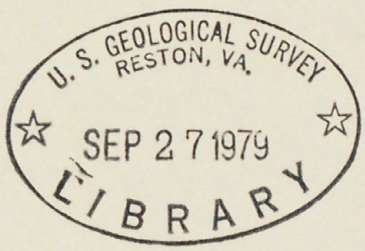
Annual Compilation and Analysis of Hydrologic Data for Pin Oak Creek, Trinity River Basin Texas, 1971

U. S. GEOLOGICAL SURVEY
WATER RESOURCES DIVISION



Prepared in cooperation with the Texas Water Development Board

Annual Compilation and Analysis of Hydrologic Data for Pin Oak Creek, Trinity River Basin Texas, 1971

By B.B. Hampton

U.S. GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
Texas District Open-File Report
I.D. Yost, District Chief

Prepared in cooperation with the Texas Water Development Board

September 1973

CONTENTS

ILLUSTRATIONS

TABLES

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR PIN OAK CREEK, TRINITY RIVER BASIN, TEXAS 1971

By

B. B. Hampton

INTRODUCTION

History of Small Watershed Projects in Texas

The U.S. Soil Conservation Service is actively engaged in the installation of flood- and soil-erosion reducing measures in Texas under the authority of "The Flood Control Act of 1936 and 1944" and "Watershed Protection and Flood Prevention Act" (Public Law 566), as amended. The Soil Conservation Service has found a total of approximately 3,500 floodwater-retarding structures to be physically and economically feasible in Texas. As of September 30, 1971, 1,496 of these structures had been built.

This watershed-development program will have varying but important effects on the surface- and ground-water resources of river basins, especially where a large number of the floodwater-retarding structures are built. Basic hydrologic data under natural and developed conditions are needed to appraise the effects of the structures on the yield and mode of occurrence of runoff.

Hydrologic investigations of these small watershed study areas were begun by the U.S. Geological Survey in 1951 and are now being made in 12 areas (fig. 1). These investigations are being made in cooperation with the Texas Water Development Board, the Soil Conservation Service, the San Antonio River Authority, the city of Dallas, and the Tarrant County Water Control and Improvement District No. 1. The 12 study areas were chosen to sample watersheds having different rainfall, topography, geology, and soils. In five of the study areas (North, Little Elm, Mukewater, Little Pond-North Elm, and Pin Oak Creeks), streamflow and rainfall records were collected prior to construction of the floodwater-retarding structures, thus affording the opportunity for analyses of the conditions "before and after" development. Structures have now been built in four of these study areas. A summary of the development of the floodwater-retarding structures in each study area as of September 30, 1971, is shown in table 1.

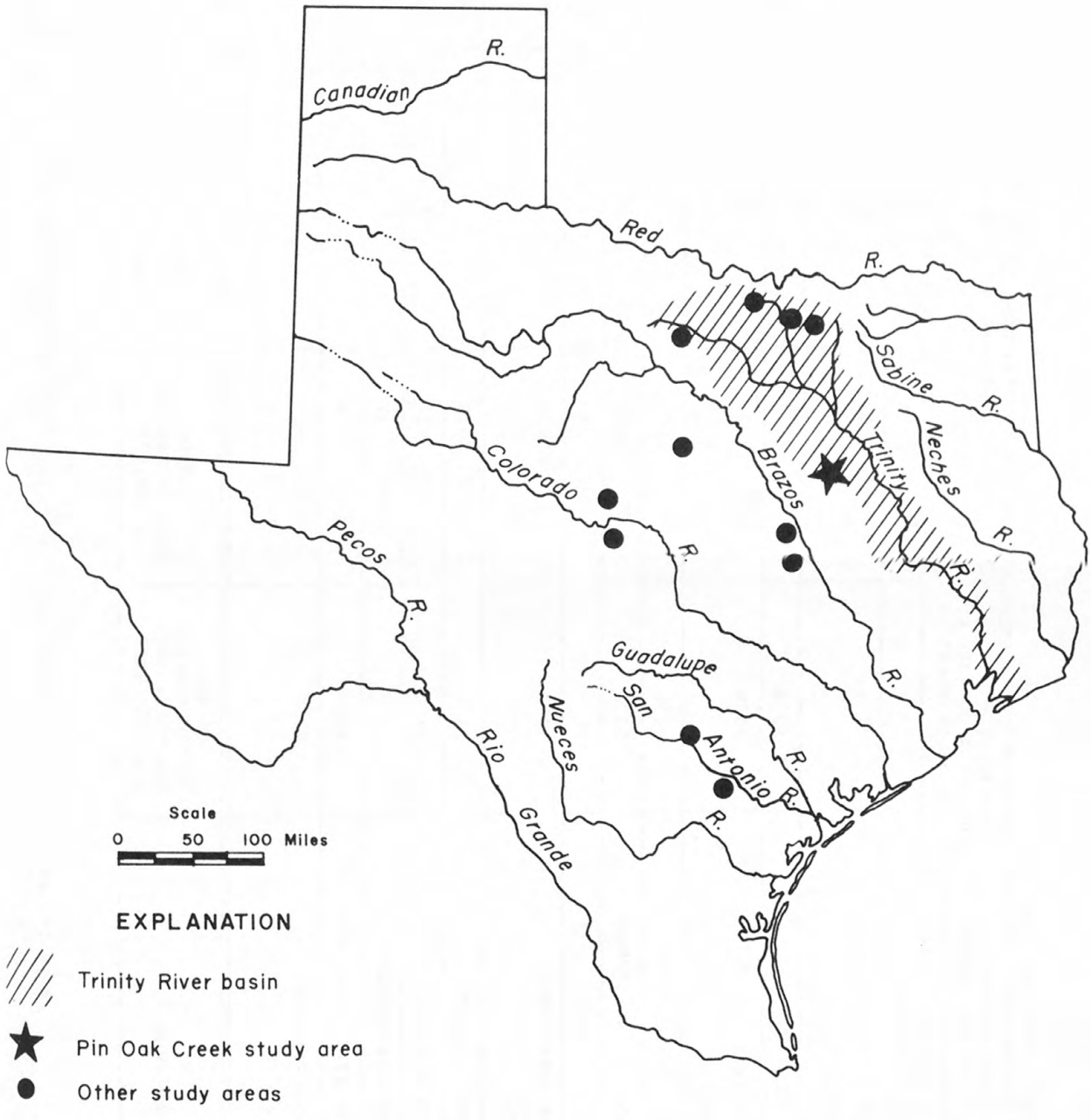


FIGURE 1.–Location of the Pin Oak Creek study area

Table 1.--Small watershed study areas in Texas as of September 30, 1971

Watershed	Drainage area above stream-gaging station (sq mi)	Hydrologic data collection began	Floodwater-retarding structures above stream-gaging station	Period the structures were built
Trinity River basin:				
North Creek near Jacksboro	21.6	Aug. 1956	3	1970-71
Elm Fork Trinity River near Muenster	46.0	July 1956	14	1954-57, 63
Little Elm Creek near Aubrey	75.5	June 1956	16	1966, 70-71
Honey Creek near McKinney	39.0	July 1951	13	1951-57, 69
Pin Oak Creek near Hubbard	17.6	Sept. 1956	6	1962-63, 65
Brazos River basin:				
Green Creek near Alexander	46.1	Oct. 1954	8	1954-56
Cow Bayou at Mooreville	85.0	Sept. 1954	26	1955-58, 64-65
1/Little Pond Creek at Burlington	22.2	Oct. 1962	None	-
1/North Elm Creek near Cameron	48.6	Oct. 1962	None	-
Colorado River basin:				
Mukewater Creek at Trickham	70.0	Aug. 1951	6	1961-62, 65
Deep Creek near Mercury	a/43.9	June 1951	5	1951-53
San Antonio River basin:				
Calaveras Creek near Elmendorf	77.2	Aug. 1954	c/ 7	1954-58
Escondido Creek at Kenedy	b/72.4	July 1954	10	1954-58

1/ Adjacent watersheds; considered as one study area.
a/ 8.31 sq mi above Dry Prong Deep Creek near Mercury not included in this total.
b/ 8.43 sq mi above Escondido Creek subwatershed No. 11 (Dry Escondido Creek) near Kenedy not included in this total.
c/ Six of the floodwater-retarding structures above Calaveras Creek near Elmendorf are in part of a 65.0 sq mi area controlled by Calaveras Creek Dam.

Objectives of the Texas Small Watershed Projects

The purpose of these investigations is to collect sufficient data to meet the following objectives:

1. To determine the net effect of floodwater-retarding structures on the regimen of streamflow at downstream points.

2. To determine the effectiveness of the structures as groundwater recharge facilities.

3. To determine the effect of the structures on the sediment yield at downstream points.

4. To develop relationships between maximum rates and/or volumes of runoff with rainfall in small natural watersheds.

5. To develop a stream-system model for basins with floodwater-retarding structures.

6. To determine the minimum instrumentation necessary for estimating the flood hydrographs below a system of structures, as needed for downstream water-management operation.

Purpose and Scope of this Basic-Data Report

This report, which is the twelfth in a series of basic-data reports published annually for the Pin Oak Creek study area, contains the rainfall and runoff data collected during the 1971 water year for the 17.6-square-mile area above the stream-gaging station Pin Oak Creek near Hubbard, Texas. The locations of floodwater-retarding structures (ungaged) and hydrologic-instrument installations in the Pin Oak Creek study area are shown on figure 2.

The investigation is scheduled to continue through a period of both above- and below-normal precipitation to define the various factors used in the analyses of rainfall-runoff relationships before and after floodwater-retarding structures were built.

To facilitate the publication and distribution of this report at the earliest feasible time, certain material contained herein does not conform to the formal publication standards of the U.S. Geological Survey.

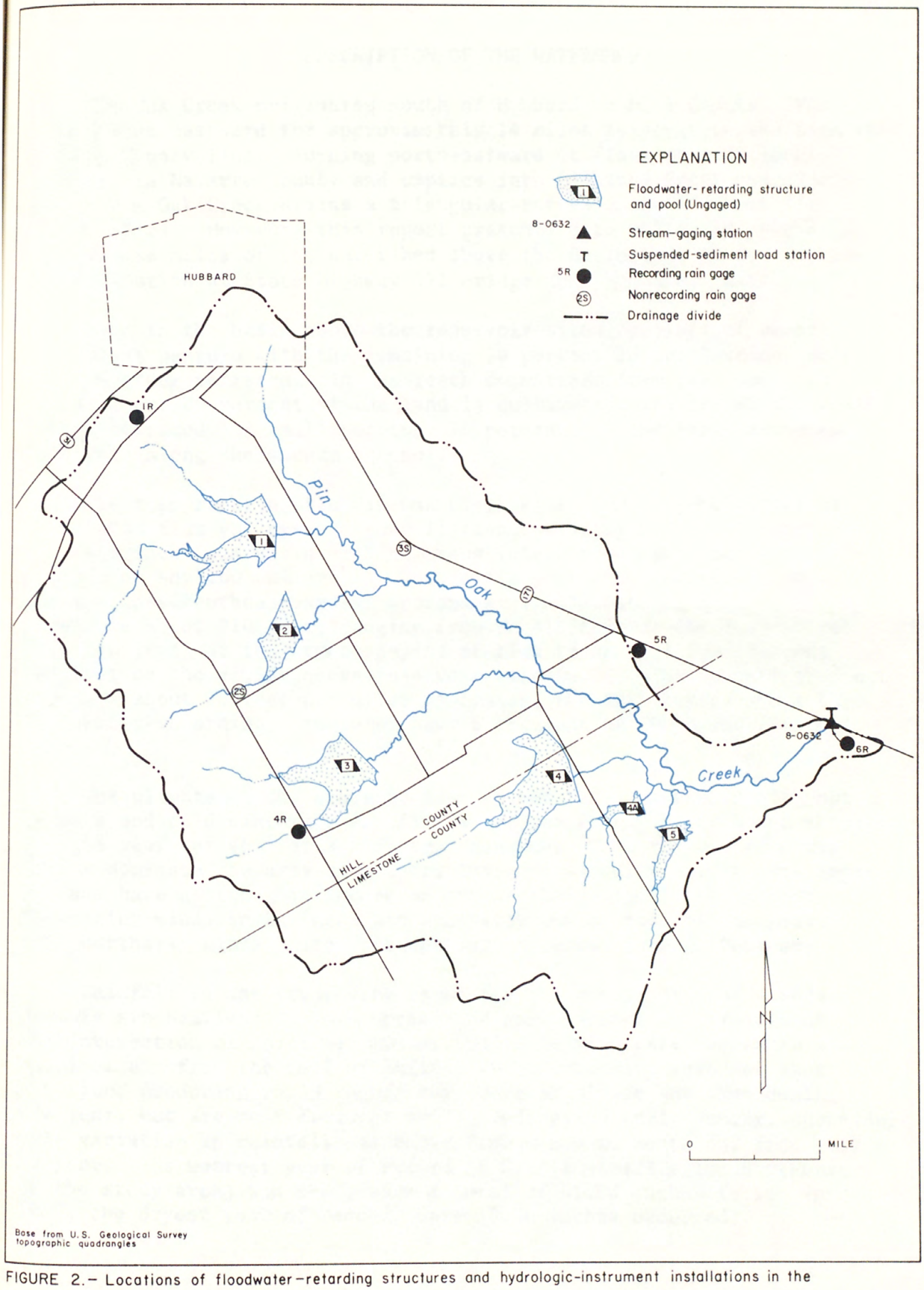


FIGURE 2.– Locations of floodwater-retarding structures and hydrologic-instrument installations in the Pin Oak Creek study area

DESCRIPTION OF THE WATERSHED

Pin Oak Creek originates south of Hubbard in Hill County. The creek flows eastward for approximately 14 miles adjacent to the Limestone-Navarro County line. Turning northeastward it flows an additional 14 miles in Navarro County and empties into Richland Creek near Richland. Pin Oak Creek drains a triangular-shaped basin of about 171 square miles. However, this report presents data collected on the 17.6 square miles of the watershed above the Geological Survey stream-gaging station at State Highway 171 bridge near Hubbard, Texas.

Land in the basin above the reservoir sites consists of about 70 percent pasture with the remaining 30 percent in cultivation, much of it contour terraced. In the reach downstream from the reservoir sites, about 80 percent of the land is cultivated with 1/2 of the cultivation terraced. A small portion, 15 percent, of the land is wooded, primarily along the stream channel.

The topography of the Pin Oak Creek watershed is gently rolling with broad flat valleys and some flattened hilltop areas. Primarily the watershed is a plain with numerous intermittent streams which have cut narrow shallow valleys in a dendritic pattern. The topographic plain slopes southeastward at approximately 17 feet per mile. Maximum relief is about 210 feet, ranging from an altitude of 460 feet above mean sea level at the stream-gaging station to an altitude of about 670 feet on the divide above reservoir site No. 1. The channel gradient averages about 20 feet per mile; generally, the tributaries above the floodwater-retarding structures have a gradient of 60 to 100 feet per mile.

The climate of the study area is temperate and subhumid with hot summers and mild winters. Rainfall is fairly evenly distributed throughout the year, except for a midsummer minimum. Tropical maritime air masses dominate the area almost completely from early May to late September and have a strong influence on the weather during other seasons. Prevailing winds in the area are southerly during most of the year, with northerly winds quite frequent from November through February.

Rainfall in the study area is mostly the result of thundershowers. Amounts are heaviest in late spring and early summer as a result of the interaction of polar air masses colliding with warm, moisture laden tropical air from the Gulf of Mexico. High-intensity rains of short duration, producing rapid runoff may occur at almost any time during the year, but are most frequent in the spring and early summer. Considerable variation in rainfall may occur from month to month and from year to year. The wettest year of record at Corsicana (28 miles northeast of the study area) was 1957, when a total of 61.50 inches fell. In 1917, the dryest year of record, only 19.36 inches occurred.

FLOODWATER-RETARDING STRUCTURES

Five floodwater-retarding structures in the study area were built during the 1963 water year, and one was completed in the 1965 water year. These six structures (sites 1, 2, 3, 4, 4A, and 5) have a combined total capacity of 3,480 acre-feet at the emergency spillway crests and partly control runoff from 9.68 square miles of the 17.6-square-mile area above the stream-gaging station. Pertinent information relating to each structure is given in table 2.

HYDROLOGIC INSTRUMENTS

Instruments to collect rainfall, runoff, and sediment data in the Pin Oak Creek study area consist of a network of rain gages and a stream-gaging station downstream from the floodwater-retarding structures. No instrumentation has been installed on the pool sites, and none is anticipated. Location of instruments presently in operation is shown on figure 2.

Four recording and two nonrecording rain gages are located in the study area to determine the amount and intensity of rainfall. The rain gages were located to give the best geometric coverage of the study area. Basin rainfall is computed as the arithmetic average of the six gages. Daily rainfall observed at the nonrecording gages is distributed to storm periods on the basis of the recorded rainfall.

The stream-gaging station, Pin Oak Creek near Hubbard, continuously records the stage, which together with measurements of streamflow are used to compute runoff from the study area. Streamflow records at this gage began September 1, 1956.

SUMMARY OF DATA FOR THE 1971 WATER YEAR

Average rainfall over the study area for the 1971 water year was 19.78 inches, or 53 percent of the long-term normal (1931-60) rainfall of 37.06 inches recorded by the National Weather Service at Corsicana (28 miles northeast). Rainfall was scattered throughout the year with every month receiving some rainfall. The monthly rainfall totals ranged from 0.24 inch in January to 3.84 inches in July. The yearly mean discharge at the stream-gaging station Pin Oak Creek near Hubbard was 0.27 cfs (cubic feet per second), compared with the 15-year (1957-71) average of 10.9 cfs. The annual runoff at the stream-gaging station was 193 acre-feet, or 0.21 inches, which represents 1 percent of the total rainfall.

Table 2.--Floodwater-retarding structure data, Pin Oak Creek study area.

Site number	Drainage area (sq mi)	Date dam completed	Capacity, in acre-feet		
			Total	Floodwater-retarding pool	Sediment pool
1	2.66	April 1963	836	769	67
2	.99	April 1963	354	303	51
3	2.13	April 1963	791	641	150
4	2.39	November 1964	943	744	199
4A	.51	December 1962	165	111	54
5	1.00	December 1962	391	283	108

A storm event is defined as a period of rainfall separated by at least 6 hours from other rainfall. Storms are selected for detailed rainfall-runoff computations on the basis of rainfall totals and distribution, the peak discharge produced from the rainfall at the stream-gaging station, and the assurance of good rainfall and runoff records for the storm periods selected.

During the 1971 water year, no storm periods were selected for detailed computations and analyses. Below-normal rainfall for the year did not produce any significant runoff events.

C O M P I L A T I O N A N D A N A L Y S I S O F D A T A

08063200 Pin Oak Creek near Hubbard, Tex.

LOCATION.--Lat 31°48'01", long 96°43'02", Limestone County (revised), on right bank 85 ft downstream from bridge on State Highway 171, 5.8 miles southeast of Hubbard, and 11 miles upstream from Elm Creek.

DRAINAGE AREA.--17.6 sq mi.

PERIOD OF RECORD.--September 1956 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,240.97 ft above mean sea level.

AVERAGE DISCHARGE.--15 years, 10.9 cfs (8.41 inches per year, 7,900 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 93 cfs Oct. 23 (gage height, 3.51 ft); no flow for many days.
Period of record: Maximum discharge, 4,340 cfs Aug. 24, 1958 (gage height, 13.86 ft); no flow at times each year.
Maximum stage since at least 1900, about 17 ft in August 1919, from information by local resident.

REMARKS.--Records good. Since 1964, flow from 9.68 sq mi above this station has been partly controlled by six floodwater-retarding structures with a total combined capacity of 3,480 acre-ft below the flood-spillway crests, of which 2,850 acre-ft is floodwater-retarding capacity and 630 acre-ft is sediment-pool capacity. The capacity in these pools allocated to sediment storage will be used for conservation storage until eliminated by sedimentation. Three recording and two standard rain gages are located in the basin above the station, and one recording rain gage is located at the station. Water-quality records for the current year are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1970 TO SEPTEMBER 1971

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.5	.02	0	.11	.08	.08	.01	0			0	.02
2	.75	.01	0	.04	.06	.12	.01	0			0	.03
3	.51	.01	0	.07	.06	.10	.01	0			0	.14
4	.24	0	0	.10	.25	.04	.01	0			.06	.01
5	.05	0	0	.06	.21	.03	0	0			1.9	0
6	.02	.12	0	.03	.25	.04	0	0			.07	0
7	.01	1.3	0	.03	.22	.02	0	.38			.01	0
8	2.4	.27	0	.04	.11	.02	0	.02			0	0
9	1.3	.87	0	.07	.09	.02	0	.01			0	0
10	.11	2.0	0	.08	.07	.02	0	.70			0	0
11	.15	.53	0	.10	.07	.02	0	.62			0	0
12	4.9	.13	0	.11	.14	.03	0	.19			.18	0
13	.79	.15	0	.07	.09	.04	0	.03			2.6	0
14	.18	.27	0	.11	.07	.04	0	.01			2.9	0
15	.04	.15	0	.11	.13	.03	0	.01			.58	0
16	.01	.10	.06	.08	.42	.02	0	0			.07	0
17	.01	.05	.10	.09	.10	.01	.13	0			.01	0
18	.01	.03	.06	.12	.05	.02	2.7	0			0	0
19	0	.02	.05	.09	.08	.06	.33	0			0	0
20	0	.01	.07	.05	.13	.04	.79	0			0	0
21	0	.01	.12	.05	.16	.02	.94	0			0	0
22	0	.01	.21	.08	.09	.02	.27	0			0	0
23	22	0	.10	.10	.08	.04	.08	0			0	0
24	13	0	.06	.10	.05	.03	.03	0			0	.43
25	4.8	0	.05	.09	.10	.04	.01	0			0	4.0
26	3.4	0	.02	.08	1.2	.03	0	0			0	1.3
27	1.7	0	.03	.07	.19	.07	0	0			0	.26
28	.53	0	.03	.06	.06	.07	0	0			0	.03
29	.20	0	.05	.08	------	.09	0	0			0	.01
30	.07	0	.11	.08	------	.04	0	0			0	0
31	.03	------	.80	.12	------	.02	------	0	------		.12	------
TOTAL	58.71	6.06	1.92	2.47	4.61	1.27	5.32	1.97	0	0	8.50	6.23
MEAN	1.89	.20	.062	.080	.16	.041	.18	.064	0	0	.27	.21
MAX	22	2.0	.80	.12	1.2	.12	2.7	.70	0	0	2.9	4.0
MIN	0	0	0	.03	.05	.01	0	0	0	0	0	0
CFSM	.11	.01	.004	.005	.009	.002	.01	.004	0	0	.02	.01
IN.	.12	.01	.004	.005	.009	.002	.01	.004	0	0	.02	.01
AC-FT	116	12	3.8	4.9	9.1	2.5	11	3.9	0	0	17	12

CAL YR 1970 TOTAL 3,028.88 MEAN 8.30 MAX 369 MIN 0 CFSM .47 IN 6.40 AC-FT 6,010
WTR YR 1971 TOTAL 97.06 MEAN .27 MAX 22 MIN 0 CFSM .02 IN .21 AC-FT 193

9-220 c
(Oct. 1951)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sheet 1 of _____ Sheets

08-0632.00

Monthly and ~~annual discharge~~ yearly average rainfall, in inches, of Pin Oak Creek ~~River~~ at near Hubbard, Texas

[Drainage area, 17.6 square miles]

16—26489-5 U. S. GOVERNMENT PRINTING OFFICE

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL	
			Station established September 1, 1956											
1956	-	-	-	-	-	-	-	-	-	-	-	0	-	
1957	-	-	-	1.76	2.55	4.26	16.09	8.53	3.39	0.03	0.66	5.59	-	
1958	5.36	4.02	0.83	2.36	1.95	1.70	3.97	3.66	2.11	1.16	9.16	4.67	40.95	
1959	2.60	2.10	1.20	.37	2.90	1.23	4.66	5.98	9.01	3.12	1.24	1.11	35.52	
1960	8.41	1.51	4.76	2.23	1.96	1.58	3.01	2.45	4.46	.20	5.95	1.35	37.87	
1961	6.48	1.90	7.87	6.07	4.65	3.17	1.94	2.02	9.69	1.49	.45	4.24	49.97	
1962	3.02	5.62	2.90	.86	2.94	1.07	5.54	2.80	5.96	.14	.10	3.78	34.73	
1963	1.06	2.22	.98	.58	.71	.41	3.71	2.29	1.71	.12	1.65	1.27	16.71	
1964	.31	3.36	1.21	2.76	1.68	2.13	1.37	1.42	1.31	.22	2.10	3.56	21.43	
1965	.72	2.27	1.00	2.86	3.97	3.29	.97	13.10	1.07	.11	1.84	4.36	35.56	
1966	1.97	3.24	1.88	1.66	3.00	1.79	14.80	1.62	.81	1.31	5.64	4.92	42.64	
1967	.19	.08	1.22	.47	.75	1.44	5.31	3.46	4.38	1.70	1.38	7.52	27.90	
1968	6.17	4.10	4.10	3.72	2.74	3.06	6.98	8.72	7.48	1.34	.28	3.26	51.95	
1969	1.23	5.21	.74	1.21	2.55	3.90	5.46	3.94	.33	.09	2.72	1.04	28.42	
1970	5.66	2.54	4.07	.91	4.43	4.59	2.40	1.83	.20	1.07	.79	10.53	39.02	
1971	2.66	.42	.96	.24	1.26	.45	2.55	1.17	1.05	3.84	2.86	2.32	19.78	

S-220 c
(Oct. 1961)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

08-0632.00

yearly mean

Monthly and ~~annual~~ discharge, in cfs, of Pin Oak Creek ~~River~~ at near Hubbard, Texas

[Drainage area, 17.6 square miles]

16—26489-5 U. S. GOVERNMENT PRINTING OFFICE

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL	
			Station established September 1, 1956											
1956												0	-	
1957	0	29.2	0.21	0.74	7.11	12.7	166	57.9	23.2	0	0	0.19	24.6	
1958	10.5	5.69	0	.93	1.09	.14	4.09	19.4	0	0	37.5	10.9	7.59	
1959	1.60	.71	.61	.19	13.4	.69	18.4	26.3	72.7	1.30	0	0	11.2	
1960	30.8	1.41	25.4	16.2	3.03	2.11	3.70	2.27	4.36	0	4.43	0	7.89	
1961	16.1	1.75	72.4	75.1	43.2	10.5	3.70	.35	52.6	.29	0	1.94	23.1	
1962	.18	31.8	12.3	.41	9.60	1.84	25.6	2.72	13.3	.003	0	.87	8.09	
1963	0	0	0	0	0	0	.74	.07	.05	0	0	0	.07	
1964	0	0	0	.003	0	.17	0	0	0	0	0	1.30	.12	
1965	0	0	0	1.84	6.14	12.3	8.10	99.3	4.18	0	0	.30	11.1	
1966	.001	2.59	.40	.27	7.21	.62	114	37.8	.04	0	1.42	9.54	14.3	
1967	.22	0	0	0	0	.003	11.5	2.02	26.2	0	0	11.1	4.20	
1968	27.4	45.3	28.3	30.3	17.3	26.3	55.1	98.3	68.1	7.17	.28	0	33.6	
1969	0	.90	1.27	.047	6.64	16.2	35.2	30.2	.032	0	0	0	7.53	
1970	1.77	.49	14.0	4.42	24.1	43.5	1.38	.21	.014	0	0	25.1	9.50	
1971	1.89	.20	.062	.080	.16	.041	.18	.064	0	0	.27	.21	.27	

Form TX-88
Rev. 10-69

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA PIN OAK CREEK — 1971 WATER YEAR

	RAIN GAGES						
Date of storm	1-R	2-S	3-S	4-R	5-R	6-R	Average
Oct. 8, 1970	0.77	0.73	0.83	0.66	0.37	0.83	
11-12	.85	.74	.92	.85	.80	.72	
18	.08	.10	.10	.10	.10	.05	
23	1.05	1.15	1.07	1.10	1.00	1.00	
October totals	2.75	2.72	2.92	2.71	2.27	2.60	2.66
Nov. 13, 1970	.38	.45	.55	.40	.35	.40	
November totals	.38	.45	.55	.40	.35	.40	.42
Dec. 15, 1970	.20	.17	.23	.26	.23	.22	
20	.21	.24	.24	.18	.19	.12	
30	.58	.61	.55	.53	.50	.47	
December totals	.99	1.02	1.02	.97	.92	.81	.96
1970 Calendar year total							30.79

Form TX-88
Rev. 10-69

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA PIN OAK CREEK — 1971 WATER YEAR

Date of storm	RAIN GAGES 1-R	2-S	3-S	4-R	5-R	6-R	Average
Jan. 3, 1971	0.12	0.24	0.23	0.25	0.18	0.10	
5	.05	0	0	.10	.02	.07	
6	0	0	0	0	0	.03	
8	0	0	0	0	0	.03	
January totals	.17	.24	.23	.35	.20	.23	0.24
Feb. 2, 1971	.05	.05	.05	.05	.05	.05	
4	.37	.25	.23	.15	.17	.29	
8	0	0	0	0	0	.07	
18	.40	.27	.20	.10	.15	.05	
21	.17	.31	.18	.19	.10	.08	
25	.50	.63	.67	.65	.65	.45	
February totals	1.49	1.51	1.33	1.14	1.12	.99	1.26
Mar. 2, 1971	.08	.06	.07	.13	.23	.31	
12	.03	.05	.05	.05	.02	0	
18	.10	.12	.08	.30	.33	.14	
25	.10	.12	.06	.08	.10	.10	
March totals	.31	.35	.26	.56	.68	.55	.45

Form TX-88
Rev. 10-69

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA PIN OAK CREEK — 1971 WATER YEAR

	RAIN GAGES						
Date of storm	1-R	2-S	3-S	4-R	5-R	6-R	Average
Apr. 16, 1971	0.87	0.91	0.71	0.60	0.72	0.62	
17	.25	.25	.25	.25	.33	.21	
17-18	.65	.75	.79	.80	.65	.57	
20	.75	.68	.63	.73	.50	.47	
29	.28	.24	.27	.25	.20	.13	
April totals	2.80	2.83	2.65	2.63	2.40	2.00	2.55
May 6, 1971	.23	.10	.38	.11	.55	.24	
8-9	.13	.13	.15	.08	.10	.10	
10	.15	.56	.41	.58	.65	1.02	
20	.18	.10	.12	0	0	0	
28	.05	.25	.10	.11	.08	0	
31	.35	0	0	0	0	0	
May totals	1.09	1.14	1.16	.88	1.38	1.36	1.17
June 19, 1971	.08	.28	0	.38	0	0	
21	.60	.62	.36	.30	.10	.08	
27	.20	0	0	0	0	0	
28	1.05	.73	.63	.55	.25	.10	
June totals	1.93	1.63	.99	1.23	.35	.18	1.05

Form TX-88
Rev. 10-69

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA PIN OAK CREEK — 1971 WATER YEAR

Date of storm	RAIN GAGES 1-R	2-S	3-S	4-R	5-R	6-R	Average
July 21, 1971	0.50	0.68	0.53	0.58	0.50	0.47	
23-24	2.06	2.07	2.05	1.57	1.60	1.41	
25	.67	.82	.80	.88	.85	.59	
27	.20	.22	.23	.14	.15	.18	
28-29	.77	.23	.52	.40	.43	.59	
30	.02	.13	.09	.04	.05	.02	
July totals	4.22	4.15	4.22	3.61	3.58	3.26	3.84
Aug. 2, 1971	.15	.18	.23	.12	(.20)	.09	
3	0	0	0	.08	0	0	
4	.80	.39	1.03	.38	.85	.82	
12-13	.40	0	.33	.36	.96	1.10	
13	0	.09	.29	.10	.86	.52	
14	0	0	.59	.25	.05	.10	
25	.57	.65	.31	.60	.20	.28	
26	0	0	0	0	0	.05	
30	.05	.69	.39	.60	1.00	.45	
August totals	1.97	2.00	3.17	2.49	4.12	3.41	2.86

() Estimated.

Form TX-88
Rev. 10-69

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA PIN OAK CREEK — 1971 WATER YEAR

Date of storm	RAIN GAGES 1-R	2-S	3-S	4-R	5-R	6-R	Average
Sept. 2, 1971	0.35	0.18	0.30	0.05	0.20	0.35	
22	.35	.45	.48	.42	.45	.39	
23	.20	.25	.12	.10	.15	.17	
24	1.00	1.27	1.80	1.68	1.40	1.79	
September totals	1.90	2.15	2.70	2.25	2.20	2.70	2.32
1971 water year total							19.78