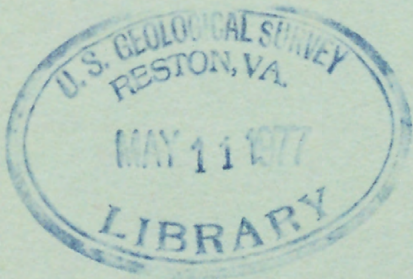


3chpo
72

Hydrologic Data for Pin Oak Creek, Trinity River Basin Texas, 1972

U. S. GEOLOGICAL SURVEY
Open-File Report



001
3chpo
72

*Prepared in cooperation with the Texas Water
Development Board*

Hydrologic Data for Pin Oak Creek, Trinity River Basin Texas, 1972

By B. B. Hampton

U. S. GEOLOGICAL SURVEY

Open-File Report



*Prepared in cooperation with the Texas Water
Development Board*

May 1974



Copies of this report may be obtained from
I. D. Yost, District Chief, U.S. Geological
Survey, Federal Building, 300 East 8th Street
Austin, TX 78701

CONTENTS

	Page
Introduction-----	3
History of small watershed projects in Texas-----	3
Objectives of the Texas small watershed projects-----	6
Purpose and scope of this basic-data report-----	7
Description of the watershed-----	7
Floodwater-retarding structures-----	9
Hydrologic instruments-----	11
Summary of data for the 1972 water year-----	11
Compilation of data-----	14
Pin Oak Creek near Hubbard, Tex.-----	15
Monthly and yearly average rainfall-----	16
Monthly and yearly mean discharge-----	17
Rainfall data summary-----	18
Storm of Dec. 8-10, 1971	
At stream-gaging station	
Runoff computations-----	21
Weighted-precipitation records-----	23
Hydrograph and mass curves-----	26

ILLUSTRATIONS

Figure 1.	Map showing the location of the Pin Oak Creek study area and other study areas-----	4
2.	Map showing the locations of floodwater-retarding structures and hydrologic-instrument installations in the Pin Oak Creek study area-----	8

TABLES

Table 1.	Small watershed study areas in Texas as of September 30, 1972-----	5
2.	Floodwater-retarding structure data, Pin Oak Creek study area-----	10
3.	Storm rainfall-runoff data, 1972 water year-----	13

HYDROLOGIC DATA FOR PIN OAK CREEK, TRINITY RIVER BASIN, TEXAS

1972

By

B. B. Hampton
U.S. Geological Survey

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, 1972, 1,551 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 six areas (fig. 1). Data collection in six study areas has been completed. 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, 1972, is shown in table 1.

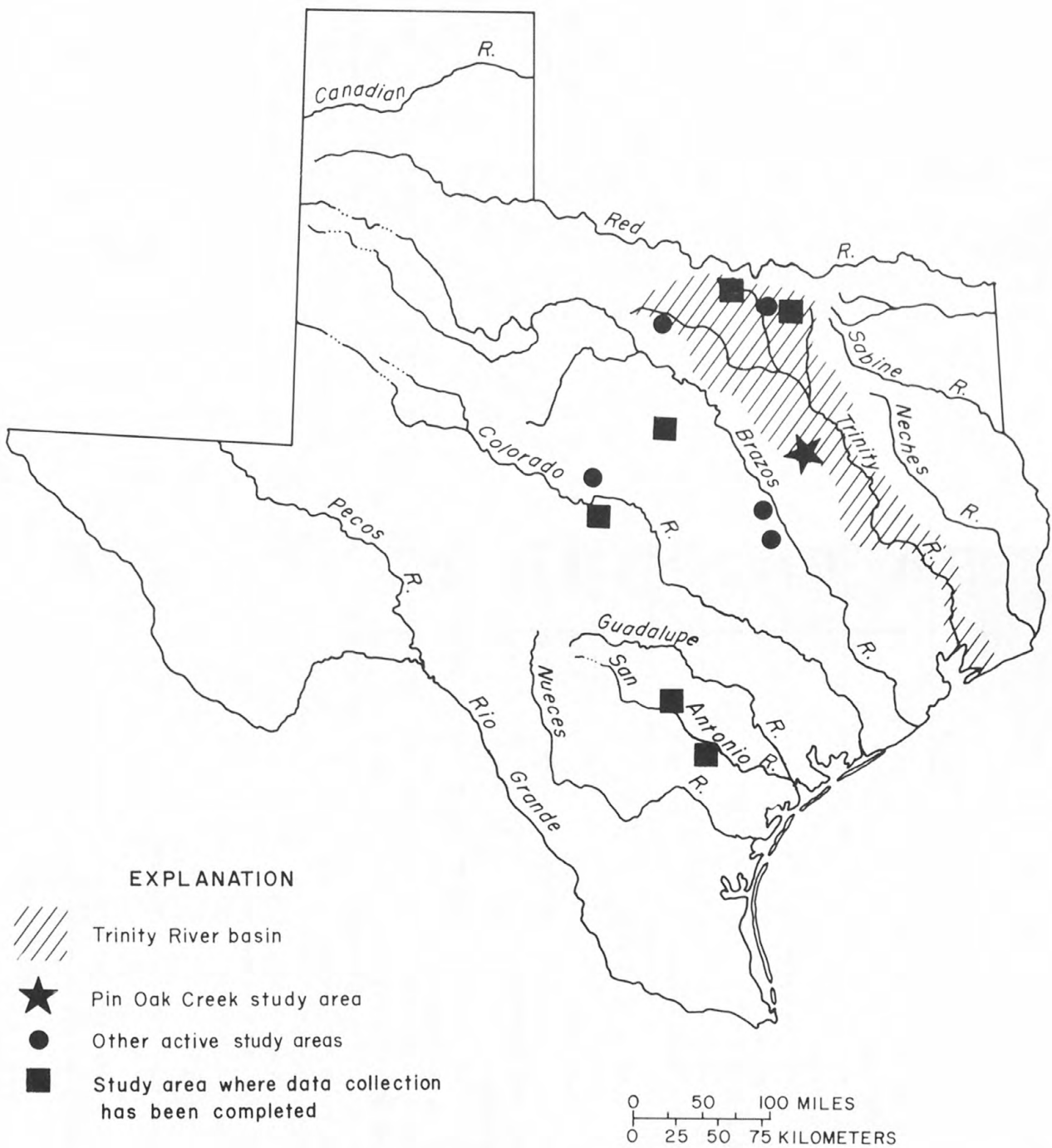


FIGURE 1.—Location of the Pin Oak Creek study area and other study areas

Table 1.--Small watershed study areas in Texas as of September 30, 1972

Watershed	Drainage area above stream- gaging station (mi. ²)	Data collection period	Floodwater-retarding structures above stream-gaging station	Period the structures were built
<u>Trinity River basin:</u>				
North Creek near Jacksboro	21.6	Aug. 1956 to	3	1970-72
Elm Fork Trinity River near Muenster	46.0	July 1956 to Sept. 1971	14	1954-57, 63
Little Elm Creek near Aubrey	75.5	June 1956 to	16	1966, 70-71
Honey Creek near McKinney	39.0	July 1951 to Sept. 1971	13	1951-57, 69
Pin Oak Creek near Hubbard	17.6	Sept. 1956 to Sept. 1972	6	1962-63, 65
<u>Brazos River basin:</u>				
Green Creek near Alexander	46.1	Oct. 1954 to Sept. 1971	8	1954-56
Cow Bayou at Mooreville	85.0	Sept. 1954 to	26	1955-58, 64-65
1/Little Pond Creek at Burlington	22.2	Oct. 1962 to	None	-
1/North Elm Creek near Cameron	48.6	Oct. 1962 to	None	-
<u>Colorado River basin:</u>				
Mukewater Creek at Trickham	70.0	Aug. 1951 to	6	1961-62, 65
Deep Creek near Mercury	43.9	June 1951 to Sept. 1971	5	1951-53
<u>San Antonio River basin:</u>				
Calaveras Creek near Elmendorf	77.2	Aug. 1954 to Sept. 1971	7	1954-58
Escondido Creek at Kenedy	a/72.4	July 1954 to Sept. 1971	10	1954-58

1/ Adjacent watersheds; considered as one study area.

a/ 8.43 mi² above Escondido Creek subwatershed No. 11 (Dry Escondido Creek) near Kenedy not included in this total.

For those readers interested in using the metric system, metric equivalents of English units of measurements are given in parentheses. The English units used in this report may be converted to metric units by the following conversion factors:

From		Multiply by	To obtain	
Unit	Abbreviation		Unit	Abbreviation
inch	in	25.4	millimeter	mm
foot	ft	0.3048	meter	m
mile	mi	1.609	kilometer	km
square mile	mi ²	2.590	square kilometer	km ²
cubic foot per second	ft ³ /s	28.32	cubic decimeter per second	dm ³ /s
		0.02832	cubic meter per second	m ³ /s
foot per mile	ft/mi	0.3048/1.609	meter per kilometer	m/km
acre-foot	ac-ft	1233	cubic meter	m ³
		1.233 x 10 ⁻³	cubic hectometer	hm ³

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 ground-water 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 thirteenth 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 1972 water year for the 17.6-square-mile (45.6-square-kilometer) 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.

This investigation will be terminated at the end of this water year. The records collected before watershed development (1956-65) and after complete watershed development (1965-72) will be used in the analyses of rainfall-runoff relationships.

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.

DESCRIPTION OF THE WATERSHED

Pin Oak Creek originates south of Hubbard in Hill County. The creek flows eastward for approximately 14 miles (23 kilometers) adjacent to the Limestone-Navarro County line. Turning northeastward it flows an additional 14 miles (23 kilometers) in Navarro County and empties into Richland Creek near Richland. Pin Oak Creek drains a triangular-shaped basin of about 171 square miles (443 square kilometers). However, this report presents data collected on the 17.6 square miles (45.6 square kilometers) 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 one-half of the cultivation terraced. A small portion, 15 percent, of the land is wooded, primarily along the stream channel.

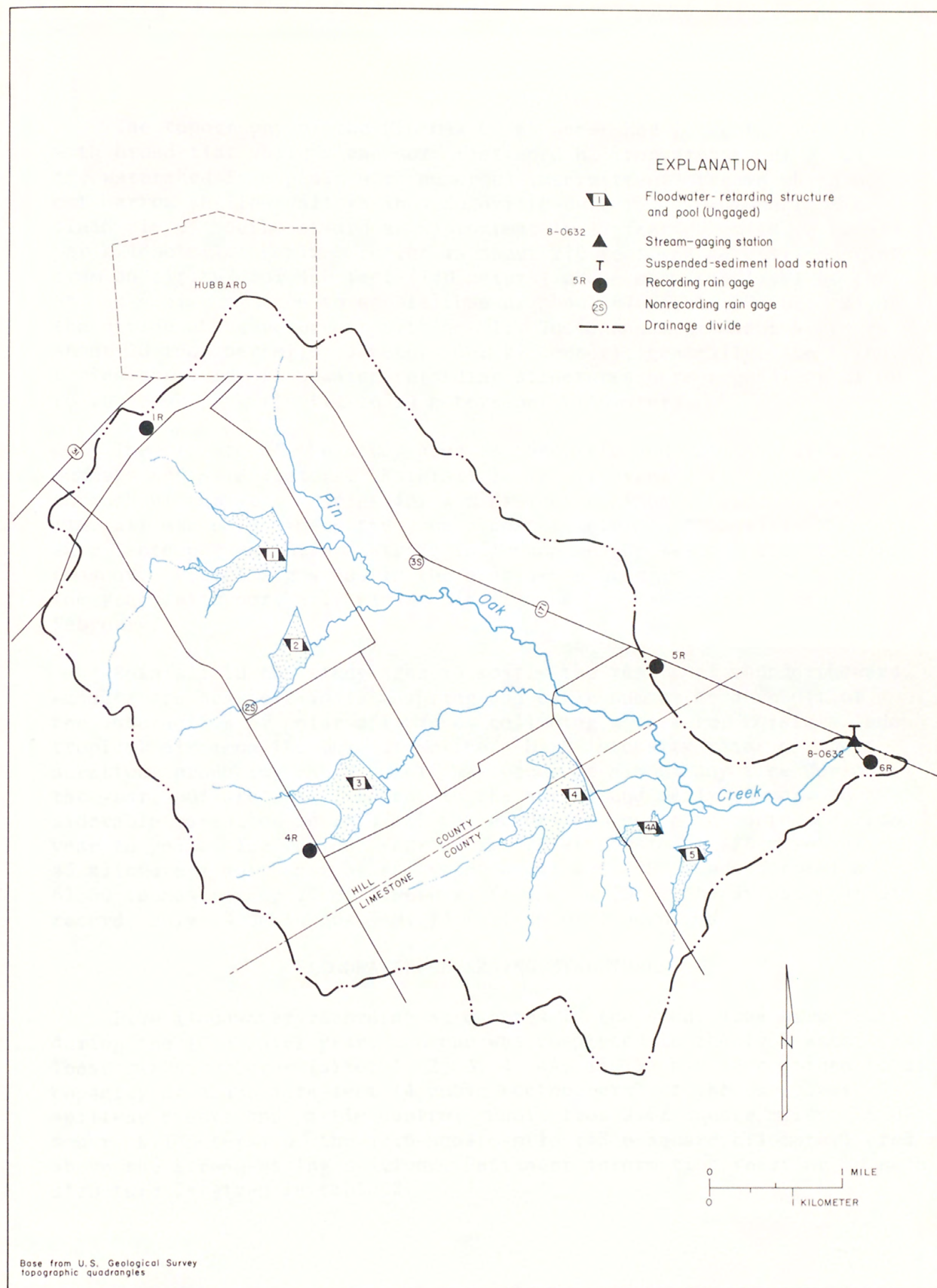


FIGURE 2.— Locations of floodwater-retarding structures and hydrologic-instrument installations in the Pin Oak Creek study area

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 (3 meters per kilometer). Maximum relief is about 210 feet (64 meters), ranging from an altitude of 460 feet (140 meters) above mean sea level at the stream-gaging station to an altitude of about 670 feet (204 meters) on the divide above reservoir site No. 1. The channel gradient averages about 20 feet per mile (4 meters per kilometer); generally, the tributaries above the floodwater-retarding structures have a gradient of 60 to 100 feet per mile (11 to 19 meters per kilometer).

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 or 45 kilometers northeast of the study area) was 1957, when a total of 61.50 inches (1,562.10 millimeters) fell. In 1917, the driest year of record, only 19.36 inches (491.74 millimeters) 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 (4 cubic-hectometers) at the emergency spillway crests and partly control runoff from 9.68 square miles (25.07 square kilometers) of the 17.6-square-mile (45.6-square kilometer) area above the stream-gaging station. Pertinent information relating to each structure is given in table 2.

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

Site number	Drainage area (mi ²)	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

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. These instruments were removed from the basin on September 30, 1972.

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 1972 WATER YEAR

Records of the Environmental Data Service show that the average rainfall over the study area for the 1972 water year was 28.90 inches (734.06 millimeters), or 78 percent of the long-term normal (1931-60) rainfall of 37.06 inches (941.32 millimeters) as recorded at Corsicana (28 miles or 45 kilometers northeast). Rainfall was scattered throughout the year with every month receiving some rainfall. The monthly rainfall totals ranged from 0.12 inch (3.04 millimeters) in March to 6.49 inches (164.85 millimeters) in December. The yearly mean discharge at the stream-gaging station Pin Oak Creek near Hubbard was $4.81 \text{ ft}^3/\text{s}$ (cubic feet per second), or $136.22 \text{ dm}^3/\text{s}$ (cubic decimeters per second), compared with the 16-year (1957-72) average of $10.5 \text{ ft}^3/\text{s}$ or $0.297 \text{ m}^3/\text{s}$ (cubic meters per second). The annual runoff at the stream-gaging station was 3,500 acre-feet (4 cubic hectometers), or 3.73 inches (94.74 millimeters), which represents 13 percent of the total rainfall.

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. Data for these storms will be used later in calibrating a watershed-response model to show the effects of flood-water-retarding structures.

One storm period was selected for detailed computations and analyses. These computations include detailed time breakdown of rainfall and discharge, hydrograph, and mass curves. The storm selected occurred on December 8-10, 1971. A summary of rainfall-runoff data for this storm is shown in table 3. Computations and graph for this storm are shown in the section "Compilation of Data."

Table 3.--Storm rainfall-runoff data, 1972 water year.

[illegible]

COMPI L A T I O N O F D A T A

TRINITY RIVER BASIN

08063200 Pin Oak Creek near Hubbard, Tex. 1/

LOCATION.--Lat 31°48'01", long 96°43'02", Limestone County, 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 September 1972 (discontinued).

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

AVERAGE DISCHARGE.--16 years, 10.5 cfs (8.10 inches per year, 7,610 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 1,080 cfs Dec. 9 (gage height, 10.90 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 1971 TO SEPTEMBER 1972

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	.04	59	13	.22	.02	.68	0	.10		
2	0	0	16	64	7.8	.22	.02	.47	0	.01		
3	1.8	0	12	70	4.4	.22	.02	.33	0	0		
4	5.1	0	2.4	62	2.9	.22	.01	.10	0	27		
5	2.6	0	41	27	2.4	.22	.02	.02	0	4.8		
6	1.4	0	20	18	2.6	.22	.02	.02	0	.06		
7	.40	0	7.5	12	2.1	.22	.02	.13	0	0		
8	.10	0	.89	7.5	1.5	.22	.01	.10	0	0		
9	.02	0	510	4.4	1.2	.22	.01	.02	0	0		
10	.01	0	179	2.1	1.1	.22	.02	.01	0	0		
11	0	0	109	1.1	1.1	.22	.02	.01	0	0		
12	0	0	82	.33	1.1	.22	.03	.08	0	0		
13	0	0	51	.22	.94	.22	.04	.27	0	0		
14	0	0	33	.08	1.4	.22	.08	.03	0	0		
15	0	0	22	.03	1.2	.22	.10	.01	.94	0		
16	0	0	9.9	.02	.94	.22	.10	.01	.03	0		
17	0	.04	4.6	.01	.55	.22	.04	.01	0	0		
18	0	30	1.8	.01	.47	.10	.04	0	0	0		
19	0	2.7	.68	.01	.40	.08	.04	0	0	0		
20	9.3	1.1	.27	.01	.40	.08	.02	0	0	0		
21	3.5	.55	.10	.01	.40	.08	.03	0	0	0		
22	1.7	1.5	.02	.01	.40	.08	.01	0	0	0		
23	.79	14	.01	.01	.46	.08	.01	0	0	0		
24	.33	2.4	2.3	.01	.40	.08	0	0	0	0		
25	.10	.94	1.5	0	.33	.03	0	0	0	0		
26	.03	.68	.47	0	.33	.03	0	0	0	0		
27	.02	.55	.22	0	.27	.03	4.6	0	0	0		
28	.01	.40	.08	.04	.22	.03	4.6	0	0	0		
29	0	.22	.02	79	.22	.04	1.7	0	0	0		
30	0	.10	.02	42	-----	.02	.79	0	.47	0		
31	0	-----	.01	20	-----	.02	-----	0	-----	0		-----
TOTAL	27.21	55.18	1,107.83	468.90	50.47	4.52	12.42	2.30	1.44	31.97	0	0
MEAN	.88	1.84	35.7	15.1	1.74	.15	.41	.074	.048	1.03	0	0
MAX	9.3	30	510	79	13	.22	4.6	.68	.94	27	0	0
MIN	0	0	.01	0	.22	.02	0	0	0	0	0	0
CFSM	.05	.10	2.03	.86	.10	.009	.02	.004	.003	.06	0	0
IN.	.06	.12	2.34	.99	.11	.009	.03	.004	.003	.07	0	0
AC-FT	54	109	2,200	930	100	9.0	25	4.6	2.9	63	0	0

CAL YR 1971 TOTAL 1,220.59 MEAN 3.34 MAX 510 MIN 0 CFSM .19 IN 2.58 AC-FT 2,420
WTR YR 1972 TOTAL 1,762.24 MEAN 4.81 MAX 510 MIN 0 CFSM .27 IN 3.72 AC-FT 3,500

1/This table reproduced from U.S. Geological Survey, 1972, Water Resources Data for Texas, Part 1, Surface Water Records.

- 16 -

-17-

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY-AUSTIN DISTRICT

RAINFALL DATA SUMMARY

STUDY AREA Pin Oak Creek

1972 WATER YEAR

RAIN GAGES

Date of storm	1-R	2-S	3-S	4-R	5-R	6-R	Avg.	By
Oct. 3-4, 1971	1.62	1.28	1.80	1.04	1.52	1.04		BBH
17	.21	.31	.26	.26	.45	.14		5710
18	.35	.42	.36	.29	.10	.20		
19-20	1.07	1.60	1.35	1.32	.92	1.30		
27-28	.22	.31	.30	.22	.19	.20		
October total	3.47	3.92	4.07	3.13	3.18	2.88	3.44	
Nov. 17-18, 1971	2.18	2.55	2.59	2.40	1.82	2.40		
22	.80	.83	.85	.78	.80	.80		
30	.05	0	0	0	0	0		
November total	3.03	3.38	3.44	3.18	2.62	3.20	3.14	
Dec. 1, 1971	.10	.05	.05	0	0	0		
2	1.05	1.24	1.14	.98	1.00	.90		
5	.72	.89	.80	.80	.71	.75		
6	.35	.86	.89	.37	.33	.35		
8	.07	.08	.11	.05	.10	.15		
8-10	2.75	3.14	3.50	3.10	3.60	3.90		
14	.30	.33	.33	.20	.15	.10		
30	.18	.22	.20	.08	.15	.14		
31	.23	.46	.46	.15	.30	.10		
December total	5.75	7.27	7.48	5.73	6.34	6.39	6.49	
1971 calendar year totals							28.81	
Jan. 1, 1972	1.30	1.00	1.09	.70	.83	1.44		
3	.82	.65	.65	.55	.50	.65		
27	(.17)	.27	.27	.20	.20	.15		
28	(.23)	.26	.26	.19	.28	.36		
29	(.90)	1.09	1.08	.81	1.03	1.24		
30	(.08)	.16	.16	.12	.08	.06		
January total	3.50	3.43	3.51	2.57	2.92	3.90	3.30	
Feb. 3, 1972	(.10)	.10	.10	.18	.05	.05		
5-6	.10	.24	.11	.05	.07	.05		
11	.05	.08	.08	.05	.06	.10		
February total	.25	.42	.29	.28	.18	.20	.27	

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY-AUSTIN DISTRICT

RAINFALL DATA SUMMARY

STUDY AREA Pin Oak Creek

1972 WATER YEAR

RAIN GAGES

Date of storm	1-R	2-S	3-S	4-R	5-R	6-R	Avg.	By
Mar. 15, 1972	.12	0	0	0	.13	0		✓
20	.07	0	0	.10	.08	.10		
27	.03	0	0	.05	0	.05		
March total	.22	0	0	.15	.21	.15	.12	
April 21, 1972	.25	.77	.95	.38	.38	.32		
27	1.45	1.70	1.62	1.65	1.50	1.52		
28	.05	.10	.08	.12	.15	.18		
April total	1.75	2.57	2.65	2.15	2.03	2.02	2.20	
May 6, 1972	.45	.86	.55	.52	.36	.28		
7	.05	.14	.18	(.45)	.14	.40		
8	.15	0	0	0	0	0		
12	.37	.92	1.01	(.30)	.35	.32		
14	0	.08	.10	0	.10	0		
May total	1.02	2.00	1.84	1.27	.95	1.00	1.35	
June 14, 1972	.28	.26	.37	.06	.10	0		
15	.27	2.45	1.36	1.03	1.18	1.68		
29	.07	.03	.05	.06	.10	0		
30	1.54	.64	1.31	1.68	1.40	1.30		
June total	2.16	3.38	3.09	2.83	2.78	2.98	2.87	
July 4, 1972	2.07	1.67	2.50	2.42	1.83	1.60		
10	0	0	0	0	0	.18		
18	.15	.66	.41	.47	.90	.35		
22	0	0	0	0	.05	0		
July total	2.22	2.33	2.91	2.89	2.78	2.13	2.54	
Aug. 9, 1972	0	0	0	.15	.10	0		
10	.98	.87	.57	.74	.86	.80		
15	0	0	0	.03	.06	0		
22	0	0	0	0	.30	.59		
23	.95	1.17	1.27	1.39	1.30	1.16		
August total	1.93	2.04	1.84	2.31	2.62	2.55	2.22	

STUDY AREA Pin Oak Creek

1972 WATER YEAR

-20-

UNITED STATES DEPARTMENT OF THE INTERIOR
 GEOLOGICAL SURVEY - TEXAS DISTRICT

RUNOFF COMPUTATIONS

Station Pin Oak Creek near Hubbard, Tex.Period of Record December 8-10, 1971Drainage Area 17.6 mi.²

Time	G. Ht. Feet	Sh. Adj.	Discharge			Runoff	
			ft ³ /s	Inc.	In/Hr.	Inches	Acc. In.
December 8, 1971							
0000	1.80	.13	.79	6	.0001	.0006	.0006
1200	1.73	.08	.55	10.5	.00005	.0005	.0011
2100	1.72		.47	5	.00004	.0002	.0013
2200	1.72		.47	.75	.00004	.00003	.0013
30	1.72	.08	.47	.5	.00004	.00002	.0014
2300	1.88	.13	2.0	.5	.0002	.0001	.0015
30	1.86	.13	1.7	.5	.0001	.00005	.0016
2400	2.50	.05	24	.25	.0021	.0005	.0021
			21.3025	24			
			.89				
December 9, 1971							
0000	2.50	.05	24	.125	.0021	.0003	.0024
15	4.00	0	122	.25	.0107	.0027	.0051
30	5.25		178	.25	.0157	.0039	.0090
45	7.00		250	.25	.0220	.0055	.0145
0100	8.37		337	.375	.0297	.0111	.0256
30	9.23		454	.5	.0400	.0200	.0456
0200	9.47		502	.75	.0442	.0332	.0788
0300	10.00		690	1	.0607	.0607	.1395
0400	10.78		1,030	.75	.0906	.0680	.2075
30	10.90		1,080	.5	.0950	.0475	.2550
0500	10.83		1,050	.75	.0924	.0693	.3243
0600	10.72		1,000	1.5	.0880	.1320	.4563
0800	10.56		932	1.5	.0820	.1230	.5793
0900	10.50		905	.75	.0796	.0597	.6390
30	10.47	0	892	.5	.0785	.0392	.6782
			1228.875	24			
			510				
December 10, 1971							
0000	5.95	0	204	.5	.0180	.0090	.0872
0100	6.50		226	1	.0199	.0199	.1071
0200	7.27		264	1	.0232	.0232	.1303
0300	7.65		283	.75	.0249	.0187	.1490
30	7.73		288	.375	.0253	.0095	.1585
45	7.75		289	.25	.0254	.0064	.1649
0400	7.73		288	.375	.0253	.0095	.1744
30	7.70	0	286	.5	.0252	.0126	.1870

Computed by BBH Date 9/11/72 Checked by JMT Date 9/19/72

UNITED STATES DEPARTMENT OF THE INTERIOR
 GEOLOGICAL SURVEY - TEXAS DISTRICT

RUNOFF COMPUTATIONS

Station Pin Oak Creek near Hubbard, Tex.Period of Record December 8-10, 1971 Drainage Area 17.6 mi.²

Time	G. Ht. Feet	Sh. Adj.	Discharge			Runoff	
			ft ³ /s	Inc.	In./Hr	Inches	Acc. In.
December 10, 1971 (cont.)							
0500	7.60	0	280	.75	.0246	.0184	1.2054
0600	7.20		260	1	.0229	.0229	1.2283
0700	6.63		232	1	.0204	.0204	1.2487
0800	6.03		207	1	.0182	.0182	1.2669
0900	5.47		185	1	.0163	.0163	1.2832
1000	5.07		172	1	.0151	.0151	1.2983
1100	4.75		161	1	.0142	.0142	1.3125
1200	4.57		152	1.5	.0134	.0201	1.3326
1400	4.33		140	2	.0123	.0246	1.3572
1600	4.18		132	3	.0116	.0348	1.3920
2000	4.00		122	4	.0107	.0428	1.4348
2400	3.92	0	117	2	.0103	.0206	1.4554
			4288.5	24			
			179				

Computed by B.B.H. Date 9/11/72 Checked by J.M.T. Date 9/19/72

WEIGHTED-PRECIPITATION RECORD

Date of storm December 8-10, 1971

[illegible]

WEIGHTED-PRECIPITATION RECORD

Study Area	Date of storm
Pin Oak Creek near Hubbard, Tex.	December 8-10, 1971

Weight Factor		Gage 1-R		Gage 4-R		Gage 5-R		Gage 6-R		Gage 7-R		Gage 8-R		Gage 9-R		Gage 10-R		Gage 11-R		Gage 12-R		Gage 13-R		Gage 14-R		Gage 15-R		Gage 16-R		Gage 17-R		Gage 18-R		Gage 19-R		Gage 20-R		Gage 21-R		Gage 22-R		Gage 23-R		Gage 24-R		Gage 25-R		Gage 26-R		Gage 27-R		Gage 28-R		Gage 29-R		Gage 30-R		Gage 31-R		Gage 32-R		Gage 33-R		Gage 34-R		Gage 35-R		Gage 36-R		Gage 37-R		Gage 38-R		Gage 39-R		Gage 40-R		Gage 41-R		Gage 42-R		Gage 43-R		Gage 44-R		Gage 45-R		Gage 46-R		Gage 47-R		Gage 48-R		Gage 49-R		Gage 50-R		Gage 51-R		Gage 52-R		Gage 53-R		Gage 54-R		Gage 55-R		Gage 56-R		Gage 57-R		Gage 58-R		Gage 59-R		Gage 60-R		Gage 61-R		Gage 62-R		Gage 63-R		Gage 64-R		Gage 65-R		Gage 66-R		Gage 67-R		Gage 68-R		Gage 69-R		Gage 70-R		Gage 71-R		Gage 72-R		Gage 73-R		Gage 74-R		Gage 75-R		Gage 76-R		Gage 77-R		Gage 78-R		Gage 79-R		Gage 80-R		Gage 81-R		Gage 82-R		Gage 83-R		Gage 84-R		Gage 85-R		Gage 86-R		Gage 87-R		Gage 88-R		Gage 89-R		Gage 90-R		Gage 91-R		Gage 92-R		Gage 93-R		Gage 94-R		Gage 95-R		Gage 96-R		Gage 97-R		Gage 98-R		Gage 99-R		Gage 100-R		Gage 101-R		Gage 102-R		Gage 103-R		Gage 104-R		Gage 105-R		Gage 106-R		Gage 107-R		Gage 108-R		Gage 109-R		Gage 110-R		Gage 111-R		Gage 112-R		Gage 113-R		Gage 114-R		Gage 115-R		Gage 116-R		Gage 117-R		Gage 118-R		Gage 119-R		Gage 120-R		Gage 121-R		Gage 122-R		Gage 123-R		Gage 124-R		Gage 125-R		Gage 126-R		Gage 127-R		Gage 128-R		Gage 129-R		Gage 130-R		Gage 131-R		Gage 132-R		Gage 133-R		Gage 134-R		Gage 135-R		Gage 136-R		Gage 137-R		Gage 138-R		Gage 139-R		Gage 140-R		Gage 141-R		Gage 142-R		Gage 143-R		Gage 144-R		Gage 145-R		Gage 146-R		Gage 147-R		Gage 148-R		Gage 149-R		Gage 150-R		Gage 151-R		Gage 152-R		Gage 153-R		Gage 154-R		Gage 155-R		Gage 156-R		Gage 157-R		Gage 158-R		Gage 159-R		Gage 160-R		Gage 161-R		Gage 162-R		Gage 163-R		Gage 164-R		Gage 165-R		Gage 166-R		Gage 167-R		Gage 168-R		Gage 169-R		Gage 170-R		Gage 171-R		Gage 172-R		Gage 173-R		Gage 174-R		Gage 175-R		Gage 176-R		Gage 177-R		Gage 178-R		Gage 179-R		Gage 180-R		Gage 181-R		Gage 182-R		Gage 183-R		Gage 184-R		Gage 185-R		Gage 186-R		Gage 187-R		Gage 188-R		Gage 189-R		Gage 190-R		Gage 191-R		Gage 192-R		Gage 193-R		Gage 194-R		Gage 195-R		Gage 196-R		Gage 197-R		Gage 198-R		Gage 199-R		Gage 200-R		Gage 201-R		Gage 202-R		Gage 203-R		Gage 204-R		Gage 205-R		Gage 206-R		Gage 207-R		Gage 208-R		Gage 209-R		Gage 210-R		Gage 211-R		Gage 212-R		Gage 213-R		Gage 214-R		Gage 215-R		Gage 216-R		Gage 217-R		Gage 218-R		Gage 219-R		Gage 220-R		Gage 221-R		Gage 222-R		Gage 223-R		Gage 224-R		Gage 225-R		Gage 226-R		Gage 227-R		Gage 228-R		Gage 229-R		Gage 230-R		Gage 231-R		Gage 232-R		Gage 233-R		Gage 234-R		Gage 235-R		Gage 236-R		Gage 237-R		Gage 238-R		Gage 239-R		Gage 240-R		Gage 241-R		Gage 242-R		Gage 243-R		Gage 244-R		Gage 245-R		Gage 246-R		Gage 247-R		Gage 248-R		Gage 249-R		Gage 250-R		Gage 251-R		Gage 252-R		Gage 253-R		Gage 254-R		Gage 255-R		Gage 256-R		Gage 257-R		Gage 258-R		Gage 259-R		Gage 260-R		Gage 261-R		Gage 262-R		Gage 263-R		Gage 264-R		Gage 265-R		Gage 266-R		Gage 267-R		Gage 268-R		Gage 269-R		Gage 270-R		Gage 271-R		Gage 272-R		Gage 273-R		Gage 274-R		Gage 275-R		Gage 276-R		Gage 277-R		Gage 278-R		Gage 279-R		Gage 280-R		Gage 281-R		Gage 282-R		Gage 283-R		Gage 284-R		Gage 285-R		Gage 286-R		Gage 287-R		Gage 288-R		Gage 289-R		Gage 290-R		Gage 291-R		Gage 292-R		Gage 293-R		Gage 294-R		Gage 295-R		Gage 296-R		Gage 297-R		Gage 298-R		Gage 299-R		Gage 300-R		Gage 301-R		Gage 302-R		Gage 303-R		Gage 304-R		Gage 305-R		Gage 306-R		Gage 307-R		Gage 308-R		Gage 309-R		Gage 310-R		Gage 311-R		Gage 312-R		Gage 313-R		Gage 314-R		Gage 315-R		Gage 316-R		Gage 317-R		Gage 318-R		Gage 319-R		Gage 320-R		Gage 321-R		Gage 322-R		Gage 323-R		Gage 324-R		Gage 325-R		Gage 326-R		Gage 327-R		Gage 328-R		Gage 329-R		Gage 330-R		Gage 331-R		Gage 332-R		Gage 333-R		Gage 334-R		Gage 335-R		Gage 336-R		Gage 337-R		Gage 338-R		Gage 339-R		Gage 340-R		Gage 341-R		Gage 342-R		Gage 343-R		Gage 344-R		Gage 345-R		Gage 346-R		Gage 347-R		Gage 348-R		Gage 349-R		Gage 350-R		Gage 351-R		Gage 352-R		Gage 353-R		Gage 354-R		Gage 355-R		Gage 356-R		Gage 357-R		Gage 358-R		Gage 359-R		Gage 360-R		Gage 361-R		Gage 362-R		Gage 363-R		Gage 364-R		Gage 365-R		Gage 366-R		Gage 367-R		Gage 368-R		Gage 369-R		Gage 370-R		Gage 371-R		Gage 372-R		Gage 373-R		Gage 374-R		Gage 375-R		Gage 376-R		Gage 377-R		Gage 378-R		Gage 379-R		Gage 380-R		Gage 381-R		Gage 382-R		Gage 383-R		Gage 384-R		Gage 385-R		Gage 386-R		Gage 387-R		Gage 388-R		Gage 389-R		Gage 390-R		Gage 391-R		Gage 392-R		Gage 393-R		Gage 394-R		Gage 395-R		Gage 396-R		Gage 397-R		Gage 398-R		Gage 399-R		Gage 400-R		Gage 401-R		Gage 402-R		Gage 403-R		Gage 404-R		Gage 405-R		Gage 406-R		Gage 407-R		Gage 408-R		Gage 409-R		Gage 410-R		Gage 411-R		Gage 412-R		Gage 413-R		Gage 414-R		Gage 415-R		Gage 416-R		Gage 417-R		Gage 418-R		Gage 419-R		Gage 420-R		Gage 421-R		Gage 422-R		Gage 423-R		Gage 424-R		Gage 425-R		Gage 426-R		Gage 427-R		Gage 428-R		Gage 429-R		Gage 430-R		Gage 431-R		Gage 432-R		Gage 433-R		Gage 434-R		Gage 435-R		Gage 436-R		Gage 437-R		Gage 438-R		Gage 439-R		Gage 440-R		Gage 441-R		Gage 442-R		Gage 443-R		Gage 444-R		Gage 445-R		Gage 446-R		Gage 447-R		Gage 448-R		Gage 449-R		Gage 450-R		Gage 451-R		Gage 452-R		Gage 453-R		Gage 454-R		Gage 455-R		Gage 456-R		Gage 457-R		Gage 458-R		Gage 459-R		Gage 460-R		Gage 461-R		Gage 462-R		Gage 463-R		Gage 464-R		Gage 465-R		Gage 466-R		Gage 467-R		Gage 468-R		Gage 469-R		Gage 470-R		Gage 471-R		Gage 472-R		Gage 473-R		Gage 474-R		Gage 475-R		Gage 476-R		Gage 477-R		Gage 478-R		Gage 479-R		Gage 480-R		Gage 481-R		Gage 482-R		Gage 483-R		Gage 484-R		Gage 485-R		Gage 486-R		Gage 487-R		Gage 488-R		Gage 489-R		Gage 490-R		Gage 491-R		Gage 492-R		Gage 493-R		Gage 494-R		Gage 495-R		Gage 496-R		Gage 497-R		Gage 498-R		Gage 499-R		Gage 500-R		Gage 501-R		Gage 502-R		Gage 503-R		Gage 504-R		Gage 505-R		Gage 506-R		Gage 507-R		Gage 508-R		Gage 509-R		Gage 510-R		Gage 511-R		Gage 512-R		Gage 513-R		Gage 514-R		Gage 515-R		Gage 516-R		Gage 517-R		Gage 518-R		Gage 519-R		Gage 520-R		Gage 521-R		Gage 522-R		Gage 523-R		Gage 524-R		Gage 525-R		Gage 526-R		Gage 527-R		Gage 528-R		Gage 529-R		Gage 530-R		Gage 531-R		Gage 532-R		Gage 533-R		Gage 534-R		Gage 535-R		Gage 536-R		Gage 537-R		Gage 538-R		Gage 539-R		Gage 540-R		Gage 541-R		Gage 542-R		Gage 543-R		Gage 544-R		Gage 545-R		Gage 546-R		Gage 547-R		Gage 548-R		Gage 549-R		Gage 550-R		Gage 551-R		Gage 552-R		Gage 553-R		Gage 554-R		Gage 555-R		Gage 556-R		Gage 557-R		Gage 558-R		Gage 559-R		Gage 560-R		Gage 561-R		Gage 562-R		Gage 563-R		Gage 564-R		Gage 565-R		Gage 566-R		Gage 567-R		Gage 568-R		Gage 569-R		Gage 570-R		Gage 571-R		Gage 572-R		Gage 573-R		Gage 574-R		Gage 575-R		Gage 576-R		Gage 577-R		Gage 578-R		Gage 579-R		Gage 580-R		Gage 581-R		Gage 582-R		Gage 583-R		Gage 584-R		Gage 585-R		Gage 586-R		Gage 587-R		Gage 588-R		Gage 589-R		Gage 590-R		Gage 591-R		Gage 592-R		Gage 593-R		Gage 594-R		Gage 595-R		Gage 596-R		Gage 597-R		Gage 598-R		Gage 599-R		Gage 600-R		Gage 601-R		Gage 602-R		Gage 603-R		Gage 604-R		Gage 605-R		Gage 606-R		Gage 607-R		Gage 608-R		Gage 609-R		Gage 610-R		Gage 611-R		Gage 612-R		Gage 613-R		Gage 614-R		Gage 615-R		Gage 616-R		Gage 617-R		Gage 618-R		Gage 619-R		Gage 620-R		Gage 621-R		Gage 622-R		Gage 623-R		Gage 624-R		Gage 625-R		Gage 626-R		Gage 627-R		Gage 628-R		Gage 629-R		Gage 630-R		Gage 631-R		Gage 632-R		Gage 633-R		Gage 634-R		Gage 635-R		Gage 636-R		Gage 637-R		Gage 638-R		Gage 639-R		Gage 640-R		Gage 641-R		Gage 642-R		Gage 643-R		Gage 644-R		Gage 645-R		Gage 646-R		Gage 647-R		Gage 648-R		Gage 649-R		Gage 650-R		Gage 651-R		Gage 652-R		Gage 653-R		Gage 654-R		Gage 655-R		Gage 656-R		Gage 657-R		Gage 658-R		Gage 659-R		Gage 660-R		Gage 661-R		Gage 662-R		Gage 663-R		Gage 664-R		Gage 665-R		Gage 666-R		Gage 667-R		Gage 668-R		Gage 669-R		Gage 670-R		Gage 671-R		Gage 672-R		Gage 673-R		Gage 674-R		Gage 675-R		Gage 676-R		Gage 677-R		Gage 678-R		Gage 679-R		Gage 680-R		Gage 681-R		Gage 682-R		Gage 683-R		Gage 684-R		Gage 685-R		Gage 686-R		Gage 687-R		Gage 688-R		Gage 689-R		Gage 690-R		Gage 691-R		Gage 692-R		Gage 693-R		Gage 694-R		Gage 695-R		Gage 696-R		Gage 697-R		Gage 698-R		Gage 699-R		Gage 700-R		Gage 701-R		Gage 702-R		Gage 703-R		Gage 704-R		Gage 705-R		Gage 706-R		Gage 707-R		Gage 708-R		Gage 709-R		Gage 710-R		Gage 711-R		Gage 712-R		Gage 713-R		Gage 714-R		Gage 715-R		Gage 716-R		Gage 717-R		Gage 718-R		Gage 719-R		Gage 720-R		Gage 721-R		Gage 722-R		Gage 723-R		Gage 724-R		Gage 725-R		Gage 726-R		Gage 727-R		Gage 728-R		Gage 729-R		Gage 730-R		Gage 731-R		Gage 732-R		Gage 733-R		Gage 734-R		Gage 735-R		Gage 736-R		Gage 737-R		Gage 738-R		Gage 739-R		Gage 740-R		Gage 741-R		Gage 742-R		Gage 743-R		Gage 744-R		Gage 745-R		Gage 746-R		Gage 747-R		Gage 748-R		Gage 749-R		Gage 750-R		Gage 751-R		Gage 752-R		Gage 753-R		Gage 754-R		Gage 755-R		Gage 756-R		Gage 757-R		Gage 758-R		Gage 759-R		Gage 760-R		Gage 761-R		Gage 762-R		Gage 763-R		Gage 764-R		Gage 765-R		Gage 766-R		Gage 767-R		Gage 768-R		Gage 769-R		Gage 770-R		Gage 771-R		Gage 772-R		Gage 773-R		Gage 774-R		Gage 775-R		Gage 776-R		Gage 777-R		Gage 778-R		Gage 779-R		Gage 780-R		Gage 781-R		Gage 782-R		Gage 783-R		Gage 784-R		Gage 785-R		Gage 786-R		Gage 787-R		Gage 788-R		Gage 789-R		Gage 790-R		Gage 791-R		Gage 792-R		Gage 793-R		Gage 794-R		Gage 795-R		Gage 796-R		Gage 797-R		Gage 798-R		Gage 799-R		Gage 800-R		Gage 801-R		Gage 802-R		Gage 803-R		Gage 804-R		Gage 805-R		Gage 806-R		Gage 807-R		Gage 808-R		Gage 809-R		Gage 810-R		Gage 811-R		Gage 812-R		Gage 813-R		Gage 814-R		Gage 815-R		Gage 816-R		Gage 817-R		Gage 818-R		Gage 819-R		Gage 820-R		Gage 821-R		Gage 822-R		Gage 823-R		Gage 824-R		Gage 825-R		Gage 826-R		Gage 827-R		Gage 828-R		Gage 829-R		Gage 830-R		Gage 831-R		Gage 832-R		Gage 833-R		Gage 8	
---------------	--	----------	--	----------	--	----------	--	----------	--	----------	--	----------	--	----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	------------	--	--------	--

WEIGHTED-PRECIPITATION RECORD

Study Area	Date of storm
Pin Oak Creek near Hubbard, Tex	December 8-10, 1971

[illegible]

HYDROGRAPH and MASS CURVES

for

STORM OF DECEMBER 8-10, 1971

at

PIN OAK CREEK NEAR HUBBARD, TEXAS

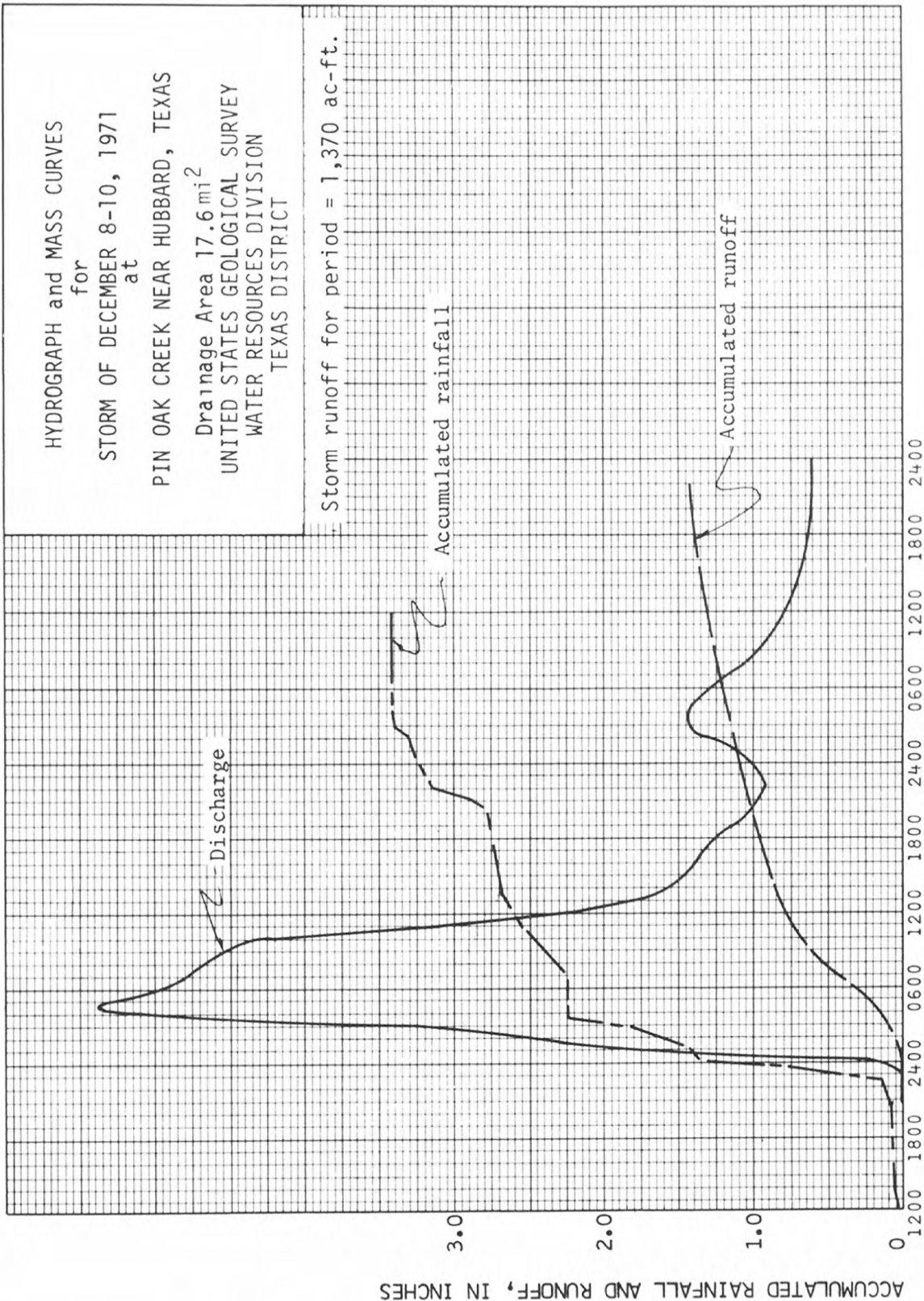
Drainage Area 17.6 mi²

UNITED STATES GEOLOGICAL SURVEY

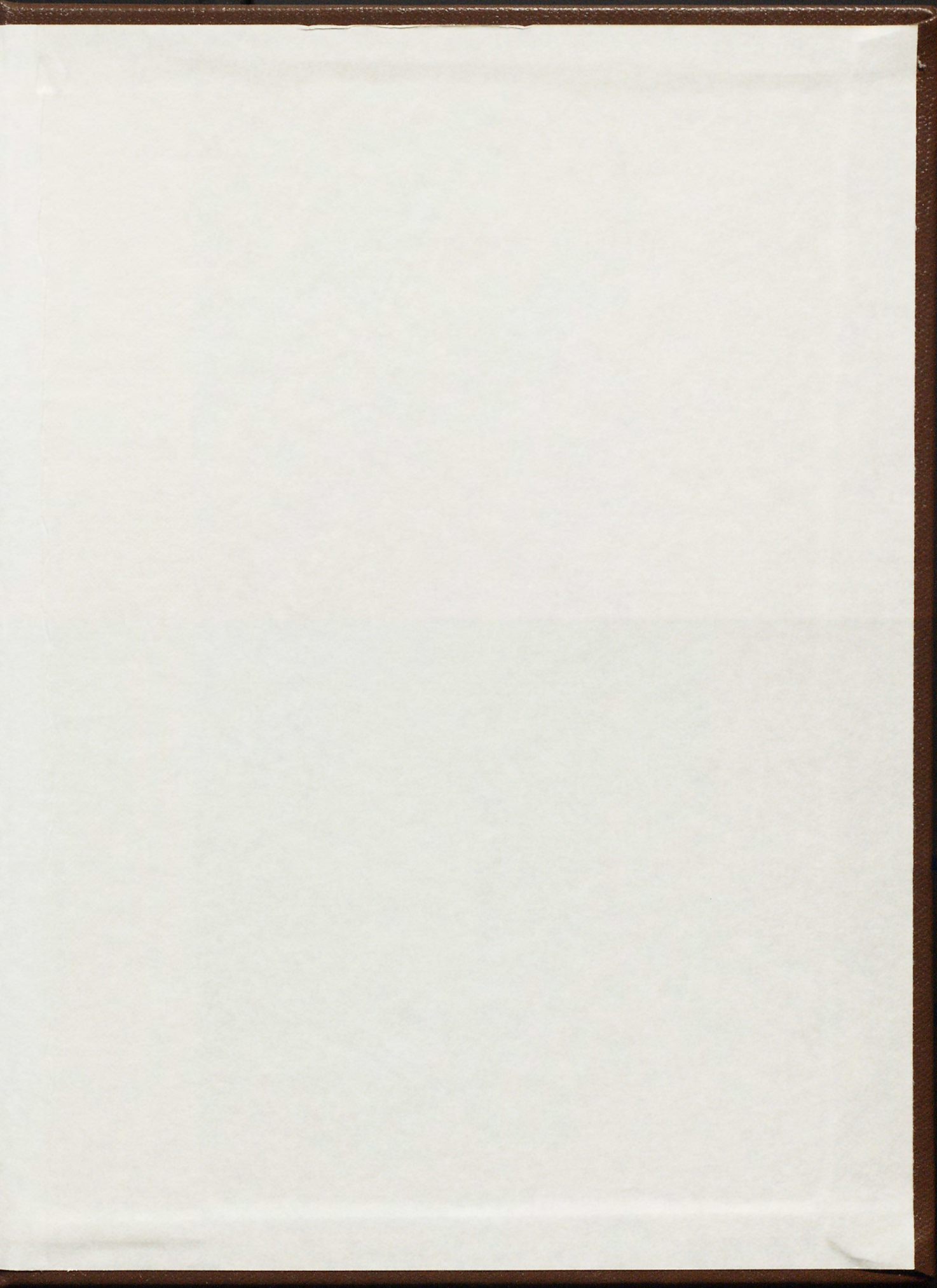
WATER RESOURCES DIVISION

TEXAS DISTRICT

Storm runoff for period = 1,370 ac-ft.



December 8 December 9 December 10



USGS LIBRARY - RESTON



3 1818 00410261 0