0 in. was recorded at Broome in Sterling County 1:00 a.m. Sept. 15 to 7:00 p.m. Sept. 17. San Angelo in Tom Green County had extensive damage—about 300 buildings were washed away.	Dalrymple and others, 1937, p. 52–67; Schoner and Molansky, 1956	E	XX
Storm of Sept. 19–24, 1936, most of Texas	A max. depth of 7.65 in. was recorded on a small area around Weatherford. Rains also fell on a wide area of the extreme upper Brazos River Basin. Max. recorded rainfall was 9.39 in. at Tahoka. Lubbock recorded 8.32 in.	Dalrymple and others, 1937, p. 52–68		X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References		Remarks
Storm of Sept. 25–28, 1936, most of Texas	The most intense rain was 15 in. near Kaufman in the Trinity River Basin. A heavy rain of 6–15 in. fell on a relatively small area of the Brazos River watershed upstream of Waco. The greatest amount, 15 in., fell at Hillsboro in Hill County. Rain of 6–10 in. fell on a small area of the Colorado River Basin between Marble Falls and Burnet in Burnet County. The rain caused Hamilton Creek to rise higher than at any other time since 1884.	Dalrymple and others, 1937, p. 52–67		X
Storm of Nov. 8–10, 1937, East Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of Jan. 20–25, 1938, East Texas	A max. recorded depth of 10.73 in. of rain fell at Naples in Morris County. Floods greater than any known occurred on the Sulphur River. Large but not record-breaking floods also occurred on Cypress Creek and the upper Sabine River. Damages were estimated at $47,650.	Breeding and Dalrymple, 1944, p. 6–9		X
Storm of June 15, 1938, Panhandle	The rains produced peak discharges at Lake Creek Basin in Donley County, where flooding greater than any known before occurred. Max. recorded rainfall was 14 in. 9:00 to 11:30 p.m. June 15. Flooding resulted in five deaths and thousands of dollars in damages.	Breeding and Dalrymple, 1944, p. 18–21; Asquith and Slade, 1995[2]	E	X
Storm of July 16–25, 1938, middle Colorado River Basin	Floods were caused by heavy rains that centered over the San Saba River, South Concho River, and Brady Creek watersheds. Max. recorded rainfall was 13 in. July 23 at two places, 8 and 10 mi north of Eldorado in Schleicher County. Eldorado recorded 30 in. July 16–25. About 70 locations had 20 in. or more. Parts of 12 counties were inundated, six people were reported drowned, and property and crop losses were estimated at $5 million.	Breeding and Dalrymple, 1944, p. 23–38		X
Tropical storm of Aug. 27–29, 1938, South Texas	The tropical disturbance entered the Gulf Coast about 200 mi south of Brownsville the morning of Aug. 28. Max. recorded rainfall was 6.5 in. at Sarita in Kenedy County.	Schoner and Molansky, 1956		X
Storm of June 19–20, 1939, Snyder in Scurry and adjacent counties	Rainfall of 4–19 in. fell during 4–10 hours on an area of about 1,000 mi^2 near Snyder in Scurry County. The resulting flood on the Colorado River and its tributaries caused one death and damages estimated at $350,000.	Breeding and Dalrymple, 1944, p. 104–105	E	X
Storm of June 28–30, 1940, south-central Texas	Max. recorded rainfall at Engle in Fayette County was 22.7 in. during the 2-day period June 29–30, with 17.5 in. 8:00 p.m. June 29 to 8:00 a.m. June 30. The heaviest 2-day rain at Smithville in Bastrop County was 20.40 in. June 29–30, with 16 in. 7:00 p.m. June 29 to 10:00 a.m. June 30. This record rainfall caused destructive floods along lower parts of the Colorado and Guadalupe Rivers and along upper parts of the Lavaca River and its creek tributaries. Two people drowned on the Colorado River, and seven lives were lost on the Lavaca River at Hallettsville. Property and crop losses were estimated at more than $1 million.	Breeding, 1948b, p. 1–7; U.S. Army Corps of Engineers[1]	E	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Storm of Nov. 21–26, 1940, areas in and adjacent to the San Jacinto River Basin	The heaviest rainfall recorded in the San Jacinto River Basin was 17.46 in. at Montgomery Nov. 21–25, with 14 in. 2:00 p.m. Nov. 23 to 2:00 p.m. Nov. 24. Shepherd in San Jacinto County recorded 19.68 in. Nov. 21–25, with 16 in. 2:00 p.m. Nov. 23 to 2:00 p.m. Nov. 24. Highways and railways were damaged greatly, and livestock worth many thousands of dollars drowned.	Breeding, 1948b, p. 62–69; U.S. Army Corps of Engineers[1]		X
Tropical storm of Sept. 15–17, 1941, upper coast	The weak tropical disturbance entered Texas during the night Sept. 14. Rainfall was light as the disturbance moved inland; however, moderate showers began over the coast of southeastern Texas Sept. 16 and spread westward to south-central Texas Sept. 17. Max. recorded rainfall was 10.2 in. at Karnes City in Karnes County.	Schoner and Molansky, 1956		X
Storm of Apr. 5–30, 1942, north-central Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of Apr. 19–20, 1942, White Rock Creek in Dallas	According to long-time area residents, this was the greatest flood since at least 1886. The rains produced historically significant peak discharges at several streamflow-gaging stations. Although official rainfall stations adjacent to the watershed did not receive extraordinary rainfall, there were unofficial reports of as much as 12 in. on the upper watershed. Two days of general thunderstorm activity in the area prior to this storm contributed to a higher-than-normal rate of flood runoff.	Gilbert, 1963; Asquith and Slade, 1995[2]		--
Hurricane of Aug. 28–30, 1942, South Texas	The hurricane moved inland over the Matagorda Bay area during the morning Aug. 30 and dissipated in the highland regions of southern Texas by evening Aug. 30. Max. recorded rainfall was 9.3 in. at Woodsboro in Refugio County.	Schoner and Molansky, 1956		X
Storm of June 6–7, 1943, upper Sabine River watershed	Heavy rains that fell on the upper Sabine River watershed June 6 caused the highest stages known at that time for the Sabine River. Kaufman in Kaufman County reported 9.18 in. of rainfall for the week ending June 8. Unofficial rainfall reports from Grand Saline in Van Zandt County indicated more than 13 in. of rainfall June 6. Total damage was estimated at $1.1 million.	U.S. Geological Survey[3]		--
Hurricane of July 27–29, 1943, upper coast	The hurricane entered the Galveston Bay area about noon July 27, moved inland over Galveston Bay, passed over Houston shortly after midnight, and continued on toward Navasota with a rapid decrease in intensity. Max. recorded storm rainfall was 23.0 in. at Devers in Liberty County 1:00 p.m. July 27 to 1:00 a.m. July 29.	Schoner and Molansky, 1956; U.S. Army Corps of Engineers[1]	E	XX
Storm of Feb. 17–22, 1944, north-central Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of Apr. 29–May 4, 1944, Central and East Texas	--	U.S. Army Corps of Engineers[1]		X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of Feb. 26–28, 1945, north-central Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Mar. 28–Apr. 2, 1945, north-central Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of July 1–3, 1945, Reeves County	Rainfall for a 48-hour period beginning about 10:00 a.m. July 1 was 2.5–13.1 in. The greatest amount was recorded at Kingston Farm, about 2.7 mi west of Toyahvale, and at Kountze Ranch, about 6 mi southeast of Toyahvale. The storm centered in the immediate vicinity of Phantom Lake Spring, about 3.5 mi southwest of Toyahvale. A band of extremely heavy rainfall about 8 mi wide extended southeast about 12–14 mi and northwest 10–12 mi. The storm caused damages estimated at $52,000.	U.S. Geological Survey[3]	--
Tropical storm of Aug. 26–29, 1945, Texas coastline	The tropical disturbance produced heavy rains on the Texas coast. The extremely slow movement of the tropical disturbance produced heavy rainfall. Max. recorded storm rainfall was 19.6 in. at Hockley in Harris County 7:00 a.m. Aug. 26 to 1:00 p.m. Aug. 29.	Schoner and Molansky, 1956; U.S. Army Corps of Engineers[1]	XX
Storm of Sept. 26–27, 1946, San Antonio	Heavy rainfall was recorded for the 2-day period. The center of the storm extended from southern San Antonio south and southeast about 20 mi. More than 16 in. of rain fell on this 110-mi^2 area, with 6.61 in. recorded 8:00 p.m. Sept. 26 to 4:00 a.m. Sept. 27. San Antonio Municipal Airport recorded 6.93 in., with 6.61 in. 8:00 p.m. to 4:00 a.m. The flood spawned by the storm resulted in the loss of several lives and much property damage around San Antonio.	Breeding, 1947, 1948a; U.S. Army Corps of Engineers[1]	X
Storm of June 23–24, 1948, Val Verde, Kinney, and Edwards Counties in Rio Grande watershed	Intense storms were centered along the divide between the Devils River and the tributaries lying immediately to the east June 23–24. The rainfall began during the morning June 23 and continued into the next day, with the most intense rainfall early morning June 24. The storm had three separate storm centers, each receiving 24 in. or more rain in less than 24 hours. Total flood damage was estimated at $3.6 million.	International Boundary and Water Commission, 1949, p. 4–18	E X
Storm of July 1–4, 1948, Rio Grande watershed	Scattered rain fell July 1–3 on the Rio Grande watershed with heavy rain beginning early morning July 4. The storm was localized and centered over San Felipe Creek northeast of Del Rio and over the Devils River in the vicinity of Juno. The max. recorded rainfall of 10 in. was measured in a garbage can about 8 mi east of Del Rio. Flood damage was estimated at $325,500.	International Boundary and Water Commission, 1949, p. 52–56	--

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Storm of Sept. 8–11, 1948, Hidalgo and Cameron Counties in Rio Grande watershed	Rain fell on the entire lower Rio Grande Valley below Eagle Pass and on most of the Mexican tributary streams that flow into the lower Rio Grande. Scattered rainfall of as much as 8 in. was recorded for the basin above Zapata and below Del Rio. The storm began about noon Sept. 8 and was more or less continuous until the end of the storm Sept. 11. The heaviest and most concentrated rainfall was at rainfall gages on the U.S. side of the Rio Grande 9:00 a.m. to 4:00 p.m. Sept. 10. Total flood damage was estimated at $5.68 million.	International Boundary and Water Commission, 1949, p. 65–71		X
Storm of May 16–17, 1949, north-central Texas	--	U.S. Army Corps of Engineers[1]		X
Storm of May 17, 1949, Fort Worth	Max. recorded rainfall was 12 in. on Village Creek in the West Fork Trinity River Basin southeast of Fort Worth. Ten lives were lost, and damages were $15 million in Fort Worth and vicinity.	Breeding, 1949		X
Storm of June 13–14, 1949, north-central Texas	--	U.S. Army Corps of Engineers[1]		X
Hurricane of Oct. 3–4, 1949, East Texas	The hurricane entered the Texas coast near Freeport during the night Oct. 3. Rainfall was heavy along the Texas-Louisiana coast ahead and east of the hurricane as it moved inland. Rainfall amounts and intensities decreased rapidly as the disturbance passed through the area and weakened. Max. recorded rainfall was 11.3 in. at Beaumont in Jefferson County.	Schoner and Molansky, 1956		X
Storm of Aug. 1, 1950, Wichita Falls	Heavy rainfall began about 1:00 a.m. Aug. 1. Reports indicate the heaviest rain fell 1:00 to 6:00 a.m. Southwest of Wichita Falls, 4–10 in. were recorded. Max. recorded rainfall was 9.75 in. during 24 hours 6.5 mi southeast of Dundee. Damage in Wichita Falls was estimated at $1 million.	Yost, 1951		X
Storm of May 13–19, 1951, northwestern Texas	Heavy thunderstorms May 13–19 produced floods of unusual magnitude on a wide area in western Oklahoma and northwestern Texas. In Texas, Palo Duro Creek Basin, a tributary of Prairie Dog Town Fork Red River northwest of Hereford, had 11 in. of rain. The max. recorded rainfall was 15 in. at Conway, east of Amarillo. Five persons lost their lives in flood waters, and estimated damage exceeded $2 million.	Wells, 1954		X
Storm of May 15, 1951, Edwards Plateau	--	U.S. Army Corps of Engineers[1]		X
Storm of Sept. 12–16, 1951, Coastal Plain	Rain of 5–21 in. fell on an area greater than 26,000 mi^2, including all of Texas south of latitude 29° and east of longitude 99°. From 7:00 to 10:00 a.m. Sept. 13, 7.65 in. was measured. Floods caused an estimated $1.5 million in damages, and 1,300 people were evacuated.	Wells, 1957, p. 288; U.S. Army Corps of Engineers[1]	E	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of May 23, 1952, north-central Texas	Heavy rains fell in eastern Comanche, central Erath, and western Hood Counties 8:00 a.m. to 5:00 p.m. May 23. Max. recorded rainfall was 20 in. 5.5 mi east of De Leon in Comanche County.	Wells, 1959b, p. 699	--
Storm of Sept. 9–11, 1952, south-central Texas	--	U.S. Army Corps of Engineers[1]	X
Storm of Sept. 9–11, 1952, Guadalupe and lower Colorado River Basins	Two to 26 in. of rain fell on a 25,000-mi^2 area that formed a 100-mi-wide belt extending from Corpus Christi northwestward for 250 mi. Storm totals of 20–26 in. were concentrated in a small area in Blanco and Kendall Counties. Hye in Blanco County recorded 23.55 in. during 48 hours, with 20.70 in. during one 24-hour period. Floods killed five people and caused an estimated $17 million in damages.	Breeding and Montgomery, 1954, p. 2–11; Orton, 1966, p. 1–17	X
Storms of Apr. 27–May 20, 1953, Sabine and Neches River Basins	Major flooding resulted from heavy rains in the Sabine and Neches River Basins during the last few days of April and continued until May 20. At Bon Wier on the Sabine River, April rainfall totaled 11.05 in., with 8 in. Apr. 29. Rainfall totaled 20.44 in. May 1–19; 8.65 in. May 18; and 15.6 in. during the 7-day period May 13–19. Flood damage in the two basins was about $2.7 million.	Wells, 1959a, p. 167–169	X
Storm of May 11–12, 1953, McLennan County on Tehuacana Creek watershed	Rainfall began about 4:00 p.m. May 11 and continued for about 24 hours. The greatest rainfall for the 2-day period, 9.30 in., was recorded about 4 mi south of Leroy in McLennan County. Total damage to the watershed exceeded $1 million.	Soil Conservation Service, 1953c	X
Storm of May 11–15, 1953, Hill County in Richland Creek watershed	The heaviest rainfall fell on southwestern Hill County near Hubbard, Malone, and Penelope. About 14 in. was recorded for the 5-day period in the vicinity of these towns, with about 70 percent of the rainfall May 11–12.	Soil Conservation Service, 1953a	X
Storm of July 15, 1953, Coke County in Salt, Paint, and Pecan Creek watersheds	The storm covered a 75-mi^2 area near Edith in Coke County. Max. recorded rainfall was 5 in. Damage was estimated at $32,000. There was no loss of life.	Soil Conservation Service, 1953b	X
Storm of Aug. 19, 1953, upper Colorado River Basin near Robert Lee and Ballinger	On Aug. 19, a flash flood occurred on the upper Colorado River, where as much as 10 in. of rain was reported.	Wells, 1959c, p. 341–364	--
Storm of Apr. 10–13, 1954, Bull Creek Basin in Borden County	Rainfall on Bull Creek in Borden County was as much as 5.1 in. Apr. 10–13.	McDaniels, 1954, p. 1–2	--

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Tropical storm of June 24–29, 1954, Crockett and Val Verde Counties in lower Rio Grande Basin	Hurricane Alice moved inland from the Gulf of Mexico June 24. The heaviest rainfall recorded was on the Pecos River below Sheffield and its tributary, Howards Creek. On Johnson Draw (a tributary of the Devils River), a large part of the town of Ozona was badly flooded, and several people drowned. As much as 34 in. of rain was observed at two centers 22 and 40 mi north of Langtry. Uncounted lives were lost in the floodwaters, particularly at Piedras Negras, Mexico, opposite Eagle Pass, Tex.	International Boundary and Water Commission, 1954, p. 56–57; Wells, 1959d, p. 228–229; U.S. Army Corps of Engineers[1]	E	X
Storm of May 17–19, 1955, McCulloch County in Deep Creek watershed	Rainfall began about 7:00 p.m. May 17 and continued for 30 hours. Max. recorded rainfall was 9.22 in. about 7 mi southeast of Mercury in McCulloch County. A depth of 0.80 in. was recorded for one 5-minute period. There was no loss of life from the storm. An estimated $14,580 damage was caused by the storm.	Soil Conservation Service, 1955a		X
Storm of May 18–19, 1955, Erath County in upper Bosque River watershed	Rainfall began about 7:30 p.m. May 18 and continued for 5.5 hours. A gage 9 mi west of Stephenville in the Green Creek watershed recorded 2.00 in. during one 30-minute period. Bucket surveys indicated that higher intensities were near the center of the storm. Max. recorded rainfall was 12.0 in. 5 mi east of Lingleville. Damage was estimated at $680,000.	Soil Conservation Service, 1955b		X
Storm of Sept. 23–25, 1955, Val Verde, Edwards, Real, Kinney, and Uvalde Counties	Rain in large amounts and of severe intensity fell Sept. 23–25 on extreme upper ends of the Nueces and South Llano River Basins and eastern Devils River Basin. A 10-in. rainfall center occurred on the West Nueces River northeast of Brackettville and west of Laguna. A 15-in. center occurred on the Dry Devils River north of Carta Valley and west of Rocksprings. A 24-in. center occurred on the Nueces River near the mouth of Hackberry Creek southeast of Rocksprings. Most of the rain fell during the night Sept. 23 and morning Sept. 24.	Wells, 1962, p. 123–127		X
Storm of Sept. 24–25, 1955, upper Brazos River Basin	Most of the rain fell in less than 24 hours. The storm was widespread, but small areas had heavy rainfall with depths of 10–15 in. The heaviest rainfall recorded was 15 in. west of Justiceburg.	Wells, 1962, p. 127–129		X
Storms of Sept. 22–27, and Oct. 2–4, 1955, Pecos River Basin	The rain-gage coverage of the area is poor, and no rainfall records are available in the Delaware River or Salt Draw Basins, where the greatest amounts of rain caused record-breaking floods Oct. 2. No bucket surveys were conducted in the area most greatly affected.	Wells, 1962, p. 129–131; Asquith and Slade, 1995[2]		--
Storm of Apr. 29–May 1, 1956, Coleman and Brown Counties in Mukewater Creek watershed	Rainfall began about 8:00 a.m. Apr. 29 and continued, with varying intensity, for 30 hours. A gage in the upper end of the watershed recorded 8.3 in. during 2.5 hours and 3.1 in. during 30 minutes. This gage recorded 10.09 in. of rain during the storm. There was no loss of life. Damage was estimated at $160,000.	Soil Conservation Service, 1956b	E	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of Apr. 29–May 1, 1956, Erath County in Green Creek watershed	Max. rainfall measured was 14.54 in. Max. intensity recorded was 5.82 in. during a 3-hour period, with 2.13 in. during one 30-minute period. There was no loss of life. Damage was estimated at $80,000.	Soil Conservation Service, 1956a	X
Storm of Apr. 30–May 3, 1956, Brazos and Colorado River Basins	Max. recorded precipitation was14.54 in. on the upper North Bosque River Basin. In Erath County 3 mi northeast of Stephenville, 11.57 in. was measured during the period, with a max. intensity of 3 in. during 45 minutes Apr. 30. As much as 8 in. of rain was reported in that area during 2.5 hours Apr. 30.	Hendricks, 1964a, p. 26–28	--
Storm of Apr.–June 1957 Texas and adjacent states	Total rainfall on much of the eastern two-thirds of Texas for the 3-month period exceeded that normally recorded for a 12-month period. These rains effectively broke the infamous 1950s drought.	Yost, 1963, p. 5–9	X
Storm of Oct. 12–15, 1957, west-central Texas	Heavy showers and thunderstorms Oct. 12–15 in west-central Texas caused excessive flooding primarily on streams in the upper Colorado River Basin upstream of Winchell. Several U.S. Weather Bureau observers in the area reported more than 8 in. during the storm. Robert Lee, near the center of the affected area, recorded 8.4 in. during the 24 hours ending 6:00 a.m. Oct. 13.	Hendricks, 1963a, p. 85	X
Storm of Feb. 20–22, 1958, south-central Texas	Heavy rains Feb. 20–22 caused major flooding on many small streams in Central and South Texas. In the Brazos River Basin, as much as 6 in. of rain caused flash flooding on Brushy Creek and the Lampasas and San Gabriel Rivers. In the Colorado River Basin, flooding generally was confined to the narrow part of the basin downstream of Austin. Major flooding also occurred in the Guadalupe River Basin downstream from New Braunfels. Victoria was the only city in the Guadalupe watershed to experience any serious flooding. About 26 blocks of the city were flooded requiring the evacuation of about 350 people. In the Nueces watershed, flash flooding occurred in the upper basin. Major flooding occurred on the Nueces River and its tributaries below Cotulla in La Salle County. Flooding from the storm caused two deaths on the Guadalupe River and damages exceeding $1 million.	Hendricks, 1963b, p. 13–14	X
Storm of Apr. 24–27, 1958, Texas and Louisiana	The storm covered an east-west belt about 50-mi wide extending from Mt. Pleasant, Tex., eastward to the Mississippi River. U.S. Weather Bureau records show that the greatest amount of rainfall in Texas during the 3-day period was 10.02 in. at Daingerfield in Morris County and 8.31 in. at Linden in Cass County.	Smith, 1964, p. 4–7	X
Tropical storm of June 16–18, 1958, southwest Texas	Flooding in the Devils River Basin on the headwaters of the Nueces and Guadalupe Rivers and on certain tributaries to the Colorado River above Lake Travis produced peak discharges at several streamflow-gaging stations. The heaviest rainfall amounts reported were 6–10 in.; however, there were a few unofficial reports of 16–20 in.	Hendricks, 1963b, p. 52–53; Asquith and Slade, 1995[2]	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Storm of May 2–3, 1959, Cherokee Bayou in Gregg and Rusk Counties	Heavy rains May 2–3 covered all of Cherokee Bayou Basin, a tributary to the Sabine River. The rainfall lasted 4–6 hours with official totals of as much as 11 in. Bucket surveys indicated rainfall amounts of as much as 13.8 in. The heaviest rainfall was on the part of the watershed upstream of the dam that forms Lake Cherokee. Severe flooding caused three deaths, and damages were estimated at slightly more than $1 million.	Hendricks, 1964b, p. 41–42		X
Storm of Sept. 28–Oct. 4, 1959, Trinity, Brazos, Colorado, Guadalupe, and Nueces River Basins	As much as 12 in. of rain caused extensive flooding in the upper Trinity River Basin on Big Fossil, Big Sandy, Chambers, and Richland Creeks and produced historically significant peak discharges at several streamflow-gaging stations. Big Fossil Creek flooded parts of Richland Hills, a suburb of Fort Worth, causing an estimated $300,000 in damages. Damage to agricultural interests and rural public properties was estimated at $700,000 by the U.S. Weather Bureau. In the middle Brazos River Basin, floods (exceeding all those previously known) on North Bosque River and Cowhouse Creek followed rains totaling more than 14 in. at some points. Spring Creek in the middle Colorado River Basin reached its highest stage since 1882 following rainfall that exceeded 10 in. Johnson Creek, in the headwaters of the Guadalupe River, recorded the second highest flood known since at least 1852. One person drowned during the flood. Flash flooding on the upper Nueces River Basin followed heavy rains Oct. 3–4. Unofficial totals of as much as 16 in. of rain were reported.	Hendricks, 1964b, p. 70–74; Asquith and Slade, 1995[2]		X
Storm of June 5–12, 1960, central High Plains	Heavy rains produced localized flooding in the Amarillo area and eastern Panhandle. The Amarillo Municipal Airport recorded 6.15 in. during 24 hours June 9–10. Because of heavy flooding, Hall County was declared a disaster area.	U.S. Geological Survey[3]		X
Tropical storm of June 24–26, 1960, Texas coast	A tropical storm moving inland caused general rains of 8 in. or more on about 20,000 mi^2. Rainfall totals of more than 30 in. were recorded at Port Lavaca during the period June 24–26. Eight people drowned, and damages were estimated at $3.5 million.	Rostvedt, 1965a, p. 92–95	E	X
Storm of July 5–8, 1960, southern High Plains	Rainfall was excessive in the Lubbock, Plainview, Levelland, Littlefield, and Slaton area of the southern High Plains. Unofficial 1-hour rainfall intensities were reported to be as much as 4.5–5 in. southeast of Lubbock. Other unofficial reports gave rainfall depths of 12–14 in. near Lubbock during a 48-hour period July 5–7. In southwestern Lamb County, as much as 8.6 in. fell 4:00 to 7:00 p.m. July 7.	U.S. Geological Survey[3]	E	X
Storm of Oct. 16–30, 1960, southern and south-central Texas	Heavy rains averaging 7–10 in. during the night Oct. 28–29 in south-central Texas caused flash floods on many small streams. Depths of as much as 19 in. were reported. Refugio recorded 13.38 in. of rainfall Oct. 16. High-intensity rains Oct. 16–17 averaged 6–8 in.; more than 15 in. of rain fell in some areas. Rainfall began again at 7 p.m. Oct. 23 and lasted about 12 hours. Floodwaters killed 13 people, and property damage was estimated at more than $6 million.	Rostvedt, 1965a, p. 131–137		X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of Oct. 23–24, 1960, Starr and Jim Hogg Counties	Heavy rains produced a severe flood in the lower reaches of Los Olmos Creek, reportedly one of the largest on record. Rainfall began at 7:00 p.m. Oct. 23 and lasted about 12 hours. The heaviest rainfall was during the last 6 hours of the storm. Rainfalls exceeding 8 in. were reported. Heavy damage occurred in Rio Grande City. Overflow from Los Olmos Creek flooded 53 city blocks, left about 2,000 of the approximately 6,000 people in the city homeless, and caused damages estimated at more than $1 million. There was no loss of life.	Rostvedt, 1965a, p. 131–133	X
Storm of June 17–18, 1961, Austin	Flash flooding in Austin during the night June 17–18 resulted from intense rainfall. The greatest recorded rainfall was 6.86 in. About 300 people were evacuated from their homes in southeast Austin when Boggy Creek overflowed its banks.	U.S. Geological Survey[3]	--
Storm of June 24–25, 1961, near Fort Worth	A small-area storm of high intensity caused flash flooding in Richland Hills near Fort Worth. Three rain gages in the area recorded rainfalls of 3.64–4.71 in. A bucket survey was conducted on upper Big Fossil Creek where 7.7, 8.0, and 8.7 in. of rain were recorded.	Rostvedt, 1965b, p. 57	--
Hurricane Carla, Sept. 10–12, 1961, Texas coast	The eye of Hurricane Carla entered the Texas coastline at 3:00 p.m. Sept. 11. Relatively low-intensity rains fell the entire 3-day period. Recorded storm rainfall was 1.22 in., Corpus Christi; 15.32 in., Galveston; and 11.66 in., Conroe. Damages from this destructive storm were an estimated $408 million. At least 32 people lost their lives.	U.S. Geological Survey[3]	--
Storm of July 26–27, 1962, near Crandall in Kaufman County	A flood-producing storm began about midnight July 26 and continued intermittently until about noon July 27. Crandall recorded 11.4 in. during a 6-hour period midnight to 6:00 a.m. July 27. There was no loss of life. Crop and pasture damage from the floodwaters was estimated at $26,000.	Soil Conservation Service, 1962	X
Storm of July 27, 1962, Mineral Wells and vicinity	Heavy rains of 5–17 in. fell within a 40-mi radius of Mineral Wells July 25–27. The area upstream from Greenville Ave. in Dallas had an average rainfall of 6.2 in. July 27. That same area recorded 2 in. the previous day. Property damage exceeded $1.5 million.	Rostvedt and others, 1968a, p. 97	--
Storm of Sept. 6–7, 1962, Haltom City near Fort Worth	As much as 11 in. of rain fell Sept. 7 on upper Big Fossil Creek Basin. During the afternoon Sept. 7, the recording rain gage near Justin, about 13 mi northeast of Big Fossil Creek Basin, measured 5 in. during 1 hour and 2 in. more the following hour.	Rostvedt and others, 1968a, p. 99–101	X
Storm of Oct. 8, 1962, White Rock Creek Basin at Dallas	During early morning Oct. 8, an intense storm of short duration centered over Cottonwood Creek in the upper White Rock Creek Basin. An average 4.6 in. of rain fell on the basin during about 3 hours. Rainfall on Cottonwood Creek Basin ranged from about 4 in. on the upper basin to 7 in. on the lower basin.	Rostvedt and others, 1968a, p. 99	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Hurricane Cindy, Sept. 17–19, 1963, southeastern Texas	Hurricane Cindy entered the Texas coast between Galveston and Port Arthur at 7:00 a.m. Sept. 17. Rainfall was 15–20 in. on the lower reaches of the Sabine and Neches Rivers. Max. recorded rainfall was 23.5 in. at Deweyville in Newton County. Two people drowned, and damages were estimated at $11.7 million.	Rostvedt and others, 1968b, p. 111–112	--
Storm of Sept. 15–30, 1964, south-central and northeastern Texas	The rains produced historically significant peak discharges at two streamflow-gaging stations. As much as 12.5 in. of rain fell during the night Sept. 15 in Dimmit County between Carrizo Springs and Encinal. As much as 15 in. fell on the Devils River Basin during 24 hours, and as much as 17 in. fell on the upper Nueces River Basin. As much as 20.33 in. was measured Sept. 15–30. During the first 8 hours of Sept. 21, more than 12 in. fell in northeastern Tarrant County, eastward over Dallas, and in Collin County. The heaviest rain fell on an area north of Dallas.	Rostvedt and others, 1970a, p. 82–90	X
Storm of Sept. 20–21, 1964, Collin and Grayson Counties in upper Trinity River watershed	The storm began about midnight Sept. 20 and continued until about 8:00 a.m. Sept. 21. McKinney in Collin County reported 12.10 in. of rain 1:15 to 7:00 a.m. Sept. 21. There was no loss of life. Damage was estimated at $234,000.	Soil Conservation Service, 1964	X
Storm of May 16–17, 1965, middle Brazos River Basin	The middle Brazos River Basin had rains of as much as 10 in. May 16–17, causing flooding on major tributary streams. Flood damage on the Nolan and Elm Creek Basins were an estimated $1.2 million, mostly in areas near Belton and Killeen.	Rostvedt and others, 1970b, p. 14	--
Storm of May 18, 1965, San Antonio	Rainfall exceeding 6 in. in some areas flooded parts of San Antonio. Property damage was estimated at $1 million. Two people drowned, and 14 were injured.	Rostvedt and others, 1970b, p. 15	--
Storm of June 10–11, 1965, Sanderson in Terrell County	Sanderson in Terrell County was struck by a 15-ft wall of water about 7:00 a.m. June 11. The flood drove hundreds from their homes and killed 26 people. As much as 9 in. of rain had fallen on parts of the watershed during the 48 hours preceding the flash flood. Mean annual rainfall in the Sanderson area is about 12 in.	Rostvedt and others, 1970b, p. 15	X
Storm of Feb. 8–9, 1966, near Gainesville in Cooke County	A runoff-producing storm occurred on the Elm Fork subwatershed of the Trinity River watershed Feb. 8–9. Rainfall began about 8:00 p.m. Feb. 8 and continued until about 6:00 a.m. Feb. 9. About 6 in. fell on the Pecan Creek watershed above Gainesville during an 8-hour period.	Soil Conservation Service, 1966b	--
Storm of Apr. 20–May 2, 1966, Navarro, Hill, Ellis, and Johnson Counties	A series of flood-producing rains of 8–15 in. fell on Chambers Creek watershed Apr. 20–May 2. Rainfall of 7.91–14.75 in. was recorded. Unofficial reports of rainfall indicate that isolated areas of the watershed had as much as 17 in. The greatest rainfall was reported for the area immediately west of Corsicana. Storm damage was estimated at $441,000.	Soil Conservation Service, 1966a	--

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Storm of Apr. 22–29, 1966, northeastern Texas	The storm produced 20–26 in. of rain on parts of Wood, Smith, Harris, Upshur, Gregg, Marion, and Harrison Counties during the 8-day period Apr. 22–29. Most of the rain fell during a 72-hour period Apr. 22–25. The heaviest rains were centered over the Gilmer-Harleton area. At Gladewater, 22.74 in. fell during 60 hours. At least 25 persons lost their lives in the flood. Total damage was estimated at $12 million.	Rostvedt and others, 1971, p. 25–26		--
Storm of Apr. 28, 1966, north Dallas	As much as 6.7 in. fell during a 6-hour period; 4.9 in. fell during 1 hour. Almost 8 in. of rain had fallen during the preceding 2 weeks, resulting in a well-saturated basin in which all storage areas were full. Flooding resulted in seven deaths and damages estimated at $2.5 million.	Mills and Schroeder, 1969		X
Storm of Aug. 13, 1966, south-central Texas	Very high intensity rains of as much as 14 in. fell on the West Nueces, extreme upper Nueces, Dry Frio, and extreme upper Frio River Basins.	U.S. Geological Survey[3]		--
Storm of Aug. 21–23, 1966, near Dell City in Hudspeth County	Rain fell along a frontal system extending from Laredo to El Paso Aug. 22. More than 12 in. fell on some areas in the mountains west of Dell City. The heaviest rains were recorded during the day and night Aug. 22. As much as 3 ft of water flooded 50 houses in Dell City. Several lives were lost, and total property damage in and around Dell City was estimated at $4.3 million.	Rostvedt and others, 1971, p. 48–50		X
Hurricane Beulah, Sept. 19–25, 1967, South Texas	Rainfall produced by Hurricane Beulah caused floods of record-breaking magnitude on many streams in a 50,000-mi^2 area of southern Texas and northeastern Mexico in September and October. The hurricane entered the Texas coastline near Brownsville about daybreak Sept. 20 and dissipated in the mountains of northern Mexico Sept. 22. During Sept. 19–25, as much as 25.5 in. of rain was measured at Falls City in Karnes County. Unofficial measurements were as much as 34 in. on the Nueces River Basin. The rains produced historically significant peak discharges at several streamflow-gaging stations. The storm covered about 39 counties in Texas, causing 13 deaths and $145 million in damages.	Schroeder and others, 1974; Asquith and Slade, 1995[2]	E	X
Storm of Jan. 18–24, 1968, south-central Texas	During Jan. 18–21, heavy rains of 10 in. or more caused flooding from San Antonio southward to the Gulf Coast. Flooding principally was on the Guadalupe and Nueces Rivers and their tributaries. Flooding in San Antonio caused five deaths and property damage estimated at $4 million.	Rostvedt and others, 1972, p. 9		--
Tropical Storm Candy, June 23–28, 1968, Central and eastern Texas	During the afternoon June 23, Tropical Storm Candy moved inland over the middle Texas coast. The storm weakened slowly as it moved north toward the Dallas-Fort Worth area. Rainfall totals of 3–4 in. were common throughout Central and eastern Texas, with numerous locations reporting 5 in. or more. No deaths or injuries resulted from this storm; however, estimates placed crop losses at $2.1 million and property losses at $625,000.	Rostvedt and others, 1972, p. 42		--

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of Aug. 28, 1968, Texas High Plains	Heavy rains of as much as 8 in. fell on Prairie Dog Town Fork Red River. Canyon in Randall County reported 7.87 in. All highways through Canyon were closed for a time during and immediately after the storm. As a result of these heavy rains, a $2-million train wreck claimed one life 15 mi northwest of Childress.	Rostvedt and others, 1972, p. 63–64	--
Storm of May 4–10, 1969, north-central Texas	General rains accompanied by severe thunderstorms caused floods on parts of the Sabine, Sulphur, Trinity, and Brazos River Basins within a triangular area bounded by Lubbock, Texarkana, and Waco. Damages were estimated at $4.6 million in the Trinity River Basin.	Reid and others, 1975	--
Storm of May 6–7, 1969, Cleburne in Johnson County	Rainfall exceeded 8 in. during the storm. Most of this rain fell during the evening May 6 and early morning May 7. Damages in Johnson County were estimated at $400,000.	Reid and others, 1975	X
Storm of June 24–30, 1971, Rio Grande watershed	The rains ended a severe drought that had affected the area for several months. Reservoirs were less than one-third of conservation capacity. During the 7-day period, rainfall averaged about 9 in. on the entire watershed between Amistad Dam and Falcon Dam. El Indio in Maverick County recorded 16–18 in.	International Boundary and Water Commission, 1971, p. 95–97	X
Hurricane Fern, Sept. 7–13, 1971, South Texas and Coastal Bend	The storm dumped heavy rainfall as it moved along the coast and inland. The heaviest rainfall was in the Coastal Bend area and extreme South Texas. Max. recorded precipitation was 22.67 in. at Kaffie Ranch, about 27 mi southwest of Falfurrias in Brooks County. A bucket survey in Bee County indicated rainfall totals of 26 in. 2 mi south-southeast of Beeville and 25.7 in. 3 mi north of Skidmore. Total flood damages from Hurricane Fern were an estimated $28.3 million.	U.S. Army Corps of Engineers, 1972	--
Storm of May 11–12, 1972, New Braunfels	During a 4-hour period, 16 in. of rain fell. Fifteen lives were lost to the rampaging floodwaters that inundated 400 homes and caused about $5.7 million in damages.	Colwick and others, 1972	X
Storm of Sept. 26–27, 1973, Seguin and vicinity	A severe frontal storm passed over Guadalupe County during the night Sept. 26 and morning Sept. 27 with rains of 2–12 in. Flood damages were $2.5 million in the Seguin area.	Diniz, 1973	X
Storm of June 10, 1974, El Paso	Heavy rain fell in and around El Paso June 10. The Hercules fire station recorded 0.95 in. from 5:00 to 7:30 p.m. The Ysleta fire station recorded 0.62 in.	U.S. Geological Survey[3]	--
Storm of Sept. 14–25, 1974, Rio Grande watershed	Rainfall during the period averaged about 8 in. on the entire watershed from Fort Quitman in Hudspeth County to Amistad Dam in Val Verde County, 10.5 in. on the Pecos River Basin, and 8.5 in. on the Devils River watershed. Extremely heavy rains fell on localized areas of both the Pecos and Devils River watersheds. Continental Ranch in the Pecos River watershed recorded a total of 23 in. during 9 days. In the Devils River watershed, a total of 21.58 in. of rain fell at Walker Ranch during 6 days. Bakers Crossing had almost 12 in. of rain during 24 hours.	International Boundary and Water Commission, 1974	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Storm of June 15, 1976, south Houston	The majority of rain fell on a small area. Hunting Bayou at Loop 610 recorded 10.2 in. during 6 hours. Floodwaters caused eight deaths and damages exceeding $25 million.	Rice Center, 1980		X
Storm of May 26–27, 1978, Palo Duro Canyon State Park in Randall County	Rainfall during the period averaged 4–10 in. on the High Plains. A 10-in. rain during 90 minutes sent a 12-ft wall of water surging through scenic Palo Duro Canyon State Park. Flooding also was widespread in other areas of Randall County. Four people drowned, and $8–10 million in damages resulted.	Bomar, 1979, p. 7; U.S. Geological Survey[3]		X
Storm of June 7, 1978, The Woodlands in Harris County	Rain from a relatively short-duration, high-intensity thunderstorm fell from about midnight to 4:00 a.m. during the morning June 7. Rainfall of 6.3 in. during 24 hours was recorded at W.G. Jones State Forest. The Woodlands fire station reported 7.0 in.	Farner & Winslow, Inc., 1978		--
Tropical Storm Amelia, Aug. 1–4, 1978, Central Texas	Rain initiated by the remnants of Tropical Storm Amelia fell over Central Texas Aug. 1–4. Rainfall of more than 48 in. near Medina in Bandera County established a U.S. record of extreme point rainfall for a 72-hour period. A second storm over the "Big Country" resulted from the interaction of a cold front with a maritime air mass producing 32.5 in. at Albany in Shackelford County, with 23 in. during the 8 hours ending 2:00 a.m. Aug. 4. Major flooding occurred on the Medina and Guadalupe Rivers. Thirty-three lives were lost, and total damages reportedly exceeded $110 million.	Schroeder and others, 1987; Asquith and Slade, 1995[2]	E	X
Tropical Storm Paul, Sept. 24–25, 1978, Trans-Pecos region	Tropical Storm Paul produced 4- to 8-in. rains in the western and southern Trans-Pecos region. Rains of as much as 15 in. fell in and around Guadalupe National Park Sept. 25. The rains deluged northern Mexico and filled reservoirs there to levels that mandated record releases down the Rio Conchos into the Rio Grande at Presidio, causing the worst flooding along the Rio Grande in 74 years.	Bomar, 1979, p. 32–33		--
Storm of Apr. 18–21, 1979, parts of upper coast	Some of the worst flooding ever to hit Montgomery County resulted from rains Apr. 18 that totaled 12 in. or more in less than 12 hours. About 10 in. was recorded during 3 hours at Splendora. As much as 14 in. was recorded in the vicinity of Conroe during an 8-hour period beginning just before dawn. Almost 2,000 residents were evacuated from their homes. The storm caused $50 million of damages in Conroe and another $50 million in other parts of Montgomery County.	Bomar, 1980, p. 225–227		X
Tropical Storm Claudette, July 24–28, 1979, East Texas and upper coast	Continuous, torrential rains fell in the eastern upper coast and southeast Texas for almost 48 hours causing major flooding that closed streets and highways and forced hundreds of residents from their homes. Rainfall totals of 10–20 in. for 2 and 3 days were common. Alvin in Brazoria County recorded the max. 24-hour rainfall on record for the United States of 25.75 in.	Bomar, 1980, p. 369–375	E	X
Storm of Sept. 17–21, 1979, East Texas and upper coast	Three-day rainfall totals throughout the upper coast were 8–27 in. Freeport in Brazoria County recorded 27 in. of rain. Four people drowned, and damages were estimated at $8 million.	Bomar, 1980, p. 429–436		X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Hurricane Allen, Aug. 5–12, 1980, southeastern Texas	Almost all of the southern one-fourth of Texas had at least 5 in. of rain from Hurricane Allen. Three-day rainfall totals exceeding 15 in. were reported in parts of Jim Wells and Hidalgo Counties and around Aransas Pass. Three people drowned in the storm surge, and damage to property was estimated at $650–700 million.	Bomar, 1983a, p. 84–88		X
Storm of Aug. 10–15, 1980, Trans-Pecos area	Five-day rains produced by residue from Hurricane Allen fell on the Trans-Pecos area. Flash floods raged on the Pecos and Devils Rivers, causing some roads to be closed. More than 6 in. of rain fell on the Chisos Basin of Big Bend National Park.	Bomar, 1983a, p. 88–90		X
Tropical Storm Danielle, Sept. 5–10, 1980, Central and East Texas	Tropical storm Danielle produced torrential rains over a large part of Texas. Jefferson and Orange Counties had 12–16 in. of rain producing floodwaters that damaged about 900 homes, 175 businesses, and hundreds of automobiles at a cost of $3 million. In Kimble County, downpours of 25 in. caused massive flooding along the Llano River. Kimble, Mason, Menard, and Llano Counties had damages totaling $20 million. The San Angelo area in Tom Green County had 5–9 in. of rain. The effects of Danielle were felt as far west as Big Bend National Park, where 4–8 in. fell.	Bomar, 1983a, p. 88–94		X
Storm of Sept. 24–29, 1980, North, West, and East Texas	Rains of 8–9 in. fell on most of Texas. Particularly hard hit were Fisher, Mitchell, Nolan, and Scurry Counties, where damages were an estimated $2.2 million.	Bomar, 1983a, p. 50–52		X
Storm of May 1–4, 1981, South Texas	Heavy thunderstorms produced rains of 2–5 in. on much of the southeastern one-half of the State. Houston Hobby Airport recorded 9.48 in. during 24 hours May 3. San Jacinto Dam recorded 8.53 in.	Bomar, 1982, p. 15–18		X
Storm of May 24–25, 1981, Austin	A short-duration, intense rainfall caused the worst flooding since 1935 on many of the small watersheds in and around Austin. The rainfall began at 9:30 p.m. May 24 and ended shortly before midnight May 25. Some locations had more than 10 in. of rain during 4 hours. Thirteen people drowned in flash flooding, and property damage was reported at $35.5 million.	Massey and others, 1982; Moore and others, 1982		X
Storm of Aug. 31, 1981, southeast and south-central Texas	Heavy storms caused considerable flooding in more than a dozen counties in southeastern Texas from Brooks County in southern Texas to as far north as Caldwell and Bastrop Counties. About 20 in. was recorded on the Lavaca River Basin. Karnes City in Karnes County had 16.29 in. of rain during a 24-hour period. Unofficial totals were as much as 19 and 21 in. in other parts of the State. Flash flooding from the rains killed five people and caused millions of dollars in damages.	Bomar, 1982		X
Storm of Oct. 10–14, 1981, north-central Texas and south-central Oklahoma	The storm extended in a southwest to northeast direction from near Abilene to near McAlester, Okla. Max. recorded rainfall was 23 in. during 34 hours about 5 mi north of Clyde, Tex. Numerous areas reported rains exceeding 10 in. Six lives were lost, and damages were about $115 million.	Buckner and Kurklin, 1984	E	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of Oct. 30–31, 1981, south-central Texas	Flood-producing rains extended along the coastline from Corpus Christi to Port O'Connor and straight northward from these two points for about 120 mi inland. Six storm centers in south-central Texas had 6–13 in. of rain. Max. recorded rainfall was 13.20 in. at La Grange in Fayette County.	National Oceanic and Atmospheric Administration, 1981	X
Storm of Feb. 18–21, 1982, southeast Texas	The storms dumped about 6 in. of rain in less than 3 hours at Harlingen. Nearby Adams Garden had 7.42 in. during 1 day. Damage to property was $250,000 in Cameron County. Heavy thunderstorms dumped 3–4 in. of rain on Karnes and Atascosa Counties Feb. 20.	Bomar, 1983b, p. 14–15	X
Storm of Feb. 24–26, 1982, south-central Texas	The storm produced 3–5 in. of rain between Corpus Christi and Matagorda from Feb. 25 until morning Feb. 26. Max. recorded rainfall was 6.17 in. at Point Comfort in Calhoun County. Floodwaters caused one drowning.	Bomar, 1983b, p. 16–17	X
Storm of May 11–14, 1982, North and East Texas	Rainfall totals for a 24-hour period ending May 13 were 13.02 in. at Trenton in Fannin County, 13.00 in. at Pilot Point in Denton County, and 12.60 in. at Bonham in Fannin County. Millions of dollars in damages were sustained.	Bomar, 1983b, p. 24	X
Hurricane Paul, Sept. 28–Oct. 1, 1982, Panhandle and Trans-Pecos	Residue from Paul caused 3-day rains over West Texas and the Panhandle. El Paso had 2 in. during a 12-hour period Sept. 30, a record intensity. Max. storm rainfall was 2.26 in. during the 24 hours ending Oct. 1 at Ysleta in El Paso County. In the Panhandle, Dalhart in Dallam County had 1.74 in.	Bomar, 1983b, p. 98–103	X
Hurricane Alicia, Aug. 17–19, 1983, Houston vicinity	Rainfall averaged 4–11 in. across the Houston area. Typical amounts were 5–9 in. Max. recorded rainfall was 10.75 in. on the northeast side of Houston.	Lambeth, 1983	X
Storm of Sept. 15, 1983, South Texas	Flash floods in several parts of South Texas resulted from 3–7 in. or more of rain Sept. 18–19. Flooding was widespread in Bexar County, where one person was killed. In the Houston area, three people drowned during the widespread flooding.	U.S. Geological Survey, 1985, p. 14	--
Storm of Oct. 18–20, 1983, southern High Plains	Record-breaking rainfall flooded Lubbock and many other areas around Lubbock. Several rainfall gages, including Lubbock, Brownfield, and Paducah, measured as much as 7 in. or more. Many other stations measured 5–7 in.	National Oceanic and Atmospheric Administration, 1983, p. 19	X
Storm of Dec. 10–11, 1983, East Texas	Heavy rains of as much as 10 in. caused local flooding in San Augustine County.	U.S. Geological Survey, 1985, p. 15	--
Storm of Sept. 16–19, 1984, southern Texas	Heavy rains, some exceeding 20 in., drenched the lower Rio Grande Valley. Cameron and Willacy Counties experienced the worst flooding since Hurricane Beulah in 1967. It was estimated that more than 50 percent of the eastern one-half of Cameron County was under water.	National Oceanic and Atmospheric Administration, 1984a, p. 20, 32	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Storm of Oct. 19, 1984, Jim Wells, Nueces, Refugio, and San Patricio Counties	Strong thunderstorms along a stationary front north of Corpus Christi produced heavy downpours Oct. 19 that resulted in serious flash flooding. Odem in San Patricio County had an unofficial total of 25 in. during a 3.5-hour period, making the event one of the largest depths for this duration in the United States.	National Oceanic and Atmospheric Administration, 1984b, p. 25	--
Storm of Oct. 25, 1984, north Houston	Heavy rains began about 7:00 a.m. in western Harris County and northern Fort Bend County. Houston Intercontinental Airport measured as much as 10 in. About 650 homes were flooded, and damage was an estimated $4.1 million.	National Oceanic and Atmospheric Administration, 1984b, p. 26	X
Storm of Dec. 31, 1984, south-central Texas	Heavy rain (as much as 6 in.) fell in Kimble and Kerr Counties, and as much as 9 in. fell in Real and Uvalde Counties. These rains caused widespread flash flooding and accompanying damages along tributaries of the Llano River and the headwaters of the Guadalupe, Frio, and Sabinal Rivers.	Moody and others, 1986	--
Storm of Apr. 27–28, 1985, North Texas	Intense thunderstorms covered most of North Texas during the late evening Apr. 27 and early morning Apr. 28. About 10 in. of rain fell 9:00 to 11:00 p.m. near Rockwall in Rockwall County. Eight people drowned as a result of driving into high waters.	Moody and others, 1986	--
Storm of May 15, 1985, Hidalgo County	In extreme southern Texas, 5–10 in. of rain May 15 caused extensive flooding in and around the town of Mission.	Moody and others, 1986	--
Storm of Oct. 9–10, 1985, Texas Plains	Rains on the Texas Plains were generally 2–4 in. and on parts of the eastern and southern Panhandle were slightly more than 6 in.	National Oceanic and Atmospheric Administration, 1985, p. 10	X
Storm of Nov. 11–12, 1985, southeastern Texas	Intense rains of 5–21 in. caused widespread flooding in a 10-county area bordering and west of Houston. Garwood in Colorado County recorded 21 in. The bridge over San Bernard River on Highway 59 was under 4 ft of water. The most severely flooded areas were in Colorado County from south of Eagle Lake to the communities of Garwood and Lissie.	Moody and others, 1988, p. 18	--
Storm of Apr. 3–5, 1986, northeastern Texas	In Grayson County, 5–7 in. of rain in less than 2 hours caused severe flooding. Flooding in Sherman caused damages estimated at $1.3 million.	Moody and others, 1988, p. 21	--
Storm of May 24, 1986, Fort Worth	The storm produced winds as strong as 95 mi per hour, hail as large as 3-in.-diameter, and about 4 in. of rain during an hour. Wind, rain, and flood damages were estimated at about $2 million. Two people drowned when swept from their car after driving into a flooded underpass.	Moody and others, 1988, p. 22	--
Storm of June 4, 1986, San Antonio	San Antonio reported 6.5 in. during 24 hours. Other unofficial amounts of about 10 in. caused widespread flash flooding. Subsequent river flooding lasted for several days along Medina and San Antonio Rivers. Local damages were estimated at $3 million.	National Oceanic and Atmospheric Administration, 1986, p. 13	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks
Hurricane Bonnie, June 26–29, 1986, East Texas	Torrential rains of 6 in. or more caused widespread flooding, including about 150 mi along the downstream one-half of the Neches River. Ace in southern Polk County had 13 in. More than 23,000 people were evacuated from the Texas-Louisiana coastal area, where sustained wind and water damages were at least $1.5 million.	National Oceanic and Atmospheric Administration, 1986, p. 52	X
Storm of Oct. 4–5, 1986, southwestern Texas	In northern Val Verde County, 10–15 in. of rain Oct. 5 caused severe flooding on the Devils and Dry Devils Rivers. McCamey in southwestern Upton County reported 16.21 in. during 24 hours. One drowning occurred when a car was washed off a road.	Carr and others, 1990, p. 18	--
Storm of Feb. 6, 1987, extreme southern Texas	Torrential rains of 6–7 in. fell during a 2-hour period in parts of Brownsville in Cameron County.	Carr and others, 1990, p. 21	--
Storm of July 16–17, 1987, Hill Country	During the evening July 16 and early morning July 17, storms produced flash floods across seven counties north and northwest of San Antonio. Heavy rains in Kerrville began at 4:00 a.m., and by dawn 3.3 in. had fallen. As much as 11.50 in. of rain fell at Hunt, with 5–10 in. on surrounding areas. Flooding caused tragic loss of life when a church bus filled with 39 teenagers and 4 adults was swept into a raging river. Ten persons drowned and the remaining 33 were rescued by helicopter.	National Oceanic and Atmospheric Administration, 1987, p. 14–16	--
Storm of May 11, 1988, near Paint Rock on Concho River	Intense rainfall of 2–3 in. caused a flash flood on the Concho River near Paint Rock. In nearby San Angelo, floodwaters swept away one person.	Paulson and others, 1991, p. 23	--
Storm of June 1, 1988, north-central Texas	Intense thunderstorms during the night June 1 dumped more than 10 in. on Comanche County. The storm caused flooding in more than a dozen counties. Damages were estimated at $3–5 million.	Paulson and others, 1991, p. 23	--
Hurricane Gilbert, Sept. 16–18, 1988, South Texas	Heavy rain caused by remnants of Gilbert began during the morning Sept. 16 in South Texas. Heaviest report of rainfall was 8.71 in. Sept. 16–18 at Lamar in Aransas County. In the lower Rio Grande Valley, 6.40 in. fell at Adams Garden.	National Oceanic and Atmospheric Administration, 1988, p. 41–42	--
Storm of Mar. 28–29, 1989, East Texas	Heavy rainfall from strong thunderstorms fell on East Texas. Rain gages recorded 14.16 in. at Longview, 12.17 in. at Atlanta, and 11.05 in. at Henderson. Flooding caused the death of one man and estimated damages of $10–16 million.	Griffiths and others, 1990, p. 31–32	X
Storm of May 16–19, 1989, parts of upper coast and North Texas	Widespread rains caused flooding that resulted in five deaths and total damages of about $50 million. Houston Intercontinental Airport recorded 10.28 in. May 17–18. Spring recorded more than 15 in. during a 24-hour period May 17–18.	Griffiths and others, 1990, p. 38–40	X
Tropical Storm Allison, June 26–July 7, 1989, southwest Texas	Tropical Storm Allison caused torrential rains of 10–15 in. from Houston to Beaumont. Houston Intercontinental Airport recorded 10.34 in. during 24 hours. Heavy rains caused major flooding that was responsible for three deaths and estimated damages of $60 million.	Griffiths and others, 1990, p. 42–44	X

Footnotes at end of table.

Table 1. Descriptions of notable and extreme storms in Texas—Continued

Event (chronological order)	Storm narrative	References	Remarks	
Storm of Apr. 25, 1990, Brownwood in Brown County	As much as 16 in. of rain fell during a 24-hour period. Brownwood Airport measured 16.05 in. Flooding was the worst in the Brownwood area since 1954. About 1,300 people were evacuated from low-lying areas of Brown County. Floods caused millions of dollars in damages.	Paulson and others, 1993, p. 26	--	
Storm of May 1–7, 1990, North Texas	Heavy rainfall May 1–4 produced major flooding in North Texas during early May. Rainfall was 5–9 in. on north-central sections of North Texas and 2–5 in. elsewhere.	National Oceanic and Atmospheric Administration, 1990		X
Storm of Dec. 18–23, 1991, Central Texas	Record-breaking peak discharges were recorded at several streamflow-gaging stations in a large area of Central Texas Dec. 18–23. Daily rainfall totals exceeded 4 in. at numerous locations. Max. recorded 24-hour rainfall was 8.6 in., and max. recorded 12-hour rainfall was 7.3 in., both at Evant in Coryell County. Medina had 15.59 in. during 5 days. Ten deaths were attributed to the flooding. The Federal Emergency Management Agency dispensed about $43 million.	Hejl and others, 1996; Asquith and Slade, 1995[2]		X
Tropical storm of Oct. 15–19, 1994, southeast Texas	A tropical, mid-latitude rainfall of unusual proportion on a 30- to 35-county area of southeast Texas resulted in catastrophic flooding. The intense rainfalls totaled more than 25 in. at several locations and more than 8 in. on much of southeast Texas. Flooding caused 18 deaths and millions of dollars in damage.	National Oceanic and Atmospheric Administration, 1995	E	X

[1] Unpublished maps on file at the U.S. Army Corps of Engineers, Fort Worth, Texas.
[2] Flooding associated with this storm is recognized as significant in Asquith and Slade, 1995.
[3] Unpublished data on file at the U.S. Geological Survey, Austin, Texas.

Table 2. Summary of notable and extreme storms in Texas

Time period	Number of storms	
	Notable storms (includes extreme storms)	Extreme storms (E, in table 1)
1899–1910	9	2
1911–20	21	0
1921–30	20	1
1931–40	24	9
1941–50	21	2
1951–60	33	5
1961–70	25	1
1971–80	18	2
1981–94	38	2
Totals	[1]209	24

[1] Total does not equal 213 (total of storms in table 1) because 4 storms before 1899 are not included.