TEXAS FLOODS

—

APRIL - MAY - JUNE

1957

San Gabriel River East of Georgetown, Texas April 24, 1957

STATE OF TEXAS

BOARD OF WATER ENGINEERS

OCTOBER 1957

DEDICATION

This report is dedicated to those whose vision and foresight have given to us our framework of operations into which has been fitted the fundamentals of sound procedures that provide for scientific integration and practical applications of modern hydrology, hydraulic engineering, and related sciences to the end that flood control and water conservation, which are broadly recognized as important facets of the economic development of the area, can be successfully resolved, provided there is applied a cooperating and continuing effort of this self-same type of vision and foresight.

Since time is of the essence, this joint report, prepared by the Board of Water Engineers and the Surface Water Branch of the U. S. Geological Survey, is released in preliminary form in order to put information in the hands of the citizens of Texas as early as possible. At some later date, a more comprehensive joint report by the two agencies which will contain additional technical data, will be released as a Water Supply Paper published by the Geological Survey.

PREFACE

The purpose of this report is to bring into proper perspective conditions of rainfall and the resulting streamflow which occurred in Texas during the months of April, May and June 1957. This was truly a significant storm period by all standards. Its true importance lay in the fact that most areas of the State were experiencing one of the most devastating droughts of a century only to be followed by one of the worst floods of history.

Early publication of these records by the Board of Water Engineers is essential, as engineers engaged in expending both public and private funds for such facilities as water-supply systems, flood-control structures, and bridges of all types need this basic information for design purposes. The tax-paying public needs to be apprised of the value of existing reservoirs and to be shown the need for additional structures. Delay in making this information available could result in even more devastating losses than were suffered in the spring of 1957.

Funds for analytical studies and compilation of flood records were not adequate to develop this report. However, substantial funds were allotted to the Board of Water Engineers by the Brazos River Authority, Guadalupe-Blanco River Authority, Lower Colorado River Authority, Sabine River Authority, and the Tarrant County Water Control and Improvement District Number One. These special funds made possible a supplemental cooperative agreement between the Board of Water Engineers and the United States Geological Survey to finance the preparation of it. The special funds allotted for this study are gratefully acknowledged, for without such financial cooperation, this report could not have been prepared.

Basic streamflow data contained in the report was compiled jointly by the Board of Water Engineers and the Surface Water Branch of the Geological Survey. Acknowledgement is made to the United States Weather Bureau, the Corps of Engineers, United States Army, and the International Boundary and Water Commission, United States Section, for furnishing data used in the report.

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TEXAS FLOODS OF APRIL, MAY AND JUNE 1957

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STORMS AND FLOODS OF 1957

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SECTION II

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SECTION I

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TEXAS FLOODS OF APRIL, MAY AND JUNE 1957

SECTION I

STORMS AND FLOODS OF 1957

ABSTRACT

The floods of April-June 1957 in Texas were outstanding both because of the large geographical area which experienced flood conditions and because of the large volume of runoff produced. All streams in the State, from the Red River to the Rio Grande, were in flood much of the time during this three-month period. Excluding the Red River and the Rio Grande and considering only the interior streams in Texas, 38 million acre-feet of runoff, adjusted for storage in major reservoirs, was produced over the State during this three-month period.

Peak flows which exceeded previously known floods occurred on only a few streams. The outstanding peak flow which occurred on Palo Pinto Creek, a tributary to the Brazos River near Santo on May 25-26, was the maximum stage known since at least 1880. The flood of May 12 on Sulphur Creek was only 1.5 feet lower than the highest known flood of 1873 at a site about three miles downstream from Lampasas.

This report has been prepared to supply hydrologic data needed for immediate planning. Included in the report are general descriptions of the floods, rainfall information, and streamflow and reservoir contents records at 97 selected gaging stations throughout the State.

INTRODUCTION

The purpose of this report is to present a statistical sampling of the streamflow and reservoir records in Texas for the period during the destructive storms of April, May and June 1957. The report has been prepared to supply hydrologic data needed for overall planning and operations.

This report covers the entire State of Texas, from the Red River to the Rio Grande, presenting streamflow and reservoir records at selected stations

in each of the major river basins in Texas to show the areal extent and magnitude of the floods occurring during the three-month period, April to June 1957.

During this period, heavy rainfall was experienced over the eastern two-thirds of the State. Weather records extending back beyond the memory of most Texans do not record a similar period when so much rainfall was experienced over such a large portion of the State in one continuing period. This was a sudden switch from drought conditions which had prevailed over practically all of the State for many years. During the past several years rainfall and streamflow had been on a gradual decline, with the flow of many streams the lowest in recorded history. For the first time in the memory of the oldest living residents, some of the larger springs in the State ceased to flow because of a combination of the drought and increased withdrawals. In contrast, however, during these extremely dry years, Texas experienced some of the greatest floods known in certain areas, such as those of September 1952 in the Colorado River basin and June 1954 on the Rio Grande and tributaries.

The State suffered extensively during the dry years; but ironically, some of the conditions produced by the drought contributed to aiding the damage reduction during the flood period. The soil was relatively dry and practically all the major reservoirs were at all-time low stages. The rainfall in early April produced little runoff. Virtually empty reservoirs caught and held a considerable part of the late April runoff. However, the continuing rainfall on the saturated soil caused high runoff which filled most reservoirs and produced floods comparable in magnitude and areal extent to the greatest known in the history of recorded streamflow records for the area. One of the

many examples was Lake Texoma where from March 19, 1957 to June 6, 1957 the lake went from its record low stage to its record high stage after being put into service in 1942.

Peak flows during the period, except in a few cases, did not exceed previous flood peaks which had been experienced. However, according to estimates published by the Corps of Engineers continued and excessive flooding over the prolonged period on all streams in the eastern two-thirds of the State, caused over 100 million dollars in damages. Great areas were flooded and thousands of homes were damaged or destroyed, causing the evacuation of several thousand families with some loss of life. Several hundred thousand acres of productive farmland were inundated for prolonged periods, to say nothing of the damage done to roads, bridges, railroads, and other structures in such areas.

DEFINITIONS OF TERMS AND ABBREVIATIONS

The terms and abbreviations of streamflow and other hydrologic data, as used in this report, are defined as follows:

Cubic foot per second (cfs) is the rate of discharge of a stream whose channel is 1 square foot in cross-sectional area and whose average velocity is 1 foot per second. The volume of water represented by a flow of 1 cubic foot per second for 24 hours is equivalent to 86,400 cubic feet, 1.983471 acre-feet, or 646,317 gallons.

Acre-foot (acre-ft) is the quantity of water required to cover an acre to a depth of 1 foot and is equivalent to 43,560 cubic feet. One acre-foot is equivalent to 325,851 gallons. The term is commonly used in relation to storage and volume of runoff.

Runoff in inches is the depth to which an area would be covered if all the water draining from it in a given period of time was uniformly distributed on its surface. The term is used for comparing the amount of runoff with rainfall, which is also expressed in inches.

Drainage area of a stream at a specified location is that area, measured in a horizontal plane, which is so enclosed by a topographic divide that direct surface runoff from rainfall normally would drain by gravity into the stream above the specified point. Figures of drainage area are expressed in square miles (sq mi) in this report.

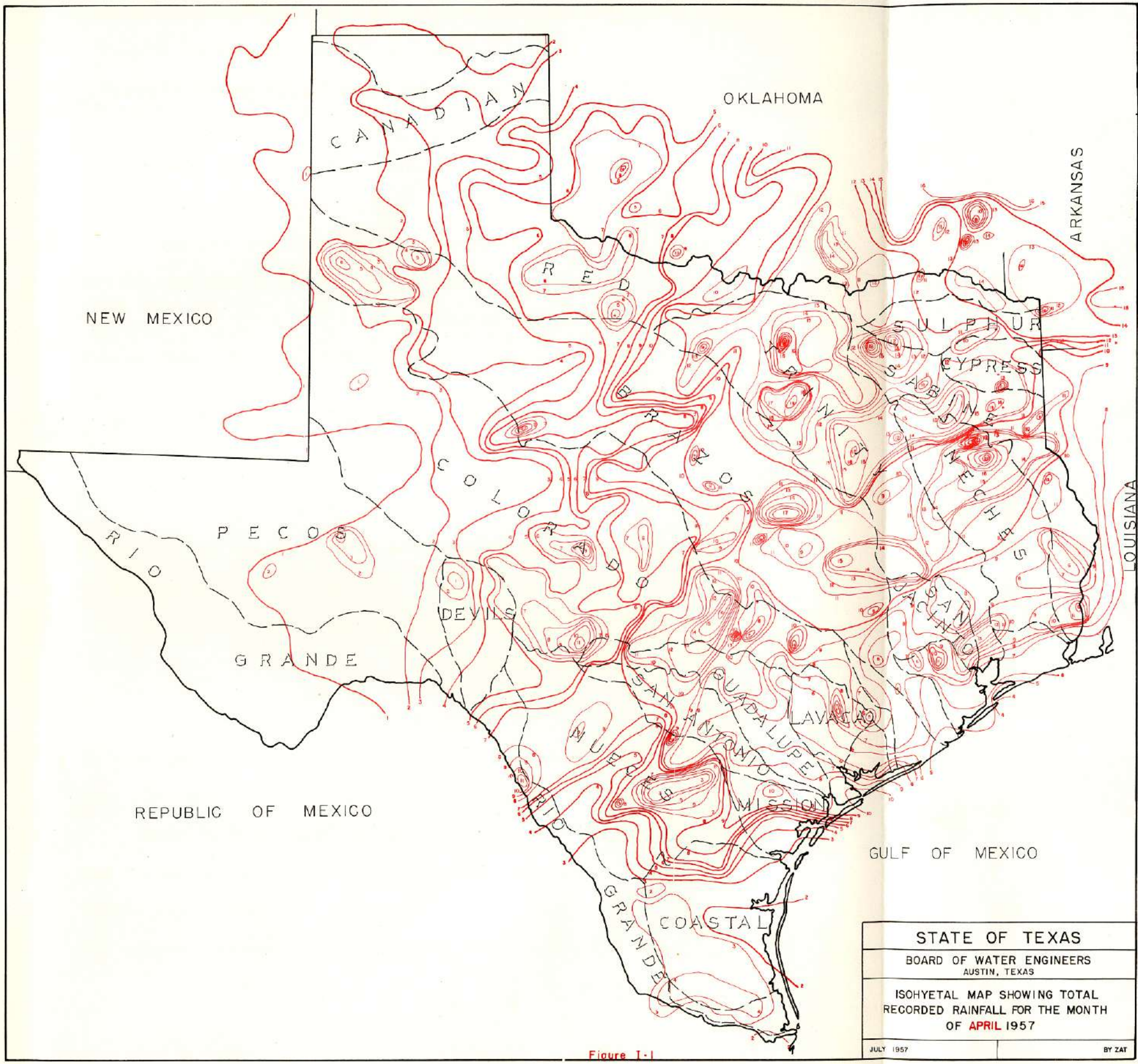
Contents is the volume of water in a reservoir and is expressed in acre-feet. Volume is computed on the basis of a level pool and does not include bank storage.

Stage-discharge relation is the relation between gage height and the rate of flow.

Control designates a feature downstream from the streamflow station that determines the stage-discharge relation at the station. This feature may be a natural constriction of the channel, a long reach of the channel, or an artificial structure in the channel.

PRECIPITATION

Rainfall during 1956 was less than fifty percent of normal over much of the State with the rainfall deficiency continuing through January 1957; however, during February and March 1957, most of the State received normal amounts of rainfall. During the first week in April much of the eastern half of the State received moderate to heavy rains; then beginning in most places on April 18 and extending through the middle of June, turbulent weather with



STATE OF TEXAS

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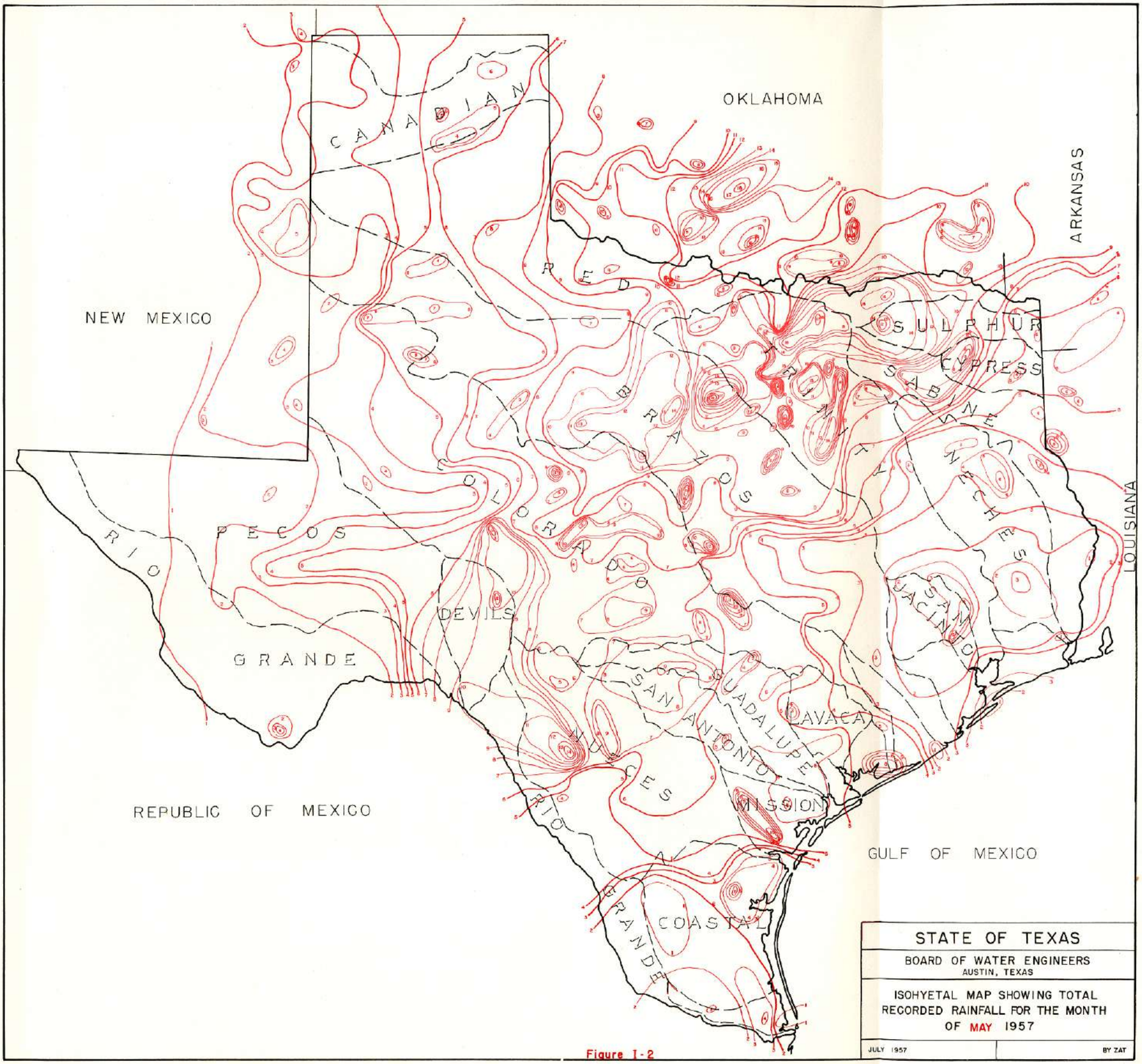
ISOHYETAL MAP SHOWING TOTAL RECORDED RAINFALL FOR THE MONTH OF APRIL 1957

JULY 1957 | BY ZAT

Figure I-1



STATE OF TEXAS

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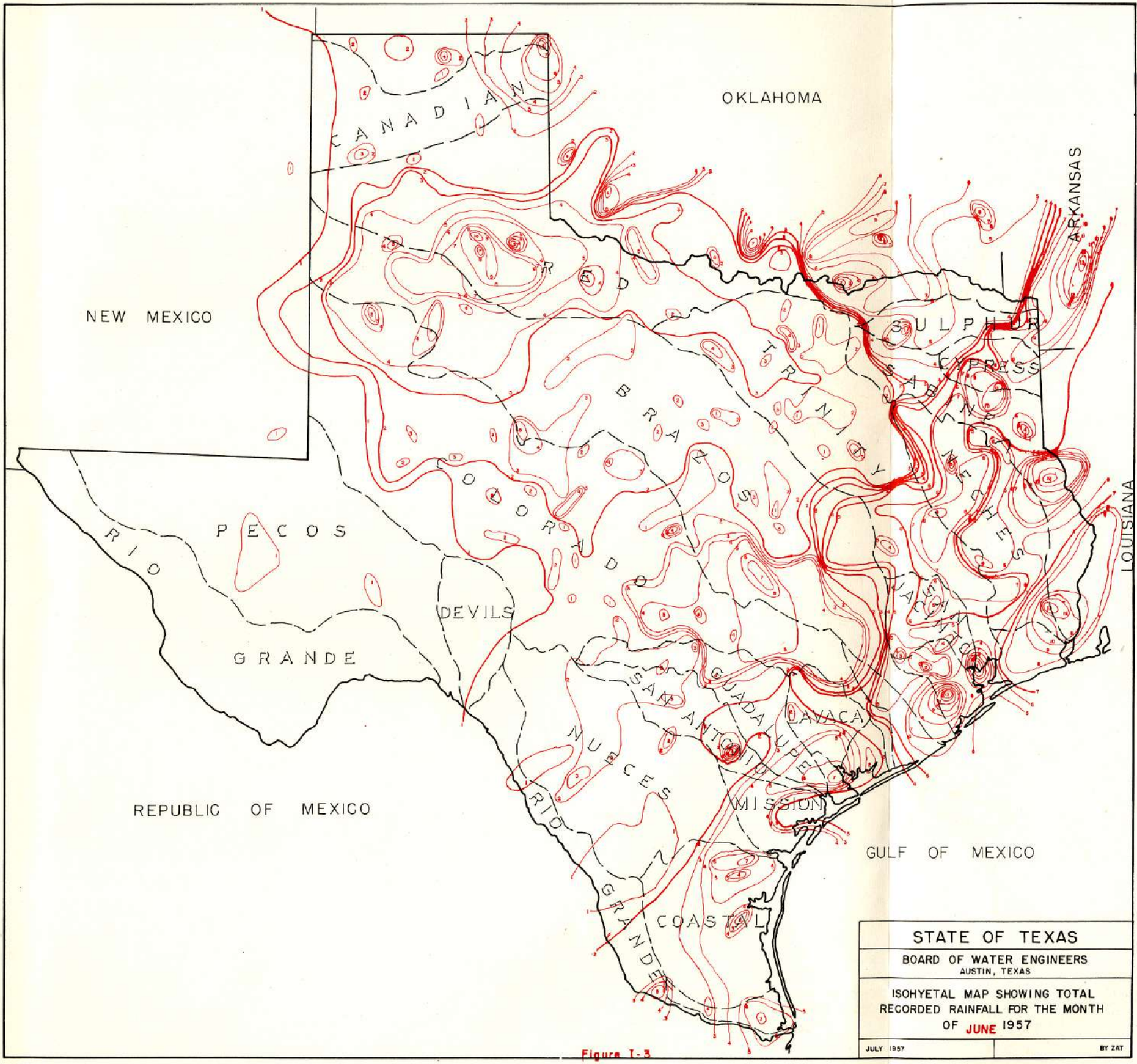
ISOHYETAL MAP SHOWING TOTAL RECORDED RAINFALL FOR THE MONTH OF MAY 1957

JULY 1957 | BY ZAT

Figure I-2



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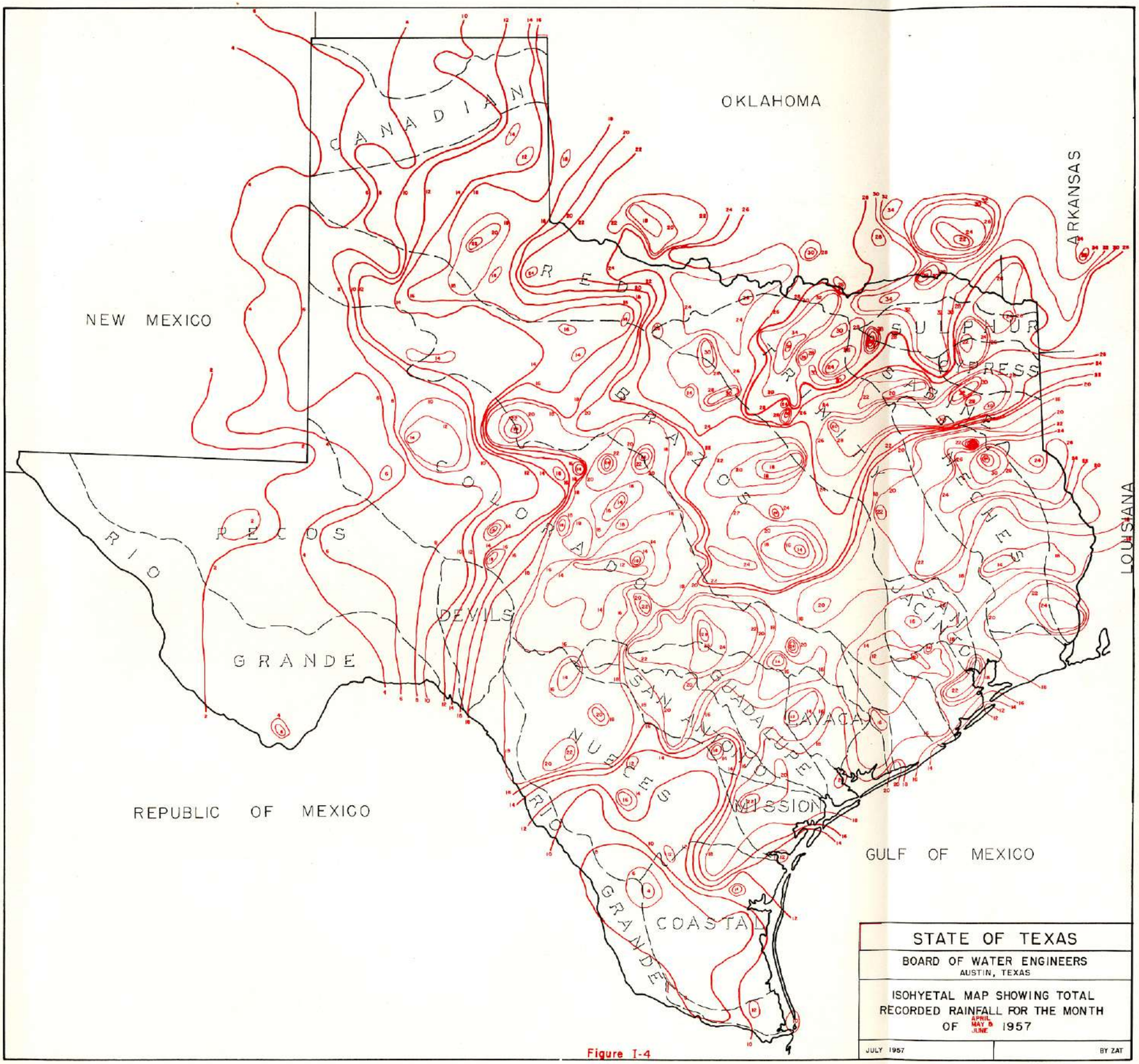
ISOHYETAL MAP SHOWING TOTAL RECORDED RAINFALL FOR THE MONTH OF JUNE 1957

JULY 1957 | BY ZAT

Figure I-3



STATE OF TEXAS

BOARD OF WATER ENGINEERS
AUSTIN, TEXAS

ISOHYETAL MAP SHOWING TOTAL RECORDED RAINFALL FOR THE MONTH OF APRIL MAY & JUNE 1957

JULY 1957 | BY ZAT

Figure I-4

tornadoes, high winds, hail, and heavy continuous rainfall was experienced over practically all of the State.

Monthly rainfall totals for April ranged from less than one inch in extreme West Texas to over 20 inches in Northeast Texas, with Glenfawn in Rusk County recording 20.48 inches. The heaviest rainfall occurred on April 26, with several stations reporting more than 7 inches on that date. Jacksboro recorded 9.60 inches on the 26th. Figure I-1, a map of Texas showing lines of equal rainfall, indicates the pattern of heavy rainfall across the State during April.

The turbulent weather continued throughout the month of May over much of the State. It was the wettest May of record at such places as Del Rio, San Angelo, Abilene, Wichita Falls, Fort Worth and Dallas, while in contrast the rainfall at Beaumont during the month of May was the lowest recorded for that month since official rainfall records had been kept. The greatest monthly total was 19.32 inches recorded at Brazos in Palo Pinto County with many places throughout Central Texas recording more than 6 inches for the month. It was May 12 that rainfall from 2 to 12 inches fell in the vicinity of Lampasas, producing the floods which caused extensive destruction in that city. Figure I-2 shows the pattern of rainfall recorded over the State during May.

The heavy rainfall extended through the first week in June, with scattered heavy rainfall for the remainder of the month over parts of the State. In general the June rainfall exceeded the longterm average rainfall in most of Central, East and Northeast Texas. Alvin, in Brazoria County, recorded a total monthly rainfall of 13.55 inches. Figure I-3 shows the distribution of total June rainfall across the State.

The total rainfall for the three-month period over much of the Eastern two-thirds of the State was in excess of that normally recorded during a twelve-month period. Figure I-4 shows the distribution of the total rainfall recorded during the period April 1 to June 30, 1957.

The following discussion of meteorological conditions in Texas and adjacent states during the period April to June 1957, was prepared by the U. S. Weather Bureau, Washington, D. C.

"METEOROLOGY OF THE TEXAS FLOODS OF THE SPRING OF 1957

The period from mid-April to mid-June 1957 was characterized by marked contrasts in the amount of rainfall over the Gulf States from Texas to the Atlantic Ocean. The eastern and western sections had above-normal precipitation while over the central part from northern Alabama and Mississippi through most of Louisiana into extreme eastern Texas the precipitation was below-normal. Especially from May 2 through 31 the central section had badly deficient precipitation. East Texas missed rains associated with a small depression that moved through the region during early May, so one of the driest Mays of record occurred there. Also, the lower Rio Grande Valley and El Paso area had deficient precipitation.

The total volume of precipitation occurring from air flowing out of the Gulf of Mexico was greater than normal but not exceedingly so. What characterized these months was the concentration of the volume of rainfall in Texas and Oklahoma, especially across central Texas from the Del Rio area to the Wichita Fallas-to-Dallas area.

The heavy precipitation period began about April 18. Prior to that time cold air masses had blown southward over the southeastern United States into the Gulf of Mexico and back into the Texas area with very small moisture content. From that time on to early June, a rather persistent weather pattern prevailed, characterized by a well-developed Bermuda High extending into the eastern Gulf of Mexico, and a well-developed North-South trough over the Mountain States. This configuration gave strong flow of moist air into the area from the Southeast. Stronger-than-normal westerly winds brought cool air across the mountains from the Pacific, but there were few strong outbreaks of cold Canadian air to push the cyclonic systems eastward.

At 10,000 feet the mean trough extending from the Dakotas to Southern California and the mean ridge near the East Coast were both stronger than normal, intensifying the southern flow. A strong jet stream, south of its normal position, had its axis from southwest Texas to Lake Erie. The cold air masses flowing from the North and Northwest did not penetrate far into Oklahoma and Texas and frontal areas became stationary through Oklahoma and West Texas. The flow of moisture from the Gulf,--originally of Caribbean and Western Atlantic origin,--was concentrated over the western part of the Gulf during much of the period.

The heavy daily rainfall occurred mostly in the warm air south and east of the fronts, although some occurred in connection with the fronts themselves. A rather typical case of these bursts occurred in Central and Northern Texas on May 12-13. The principal front lay across West Texas during all of this period. Now to the east of the front, the air in lower layers was quite warm and moist as compared with the air at levels from 20,000 to 40,000 feet. As this air came near the frontal zone, it began to rise, thus producing a rather local warming, rise of pressure, and consequent net outflow of air at upper levels. This net outflow produced a reduction of the total mass of air above Central Texas and a secondary low pressure area developed there, well to the east of the front. The heavy precipitation occurred in connection with this secondary low pressure area. Modifications of such patterns occurred day after day during the period from mid-April to mid-May to produce the heavy concentration of rainfall in Texas, Oklahoma, and adjoining states.

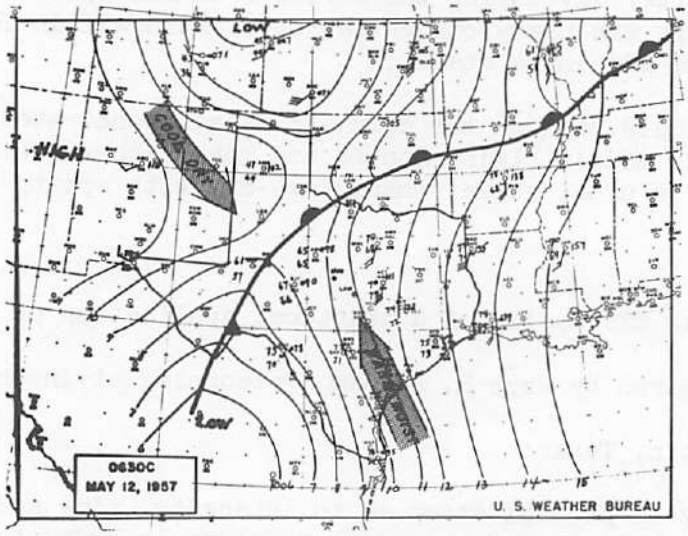
After the middle of June the cold air masses penetrated only as far as the middle Plains States and the weather over Texas returned to is usual summer character--dry with spotty showers."

The following discussion of a practical application of radar in measuring rainfall was prepared by Hoye S. Dunham, Meteorologist-in-Charge, U. S. Weather Bureau, Austin, Texas:

"Variability in precipitation as to intensity, time and spacing has long been one of the major problems in hydrology. Radar is offering a new approach to the problem of measuring rainfall at scattered points in a watershed. Although radar is a proven, valuable tool in severe weather and aviation weather-briefing, it is in its infancy in its application to hy-

drology and flood forecasting. In weather-search radar, radio signals go out and strike falling rain. These signals are then reflected back to a receiver which in turn shows the rain pattern on the scope. The radar has been so modified that it reflects only more or less solid objects such as rain drops or hail and does not show clouds. The solid echoes near the radar site are "ground echoes" from buildings, trees and hills.

On the morning of May 12, 1957, an almost stationary frontal line extended from Evansville, Indiana to Ft. Smith, Arkansas and then southwestward to Texas. Its location is shown on the weather map below. It passed just to the northwest of Wichita Falls, near Big Spring and down to the Rio Grande in the Trans-Pecos region. To the south and east of this boundary line, humid Gulf air even at high elevations was flowing northward. To the west and north of the line, drier and cooler air was moving southeastward from the Rockies. The pressure pattern favored a convergence in the moist air stream which meant a marked lifting or upward motion. In addition, colder air was moving in from the west at high levels--a perfect pattern for the formation of numerous squall-line thunderstorms. First of the tallest of these thunderstorms was picked up by the Austin radar at 3:00 p.m. some 100 miles to the west and northwest of Austin. (See figures 5 and 6). The line continued



Map Showing Path of the Squall Line
Discussed in the Paragraph above

to increase in intensity and moved southeastward. But, as it approached the headwaters of Lake Buchanan and the Lampasas area, the line moved very slowly. Heavy rain fell in individual cells as the line formed and re-formed and moved southeastward. The squall line itself remained practically stationary.

The pictures on the following pages (figures 5 and 6) were taken at the Weather Bureau radar site at Municipal Airport, Austin on May 12, 1957. They show the echoes on the scope each 30 minutes from 3:00 p.m. to 8:00 p.m. and at 9:00 p.m. on May 12, which was the day of the Lampasas flood disaster. The town of Lampasas is 329 degrees and 51 nautical miles from the Austin radar. Each circle marker represents a distance of twenty miles; the Austin radar instrument was at the exact center of each picture. Texas rainfall patterns are recorded by continuous scope pictures taken at all Weather Bureau radar installations in the State.

Unofficial rainfall totals up to 12 inches were measured some five miles west of the town of Lampasas. The official recording gage at Lampasas totaled 6.15 inches. The rain began at 6:00 p.m. and hourly rainfall records are as follows:

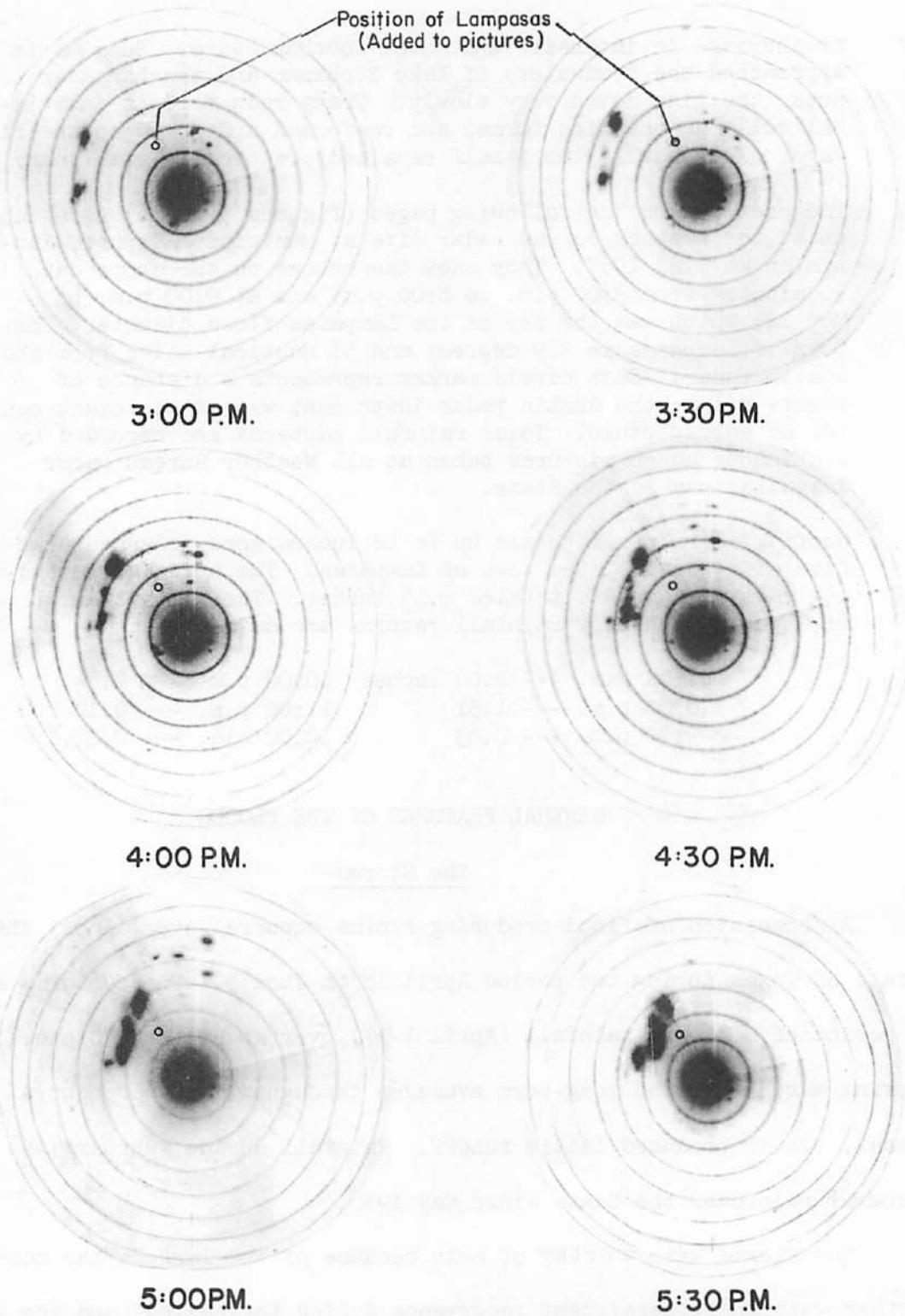
7:00 p.m. --- 2.00 inches	10:00 p.m. --- 1.84
8:00 p.m. --- 1.51	11:00 p.m. --- 0.10
9:00 p.m. --- 0.63	12:00 mid. --- 0.07."

GENERAL FEATURES OF THE FLOODS

The Storms

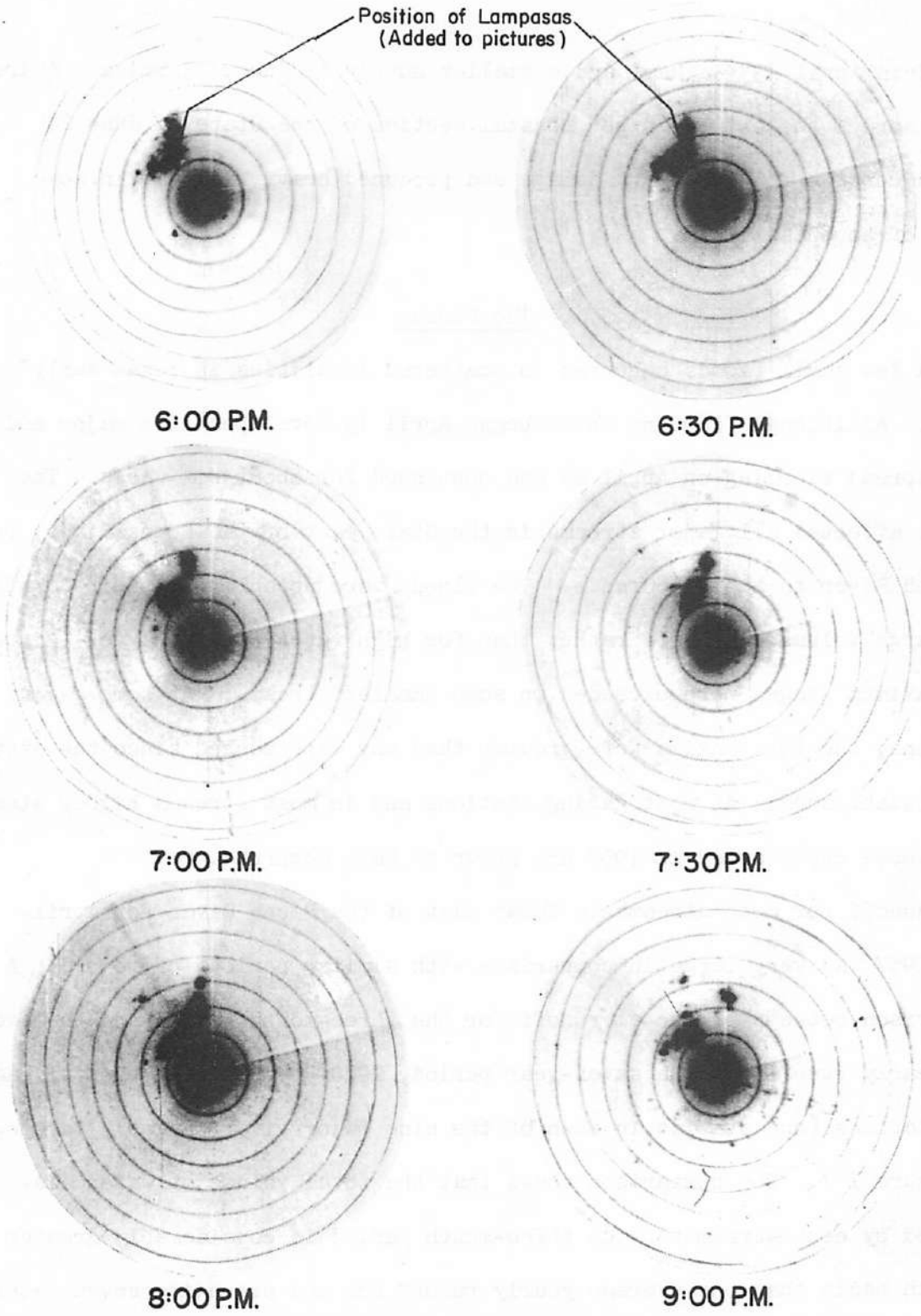
A succession of flood-producing storms occurred over almost the entire State of Texas during the period April 18 to June 5. These storms followed a period of moderate rainfall (April 1-17) over much of the State. Rainfall during March exceeded long-term averages throughout most of central and east Texas, but it produced little runoff. Rainfall during February was the first general rain over the State since May 1956.

The storms were worthy of note because of the large areas covered, together with their persistent recurrence during the period, and the severe weather that frequently accompanied them. A total of 65 tornadoes were re-



RADAR SCOPE PICTURES - U.S. WEATHER BUREAU STATION - MUNICIPAL AIRPORT - AUSTIN, TEXAS - MAY 12, 1957

Figure I - 5



RADAR SCOPE PICTURES - U.S. WEATHER BUREAU STATION - MUNICIPAL AIRPORT - AUSTIN, TEXAS - MAY 12, 1957

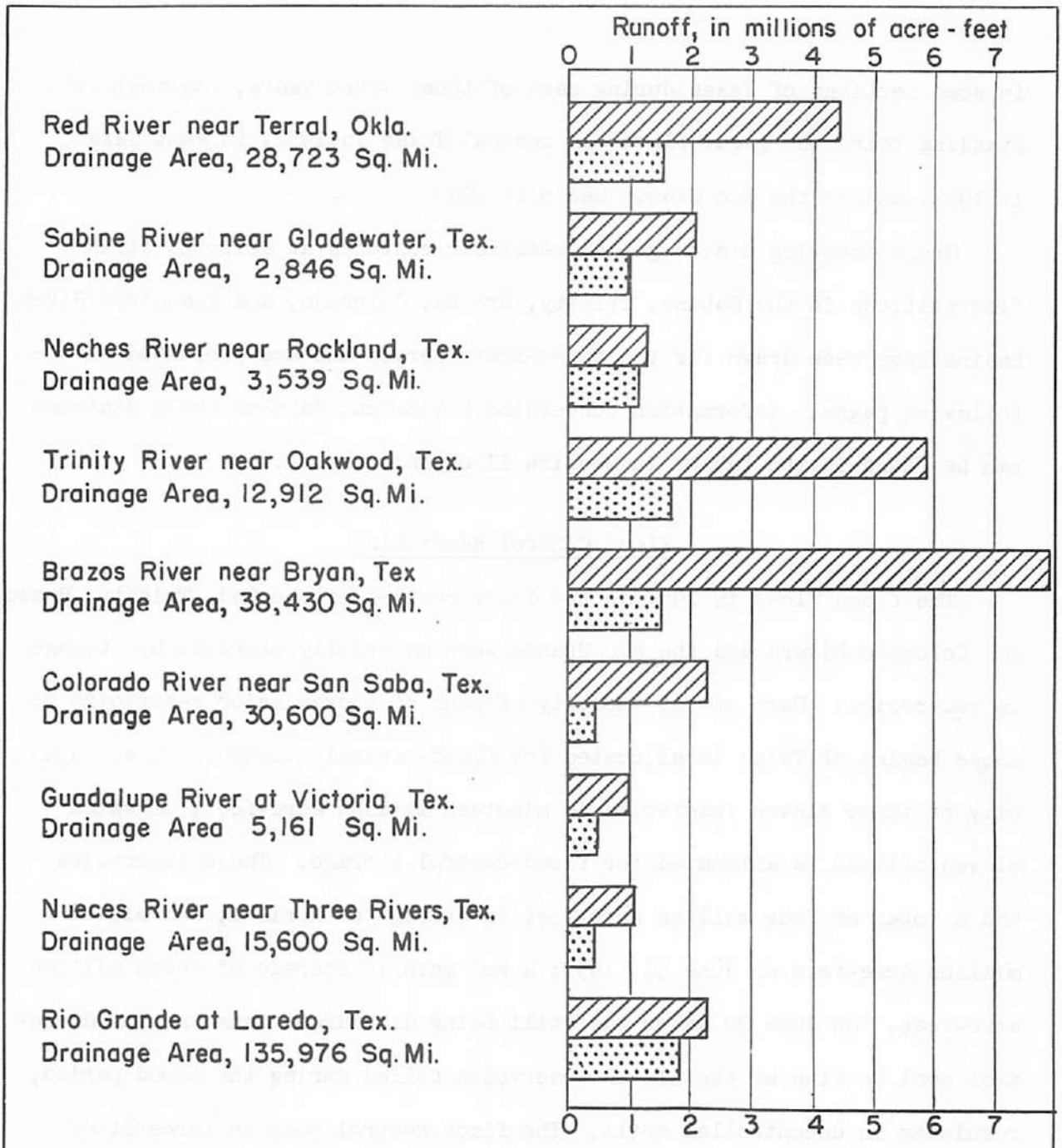
Figure I - 6

corded in April, 33 in May, and a smaller number in June. Hurricane Audrey which struck the extreme upper coastal section of the State on June 27 caused considerable property damage and produced heavy rainfall in some areas of southeast Texas.

The Floods

A few small floods occurred in scattered localities in Texas early in April. Additional flooding which began April 19 developed into major and wide-spread flooding on April 24 and continued for about six weeks. The floods affected all major streams in the State east of the Pecos River, from the Red River to the Rio Grande. The floods were notable for their duration and large volume of runoff rather than for high rates of discharge. Historical maximum stages were exceeded on some smaller streams. At some gaging stations, the 1957 maxima were greater than any experienced since the stations were established. At most gaging stations and in most streams higher stages than those experienced in 1957 are known to have occurred.

Runoff for most streams in Texas east of the Pecos River for April-June 1957 was very large in comparison with similar periods of record. A comparison between the total runoff for the three-month period and the average yearly runoff for the seven-year period, 1950-56, for nine typical gaging stations (one station in each of the nine major river basins), is shown in figure I-7. The comparison shows that the total volume of water discharged by each stream for the three-month period is considerably greater in each basin than the average yearly runoff for the preceding seven water years. The period 1950-56 is generally considered to have been a period of severe drought in Texas. However, there were large or record-breaking floods



Total runoff, in acre-feet, during flood period April - June 1957. (Not adjusted for storage)

Average yearly runoff, in acre-feet, for 7 - year period 1950-56. (Not adjusted for storage)

Comparison of total runoff, in acre-feet, during flood period April - June 1957 with average yearly runoff, in acre - feet, for 7 - year period 1950 - 56, at selected stream flow gaging stations.

Figure I - 7

in some sections of Texas during each of those seven years, the most outstanding being the great floods in central Texas in 1952, in east Texas in 1953, and in the Rio Grande basin in 1954.

Graphs showing discharge and reservoir contents at selected streamflow stations in the Sabine, Trinity, Brazos, Colorado, and Guadalupe River basins have been drawn for the three-month period and are presented on the following pages. Information concerning historical data at these stations can be found in the tables in Section II of this report.

Flood Control Reservoirs

The flood flows in 1957 in the lower reaches of the Red, Trinity, Brazos and Colorado Rivers and the Rio Grande were materially affected by storage in reservoirs. Part of the capacity of each of eleven major reservoirs in those basins of Texas is allocated for flood-control storage. Total capacity of these eleven reservoirs is nineteen million acre-feet, of which eleven million is allocated for flood-control storage. These reservoirs had a total of four million acre-feet in storage on April 1, and eleven million acre-feet on June 30, 1957; a net gain in storage of seven million acre-feet. On June 30 water was still being discharged from the flood control pool in nine of the eleven reservoirs filled during the flood period, resulting in uncontrolled spill. The flood-control pool in three other reservoirs would have filled except for releases made during the flood period. During the period covered by this report, numerous reservoirs in addition to the eleven discussed above caught and held a great quantity of runoff which had a material effect in reducing the flow of many streams.

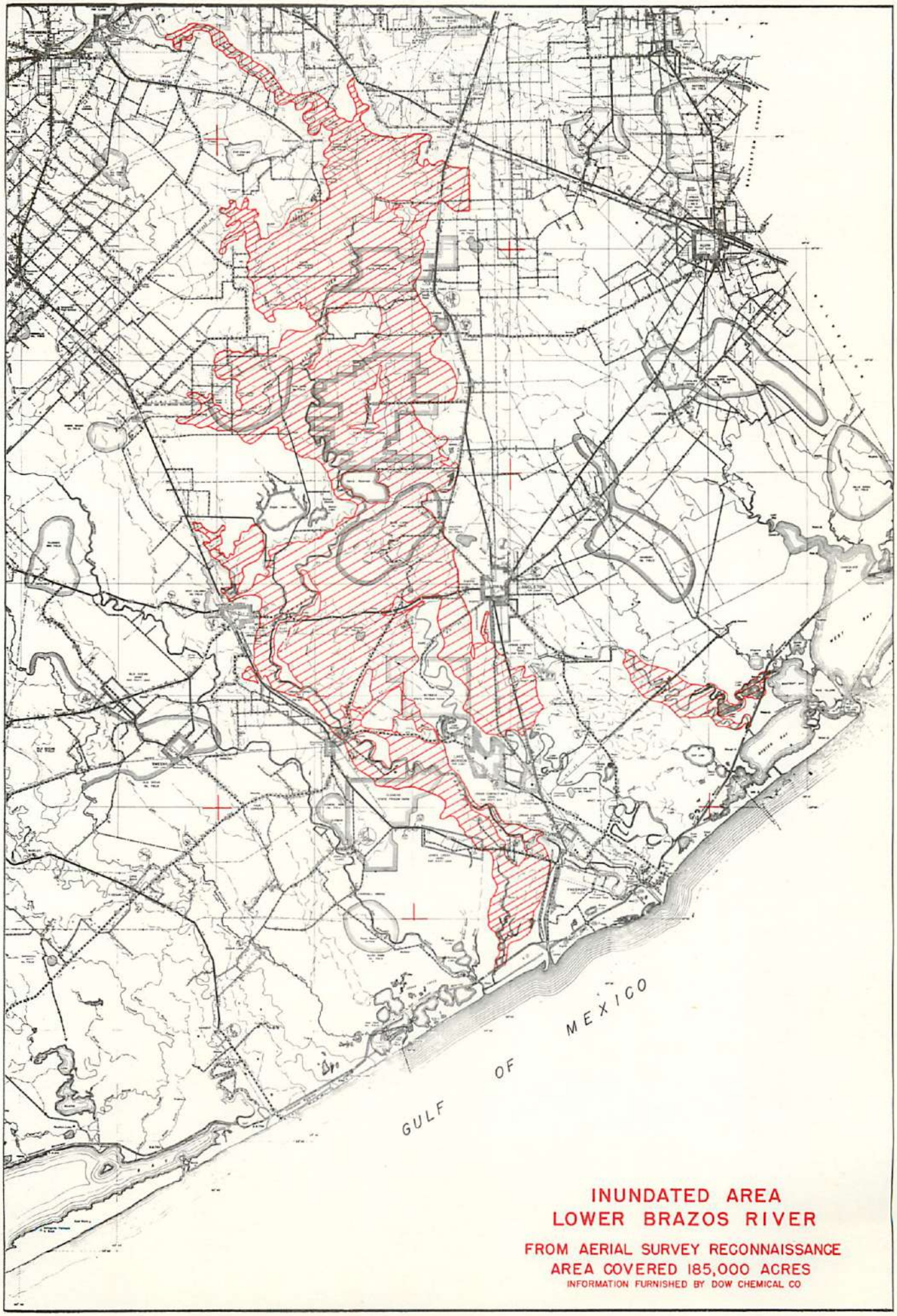
Flood Damages

Flood damage during the April, May and June storm period has been tentatively estimated at 100 million dollars by the Corps of Engineers. This figure is subject to revision in the Corps' final report. It is known that crippling losses were sustained by a major cross-section of enterprises of the State, including the flooding of oil fields, loss of highway and railroad embankments and bridges, loss of homes and furnishings, and motor vehicles. Farms and ranches suffered untold damages in erosion, loss of livestock, and farm improvements including houses, barns and fences. Prolonged rainfall delayed planting in many areas and destroyed young crops in other sections of the State. Views of flood damages are shown in figures I-19 to I-30.

SUMMARY

It is recognized that the State needs many more flood-control reservoirs to more positively regulate streamflow and reduce the destructiveness of floods. However, completing an adequate system of reservoirs will require many years. In the interim a more positive means for determining time, place, and quantity of rainfall preparatory to initiating a flood-warning service would keep the public advised relative to the location of flood-producing storms. More stream gaging stations are needed at selected points on major tributaries to determine the quantity of water produced by a storm on the watershed. These data are needed to provide information for predicting downstream flooding and determining rainfall-runoff relationships so that engineers will know the quantity of water produced and the amount that will actually be in transit in the streams. Topographic maps

to determine water storage and water retaining capacities in the streambeds, including flood plains between certain points of the river, will be necessary before flood forecasting can be done with accuracy. If such data and maps were available, it would then be possible to compare the volume of water in transit with the volume of available storage and make accurate flood forecasts. Accurate rainfall determinations, streamflow measurements, and topographic maps are needed as tools in flood forecasting, but they are all requisite to the final watershed planning and development of the water resources of the basin.



INUNDATED AREA
LOWER BRAZOS RIVER

FROM AERIAL SURVEY RECONNAISSANCE
AREA COVERED 185,000 ACRES
INFORMATION FURNISHED BY DOW CHEMICAL CO

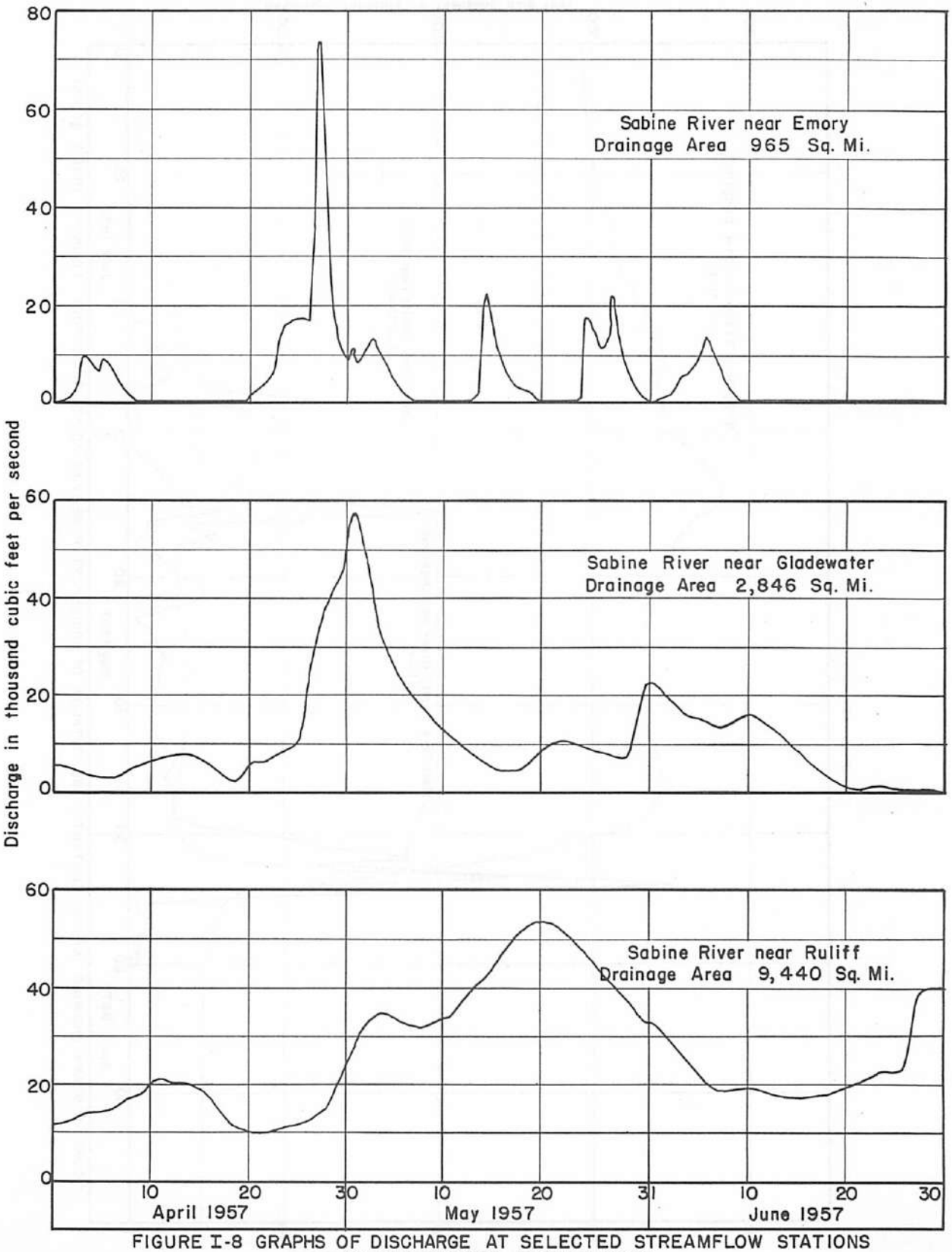


FIGURE I-8 GRAPHS OF DISCHARGE AT SELECTED STREAMFLOW STATIONS IN THE SABINE RIVER BASIN.

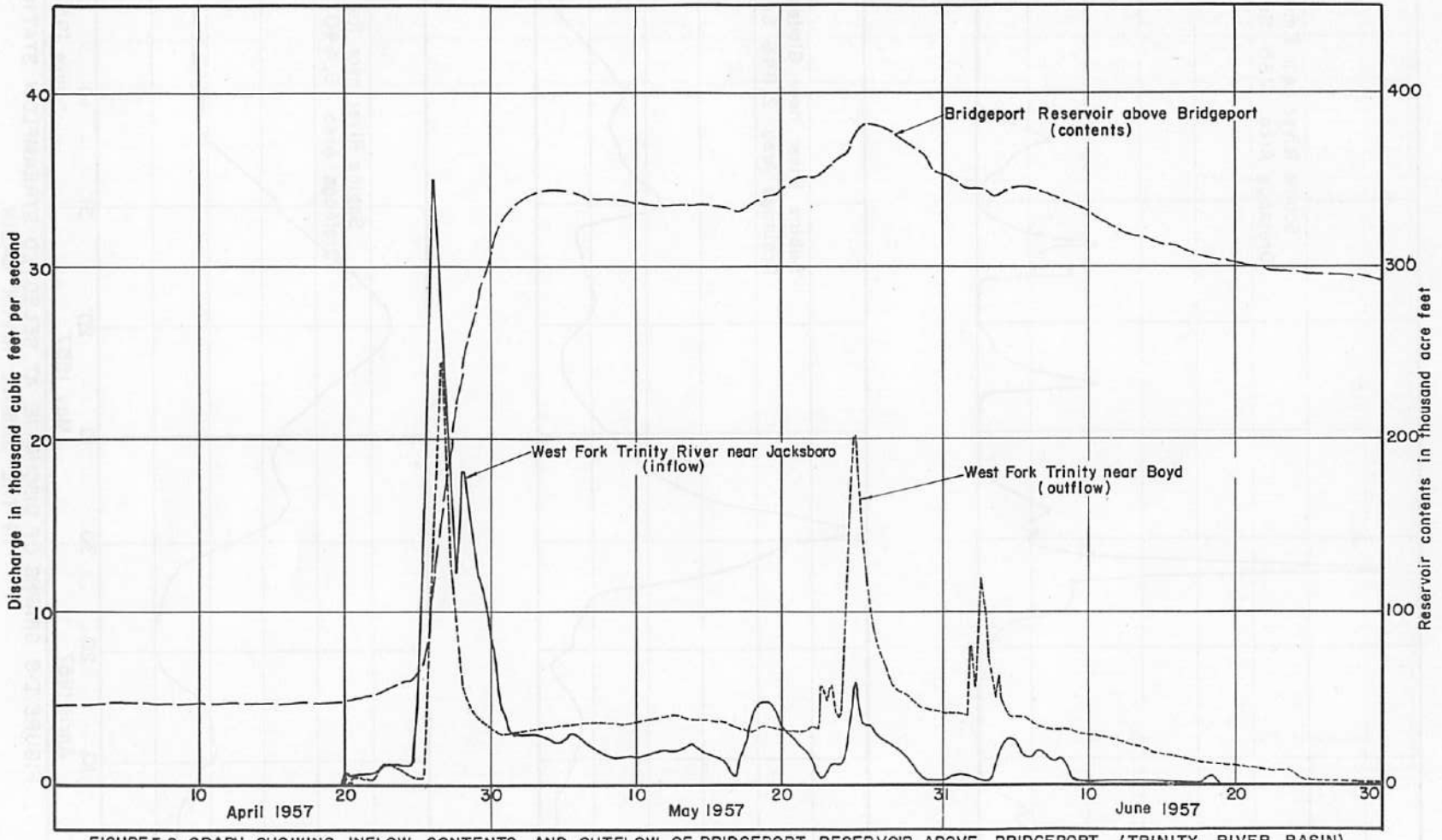


FIGURE I-9 GRAPH SHOWING INFLOW, CONTENTS, AND OUTFLOW OF BRIDGEPORT RESERVOIR ABOVE BRIDGEPORT (TRINITY RIVER BASIN).

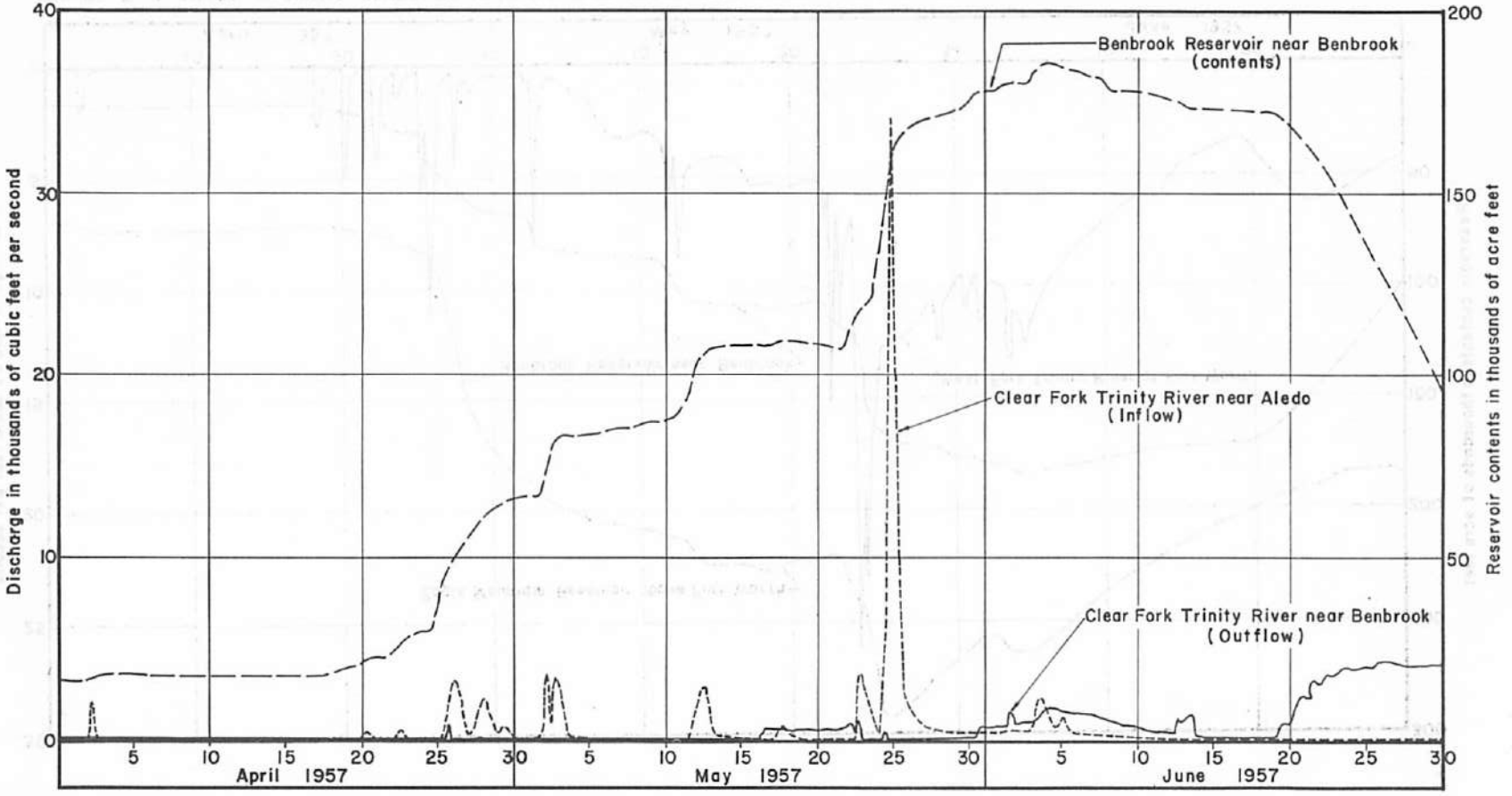


FIGURE I-10. GRAPH SHOWING INFLOW, CONTENTS, AND OUTFLOW FROM BENBROOK RESERVOIR NEAR BENBROOK

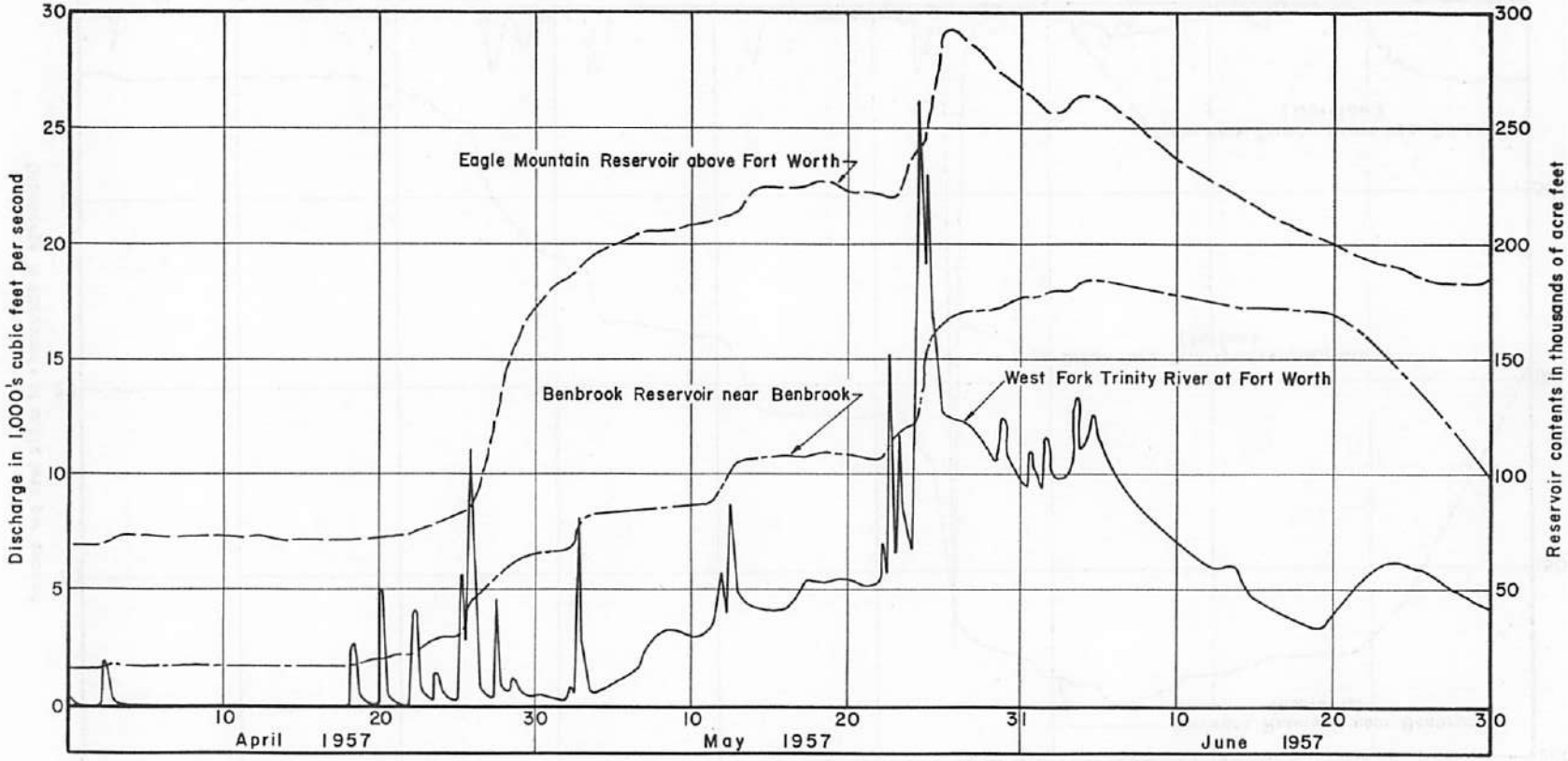


FIGURE I - II. GRAPH SHOWING CONTENTS OF RESERVOIRS ABOVE FORT WORTH AND FLOW OF WEST FORK TRINITY RIVER AT FORT WORTH

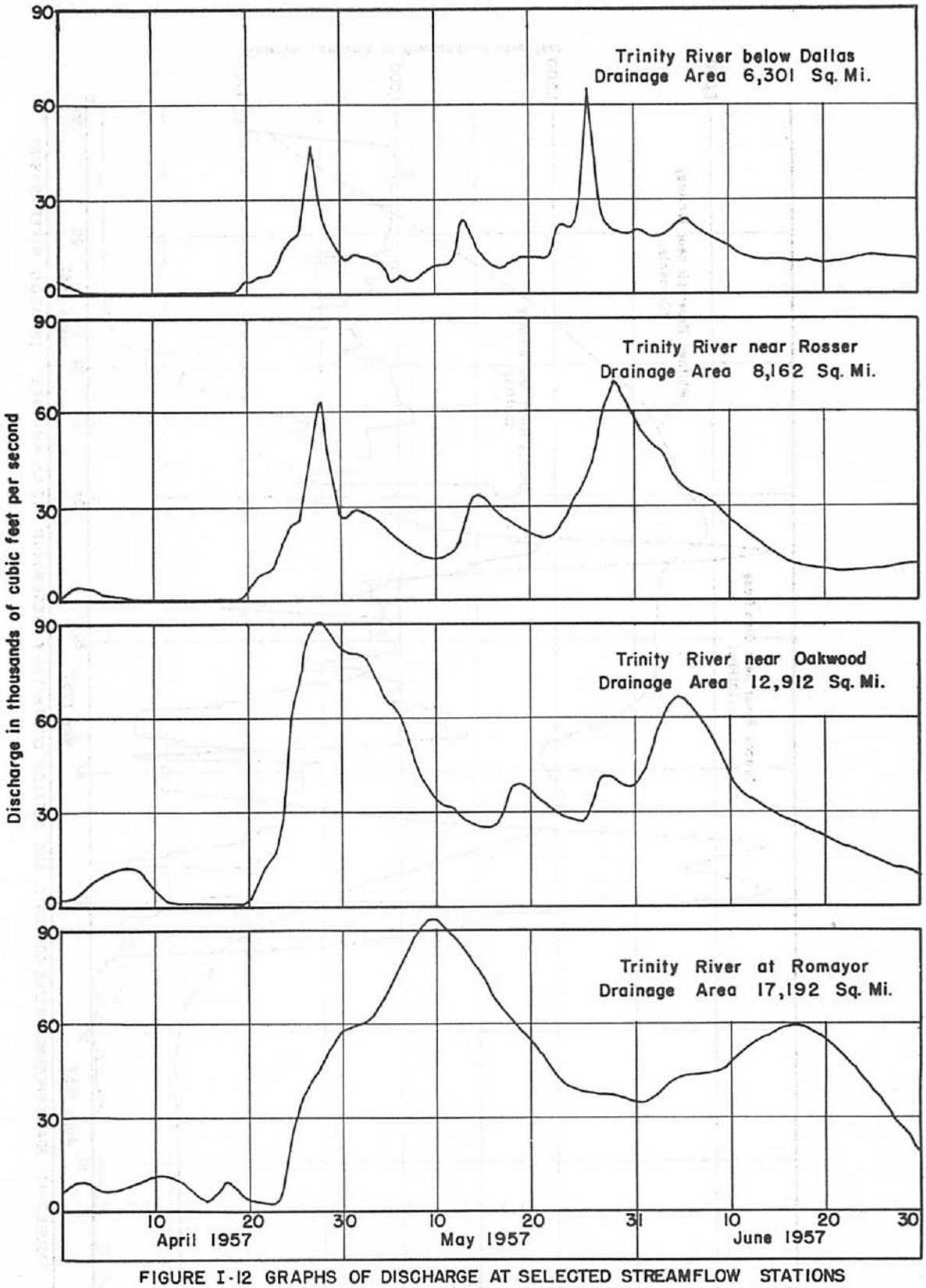


FIGURE I-12 GRAPHS OF DISCHARGE AT SELECTED STREAMFLOW STATIONS IN THE TRINITY RIVER BASIN.

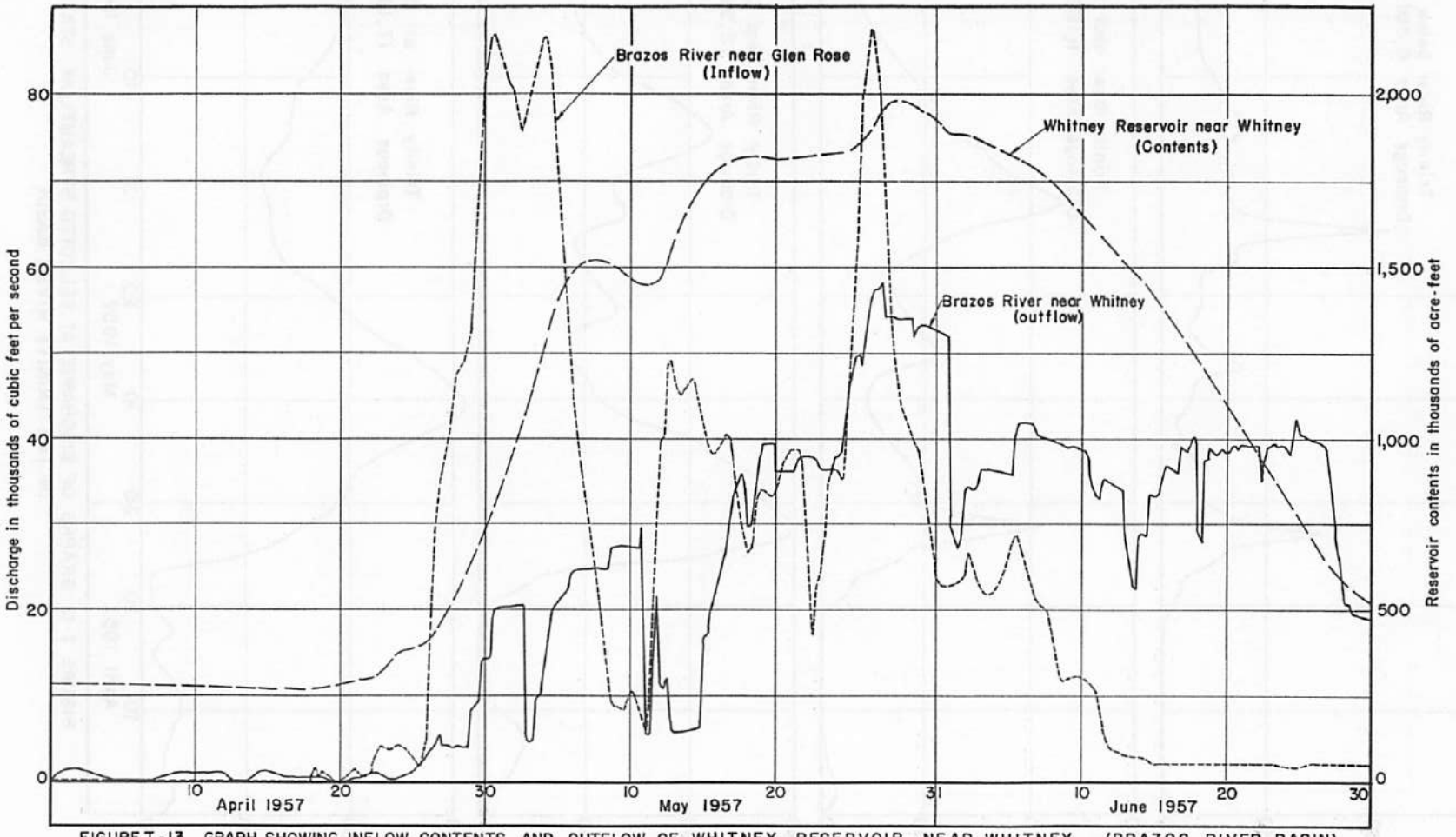


FIGURE I-13 GRAPH SHOWING INFLOW, CONTENTS, AND OUTFLOW OF WHITNEY RESERVOIR NEAR WHITNEY (BRAZOS RIVER BASIN).

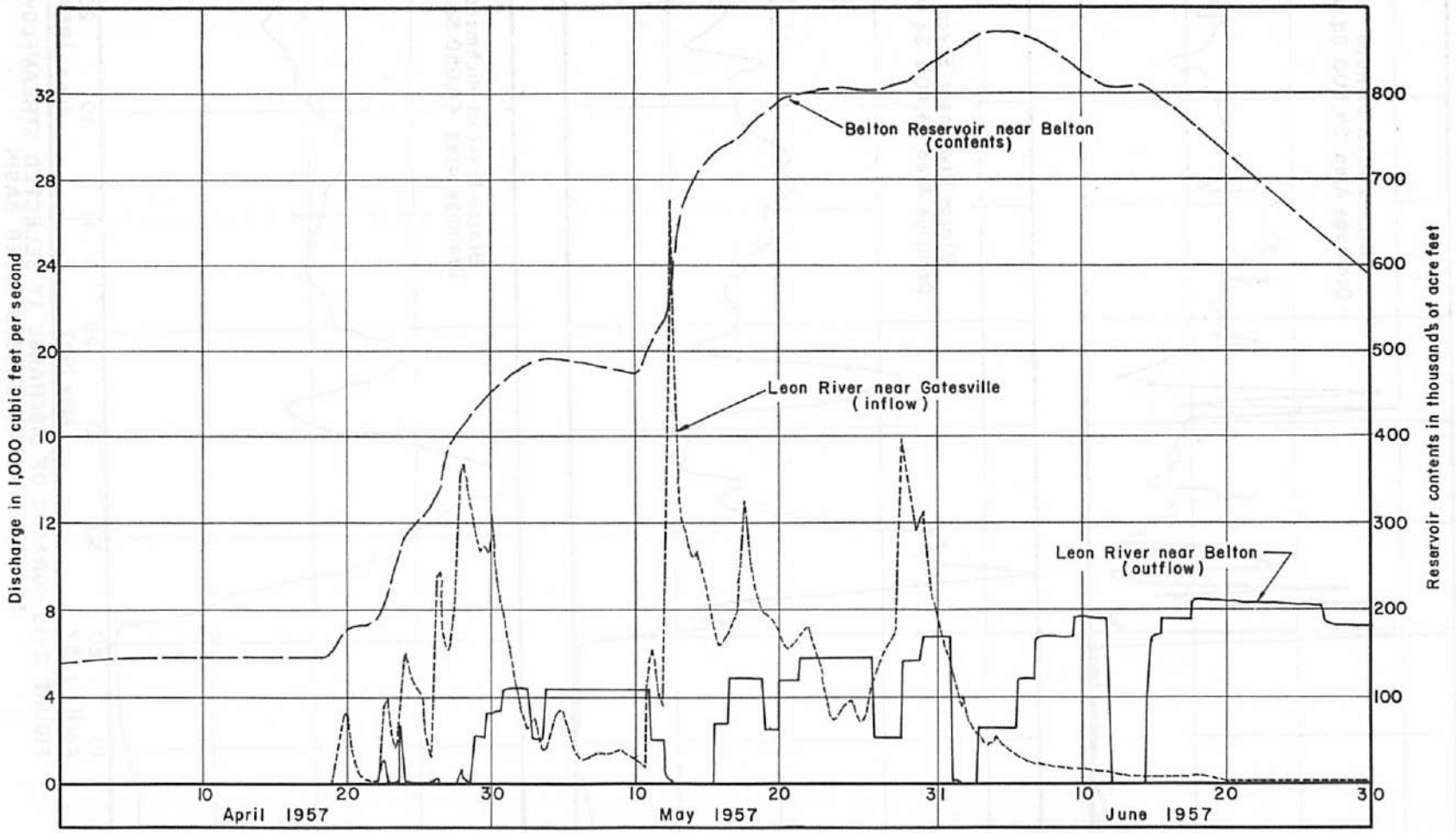


FIGURE I - 14 GRAPH SHOWING INFLOW, CONTENTS, AND OUTFLOW OF BELTON RESERVOIR NEAR BELTON (BRAZOS RIVER BASIN).

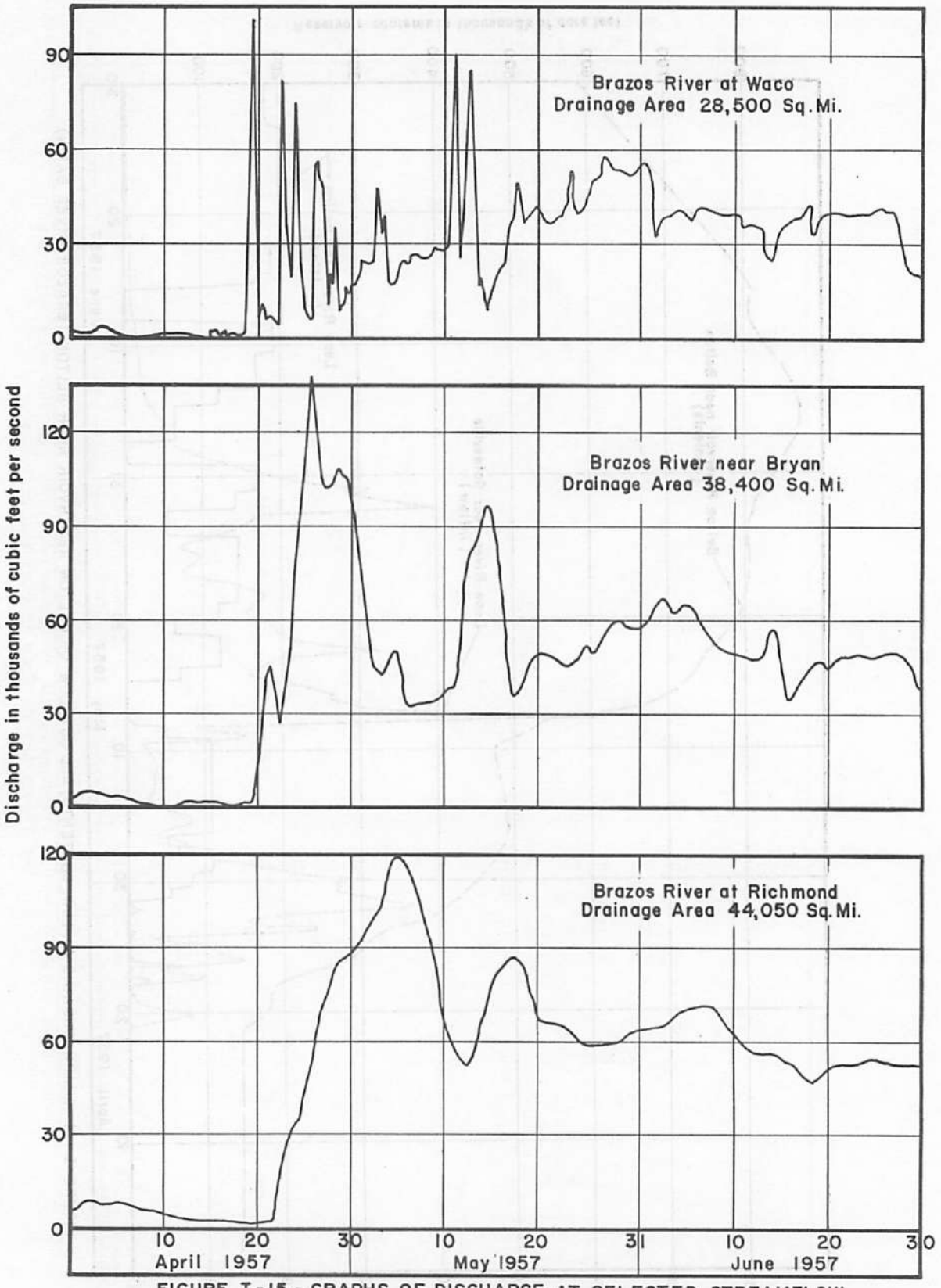


FIGURE I-15 - GRAPHS OF DISCHARGE AT SELECTED STREAMFLOW STATIONS IN THE BRAZOS RIVER BASIN

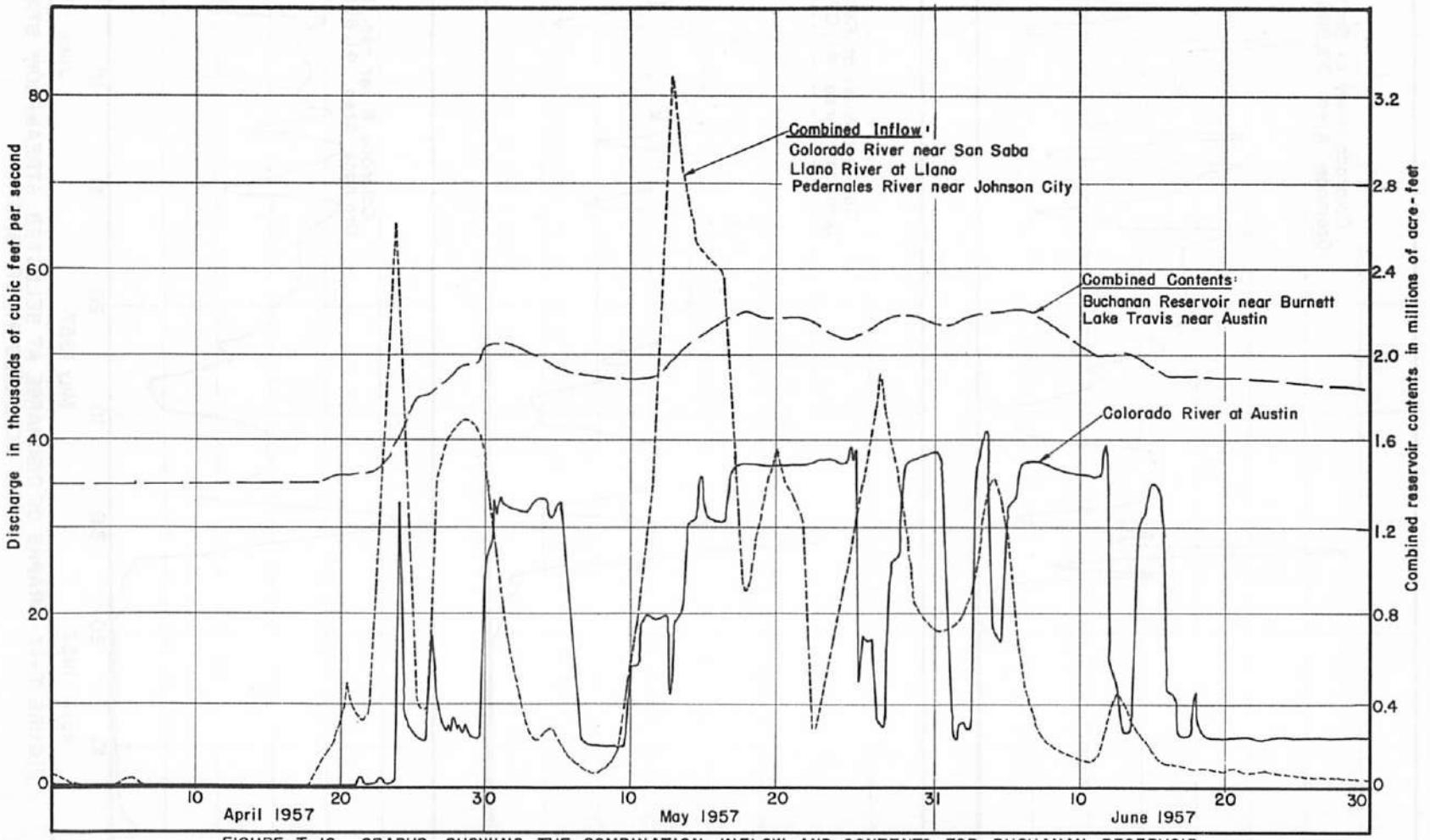


FIGURE I-16 GRAPHS SHOWING THE COMBINATION INFLOW AND CONTENTS FOR BUCHANAN RESERVOIR AND LAKE TRAVIS AND OUTFLOW AS MEASURED AT AUSTIN

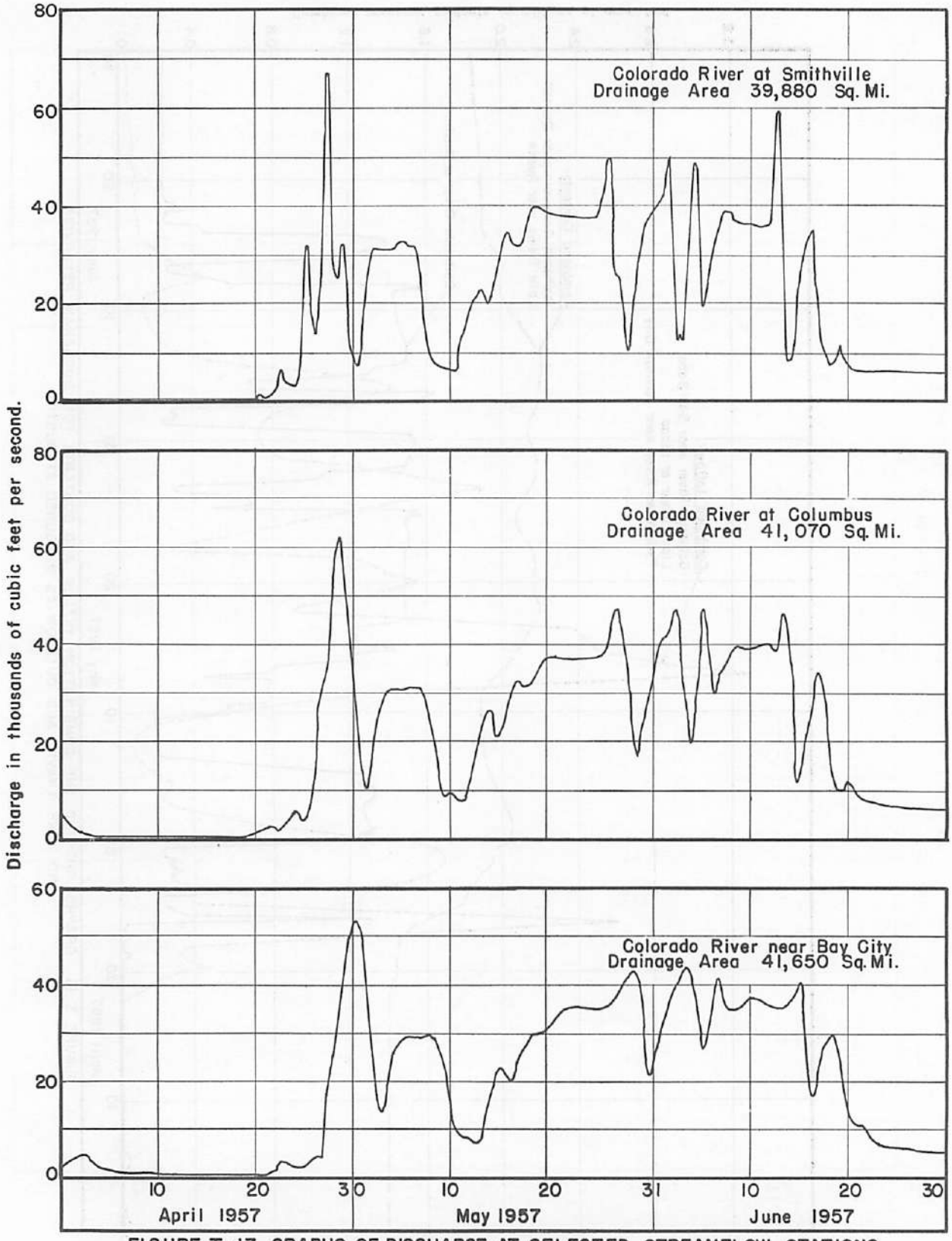


FIGURE I-17 GRAPHS OF DISCHARGE AT SELECTED STREAMFLOW STATIONS IN THE COLORADO RIVER BASIN.

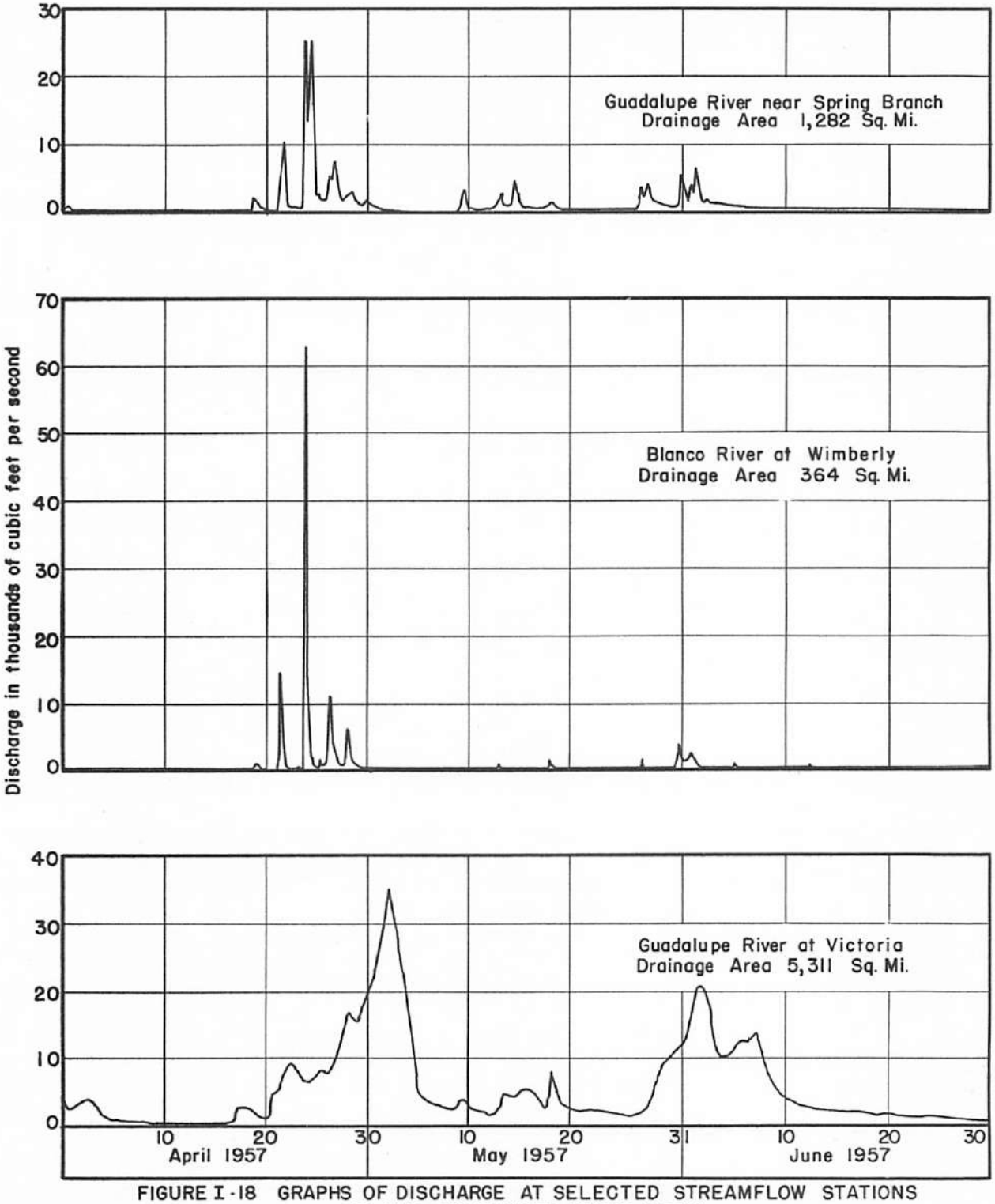


FIGURE I-18 GRAPHS OF DISCHARGE AT SELECTED STREAMFLOW STATIONS IN THE GUADALUPE RIVER BASIN

FIGURE I-19. Flow over spillway at Denison Dam during flood of June, 1957. Photograph by Denison Herald, Denison, Texas.

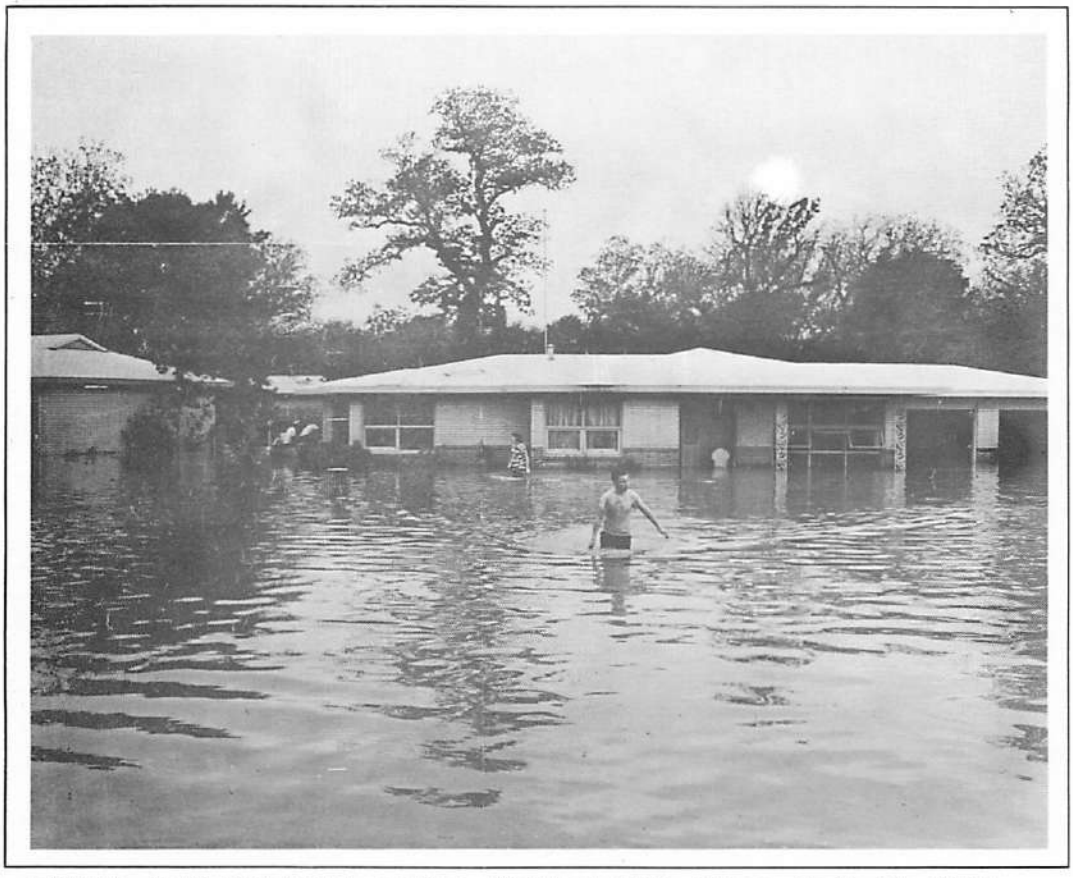


FIGURE I-20. Residential section, Richland Hills, Texas, April 26, 1957, flooded by Big Fossil Creek. Photograph by Corps of Engineers, U. S. Army.

FIGURE I-21. Flooded residential section in Fort Worth area, April, 1957. Photograph by Bell Helicopter Corporation.

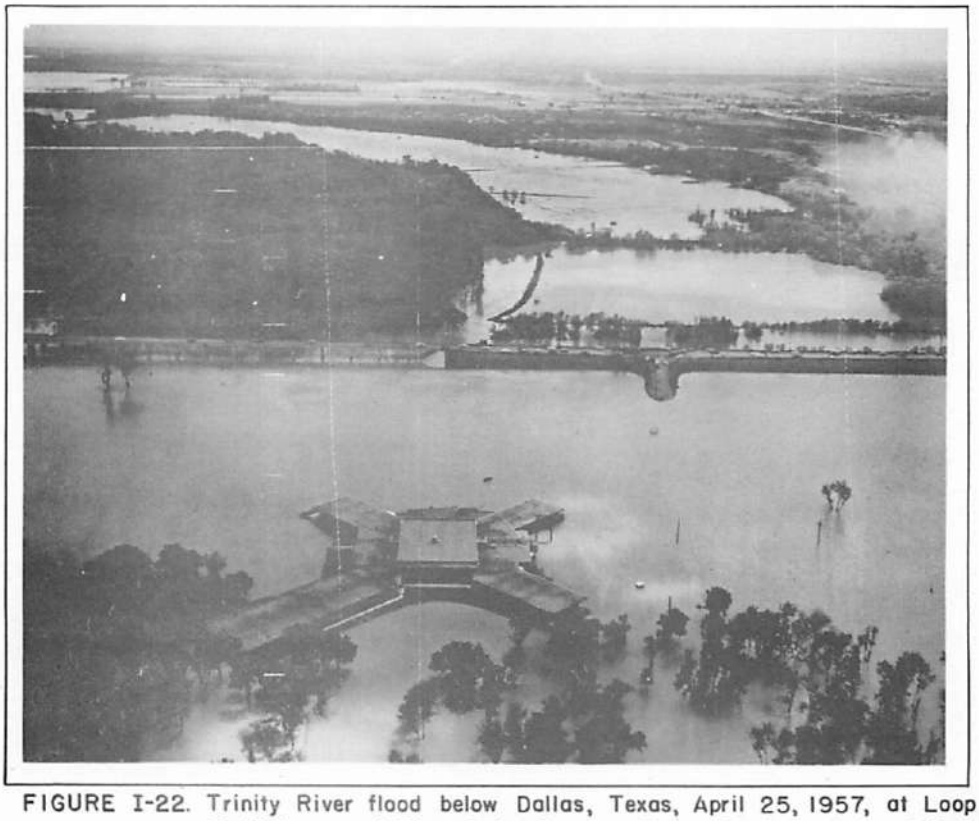


FIGURE I-22. Trinity River flood below Dallas, Texas, April 25, 1957, at Loop 12 highway and River Lake Country Club. Flood reached a 5 foot higher stage at a later date. Photograph by Corps of Engineers, U.S. Army

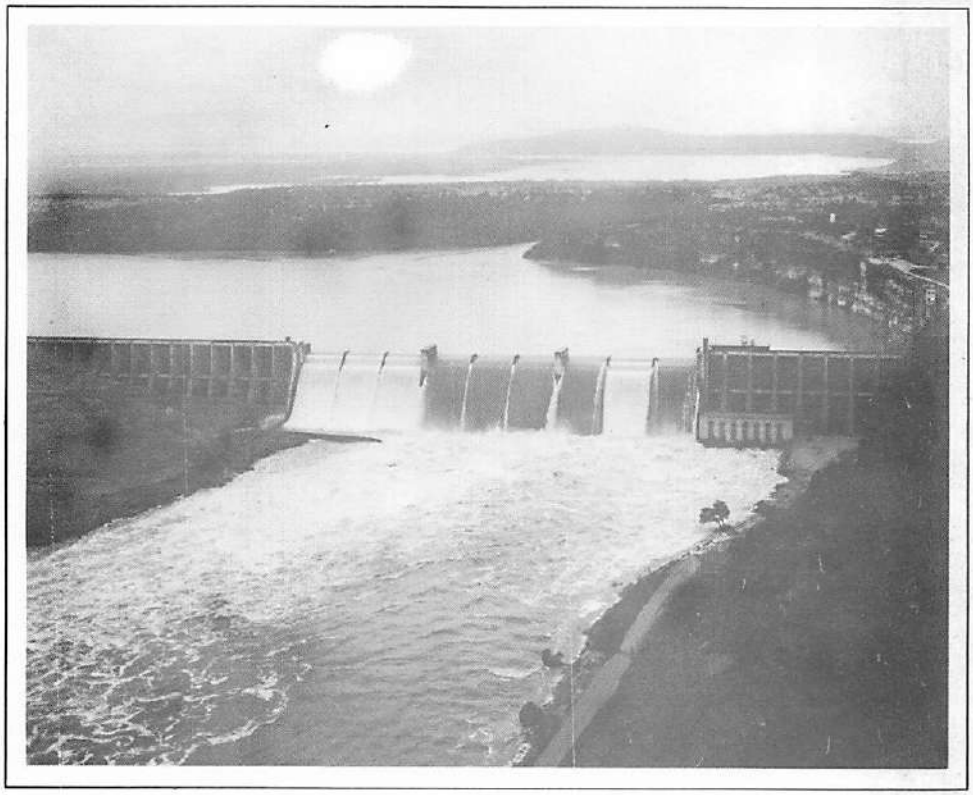


FIGURE I-23. Brazos River at Possum Kingdom Dam, May 1, 1957. Discharge about 75,000 cfs. Photograph by Corps of Engineers, U.S. Army.

FIGURE I-24. Brazos River flood at Southern Pacific Railroad near Hempstead, Texas, May 1, 1957. Discharge about 140,000 cfs. Photograph by Corps of Engineers, U.S. Army.

FIGURE I-25. Damage at Lampasas, Texas by Sulphur Creek flood of May 12, 1957. Photograph by Texas Department of Public Safety, May 13, 1957.

FIGURE I-26. San Gabriel River at Missouri-Kansas-Texas Railroad bridge at Georgetown, Texas; near crest of flood April 24, 1957. Photograph by United Press.

FIGURE I-27. Flooded small stream at San Antonio, Texas, April 28, 1957. Note garden-hose lifeline. Photograph by United Press.

FIGURE I-28. North San Gabriel River at U.S. Hwy. 81 bridge, Georgetown, Texas; near crest of flood April 24, 1957. Photograph by United Press.

FIGURE I-29. Flooding of lowlands near the mouth of the Colorado River, April 29, 1957. Photographed by Lower Colorado River Authority.

FIGURE I-30 Flooding of lowlands on the Colorado River near Matagorda, Texas, May 1, 1957. Photographed by Lower Colorado River Authority.

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TEXAS FLOODS OF APRIL, MAY AND JUNE 1957

SECTION II

RUNOFF RECORDED AT GAGING STATIONS

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LIST OF ILLUSTRATIONS

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SECTION II

RUNOFF RECORDED AT GAGING STATIONS

METHODS OF OBTAINING BASIC DATA

More than fifty years ago a system of streamflow measurement stations was established in Texas. At the present time there are 293 such points of measurement in operation in the State.

There is a wide variation in flow conditions and physical characteristics of Texas streams. Some streams have almost continuous flows; others flow only during periods of rainfall on the watershed. Many streams are confined within well-defined banks, which makes the measurement of streamflow less difficult than in streams having poorly defined beds and banks. In Texas where so much of the total water supply is developed from storm flow, it is important that records be obtained on intermittent streams as well as on the perennial streams.

Measuring the flow of streams is a technique which requires engineering judgement and experience in selecting the best site for making measurements. Instruments have been developed to record automatically the stage of water flowing in the stream, but in order to determine the quantity of water, it is also essential to know the area of the cross-section of water in the stream, and the velocity at which the water flows. The velocity is measured with an instrument known as a current meter. Streambeds do not maintain a uniform cross-section through the years, resulting in variations in flow characteristics. For the purpose of establishing the relationship between depth of flow and quantity of flow it is necessary to make current-

meter measurements periodically. Streamflow stations are located on highway or railroad bridges when other conditions permit so that during floods current-meter measurements can be made from the bridge. In other locations a cableway is built across the stream and is equipped with a travelling car from which measurements are made. A substantial part of the cost of the gaging station program goes into construction and field operations incident to making the necessary determination of flow characteristics and maintaining a rating curve at the gaging sites. For the purpose of bringing the stream-gaging network up to the minimum requirements, more than 100 additional sites have been selected, and funds for their establishment have been requested.

PEAK FLOW MEASUREMENTS

Following critical flood periods, such as were experienced in Texas during the period April to June 1957, it is often found that some very important tributary contributions to the floods could not be measured. Flooding possibly occurred on streams that are inaccessible during flood periods, or possibly at places where funds had not been provided for the installation of measuring facilities. When this condition occurs, the maximum instantaneous discharge, or peak flow, can be measured after the storm. Peak-flow measurements take into consideration such factors as roughness of the stream channel, cross-sectional area of the water in the channel at is maximum depth, and slope of the water surface at the maximum stage of the storm. High-water stages are marked by drift floating on the water. The method is accurate and adds much to the record, but as it is costly and time consuming it is used to supplement current-meter measurements. Following the flood period six such measurements were made at selected sites where information

was badly needed for water resources planning and design purposes.

In the listing below are the results of these six peak flow measurements. Included are the geographic location of the site, the drainage area, the peak flow discharge with time and date of occurrence, and information relative to previous floods where such data are available. It is noted that the six points selected for this study are on major tributaries of larger river basin systems.

Rock Creek near Mineral Wells

Location.--Lat 32°48'50", long 98°02'30", at Lake Mineral Wells dam on Rock Creek in Parker County about 3/4 mile upstream from bridge on U. S. Highway 180, and 4 miles east of Mineral Wells, Palo Pinto County.

Drainage area.--74.4 sq mi.

Maxima.--April-June 1957: Discharge, 6,440 cfs May 23 or 25, 1957.

Remarks.--From information by Mr. C. H. McCaun who lives near the dam, there were three days, April 25, May 23, and May 25, 1957, on which peak flows of near the same magnitude occurred. The lake level was 9 ft below spillway crest prior to the April flood, and the lake was full prior to the May floods. Shortly after the present dam was completed in 1940, there was flow over the spillway as great or greater than that which occurred during the floods of April and May 1957.

Sulphur Creek above Lampasas

Location.--Lat 31°02'17", long 98°11'39", on the Stanley Ranch, 1.6 miles southwest of the Sulphur Creek bridge on U. S. Highway 183 at Lampasas, Lampasas County.

Drainage area.--78.0 sq mi.

Maxima.--April-June 1957: Discharge, 65,300 cfs May 12, 1957.

Remarks.--Maximum stage occurred in Lampasas between 10 and 10:30 p.m. May 12, 1957, from information by city employees.

Burleson Creek near Lampasas

Location.--Lat 31°05'02", long 98°11'56", just downstream from the old Lampasas-Lometa road crossing.

Drainage area.--7.42 sq mi.

Maxima.--April-June 1957: Discharge, 14,300 cfs May 12, 1957.

Remarks.--Maximum stage at U. S. Highway 281 bridge occurred between 8 and 9 p.m. May 12, 1957, from information by employee of radio station KCYL.

Sulphur Creek below Lampasas

Location.--Lat 31°04'23", long 98°08'20", just downstream from Second Santa Fe Railroad bridge below Lampasas, just upstream from Pecan Branch, and 2.6 miles northeast of the Sulphur Creek bridge on U. S. Highway 183 at Lampasas, Lampasas County.

Drainage area.--108 sq mi.

Maxima.--April-June 1957: Discharge, 74,600 cfs May 12, 1957.

Remarks.--A resident at Gunderland Park 0.3 mile upstream stated that the maximum stage occurred there between 10:30 and 11 p.m. May 12, 1957. This flood reached a stage 4.8 ft higher than the flood of Sept. 27, 1936 at the stone pavilion in Gunderland Park, and 4.8 ft higher than the 1936 flood at the E. J. Noyes home one mile downstream from Gunderland Park. Flood of 1873 was 1.5 ft higher than the 1957 flood at the Noyes home.

North San Gabriel River near Georgetown

Location.--Lat 30°39'20", long 97°41'50", half a mile upstream from Middle Fork, 1-3/4 miles northwest of Georgetown, Williamson County, and 2.2 miles upstream from confluence with South San Gabriel River.

Drainage area.--240 sq mi.

Maxima.--April-June 1957: Discharge, 102,000 cfs, about 5 p.m. April 24, 1957.

Remarks.--According to Mr. Edward Jenkins who lives about 4 miles upstream from the measurement site, the greatest flood since at least 1878 occurred in September 1921 and was about 3 ft higher than the flood of April 1957. He stated that large floods occurred in 1900 and 1913 but in his opinion were not as large as the 1957 flood.

South San Gabriel River near Leander

Location.--Lat 30°37'05", long 97°51'05", one mile downstream from bridge on U. S. Highway 183, 2.6 miles north of Leander, Williamson County, and 13 miles upstream from confluence with North San Gabriel River.

Drainage area.--120 sq mi.

Maxima.--April-June 1957: Discharge, 78,800 cfs 2 p.m. April 24, 1957.

Remarks.--According to Mr. T. J. Cashion who lives near the measurement site, the flood of April 1957 was the highest since at least 1869, and the flood of September 1921 was the second highest since 1869. He had heard of a large flood which occurred in 1869 but believed it to have been smaller than the 1921 flood. By levels to floodmarks, the 1957 flood was determined to be 6.4 ft higher than the 1921 flood.

EXPLANATION OF DATA

The data tabulated on the following pages for each streamflow station show a station description and a table of daily mean discharges for the three-month period, April to June 1957. A summary at the bottom of the table gives the monthly mean discharge in cubic feet per second, the runoff in acre-feet, and for some stations, runoff in inches. In general, runoff in inches is computed for only those stations in areas where the average annual rainfall exceeds 20 inches. For reservoir stations the table shows contents in acre-feet at the indicated time each day and a summary of change in contents during each month.

For the purpose of this report, the data are shown for only 97 selected streamflow and reservoir stations throughout the State, the locations of which are shown as numbered circles on figure II-1. These stations were selected to show concisely the areal extent, origin, and volume of floods in Texas during the period April to June 1957. The open circles shown on figure II-1 indicate the location of the remainder of the stations where streamflow

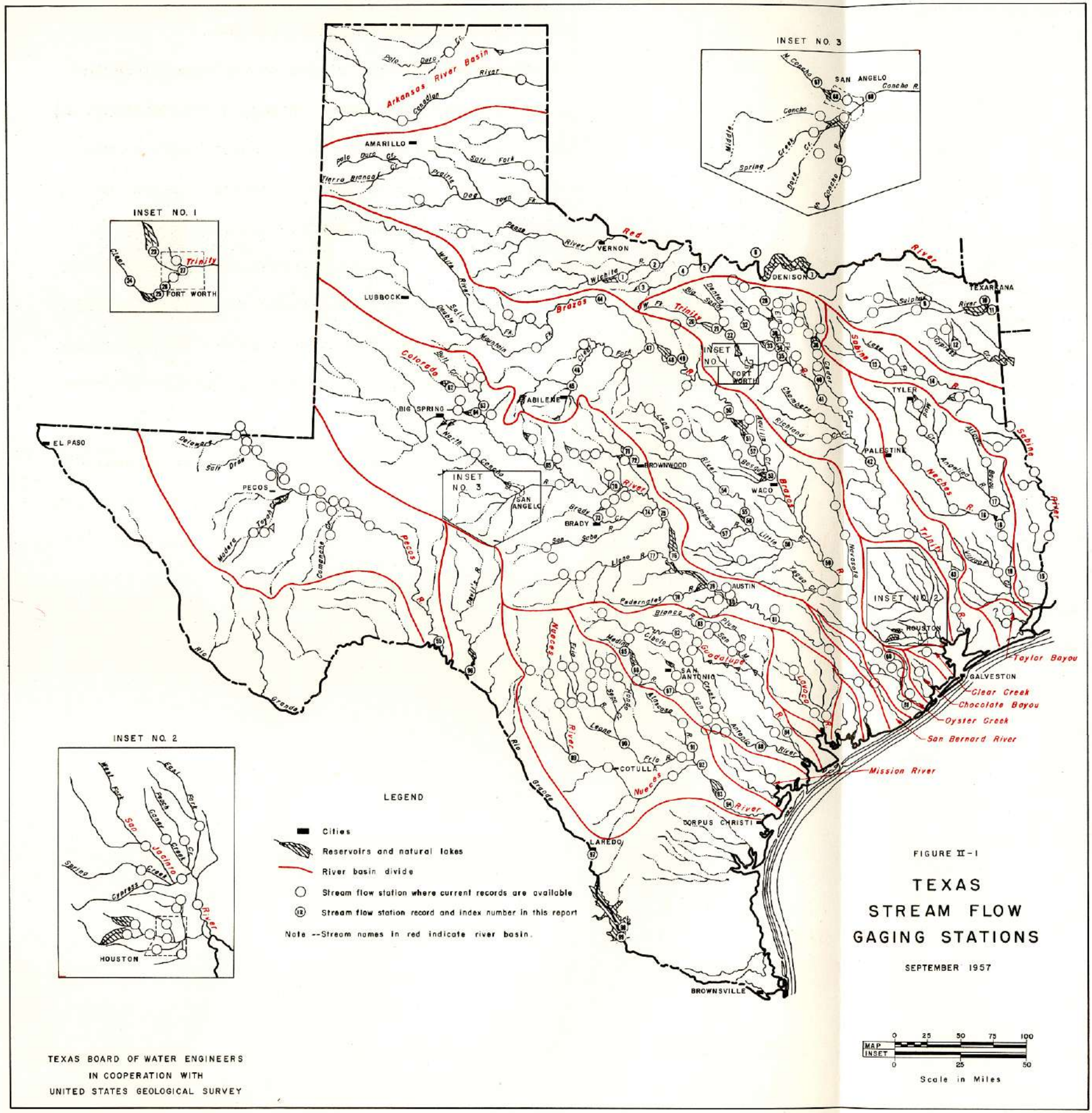

FIGURE II-1

TEXAS STREAM FLOW GAGING STATIONS

SEPTEMBER 1957

TEXAS BOARD OF WATER ENGINEERS
IN COOPERATION WITH
UNITED STATES GEOLOGICAL SURVEY

records are systematically collected and avilable for use.

The station description gives information as to the type, location and datum of the gage; the drainage area above the gage; information relative to the methods used in determining the stage and defining the stage-discharge relation during the flood period; and the maximum stages and discharges. The maximum stage and discharge which occurred during the period April to June 1957, are shown first, followed by the maximum recorded during the indicated period of station records together with historical flood information preceding the period of record when available. The reference number shown by each station name refers to the site as identified by the number on figure II-1.

More detailed data on the station records in this report, as well as the records for other streamflow stations operated throughout Texas, are on file and available in the offices of the Texas Board of Water Engineers and United States Geological Survey.

(1) Lake Kemp near Mabelle, Tex.

Location.--Lat 33°45', long 99°09', in outlet-gate control house at dam on Wichita River, 6.2 miles north of Mabelle, Baylor County, and 10.2 miles northeast of Seymour, Datum of gage is 2.4 ft above mean sea level, datum of 1929, Fort Worth supplementary adjustment of 1942.

Drainage area.--2,099 sq mi.

Gage-height record.--Float-tape gage read daily at 8 a.m.

Maxima.--April-June 1957: Contents, 390,900 acre-ft 8 a.m. May 21 (gage height, 1,147.8 ft).
1922 to March 1957: Contents, 420,900 acre-ft June 30, 1941 (gage height, 1,149.6 ft).

Remarks.--Reservoir is formed by hydraulic earth-fill dam 7,500 ft long, having an uncontrolled semi-circular concrete service spillway 564 ft long with crest at gage height 1,150.6 ft (capacity, 438,000 acre-ft). Two uncontrolled emergency spillways are located between the left end of dam and the service spillway, one 70 ft long with crest at gage height 1,159.1 ft, and the other 335 ft long with crest varying from gage heights 1,159.6 to 1,162.9 ft. Storage began Oct. 1, 1922; dam completed Aug. 25, 1923. Outlet works consists of 6 conduits, 7 ft in diameter, controlled by lift-type gates. Records of daily gage heights furnished by Wichita County Water Improvement Districts Nos. 1 and 2. Capacity table furnished by Corps of Engineers and based on their survey in 1944. Two outlet gates were opened May 19 and closed June 12. Discharge through the gates was about 3,300 cfs.

Contents, in acre-feet, at 8 a.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	164,900	254,300	356,400	11	165,800	304,700	335,600	21	164,900	390,900	343,600
2	164,900	269,900	353,200	12	164,900	312,200	330,800	22	172,400	387,600	343,600
3	164,900	273,900	351,600	13	164,900	324,600	330,800	23	182,200	384,300	345,200
4	164,900	279,300	351,600	14	164,900	332,400	332,400	24	187,300	389,200	345,200
5	165,800	287,500	354,800	15	164,900	337,200	332,400	25	191,700	389,200	345,200
6	165,800	290,300	356,400	16	164,900	337,200	332,400	26	196,100	384,300	345,200
7	165,800	290,300	354,800	17	164,900	338,800	334,000	27	198,400	381,000	345,200
8	165,800	290,300	351,600	18	164,900	353,200	335,600	28	201,800	376,000	345,200
9	165,800	294,500	345,200	19	164,900	362,800	335,600	29	211,100	371,100	345,200
10	165,800	298,700	340,400	20	164,900	384,300	342,000	30	230,300	366,200	343,600
								31		361,200	
Change in contents during month.									+65,400	+130,900	-17,600

(2) Wichita River at Wichita Falls, Tex.

Location.--Lat 33°54'30", long 98°32'05", near center of stream on downstream side of Beverly Drive Bridge in Wichita Falls, Wichita County, 4 miles upstream from Fort Worth & Denver City Railway bridge, and about 7 miles upstream from Holliday Creek. Datum of gage is 924.26 ft above mean sea level, datum of 1929.

Drainage area.--3,140 sq mi, of which 2,099 sq mi is above Lake Kemp Dam.

Gage-height record.--From graph based on twice-daily or oftener, readings of wire-weight gage.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 3.

Maxima.--April-June 1957: Discharge 7,200 cfs 6 p.m. May 2 (gage height 18.27 ft); maximum gage height 18.52 ft 3 a.m. May 20.
1938 to March 1957: Maximum discharge observed, 17,800 cfs Oct. 3, 1941 (gage height, 24.00 ft).
Maximum discharge known, 50,000 cfs June 8, 1915, computed by Vernon L. Sullivan, engineer for Big Wichita River Irrigation Co.

Remarks.--Flow partly regulated by Lake Kemp and slightly regulated by Lake Diversion (capacity 40,000 acre-ft) about 50 miles upstream. Two outlet gates in Lake Kemp Dam were opened May 19 and closed June 12. Discharge through the gates was about 3,300 cfs.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	29	2,820	4,160	11	27	1,210	3,060	21	1,320	5,630	345
2	30	3,770	5,900	12	29	1,550	3,070	22	712	3,960	255
3	30	6,720	6,490	13	27	2,260	3,320	23	835	3,770	199
4	32	6,760	5,640	14	30	1,190	3,360	24	642	4,270	177
5	32	5,810	4,830	15	30	847	1,640	25	267	4,450	187
6	30	4,560	4,490	16	32	644	794	26	1,500	4,210	144
7	32	2,600	4,350	17	31	648	471	27	799	4,210	135
8	30	1,280	3,170	18	30	4,370	390	28	992	4,210	139
9	27	1,250	3,550	19	35	6,530	972	29	2,920	4,080	125
10	27	2,010	3,150	20	119	6,750	555	30	3,380	4,090	121
								31		4,370	
Monthly mean discharge, in cubic feet per second.									468	3,575	2,173
Runoff, in acre-feet.									27,880	219,800	129,300

(3) Lake Kickapoo near Archer City, Tex.

Location.--Lat 33°39'45", long 98°45'45", at intake tower near left end of dam on North Fork Little Wichita River, 8.2 miles south of Mankins, and 9.2 miles northwest of Archer City, Archer County. Datum of gage is at mean sea level, datum of 1929.

Drainage area.--275 sq mi.

Gage-height record.--Twice-daily staff gage readings.

Maxima.--April-June 1957: Contents, 117,900 acre-ft 8 a.m. May 19 (elevation, 1046.8 ft).
1946 to March 1957: Contents, 134,300 acre-ft Aug. 2, 1950 (elevation, 1,049.2 ft).

Remarks.--Reservoir is formed by a rolled-fill earthen type dam 6,800 ft long, containing a reinforced concrete Ogee-type service spillway at right end of dam, 482.7 ft long without gates. Dam completed Dec. 15, 1945, and storage began Feb. 1, 1946. Capacity, 106,000 acre-ft between elevations 1,000.92 (bottom of two 48" x 60" outlet conduits) and 1,045.0 ft (top of service spillway). Maximum capacity 220,000 acre-ft at elevation 1,060 ft with 2-foot freeboard. There is no dead storage. Reservoir contents used as municipal supply for city of Wichita Falls, Capacity curve, records of observed lake elevations and diversions for municipal use, furnished by city of Wichita Falls.

Contents, in acre-feet, at 8 a.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	68,420	101,000	106,600	11	67,940	109,200	108,000	21	67,460	111,200	106,600
2	68,420	103,500	107,300	12	67,460	110,600	108,000	22	67,940	109,900	106,600
3	68,420	106,000	108,000	13	67,460	110,600	108,000	23	68,900	109,200	106,600
4	68,420	108,000	108,000	14	67,460	110,600	107,300	24	69,380	108,600	106,600
5	68,420	112,500	109,200	15	66,980	109,900	107,300	25	69,380	108,600	106,000
6	68,420	111,200	109,900	16	66,980	108,600	106,600	26	69,860	108,600	106,000
7	67,940	109,900	109,900	17	66,980	108,000	106,600	27	75,980	108,600	106,000
8	67,940	109,900	109,200	18	66,500	113,800	107,300	28	77,050	108,000	106,000
9	67,940	109,200	108,600	19	66,500	117,900	107,300	29	86,560	108,000	106,000
10	67,940	109,200	108,000	20	66,500	114,500	107,300	30	95,430	107,300	105,400
								31		107,300	
Change in contents during month									+27,010	+11,870	-1,900

(4) Little Wichita River near Henrietta, Tex.

Location.--Lat 33°50'00", long 98°12'30", on left bank at downstream side of bridge on State Highway 148, 1.5 miles northwest of Henrietta, Clay County, 4 miles upstream from Turkey Creek, and 5 miles upstream from Dry Fork Little Wichita River. Datum of gage is 831.57 ft above mean sea level, datum of 1929.

Drainage area.--1,037 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current meter measurements. Shifting-control method used April 23-May 11, May 18-25, 29, June 1, 2.

Maxima.--April-June 1957: Discharge, 6,390 cfs 4 p.m. May 2 (gage height, 18.36 ft).
1953 to March 1957: Discharge, 5,890 cfs Oct. 26, 1953 (gage height, 17.91 ft). Flood of 1908 reached a stage of about 21 ft from information by State Highway Department.

Remarks.--Some regulation by Lake Kickapoo on North Fork. City of Wichita Falls diverts water from Lake Kickapoo for municipal use and city of Henrietta diverts water from gage pool for municipal use.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	2.7	5,380	1,230	11	0	3,050	348	21	1,220	3,620	194
2	2.0	6,110	1,910	12	0	2,510	168	22	654	3,990	70
3	2.7	5,530	2,220	13	0	2,830	124	23	1,150	4,050	34
4	2.0	5,010	2,030	14	0	2,680	189	24	1,490	3,840	18
5	.7	4,360	1,700	15	0	2,220	168	25	1,620	3,700	10
6	.1	4,080	1,720	16	0	2,200	92	26	3,110	3,030	7.6
7	.1	3,930	2,040	17	0	2,410	59	27	3,440	2,240	6.4
8	0	3,750	2,170	18	0	3,740	43	28	3,290	1,890	2.7
9	0	3,670	2,140	19	6.8	3,460	152	29	4,050	1,230	1.5
10	0	3,410	1,540	20	98	3,200	346	30	5,140	331	.7
								31		361	
Monthly mean discharge, in cubic feet per second									843	3,280	691
Runoff, in acre-feet									50,140	201,900	41,130

(5) Red River near Terral, Okla.

Location.--Lat 33°52'50", long 97°56'15", near center of stream on downstream side of pier of bridge on U. S. Highway 81, a quarter of a mile downstream from Chicago, Rock Island & Pacific Railroad bridge, 1.2 miles south of Terral, Jefferson County, and 3.2 miles downstream from Little Wichita River and at mile 872. Datum of gage is 770.31 ft above mean sea level, datum of 1929.

Drainage area.--28,723 sq mi, of which 5,936 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder except April 1-20 and June 6-30, when record is from graph based on one or more daily wire-weight gage readings.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 22 to May 23, May 28 to June 4, June 9-30.

Maxima.--April-June 1957: Discharge, 110,000 cfs 8 a.m. June 4 (gage height 22.72 ft).
1938 to March 1957: Discharge, 197,000 cfs June 8, 1941 (gage height, 28.12 ft).
Maximum stage known prior to 1938, 27.2 ft, present site and datum, May 19, 1935; floods of 1891 and May 1, 1908 are reported to have reached about the same stage.

Remarks.--Some regulation by Lake Kemp on Wichita River in Baylor County, Tex., Lake Kickapoo on North Fork Little Wichita River in Archer County, Tex., Lake Altus on North Fork Red River in Kiowa County, Okla., Lake Lawtonka and Lake Thomas in Cache Creek Basin in Comanche County, Okla. Principal diversions are from Wichita River for irrigation of about 20,000 acres in the vicinity of Wichita Falls, Tex., and from North Fork Red River for irrigation of about 48,000 acres in vicinity of Altus, Okla.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	328	53,200	24,100	11	538	45,900	10,200	21	7,700	48,700	12,400
2	328	42,400	49,400	12	440	35,500	9,890	22	36,200	20,600	6,300
3	338	54,700	63,300	13	430	55,200	5,800	23	32,300	31,200	3,920
4	342	61,900	86,800	14	380	53,600	6,270	24	35,100	33,600	3,430
5	1,200	67,300	42,700	15	328	34,300	6,270	25	35,900	30,700	2,740
6	2,750	68,100	39,800	16	285	28,200	5,360	26	37,200	42,400	2,270
7	1,860	49,000	27,000	17	294	29,700	4,090	27	43,300	64,900	2,000
8	1,190	27,200	17,200	18	255	62,800	3,160	28	31,200	39,600	1,900
9	822	17,200	13,300	19	289	80,700	10,000	29	32,300	15,800	1,710
10	628	36,200	11,000	20	621	84,100	14,400	30	61,400	11,600	1,530
								31		24,600	
Monthly mean discharge, in cubic feet per second.									12,210	43,580	16,270
Runoff, in acre-feet.									726,400	2,679,000	968,400

(6) Washita River near Durwood, Okla.

Location:--Lat 34°14', long 96°58', in SE-1/4 sec. 3, T. 4 S., R. 3 E., near left bank on downstream side of pier of bridge on State Highway 18, 1.3 miles downstream from Caddo Creek, 4 miles north of Durwood, and at mile 63.4. Datum of gage is 650.57 ft above mean sea level (levels by Corps of Engineers).

Drainage area.--7,202 sq mi.

Gage-height record.--Water-stage recorder graph except Apr. 10-21, 28-30, May 2, 3, 5 to 2 p.m. May 13, 4 a.m. May 15 to 1 a.m. May 17, 7 p.m. May 19 to 8 a.m. May 20, 12 M. May 21 to 11 a.m. May 22, June 13, 14, 20-23, for which graphs were drawn based on floodmark, observed crest time and at least twice daily wire-weight gage readings.

Discharge record.--Stage-discharge relation defined by current meter-measurements. Shifting-control method used except Apr. 10-30, and May 18.

Maxima.--April-June 1957: Discharge, 98,000 cfs about 3 a.m. May 19 (gage height, 42.30 ft, from floodmark).
1928 to March 1957: Discharge, 91,300 cfs May 11, 1943; maximum gage height, 44.37 ft Oct. 31, 1941.
Maximum discharge known, that of May 19,1957.

Remarks.--Ten discharge measurements furnished by Corps of Engineers.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	3,610	15,100	23,000	11	1,190	8,900	4,210	21	22,300	10,900	2,630
2	1,600	13,200	24,200	12	930	5,790	3,540	22	20,400	7,810	2,590
3	13,500	14,500	18,000	13	805	13,500	2,920	23	24,400	24,800	3,980
4	6,930	16,500	15,900	14	580	23,700	2,720	24	26,100	12,300	6,620
5	3,320	11,800	17,500	15	520	11,100	10,700	25	11,300	25,400	4,450
6	2,230	7,700	14,700	16	500	6,050	15,400	26	24,000	39,900	2,820
7	2,490	6,570	9,700	17	452	44,500	7,820	27	20,800	32,500	2,360
8	3,430	7,130	8,300	18	408	74,900	4,670	28	10,800	12,400	2,220
9	2,540	8,450	7,550	19	384	87,800	5,670	29	10,100	7,700	2,450
10	1,740	9,820	5,530	20	633	51,000	3,820	30	11,400	8,690	2,090
								31		28,200	
Monthly mean discharge, in cubic feet per second.									7,646	20,920	7,935
Runoff, in acre-feet.									455,000	1,286,000	472,200
Runoff, in inches.									1.16	3.35	1.23

(7) Lake Texoma near Denison, Tex.

Location.--Lat 33°49', long 96°34', in NE-1/4 sec. 33, T. 8 S., R. 7 E., Indian meridian, in control tower of Denison Dam on Red River, 1-1/4 miles upstream from Shawnee Creek, 1-3/4 miles upstream from San Creek, 4 miles northwest of Denison, and at mile 725.9. Datum of gage is at mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--39,719 sq mi, of which 5,936 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 5,991,300 acre-ft 9 p.m. June 5 (elevation, 643.18 ft). Daily outflow, 93,590 cfs June 6.
1942 to March 1957: Contents, 4,295,000 acre-ft April 19, 1945 (elevation, 629.07 ft), capacity table then in use.

Remarks.--Reservoir is formed by a rolled-fill earth dam. Regulated storage began Oct. 31, 1943. Capacity, 5,659,000 acre-ft at elevation 640.0 ft (crest of spillway) and 2,945,600 acre-ft at elevation 617.0 ft (maximum power pool). Reservoir is used principally for flood control and power development. Figures given herein represent total contents in acre-feet and daily outflow in cubic feet per second.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	1,646,600	3,297,700	5,794,800	11	1,775,200	3,594,900	5,444,700	21	1,822,600	4,753,000	4,527,900
2	1,651,200	3,394,600	5,834,400	12	1,776,400	3,613,200	5,344,000	22	1,849,600	4,786,000	4,440,300
3	1,709,400	3,449,200	5,881,500	13	1,778,200	3,657,500	5,246,800	23	2,007,200	4,840,100	4,363,500
4	1,727,000	3,490,200	5,981,500	14	1,780,000	3,763,300	5,198,200	24	2,128,200	4,998,400	4,256,700
5	1,732,700	3,539,500	5,986,800	15	1,778,800	3,881,000	5,025,400	25	2,280,700	5,211,700	4,141,100
6	1,744,000	3,583,000	5,941,800	16	1,777,000	3,927,000	4,955,200	26	2,547,100	5,357,800	4,030,300
7	1,765,000	3,637,000	5,850,600	17	1,775,800	3,980,800	4,887,600	27	2,743,600	5,497,200	3,917,600
8	1,760,800	3,653,200	5,766,800	18	1,775,200	4,116,700	4,805,800	28	2,904,800	5,634,000	3,802,300
9	1,765,000	3,610,000	5,663,800	19	1,786,000	4,316,900	4,713,400	29	3,037,600	5,662,400	3,679,100
10	1,768,000	3,572,200	5,555,900	20	1,802,200	4,570,400	4,610,400	30	3,167,400	5,643,900	3,559,400
								31		5,678,000	
Change in contents during month.									+1,524,700	+2,510,600	-2,118,600

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	2,270	15,850	54,420	11	2,040	39,190	72,700	21	180	59,910	59,610
2	2,860	27,470	65,530	12	2,370	39,290	71,470	22	2,210	55,550	57,920
3	2,930	33,060	67,260	13	790	29,170	61,740	23	2,390	24,500	56,780
4	2,700	44,660	81,050	14	40	17,900	65,060	24	2,770	8,040	60,250
5	2,190	47,080	92,230	15	2,680	12,190	64,970	25	2,280	7,260	62,000
6	30	50,700	93,590	16	2,480	12,930	62,720	26	5,370	4,730	61,870
7	20	48,510	93,470	17	2,810	17,710	57,790	27	9,390	6,530	61,940
8	2,570	46,170	81,860	18	2,520	33,700	52,330	28	9,140	17,390	61,450
9	3,030	52,020	74,920	19	2,360	52,140	55,000	29	8,580	34,530	64,740
10	2,440	49,200	73,610	20	950	58,000	58,640	30	7,430	40,830	65,790
								31		48,980	
Monthly mean discharge, in cubic feet per second.									2,994	33,390	67,090
Runoff, in acre-feet.									178,200	2,053,000	3,992,000

(9) Sulphur River near Talco, Tex.

Location.--Lat 33°23'20", long 95°07'50", on right bank at downstream side of pier of bridge on U. S. Highway 271, 2.4 miles northwest of Talco, Titus County, 3.0 miles downstream from Mustang Creek. Datum of gage is 290.82 ft above mean sea level, datum of 1929.

Drainage area.--1,365 sq mi.

Gage-height record.--Water-stage recorder graph except Apr. 13-16, June 19-23, and June 27-30 when there was no gage-height record.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 31,900 cfs.

Maxima.--April-June 1957: Discharge, 46,300 cfs 2 p.m. April 27 (gage height, 23.68 ft).
December 1956 to March 1957: Discharge, 15,200 cfs Mar. 18, 1957 (gage height, 22.28 ft).
Maximum stage known since at least 1908 about 27.5 ft in 1908 and 1914.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	8,820	17,400	9,600	11	130	746	2,080	21	1,390	1,780	78
2	24,400	12,800	11,800	12	86	645	1,240	22	9,700	1,290	60
3	11,600	9,440	8,040	13	62	8,160	992	23	14,900	4,090	46
4	16,800	8,100	13,400	14	52	24,700	902	24	27,400	15,400	75
5	13,800	6,510	30,300	15	46	21,500	802	25	33,300	16,100	254
6	8,900	4,000	19,100	16	47	18,200	663	26	33,200	24,200	158
7	6,000	2,290	14,000	17	62	12,500	481	27	39,400	29,600	110
8	2,550	1,520	23,400	18	92	8,200	276	28	32,400	19,200	74
9	750	1,170	6,720	19	70	5,140	150	29	27,000	15,200	54
10	258	950	3,800	20	68	3,290	102	30	23,000	10,200	42
								31		7,690	
Monthly mean discharge, in cubic feet per second.									11,209	10,065	4,960
Runoff, in acre-feet.									667,000	618,900	295,100

(10) Texarkana Reservoir near Texarkana, Tex.

Location.--Lat 33°18'17", long 94°09'36", in control house of Texarkana Dam on Sulphur River, 9 miles southwest of Texarkana and at mile 44.5. Datum of gage is at mean sea level.

Drainage area.--3,400 sq mi.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 1,698,000 acre-feet 7:30 p.m. June 12 (elevation, 250.34 ft).

Remarks.--Reservoir is formed by a rolled-fill earth dam with an uncontrolled concrete spillway and two controlled outlet conduits, near south abutment. Storage began June 27, 1956; dam scheduled for completion about Dec. 31, 1957. Reservoir capacity, 2,654,000 acre-ft at elevation 259.5 ft (crest of spillway) including conservation storage of 145,300 acre-ft at elevation 220.0 ft. Records furnished by Corps of Engineers.

Contents, in acre feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	352,600	838,800	1,381,000	11	528,500	928,800	1,695,000	21	333,000	1,079,000	1,482,000
2	354,000	899,800	1,399,000	12	519,800	918,700	1,697,000	22	320,200	1,082,000	1,464,000
3	371,200	935,000	1,420,000	13	505,600	911,600	1,692,000	23	315,700	1,089,000	1,435,000
4	389,000	947,900	1,436,000	14	489,300	900,900	1,681,000	24	316,000	1,065,000	1,396,000
5	405,300	948,500	1,468,000	15	467,300	892,000	1,664,000	25	321,800	1,036,000	1,359,000
6	445,200	938,700	1,498,000	16	444,000	902,100	1,645,000	26	339,500	1,030,000	1,324,000
7	481,400	939,300	1,555,000	17	420,700	951,000	1,622,000	27	417,000	1,062,000	1,292,000
8	508,000	943,000	1,616,000	18	396,500	1,009,000	1,587,000	28	527,200	1,125,000	1,261,000
9	527,200	940,500	1,659,000	19	369,100	1,046,000	1,549,000	29	648,700	1,209,000	1,225,000
10	531,500	936,200	1,686,000	20	347,900	1,069,000	1,514,000	30	751,300	1,287,000	1,186,000
								31		1,345,000	
Change in contents during month.									+405,800	+593,700	-159,000

(11) Sulphur River below Texarkana Reservoir near Texarkana, Tex.

Location.--Lat 33°18'17", long 94°09'06", at downstream side of bridge on U. S. Highway 59, about 2,000 ft downstream from Texarkana Reservoir about 9 miles southwest of Texarkana, and at mile 44.2. Datum of gage is at mean sea level.

Drainage area.--3,400 sq mi (above Texarkana Reservoir).

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--April-June 1957: Discharge, 24,800 cfs 2:30 p.m. May 24 (elevation, 216.06 ft).

Remarks.--Discharge regulated by Texarkana Reservoir since June 27, 1956. Records furnished by Corps of Engineers.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	8,100	21,800	10,500	11	15,900	10,400	10,500	21	12,500	10,500	20,400
2	8,710	22,700	11,800	12	15,800	10,400	10,300	22	10,400	10,500	20,300
3	9,210	23,200	10,600	13	15,700	10,500	10,300	23	10,300	12,200	20,200
4	11,600	23,500	10,600	14	15,500	10,600	10,600	24	10,700	18,900	20,000
5	13,600	23,600	10,600	15	15,200	10,900	10,600	25	11,400	24,500	19,900
6	14,400	23,500	10,700	16	13,800	11,000	10,600	26	13,200	24,300	19,700
7	15,000	18,100	10,800	17	12,800	10,900	13,200	27	15,100	18,200	19,500
8	15,400	12,800	10,900	18	13,200	10,600	18,300	28	15,300	12,100	19,400
9	15,700	12,200	11,000	19	14,200	10,400	20,600	29	14,300	10,400	20,400
10	15,800	11,000	11,000	20	13,900	10,500	20,500	30	20,600	10,400	20,800
								31		10,300	
Monthly mean discharge, in cubic feet per second.									13,580	14,870	14,820
Runoff, in acre-feet.									807,900	914,200	881,900

(12) Ellison Creek Reservoir near Daingerfield, Tex.

Location.--Lat 32°55'05", long 94°43'35", at pumphouse, 1,700 ft upstream from dam of Lone Star Steel Co., on Ellison Creek, half a mile upstream from Cypress Creek, and 7.6 miles south of Daingerfield, Morris County.

Drainage area.--37 sq mi.

Gage-height record.--Water-stage recorder graph.

Maxima.--April 1 to June 30: Contents, 26,240 acre-ft, 12 p.m. April 24 (gage height, 69.00 ft).
1943 to March 1957: Contents, 28,490 acre-ft Mar. 30, 1945 (gage height, 70.38 ft).

Remarks.--Reservoir is formed by rolled earthen-fill type dam. Storage began Jan. 14, 1943. Dam completed in April 1943. Capacity of reservoir, 24,700 acre-ft (gage height, 68.0 ft, crest of 300-ft concrete service spillway). Dead storage 196 acre-ft (gage height, 35.0 ft, top of conduit discharge box). At times water is diverted from Cypress Creek into reservoir by pumping. Capacity of pumps, 40 cfs. Figures given herein represent total contents. Water used by Lone Star Steel Co.'s iron smelter.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	23,450	25,260	24,910	11	24,540	24,890	24,770	21	25,670	24,600	24,750
2	23,530	25,160	24,940	12	24,500	24,880	24,810	22	25,430	24,580	25,080
3	23,860	25,170	24,970	13	24,580	24,910	24,720	23	26,190	25,090	25,030
4	24,100	25,080	26,260	14	24,610	24,880	24,720	24	26,240	25,050	24,920
5	24,230	25,000	25,200	15	24,690	24,840	24,640	25	25,820	24,970	24,840
6	24,300	24,920	25,080	16	24,720	24,810	24,690	26	25,810	25,250	24,740
7	24,400	24,910	24,820	17	24,940	24,740	24,670	27	25,910	25,120	24,720
8	24,440	24,000	24,890	18	24,920	24,750	24,630	28	25,460	24,920	24,670
9	24,490	24,890	24,840	19	24,890	24,710	24,670	29	25,360	24,840	24,660
10	24,520	24,890	24,860	20	25,340	24,660	24,690	30	25,300	24,780	24,670
								31		24,800	
Change in contents during month.									+2,090	- 500	-130

(13) Sabine River near Emory, Tex.

Location.--Lat 32°46', long 95°48', on left bank at downstream side of bridge on State Highway 19, 3.0 miles upstream from Giladon Creek, 7.5 miles south of Emory, Rains County, 8.0 miles downstream from McBees Creek, and at mile 501. Datum of gage is 350.28 ft above mean sea level, unadjusted (Texas Reclamation Department benchmark).

Drainage area.--965 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 46,200 cfs. Shifting-control method used Apr. 1-10, 20-23, Apr. 30 to May 4, May 16-21, May 23 to June 14.

Maxima.--April-June 1957: Discharge, 74,000 cfs 12 p.m. Apr. 27 (gage height, 25.06 ft).
1952 to March 1957: Discharge, 34,400 cfs Apr. 30, 1953 (gage height, 20.28 ft).
Maximum stage known since 1900, 25.7 ft June 1943, from information by local resident and the Texas Highway Department.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	517	11,600	703	11	62	71	548	21	2,680	202	15
2	1,140	9,880	1,280	12	42	66	71	22	3,970	73	24
3	4,540	12,700	3,580	13	31	347	53	23	7,960	92	65
4	9,010	9,580	5,590	14	24	4,870	39	24	15,500	856	21
5	7,580	5,660	8,230	15	21	20,600	31	25	17,000	16,900	12
6	8,190	2,860	12,200	16	18	11,900	28	26	17,200	14,200	8.7
7	4,720	1,380	9,840	17	14	6,140	23	27	38,900	15,000	6.8
8	2,070	374	4,870	18	12	3,500	18	28	55,500	17,900	8.0
9	425	149	1,990	19	9.8	2,710	15	29	21,600	8,900	18
10	108	99	446	20	317	1,190	12	30	10,400	3,180	16
								31		1,260	
Monthly mean discharge, in cubic feet per second.									7,652	5,943	1,659
Runoff, in acre-feet.									455,300	365,400	98,700
Runoff, in inches									8.88	7.13	1.93

(14) Sabine River near Gladewater, Tex.

Location.--Lat 32°32', long 94°57', on right bank on downstream side of pier of bridge on U. S. Highway 271, half a mile downstream from Glade Creek, 1 mile southwest of Gladewater, Gregg County, and at mile 398. Datum of gage is 243.85 ft above mean sea level (Texas Reclamation Department benchmark based on Geological Survey datum).

Drainage area.--2,846 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 28 to May 5.

Maxima.--April-June 1957: Discharge, 57,500 cfs 4 p.m. May 1 (gage height, 40.35 ft).
1932 to March 1957: Discharge, 138,000 cfs April 2, 1945 (gage height, 44.16 ft, from floodmark).
Maximum stage known since at least 1914, that of Apr. 2, 1945. Flood of May 1914 reached a stage of about 41.7 ft (discharge, 71,100 cfs), from information by local resident.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	5,950	56,000	22,600	11	6,990	12,100	15,800	21	6,090	9,320	1,260
2	5,380	53,300	20,200	12	7,760	10,400	14,700	22	6,430	10,200	866
3	4,620	44,700	18,200	13	7,870	8,990	13,200	23	7,660	10,400	1,180
4	3,760	33,000	16,400	14	7,880	7,030	11,500	24	8,520	9,990	1,320
5	3,080	28,600	15,600	15	7,430	5,800	9,850	25	9,330	9,270	1,110
6	3,080	23,800	14,900	16	6,180	4,800	7,650	26	13,900	8,680	959
7	2,950	20,500	13,800	17	4,920	4,200	5,950	27	28,400	8,080	836
8	4,150	18,200	13,800	18	3,390	4,400	4,150	28	36,300	7,390	763
9	5,430	15,800	14,800	19	2,330	5,660	2,760	29	40,900	7,090	656
10	6,280	13,800	15,800	20	3,210	7,390	1,840	30	46,400	13,400	460
								31		21,400	
Monthly mean discharge, in cubic feet per second.									10,220	15,930	8,764
Runoff, in acre-feet.									608,100	979,200	521,500
Runoff, in inches									4.01	6.45	3.44

(15) Sabine River near Ruliff, Tex.

Location.--Lat 30°18'10", long 93°44'40", at bridge on State Highway 235, 2.4 miles north of Ruliff, Newton County, 4.2 miles upstream from Kansas City Southern Railway bridge, 4.5 miles downstream from Cypress Creek and at mile 40. Datum of gage is 4.08 ft above mean sea level, datum of 1929, supplementary adjustment of 1941.

Drainage area.--9,440 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--April-June 1957: Discharge, 53,800 cfs 7 a.m. May 20 to 11 a.m. May 21 (gage height, 15.96 ft).
1924 to March 1957: Discharge, 121,000 cfs May 22, 1953 (gage height, 19.98 ft).
Maximum stage known since at least 1835, about 22.2 ft in May or June 1884 (adjusted to present site and datum), from information by local residents.

Remarks.--No large diversion above station.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	12,000	25,600	33,000	11	20,900	33,900	19,200	21	10,000	53,500	20,000
2	12,300	30,100	30,700	12	20,900	35,900	18,700	22	10,000	52,500	20,800
3	13,000	33,900	28,100	13	20,100	38,000	18,200	23	10,400	51,200	21,800
4	14,000	34,700	25,600	14	20,000	40,500	17,700	24	11,000	49,100	22,700
5	14,300	33,900	23,000	15	19,600	42,100	17,500	25	11,700	47,100	22,700
6	14,800	33,000	21,200	16	18,600	44,900	17,500	26	12,000	44,900	23,000
7	15,700	32,200	19,800	17	16,000	47,900	17,700	27	12,600	42,600	28,900
8	16,800	32,100	19,000	18	13,400	50,500	18,000	28	14,400	40,500	38,700
9	17,600	32,200	19,000	19	11,700	52,800	18,500	29	16,900	38,000	40,000
10	18,100	33,400	19,200	20	10,500	53,700	19,200	30	21,200	35,400	40,000
								31		33,000	
Monthly mean discharge, in cubic feet per second.									15,020	40,290	23,310
Runoff, in acre-feet.									893,600	2,478,000	1,387,000
Runoff, in inches									1.77	4.92	2.75

(16) Neches River near Rockland, Tex.

Location.--Lat 31°01'45", long 94°23'50", on left bank 2,100 ft upstream from Texas & New Orleans Railroad bridge, 2,200 ft downstream from bridge on U. S. Highway 69, 1 mile north of Rockland, Tyler County, 3.6 miles downstream from Billams Creek, and at mile 158. Datum of gage is 91.41 ft above mean sea level, datum of 1929.

Drainage area.--3,539 sq mi.

Gage-height record.--From twice-daily staff gage readings.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used April 29 to May 15.

Maxima.--April-June 1957: Discharge, 29,700 cfs, 1 p.m. May 3 (gage height, 25.10 ft); maximum gage height, 25.34 ft at 3 p.m. May 4.
1903 to March 1957: Discharge, 49,800 cfs May 6, 1944 (gage height, 31.84 ft).
Maximum stage known, 39.4 ft in May 1884, from information by local residents.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	1,890	16,200	2,280	11	1,310	20,400	3,410	21	1,160	7,600	6,480
2	1,790	25,100	2,370	12	1,250	18,700	3,550	22	1,140	6,850	6,620
3	1,780	29,000	2,110	13	1,200	17,700	3,580	23	1,120	6,150	6,690
4	2,770	28,100	2,120	14	1,160	16,400	3,470	24	1,210	5,570	6,570
5	2,060	27,000	2,180	15	1,140	15,000	3,360	25	2,440	4,950	6,060
6	1,830	26,300	2,370	16	1,260	13,500	3,350	26	4,430	4,530	5,630
7	1,650	25,500	2,470	17	1,310	12,200	3,540	27	4,620	4,110	5,320
8	1,410	24,400	2,630	18	1,220	10,800	4,240	28	5,470	3,660	5,240
9	1,260	23,100	2,870	19	1,200	9,590	5,140	29	7,420	3,260	4,440
10	1,160	21,600	3,170	20	1,180	8,540	5,960	30	9,860	2,930	3,700
								31		2,540	
Monthly mean discharge, in cubic feet per second.									2,290	14,230	4,031
Runoff, in acre-feet.									136,300	875,300	239,800
Runoff, in inches									0.72	4.64	1.27

(17) Angelina River near Zavalla, Tex.

Location.--Lat 31°13', long 94°18', at bridge on State Highway 147, just downstream from Harvey Bayou, 3 miles downstream from Attoyac Bayou, and 8-1/2 miles northeast of Zavalla, Angelina County. Datum of gage is 104.48 ft above mean sea level, datum of 1929.

Drainage area.--2,880 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 1-25, May 25 to June 9, June 28-30.

Maxima.--April-June 1957: Discharge, 32,700 cfs 9 p.m. May 3 (gage height, 27.23 ft).
1951 to March 1957: Discharge, 37,300 cfs May 18, 1953 (gage height, 27.72 ft).

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	2,020	25,700	1,660	11	1,770	15,400	3,320	21	983	5,680	5,590
2	2,030	28,800	1,650	12	1,680	14,100	3,720	22	912	4,850	5,090
3	2,230	31,900	1,730	13	1,660	12,800	4,000	23	944	3,900	4,910
4	3,070	31,000	2,100	14	1,570	11,500	4,350	24	1,160	2,970	4,460
5	2,680	26,400	2,280	15	1,410	10,300	4,930	25	3,640	2,250	3,980
6	2,440	22,800	2,440	16	1,240	9,030	5,580	26	4,820	1,870	3,440
7	2,290	20,500	2,690	17	1,140	8,160	6,130	27	5,280	2,020	2,900
8	2,220	19,200	2,850	18	1,100	7,570	6,340	28	10,400	2,500	2,750
9	2,150	18,000	2,920	19	1,050	7,080	6,300	29	17,500	2,410	2,520
10	1,970	16,800	3,030	20	1,010	6,420	6,120	30	21,800	1,950	2,440
								31		1,710	
Monthly mean discharge, in cubic feet per second.									3,472	12,120	3,741
Runoff, in acre-feet.									206,600	744,900	222,600
Runoff, in inches									1.34	4.85	1.45

(18) Dam B Reservoir at Town Bluff, Tex.

Location.--Lat 30°47'47", long 94°10'52", near right bank 70 ft upstream from outlet structure of Dam "B" on Neches River, about 0.4 miles north of Town Bluff, Tyler County, and at mile 114. Datum of gage is at mean sea level, datum of 1929 Galveston-Houston supplementary adjustment (levels by Corps of Engineers).

Drainage area.--7,407 sq mi.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 96,180 acre-ft at 12 p.m. June 4 (elevation, 83.14 ft).
1951 to March 1957: Contents, 128,400 acre-ft May 22, 1953 (elevation, 85.21 ft).

Remarks.--Reservoir is formed by earth-fill dam with a concrete section having six 40 x 35-ft taintor gates and a 6,100 ft uncontrolled emergency spillway. Capacity, 306,400 acre-ft at maximum design level (elevation, 93.0 ft), 124,700 acre-ft at spillway crest (elevation, 85.0 ft), 94,200 acre-ft at normal operating level (elevation, 83.0 ft). Dam completed in April 1951 and storage begun on Apr. 16, 1951. Records furnished by Corps of Engineers.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	91,540	84,510	91,540	11	91,270	83,880	91,130	21	92,070	92,480	88,100
2	89,930	84,000	93,160	12	90,200	84,000	91,800	22	91,000	91,940	89,020
3	94,520	85,910	94,940	13	89,150	84,130	90,200	23	90,200	91,540	88,620
4	94,800	86,160	96,180	14	89,810	85,010	89,150	24	89,540	90,740	87,190
5	90,340	84,380	94,660	15	90,870	86,550	89,680	25	90,470	92,210	86,040
6	90,340	84,760	91,270	16	91,270	87,580	91,940	26	89,280	93,160	86,290
7	91,540	83,250	89,150	17	89,930	88,490	94,520	27	89,680	92,880	87,060
8	92,070	82,760	88,100	18	89,680	88,230	93,160	28	89,680	93,430	86,940
9	91,540	83,130	86,940	19	90,600	88,880	89,150	29	83,750	93,840	88,620
10	91,130	83,630	88,360	20	91,800	91,000	87,840	30	84,000	93,020	89,020
								31		92,750	
Change in contents during month.									-9,160	+8,750	-3,730

(19) Neches River at Evadale, Tex.

Location.--Lat 30°21', long 94°05', at bridge on U. S. Highway 96, 200 ft upstream from Gulf, Colorado & Santa Fe Railway bridge at Evadale, Jasper County, 600 ft downstream from Mill Creek, 15 miles upstream from Village Creek, and at mile 55. Datum of gage is 8.25 ft above mean sea level, datum of 1929, Galveston-Houston supplementary adjustment of 1936.

Drainage area.--7,908 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 2 to June 30.

Maxima.--April-June 1957: Discharge, 55,300 cfs 1 a.m. to 6 a.m. May 10 (gage height, 20.55 ft).
1904-6, 1923 to March 1957: Discharge, 92,100 cfs May 11, 1944 (gage height, 23.58 ft from floodmark).
Maximum stage known, 26.2 ft in May 1884 (discharge, about 125,000 cfs), and 24.5 ft in August 1915 (discharge, about 102,000 cfs), from rating curve extended above 92,000 cfs by logarithmic plotting. Stages by Gulf, Colorado & Santa Fe Railway Co.

Remarks.--Slight regulation by Dam B Reservoir.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	4,920	20,900	6,760	11	5,820	53,200	7,320	21	2,540	27,600	10,400
2	5,660	23,800	6,390	12	5,480	50,300	6,530	22	2,220	25,100	12,000
3	6,650	25,400	5,880	13	5,700	47,200	6,030	23	2,310	22,300	13,100
4	6,830	27,300	5,120	14	5,720	44,400	6,520	24	2,650	19,600	13,400
5	6,710	30,200	4,670	15	4,700	41,800	7,390	25	2,900	16,900	13,700
6	7,880	37,000	5,060	16	3,620	39,200	8,010	26	3,420	14,500	14,100
7	9,400	46,000	6,050	17	3,250	36,500	8,110	27	4,850	11,600	15,400
8	9,300	52,000	7,060	18	3,400	34,000	8,030	28	7,550	9,440	16,300
9	7,390	54,800	7,550	19	3,490	32,000	8,210	29	11,200	7,960	15,500
10	5,950	55,000	7,630	20	3,120	29,700	9,040	30	15,800	7,100	14,900
								31		6,680	
Monthly mean discharge, in cubic feet per second.									5,681	30,630	9,205
Runoff, in acre-feet.									338,000	1,883,000	547,800

(20) West Fork Trinity River near Jacksboro, Tex.

Location.--Lat 33°17'30", long 98°04'40", on left bank at downstream side of bridge on State Highway 24, 4 miles downstream from North Creek, 7 miles upstream from Carroll Creek, 7 miles northeast of Jacksboro, Jack County, and at mile 660. Datum of gage is 873.98 ft above mean sea level, unadjusted (levels by State Highway Department).

Drainage area.--683 sq mi.

Gage-height record.--Water-stage recorder graph except 10 a.m. April 26 to 7 p.m. April 29. Graph drawn on basis of outside gage readings April 27-29.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used April 30, May 1.

Maxima.--April-June 1957: Discharge, 35,100 cfs about 2 a.m. April 27 (gage height, 32.10 ft, from floodmark).
March 1956 to March 1957: Discharge, 1,890 cfs June 5, 1956 (gage height, 17.27 ft).
Maximum stage known since at least 1900, that of Apr. 27, 1957. Flood of June 1941 reached a stage of about 30 ft, from information by local resident.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	1.2	5,920	660	11	0	1,680	160	21	632	2,860	137
2	.8	2,940	711	12	0	2,020	198	22	706	2,140	127
3	.6	2,880	407	13	0	1,980	230	23	998	895	124
4	.5	2,770	1,120	14	0	2,390	232	24	1,190	1,150	145
5	.2	2,510	2,670	15	0	1,920	220	25	1,380	3,050	122
6	0	3,010	2,090	16	0	1,610	161	26	18,700	4,180	134
7	0	2,490	1,790	17	0	1,000	144	27	29,200	2,870	125
8	0	1,880	1,800	18	0	3,000	188	28	16,100	2,350	115
9	0	1,540	1,070	19	0	4,160	424	29	15,700	1,700	107
10	0	1,680	205	20	56	4,310	160	30	10,900	546	82
								31		329	
Monthly mean discharge, in cubic feet per second.									3,186	2,379	529
Runoff, in acre-feet.									189,600	146,300	31,450

(21) Bridgeport Reservoir above Bridgeport, Tex.

Location.--Lat 33°13'20", long 97°50'10", at left end of Bridgeport Dam on West Fork Trinity River, 2.0 miles west of Bridgeport, Wise County, 5.8 miles upstream from Big Sandy Creek, and at mile 626. Datum of gage is 0.06 ft above mean sea level, datum of 1929.

Drainage area.--1,114 sq mi.

Gage-height record.--Staff gage read once daily.

Maxima.--April-June 1957: Contents observed, 380,800 acre-ft May 26, 27 (gage height, 835.9 ft).
1932 to March 1957: Contents observed, 407,600 acre-ft April 29, 30, 1942 (gage height, 836.2 ft).

Remarks.--Reservoir formed by a rolled-fill earthen-type dam, containing a concrete service spillway with three 20-foot bays, two of which are equipped with vertical lift gates, the other left open. There are two emergency spillways of natural ground. Dam completed Dec. 15, 1931; storage began Apr. 1, 1932. Capacity, 270,300 acre-ft between gage heights 751.4 ft (bottom of three 48-inch outlet conduits) and 826.1 ft (top of service spillway). Dead storage is negligible. Reservoir used for flood control and municipal supply for city of Fort Worth. Figures given herein represent total contents. Capacity figures for current year are based on a redetermination of reservoir capacity during fall of 1952. Capacity curve and record of daily gage heights furnished by Tarrant County Water Control and Improvement District No. 1.

Contents, in acre-feet, at 7 a.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	47,090	321,600	351,300	11	47,480	336,400	328,400	21	49,040	347,900	301,500
2	47,090	335,200	345,600	12	47,480	335,200	323,800	22	51,010	351,300	299,300
3	47,480	339,800	345,600	13	47,480	335,200	319,300	23	53,470	351,300	297,100
4	47,480	343,200	341,000	14	47,480	335,200	317,100	24	57,640	359,500	297,100
5	47,870	343,200	343,200	15	47,480	335,200	314,800	25	59,780	365,300	296,000
6	47,870	343,200	345,600	16	47,480	334,100	312,600	26	73,310	380,800	295,000
7	47,870	339,800	344,400	17	47,480	331,800	309,300	27	147,800	380,800	295,000
8	47,480	338,600	341,000	18	47,480	332,900	307,000	28	213,800	377,200	295,000
9	47,480	338,600	337,500	19	47,480	338,600	304,800	29	261,200	372,400	295,000
10	47,480	337,500	334,100	20	47,480	341,000	303,700	30	295,000	365,300	293,900
								31		357,100	
Change in contents during month.									+247,900	+62,100	-63,200

(22) West Fork Trinity River near Boyd, Tex.

Location.--Lat 33°05'05", long 97°33'33", on right bank at downstream side of bridge on Farm Road 730, 0.6 mile northeast of Boyd, Wise County, 3.5 miles downstream from Boggy Creek, and at mile 602. Datum of gage is 660.57 ft above mean sea level, datum of 1929.

Drainage area.--1,729 sq mi.

Gage-height record.--Water-stage recorder graph except June 26, 27, when there was no gage-height record.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Discharge for the period of no gage-height record estimated on basis of weather records and engineer's notes. Shifting-control method used April 1-23, June 25-30.

Maxima.--April-June 1957: Discharge, 24,400 cfs 1 a.m. Apr. 27 (gage height, 21.60 ft).
1947 to March 1957: Discharge, 6,650 cfs July 28, 1950 (gage height, 18.20 ft) at former site 2.2 miles downstream at datum 5.48 ft lower.
Maximum stage known since at least 1880, 20.7 ft in 1908, present site and datum, from floodmarks, from information by local resident.

Remarks.--Flow partly regulated by Bridgeport Reservoir, 21 miles upstream. Flood of April 27, 1957, originated downstream from Bridgeport Reservoir.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	3.5	3,020	4,220	11	1.8	3,710	2,870	21	427	3,150	1,140
2	8.8	2,960	5,050	12	1.7	3,860	2,710	22	387	3,180	1,060
3	87	3,080	8,900	13	1.6	3,950	2,460	23	1,130	4,190	966
4	83	3,220	6,500	14	1.6	3,770	2,210	24	1,100	4,790	905
5	46	3,350	4,100	15	1.4	3,680	1,930	25	657	13,000	501
6	19	3,410	3,950	16	1.2	3,710	1,770	26	4,150	15,000	324
7	8.0	3,530	3,500	17	1.2	3,470	1,590	27	18,600	8,440	288
8	5.0	3,560	3,300	18	1.3	3,080	1,440	28	11,200	5,800	258
9	3.3	3,560	3,180	19	13	3,350	1,350	29	4,890	5,220	251
10	2.3	3,500	3,000	20	51	3,300	1,240	30	3,590	4,530	244
								31		4,360	
Monthly mean discharge, in cubic feet per second.									1,549	4,540	2,374
Runoff, in acre-feet.									92,180	279,100	141,200

(23) Eagle Mountain Reservoir above Fort Worth, Tex.

Location.--Lat 32°52'35", long 97°28'15", at right end of main dam on West Fork Trinity River, 3.0 miles downstream from Ash Creek, 4.1 miles downstream from Walnut Creek, 14.6 miles northwest of Fort Worth, Tarrant County, and at mile 583. Datum of gage is sea level elevation, datum of 1929.

Drainage area.--1,974 sq mi.

Gage-height record.--Staff gage read once daily at 8 a.m.

Maxima.--April-June 1957: Contents observed, 292,200 acre-ft May 27 (elevation, 658.9 ft).
1934 to March 1957: Contents observed, 333,500 acre-ft Apr. 26, 1942 (elevation, 659.9 ft).

Remarks.--Reservoir is formed by a composite rolled-fill and hydraulic-fill earthen-type dam, containing a concrete service spillway with four 25-foot bays, three of which are equipped with vertical lift gates, and the other left open. There is an emergency spillway of natural ground. Dam completed Oct. 24, 1932, and storage began Feb. 28, 1934. Capacity, 182,700 acre-ft between elevations 599.9 ft (bottom of four 48-inch outlet conduits) and 649.1 ft (top of service spillway). Dead storage is negligible. Reservoir used for flood control and to maintain level of Lake Worth from which city of Fort Worth derives its municipal supply. Figures given herein represent total contents. Capacity figures since Oct. 1, 1951 are based on redetermination of reservoir capacity during fall of 1952. Capacity curve and record of daily elevations furnished by Tarrant County Water Control and Improvement District No. 1.

Contents, in acre-feet, at 8 a.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	69,230	180,200	261,700	11	72,640	209,400	232,300	21	73,130	222,400	197,400
2	69,230	185,600	256,900	12	72,640	211,400	229,000	22	74,110	221,300	194,400
3	71,660	191,400	258,100	13	71,660	214,700	224,600	23	76,600	220,200	192,400
4	72,640	196,400	264,100	14	71,170	223,500	220,200	24	79,600	235,700	190,400
5	73,130	199,400	264,100	15	71,170	224,600	216,900	25	82,200	247,300	187,500
6	72,640	202,400	259,300	16	71,170	224,600	212,500	26	87,650	287,200	184,700
7	72,640	205,400	254,500	17	71,170	224,600	209,400	27	108,700	292,200	183,700
8	72,640	205,400	248,500	18	71,170	226,800	206,400	28	140,800	285,900	183,700
9	72,640	206,400	242,600	19	71,170	226,800	203,400	29	162,100	279,700	182,700
10	72,640	208,400	236,800	20	72,150	223,500	200,400	30	172,700	272,500	183,700
								31		267,700	
Change in contents during month.									+103,900	+95,000	-84,000

(24) Clear Fork Trinity River near Aledo, Tex.

Location.--Lat 32°38'25", long 97°33'50", on left bank 3 miles downstream from Turkey Creek, 3-1/2 miles upstream from bridge on U. S. Highway 377, 4 miles southeast of Aledo, Parker County, and 11.8 miles upstream from Benbrook Dam. Datum of gage is 723.33 ft above mean sea level, datum of 1929 (Corps of Engineers benchmark).

Drainage area.--246 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 17,500 cfs. Shifting-control method used May 9 to June 30.

Maxima.--April-June 1957: Discharge, 34,000 cfs 8:30 p.m. May 25 (gage height, 29.00 ft).
1947 to March 1957: Discharge, 15,900 cfs (revised) May 17, 1949 (gage height, 25.00 ft).
Maximum stage known since at least 1858, about 34 ft between April 25 and May 9, 1922, from information by local residents.

Remarks.--Flow partly regulated by city of Weatherford reservoir, capacity, 19,500 acre-feet. Flow from 57.9 sq mi above this station was partly controlled by 24 flood detention structures with a total combined capacity of 18,085 acre-ft below the spillway crests of which 14,842 acre-ft is flood water detention capacity and 3,243 acre-ft is sediment pool capacity.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	6.2	161	431	11	.7	69	198	21	237	77	100
2	3.5	146	518	12	1.1	311	173	22	24	69	100
3	164	2,020	537	13	1.2	2,170	153	23	251	1,370	100
4	8.9	721	1,260	14	1.7	441	142	24	71	2,060	99
5	3.2	138	1,120	15	1.2	138	124	25	33	13,100	99
6	1.4	91	856	16	1.7	108	115	26	754	7,000	97
7	1.1	76	397	17	1.2	83	113	27	2,060	1,310	97
8	1.0	67	302	18	1.2	480	110	28	864	756	96
9	.9	90	249	19	33	193	102	29	1,320	560	94
10	.8	76	219	20	16	100	102	30	428	507	93
								31		487	
Monthly mean discharge, in cubic feet per second.									210	1,128	273
Runoff, in acre-feet.									12,480	69,370	16,260

(25) Benbrook Reservoir near Benbrook, Tex.

Location.--Lat 32°29', long 97°27', in intake structure of Benbrook Dam on Clear Fork Trinity River, 2.5 miles south of Benbrook, Tarrant County, 3.5 miles upstream from Marys Creek, and 15 miles upstream from mouth of Clear Fork. Datum of gage is at mean sea level, datum of 1929, Fort Worth supplementary adjustment of 1942 (levels by Corps of Engineers).

Drainage area.--433 sq mi.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June, 1957: Contents, 185,000 acre-ft at 6 a.m. June 6 (elevation, 713.35 ft).
1952 to March 1957: Contents 20,890 acre-ft May 5, 1956 (elevation, 668.90 ft).

Remarks.--Reservoir is formed by rolled earth-fill dam with a 500 ft uncontrolled concrete spillway. Outlet works consists of 13 ft diameter concrete conduit controlled by two 6.5 x 13-ft broome-type gates and two 30-inch steel pipes, controlled by slide gates. Gates closed Sept. 29, 1952. Capacity, 258,600 acre-ft at spillway crest (elevation, 724.0 ft), 164,800 acre-ft at crest of 100 ft notch in spillway (elevation, 710.0 ft), and 88,250 acre-ft at top of conservation pool (elevation, 694.0 ft). Reservoir built for flood control, navigation, and low-flow regulation. Records furnished by Corps of Engineers.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	16,000	65,980	177,300	11	17,150	87,240	177,100	21	21,880	107,600	166,300
2	16,010	66,930	179,500	12	17,130	94,690	176,200	22	22,080	106,700	161,000
3	17,200	79,580	179,700	13	17,120	105,300	175,000	23	26,430	115,800	154,600
4	17,240	82,310	184,000	14	17,100	107,000	173,300	24	29,010	121,100	147,500
5	17,240	83,250	184,900	15	17,120	107,800	172,800	25	29,580	150,400	140,200
6	17,230	83,940	183,900	16	17,120	108,000	172,300	26	45,350	166,100	132,200
7	17,210	84,420	182,400	17	17,120	107,900	172,000	27	51,800	169,100	124,000
8	17,190	84,940	180,800	18	17,120	109,200	171,600	28	57,610	170,700	115,900
9	17,170	86,050	179,400	19	18,950	109,000	171,400	29	62,410	171,700	107,800
10	17,160	86,610	178,200	20	19,480	108,300	169,800	30	64,760	174,000	99,900
								31		177,100	
Change in contents during month.									+48,860	+112,340	-77,200

(26) Clear Fork Trinity River near Benbrook, Tex.

Location.--Lat 32°39'54", long 97°26'30", on left bank 1-1/2 miles downstream from Benbrook Dam, 1.7 miles southeast of Benbrook, Tarrant County, and 2.9 miles upstream from Marys Creek. Datum of gage is 604.22 ft. above mean sea level, datum of 1929 (Corps of Engineers benchmark).

Drainage.--435 sq. mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 23.

Maxima.--April-June, 1957: Discharge, 4,350 cfs 4 p.m. June 26 (gage-height, 11.28 ft).
1947 to March 1957: Discharge, 82,900 cfs May 17, 1949 (gage-height, 28.72 ft), from rating curve extended above 11,000 cfs on basis of velocity-area studies and slope-area determination of peak flow; no flow at times.
Maximum stage known since at least 1922, that of May 17, 1949.

Remarks.--Flow regulated since September 1952 by Benbrook Reservoir (capacity 164,800 acre-ft).

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	1.4	2.5	788	11	.2	1.2	711	21	21	641	1,810
2	.4	1.7	964	12	.2	23	580	22	1.4	755	2,900
3	4.2	5.8	1,100	13	.2	18	764	23	32	389	3,450
4	.5	2.0	1,420	14	2.0	2.2	957	24	13	25	3,810
5	.3	1.5	1,820	15	1.2	39	264	25	3.2	79	3,950
6	.3	1.1	1,800	16	1.2	140	233	26	120	19	4,150
7	.3	1.1	1,560	17	1.1	464	204	27	14	35	4,280
8	.3	1.0	1,310	18	.7	690	180	28	28	104	4,160
9	.3	2.5	1,100	19	27	670	165	29	5.0	173	4,060
10	.2	1.0	892	20	1.0	655	669	30	2.8	240	4,060
								31		772	
Monthly mean discharge, in cubic feet per second.									9.45	192	1,804
Runoff, in acre-feet.									562	11,810	107,300

(27) West Fork Trinity River at Fort Worth, Tex.

Location.--Lat 32°46', long 97°20', on left bank, 125 ft upstream from Texas Electric Service Co.'s concrete dam, 800 ft downstream from Paddock Viaduct (North Main Street) at Fort Worth, Tarrant County, 2,600 ft downstream from Clear Fork Trinity River, and at mile 559. Datum of gage is 519.24 ft above mean sea level, datum of 1929.

Drainage area.--2,627 sq mi.

Gage-height record.--Water-stage recorder graph except May 30 to June 13, during which graph was drawn on basis of several readings daily from a telemark gage.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--April-June 1957: Discharge, 26,200 cfs 4:30 p.m. May 25 (gage height 8.66 ft).
1920 to March 1957: Discharge, 85,000 cfs April 25, 1922 (gage height, 23.95 ft, affected by failure of levee in vicinity of gage), by slope-area determination of peak flow by city engineer of Fort Worth; maximum gage-height, 25.91 ft May 17, 1949 (discharge, 64,300 cfs).
Maximum stage known since at least 1866, that of May 17, 1949.

Remarks.--Flow largely regulated by Bridgeport, Eagle Mountain and Benbrook Reservoirs.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	163	482	9,960	11	17	2,960	6,750	21	1,440	5,350	4,400
2	41	359	10,200	12	15	3,910	6,250	22	154	5,210	5,090
3	536	1,750	9,840	13	13	5,860	5,930	23	1,890	7,840	5,700
4	110	860	11,100	14	13	4,510	6,020	24	709	8,280	6,080
5	38	850	11,700	15	15	4,200	4,920	25	387	16,700	6,020
6	26	1,250	11,000	16	24	4,140	4,400	26	4,690	17,400	5,880
7	22	1,640	9,600	17	22	4,280	4,060	27	2,180	12,600	5,580
8	17	2,860	8,790	18	19	5,440	3,730	28	1,430	12,300	5,090
9	17	3,240	8,100	19	965	5,300	3,420	29	878	11,600	4,720
10	15	3,120	7,440	20	142	5,440	3,420	30	593	10,700	4,370
								31		10,500	
Monthly mean discharge, in cubic feet per second.									553	5,836	6,652
Runoff, in acre-feet.									32,890	358,900	395,800

(28) Elm Fork Trinity River near Sanger, Tex.

Location.--Lat 33°23'25", long 97°05'10", on right bank on downstream side of pier of bridge on State Farm Highway 455, 4.1 miles downstream from Spring Creek, 5.0 miles upstream from Isle du Bois Creek, and 5.4 miles northeast of Sanger, Denton County. Datum of gage is 553.93 ft above mean sea level, datum of 1929, Fort Worth supplementary adjustment of 1942 (Corps of Engineers benchmark).

Drainage area.--379 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 12,800 cfs.

Maxima.--April-June 1957: Discharge, 20,800 cfs 8 p.m. April 26 (gage height, 27.45 ft).
1949 to March 1957: Discharge, 20,100 cfs Sept. 14, 1950 (gage height, 27.15 ft at site 500 ft downstream), from rating curve extended above 11,000 cfs.
Maximum stage known since at least 1903, about 30.7 ft in 1908, from information by local residents. Flood of May 18, 1935, reached a stage of 29.7 ft, from floodmarks.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	454	1,660	1,760	11	48	922	282	21	1,250	444	136
2	129	2,680	4,660	12	64	662	257	22	485	374	120
3	4,390	2,000	2,610	13	84	2,180	236	23	4,510	2,380	122
4	756	3,160	818	14	84	2,040	214	24	2,170	7,700	141
5	92	709	898	15	60	501	196	25	363	12,900	116
6	51	505	507	16	100	428	181	26	14,000	6,980	108
7	34	437	417	17	99	406	171	27	13,600	868	102
8	24	389	362	18	98	4,150	161	28	2,770	591	99
9	13	412	330	19	160	1,460	151	29	4,540	473	96
10	33	430	303	20	156	525	146	30	6,280	429	90
								31		2,160	
Monthly mean discharge, in cubic feet per second.									1,897	1,966	526
Runoff, in acre-feet.									112,900	120,900	31,320

(30) Garza-Little Elm Reservoir near Lewisville, Tex.

Location.--Lat 33°04', long 96°58', in intake structure of Lewisville Dam on Elm Fork Trinity River, 2 miles upstream from bridge on State Highway 121, 2.4 miles northeast of Lewisville, Denton County, and 12 miles upstream from Denton Creek. Datum of gage is at mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--1,658 sq mi.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 1,149,000 acre-ft at 11 a.m. June 3 (elevation, 535.77 ft).
1954 to March 1957: Contents, 36,850 acre-ft Feb. 19, 1956 (elevation, 478.53 ft).

Remarks.--Reservoir is formed by a rolled earth-fill dam with a 560 ft uncontrolled concrete spillway. Outlet works consist of a 16 ft diameter concrete conduit controlled by three 6.5 x 13 ft broome-type gates and two 60-inch steel pipes controlled by service valves. Gates closed Nov. 1, 1954 and dam completed January 1955. Capacity, 1,002,900 acre-ft at crest of spillway (elevation, 532.0 ft) and 489,500 acre-ft at top of conservation pool (elevation, 515.0 ft). When the water surface reaches an elevation of 525.0 ft, water backs over the service spillway of Lake Dallas and the two reservoirs are combined. This condition occurred on May 21, 1957; therefore, in order to maintain continuity, records herein have been combined to show total contents of both reservoirs for the period April 1 to June 30, 1957. Reservoir built for flood control and water conservation. Records for Garza-Little Elm Reservoir furnished by Corps of Engineers.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	87,500	681,400	1,145,000	11	130,700	680,000	1,071,000	21	184,600	756,300	988,300
2	96,870	691,500	1,146,000	12	130,800	689,100	1,065,000	22	199,200	755,300	979,900
3	109,900	698,500	1,144,000	13	130,900	734,100	1,056,000	23	236,500	812,500	972,200
4	126,800	718,600	1,137,000	14	131,100	759,500	1,046,000	24	273,300	895,100	962,700
5	129,600	720,000	1,128,000	15	131,200	762,400	1,039,000	25	289,800	1,052,000	953,400
6	129,700	715,200	1,113,000	16	131,400	758,400	1,032,000	26	389,500	1,146,000	944,800
7	130,900	711,300	1,102,000	17	131,000	750,400	1,023,000	27	563,600	1,144,000	936,600
8	131,000	701,000	1,092,000	18	131,400	765,600	1,016,000	28	603,700	1,127,000	927,300
9	130,400	691,900	1,084,000	19	146,800	775,200	1,007,000	29	635,300	1,112,000	917,900
10	130,400	684,100	1,077,000	20	162,900	771,900	998,300	30	664,200	1,103,000	909,200
								31		1,116,000	
Change in contents during month.									+590,300	+451,800	-206,800

(31) Elm Fork Trinity River near Lewisville, Tex.

Location.--Lat 33°02'45", long 96°57'40", on left bank at downstream side of pier of bridge on State Highway 121, 1.8 miles east of Lewisville, Denton County, 1.9 miles downstream from Garza-Little Elm Reservoir, and 8.3 miles upstream from Denton Creek. Datum of gage is 432.39 ft above mean sea level, datum of 1929 (Corps of Engineers benchmark).

Drainage area.--1,671 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 6,080 cfs.

Maxima.--April-June 1957: Discharge, 10,800 cfs 6 p.m. May 27 (gage height, 26.72 ft).
1949 to March 1957: Discharge, 21,700 cfs Sept. 15, 1950 (gage height, 30.75 ft).
Maximum stage known since at least 1907, 33.8 ft in 1908, present site and datum, from floodmarks.

Remarks.--Flow largely regulated by Garza-Little Elm Reservoir.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	214	2,150	8,080	11	96	4,040	2,620	21	199	3,580	4,400
2	20	3,600	9,600	12	90	2,010	2,300	22	41	5,010	4,680
3	38	3,090	9,960	13	85	279	2,540	23	633	4,310	4,740
4	46	1,120	9,210	14	70	127	3,440	24	330	659	4,650
5	47	1,360	8,240	15	95	1,000	3,610	25	178	1,580	4,360
6	60	3,240	6,950	16	77	2,610	3,680	26	1,340	4,340	4,320
7	60	1,650	5,670	17	100	4,180	4,030	27	850	10,000	4,300
8	67	4,100	4,560	18	98	5,030	4,300	28	61	8,640	4,290
9	104	6,160	3,800	19	361	3,690	4,160	29	150	7,200	4,270
10	119	5,930	3,120	20	49	3,740	4,150	30	648	5,970	4,260
								31		5,890	
Monthly mean discharge, in cubic feet per second.									211	3,751	4,943
Runoff, in acre-feet.									12,550	230,600	294,100

(32) Denton Creek near Justin, Tex.

Location.--Lat 33°07', long 97°18', on right bank at downstream side of bridge on State Farm Highway 156, 100 ft upstream from Gulf, Colorado & Santa Fe Railway bridge, 2.2 miles north of Justin, Denton County, 3.0 miles upstream from Olivers Creek, 12.9 miles upstream from Harriet Creek, and 32.9 miles upstream from Grapevine Dam. Datum of gage is 606.66 ft above mean sea level, datum of 1929, Fort Worth supplementary adjustment of 1942.

Drainage area.--409 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 20,200 cfs.

Maxima.--April-June 1957: Discharge, 29,800 cfs 6 a.m. May 24 (gage height, 17.64 ft).
1949 to March 1957: Discharge. 6,210 cfs May 1, 1950 (gage height, 15.67 ft).
Maximum stage known, 21.6 ft in May 1908, which was about 1 ft higher than flood in May 1935 at site 1,500 ft upstream, from floodmarks, from information by local residents.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	0	1,140	2,120	11	.2	496	131	21	452	312	41
2	0	653	3,410	12	0	982	115	22	331	157	38
3	762	308	3,670	13	0	3,020	121	23	1,430	2,740	37
4	78	330	1,480	14	0	1,250	99	24	993	7,840	48
5	23	397	4,520	15	0	968	82	25	492	13,700	47
6	13	258	792	16	0	424	67	26	11,700	9,380	54
7	8.5	136	362	17	0	181	58	27	17,200	3,100	37
8	4.0	100	241	18	0	1,450	50	28	7,740	576	32
9	1.8	152	191	19	56	1,310	45	29	4,290	284	29
10	.5	179	159	20	25	1,310	44	30	2,770	245	29
								31		1,010	
Monthly mean discharge, in cubic feet per second.									1,612	1,754	605
Runoff, in acre-feet.									95,940	107,900	36,000

(33) Grapevine Reservoir near Grapevine, Tex.

Location.--Lat 32°58', long 97°03', in intake structure of Grapevine Dam on Denton Creek, 2.7 miles northeast of Grapevine, Tarrant County, 4.3 miles upstream from bridge on State Highway 121, and 11.7 miles upstream from mouth of Denton Creek. Datum of gage is at mean sea level, datum of 1929. (levels by Corps of Engineers).

Drainage area.--694 sq mi.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 445,800 acre-ft at 12 p.m. June 6 (elevation, 560.80 ft).
1952 to March 1957: Contents, 39,380 acre-ft June 19,1954 (elevation, 506.08 ft).

Remarks.--Reservoir is formed by rolled earth-fill dam with a 500 ft uncontrolled concrete spillway. Outlet works consists of a 13 ft diameter concrete conduit controlled by two 6.5 x 13 ft broome-type gates and two 30-inch steel pipes controlled by slide gates. Dam completed June 1952, and gates closed July 3, 1952. Capacity, 435,500 acre-ft at crest of spillway (elevation, 560.0) and 188,500 acre-ft at top of conservation pool (elevation, 535.0 ft). Reservoir built for flood control, navigation, and water conservation. Records furnished by Corps of Engineers.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	18,090	184,200	395,400	11	22,120	193,100	442,200	21	31,060	219,700	417,800
2	18,160	186,800	407,100	12	22,100	195,800	440,800	22	32,280	220,000	415,200
3	21,320	188,000	421,600	13	22,100	213,600	438,500	23	43,000	230,500	413,400
4	22,100	188,800	431,100	14	22,040	217,100	435,500	24	48,130	266,500	410,300
5	22,160	189,500	443,900	15	22,000	219,000	433,200	25	50,280	331,900	407,100
6	22,180	190,100	445,800	16	22,040	219,800	430,700	26	74,930	369,400	404,300
7	22,180	190,300	445,400	17	22,040	220,000	428,200	27	119,300	377,700	401,700
8	22,160	190,600	444,600	18	22,040	223,600	425,800	28	147,200	379,300	398,600
9	22,140	191,000	444,000	19	25,770	221,700	422,900	29	168,500	379,900	395,800
10	22,120	191,500	443,400	20	26,110	220,600	420,400	30	180,600	381,500	392,900
								31		390,700	
Change in contents during month									+162,740	+210,100	+2,200

(34) Denton Creek near Grapevine, Tex.

Location.--Lat 32°59'15", long 97°00'45", on left bank at downstream side of left pier of bridge on State Highway 121, 1.3 miles downstream from Bakers Branch, 4.3 miles downstream from Grapevine Dam, 5.0 miles northeast of Grapevine, Tarrant County, and 6.1 miles upstream from mouth. Datum of gage is 439.11 ft above mean sea level, datum of 1929.

Drainage area.--694 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 1-19, June 14-30.

Maxima.--April-June 1957: Discharge, 2,570 cfs 12:30 p.m. May 19 (gage height, 21.91 ft).
1947 to March 1957: Discharge, 13,900 cfs Feb. 26, 1948 (gage height, 30.38 ft), from rating extended above 6,000 cfs by conveyance-slope method.
Maximum stage known occurred in May 1908 and was slightly higher than the flood in April 1942, which reached a stage of 35.9 ft, from floodmarks, from information by local resident.

Remarks.--Flow regulated by Grapevine Reservoir.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	56	15	67	11	.8	6.7	496	21	127	1,420	1,230
2	2.9	24	72	12	.8	12	907	22	7.0	150	1,260
3	8.8	9.0	120	13	.9	66	1,160	23	40	391	1,420
4	2.7	7.9	235	14	.9	9.0	1,310	24	160	171	1,440
5	.9	7.6	135	15	.9	39	1,250	25	24	1,310	1,440
6	.8	7.0	614	16	1.0	110	1,220	26	1,310	558	1,440
7	.8	6.9	673	17	.9	110	1,220	27	294	81	1,420
8	.8	6.9	597	18	.9	372	1,230	28	47	51	1,420
9	.7	7.0	505	19	177	2,350	1,240	29	113	51	1,420
10	.8	6.9	448	20	5.1	2,200	1,230	30	19	57	1,420
								31		89	
Monthly mean discharge, in cubic feet per second.									80.2	313	955
Runoff, in acre-feet.									4,770	19,240	56,800

(35) Elm Fork Trinity River near Carrollton, Tex.

Location.--Lat 32°57'55", long 96°56'40", near left bank on downstream side of pier of highway bridge 40 ft upstream from Carrollton Dam, 0.3 mile downstream from Denton Creek, 1 mile upstream from St. Louis Southwestern Railway bridge, and 2.3 miles northwest of Carrollton, Dallas County. Datum of gage is 432.23 ft above mean sea level, datum of 1929.

Drainage area.--2,457 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 8,000 cfs.

Maxima.--April-June 1957: Discharge, 13,700 cfs 4:30 a.m. June 5 (gage height, 8.54 ft).
1907 to March 1957: Maximum gage height, about 28 ft May 25, 1908, at site 8.5 miles downstream at datum 22.94 ft lower, from floodmarks, furnished by State Reclamation Department (discharge not determined); maximum discharge subsequent to 1908, 90,700 cfs Apr. 26, 1942 (gage height, 21.05 ft) at site 8.5 miles downstream at datum 22.94 ft lower.

Remarks.--Flow largely regulated by Garza-Little Elm and Grapevine Reservoirs (combined capacity, 1,438,000 acre-ft).

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	835	2,230	6,330	11	1.5	4,120	3,560	21	938	4,690	4,930
2	9.2	4,320	8,490	12	9.3	2,540	3,560	22	186	4,560	5,150
3	.8	3,620	11,500	13	26	1,020	3,670	23	2,410	5,750	5,320
4	2.6	1,500	11,900	14	6.4	136	4,410	24	1,420	2,080	5,320
5	.8	1,260	12,300	15	32	628	4,470	25	943	5,420	5,150
6	.8	3,160	9,650	16	14	2,480	4,410	26	4,870	6,960	5,080
7	.8	1,800	7,790	17	25	3,910	4,640	27	3,950	7,740	5,060
8	.8	3,480	5,950	18	39	4,760	4,860	28	330	10,400	5,030
9	.8	4,930	4,980	19	1,080	5,360	4,790	29	700	9,390	5,010
10	.8	5,100	4,170	20	173	5,030	4,760	30	780	7,360	5,010
								31		5,830	
Monthly mean discharge, in cubic feet per second.									626	4,244	5,908
Runoff, in acre-feet.									37,260	261,000	351,600

(36) Trinity River below Dallas, Tex.

Location.--Lat 32°42', long 96°44', on left bank on downstream side of bridge on South Loop Highway 12 at Dallas, Dallas County, 1 mile downstream from White Rock Creek, 1.5 miles upstream from Five Mile Creek, 3.5 miles downstream from Texas and New Orleans Railroad bridge, 8.0 miles downstream from gaging station "Trinity River at Dallas" and at mile 492. Datum of gage is 365.89 ft above mean sea level, datum of 1929.

Drainage area.--6,301 sq mi.

Gage-height record.--Water-stage recorder graph except April 1-2.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Discharge for period of no gage-height record estimated on basis of record for "Trinity River at Dallas". Shifting control method used April 6-19, 24, 25, May 30 to June 30.

Maxima.--April-June 1957: Discharge 65,700 cfs 4 a.m. May 27 (gage height, 32.02 ft).
Nov. 1956 to March 1957: Discharge 963 cfs Dec. 21, 1957 (gage height 7.57 ft).
Maximum stage known since 1866, 41.0 ft May 25, 1908, flood peak obtained from Corps of Engineers flood profile. Flood of 1866 reached about same stage.

Remarks.--Flow partly regulated by Bridgeport, Eagle Mountain, Benbrook, Grapevine, Lake Dallas, Garza-Little Elm and several smaller reservoirs.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	3,600	10,900	20,400	11	212	9,580	14,100	21	4,170	11,300	9,970
2	2,500	12,100	19,000	12	203	9,440	12,400	22	5,530	11,300	10,200
3	1,190	11,400	18,200	13	190	18,300	11,500	23	6,210	14,000	10,900
4	903	10,400	20,100	14	180	21,200	11,200	24	11,300	21,800	11,700
5	754	9,850	22,300	15	183	15,000	11,200	25	16,900	21,300	12,100
6	446	3,940	23,800	16	187	11,000	11,100	26	19,400	35,500	12,400
7	322	5,780	21,700	17	195	9,860	10,500	27	41,400	55,700	12,300
8	265	4,280	19,600	18	195	9,790	10,200	28	33,700	29,000	12,100
9	230	6,200	17,500	19	782	10,300	10,700	29	20,400	20,600	11,900
10	231	7,900	16,200	20	3,620	10,900	10,300	30	14,500	19,500	11,600
								31		19,200	
Monthly mean discharge, in cubic feet per second.									6,330	15,070	14,240
Runoff, in acre-feet.									376,700	926,900	847,300

(38) Lavon Reservoir near Lavon, Tex.

Location.--Lat 33°02', long 96°29', in right abutment of spillway of dam on East Fork Trinity River, 3/4 mile upstream from St. Louis & Southwestern Railroad bridge, 1 mile upstream from bridge on State Highway 78, 2.5 miles west of Lavon, Collin County. Datum of gage is at mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--777 sq mi.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 462,800 acre-ft at 6 p.m. May 26 (elevation, 491.90 ft).
1953 to March 1957: Contents, 155,200 acre-ft May 3, 1956 (elevation, 473.03 ft).

Remarks.--Reservoir is formed by rolled earth-fill dam with a 568 ft gated spillway. Outlet works consist of twelve 40 x 28 ft taintor gates and five 36-inch diameter sluices. Gates were closed Sept. 14, 1953 and dam was completed in October 1953. Capacity, 423,400 acre-ft at top of taintor gates (elevation, 490.0 ft), 143,600 acre-ft at top of conservation pool (elevation 472.0 ft), and 56,290 acre-ft at spillway crest (elevation, 462.0 ft, sill of gates). The reservoir is designed for flood control and water conservation. Diversions for municipal use. Records furnished by Corps of Engineers.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	118,300	398,200	262,700	11	133,900	358,700	300,200	21	155,600	376,000	303,400
2	124,500	403,800	275,700	12	133,900	356,000	300,500	22	163,000	384,300	303,600
3	128,200	400,500	283,300	13	133,900	380,000	301,000	23	178,700	401,500	303,900
4	131,900	400,500	287,800	14	133,800	397,800	301,700	24	209,300	424,600	303,700
5	133,100	396,600	293,500	15	133,800	396,800	301,900	25	239,000	449,300	303,600
6	133,200	390,500	295,700	16	133,800	396,800	302,400	26	291,700	455,200	302,900
7	133,800	383,500	296,800	17	133,900	393,900	302,700	27	357,600	413,900	301,200
8	133,800	377,100	297,800	18	134,000	391,000	303,400	28	368,300	378,500	298,500
9	133,800	371,100	299,400	19	134,600	388,900	303,400	29	370,000	345,900	295,000
10	133,800	365,300	299,500	20	147,200	381,700	303,400	30	380,700	312,100	291,700
								31		281,500	
Change in contents during month.									+267,400	-99,200	+10,200

(40) East Fork Trinity River near Crandall, Tex.

Location.--Lat 32°38', long 96°29', on right bank at downstream side of bridge on U. S. Highway 175, 4,500 ft downstream from Mustang Creek, 1.8 miles northwest of Crandall, Kaufman County, 2.9 miles upstream from Little Buffalo Creek, and at mile 13.8. Datum of gage is 343.69 ft above mean sea level, datum of 1929.

Drainage area.--1,257 sq mi.

Gage-height record.--Water-stage recorder graph except June 21-30, when graph was drawn on basis of several readings daily from telemark located inside gage structure.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 18,000 cfs. Shifting-control method used Apr. 24-29, May 13, June 5-7, 30.

Maxima.--April-June 1957: Discharge, 40,300 cfs 1 p.m. May 28 (gage height, 22.81 ft).
1949 to March 1957: Discharge, 24,000 cfs May 4, 1950 (gage height, 22.12 ft).

Remarks.--Flow largely regulated by Lavon Reservoir.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	406	2,920	12,400	11	59	3,600	453	21	1,000	3,300	242
2	634	6,380	12,700	12	50	3,560	407	22	1,560	3,320	192
3	960	7,540	9,180	13	43	9,960	366	23	2,420	4,920	176
4	1,000	4,070	3,850	14	39	16,700	337	24	3,830	14,900	166
5	1,160	3,300	1,780	15	36	10,700	306	25	5,890	13,900	150
6	621	3,700	1,550	16	33	3,920	276	26	9,180	13,200	125
7	206	3,640	1,420	17	32	3,560	256	27	23,900	27,500	119
8	125	3,600	972	18	32	3,700	253	28	14,800	35,500	327
9	93	3,620	692	19	34	3,600	350	29	6,620	23,300	485
10	76	3,620	537	20	363	3,440	452	30	3,160	15,700	595
								31		12,800	
Monthly mean discharge, in cubic feet per second.									2,612	8,822	1,704
Runoff, in acre-feet.									155,400	542,400	101,400

(41) Trinity River near Rosser, Tex.

Location.--Lat 32°25'40", long 96°27'50", on left bank at downstream side of left pier of bridge on State Highway 34, 2.5 miles south of Rosser, Kaufman County, 8.5 miles downstream from East Fork Trinity River, and at mile 451. Datum of gage is 302.65 ft above mean sea level, datum of 1929.

Drainage area.--8,162 sq mi.

Gage-height record.--Water-stage recorder graph except for period 5 p.m. May 3 to 3 p.m. May 17, for which graph was drawn based on three daily readings of outside gage by U. S. Weather Bureau.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 29 to May 11.

Maxima.--April-June 1957: Discharge, 70,000 cfs 8 p.m. May 29 (gage height, 38.00 ft).
1924, 1938 to March 1957: Discharge, not determined, occurred April 23 or 24, 1942, following numerous breaks in levee system on both banks; daily discharge, 133,000 cfs Apr. 23, 1942.
Maximum stage known, 41.55 ft Apr. 22, 1942, just prior to levee breaks; flood in May 1908 reached a stage of about 33 ft, from information by Corps of Engineers (discharge believed to have been about the same as that of Apr. 23 or 24, 1942).

Remarks.--Flow largely regulated by reservoirs above Dallas and by Lavon Reservoir on East Fork Trinity River. At times during flood period there was uncontrolled flow over the spillway of each major reservoir upstream. Levee system constructed in 1916.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	2,010	26,600	55,300	11	327	13,800	25,200	21	6,080	21,000	10,200
2	4,790	28,700	51,300	12	292	14,600	22,900	22	8,920	20,200	9,820
3	4,410	28,000	48,600	13	271	18,000	20,400	23	10,200	21,100	9,500
4	4,090	26,100	43,900	14	254	30,600	18,000	24	17,000	24,400	9,460
5	2,420	23,700	38,600	15	233	33,700	16,000	25	23,600	31,000	9,720
6	1,960	20,900	35,800	16	225	32,600	13,800	26	25,300	36,300	10,200
7	1,390	18,700	34,300	17	233	28,900	12,400	27	42,900	43,400	10,800
8	706	16,800	33,000	18	233	26,800	11,400	28	61,300	56,400	11,200
9	464	14,800	30,800	19	239	24,600	10,700	29	48,400	67,700	11,500
10	372	13,900	27,900	20	1,230	22,500	10,400	30	32,600	67,700	11,500
								31		61,500	
Monthly mean discharge, in cubic feet per second.									10,080	29,520	22,150
Runoff, in acre-feet.									599,900	1,815,000	1,318,000

(42) Trinity River near Oakwood, Tex.

Location.--Lat 31°38'50", long 95°47'20", on left bank at downstream side of bridge on U. S. Highway 79 and 84, 1-1/2 miles upstream from International-Great Northern Railroad bridge, 6 miles northeast of Oakwood, Leon County, and at mile 313. Datum of gage is 175.03 ft above mean sea level, datum of 1929, supplementary adjustment of 1942.

Drainage area.--12,912 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 25 to May 9

Maxima.--April-June 1957: Discharge, 91,800 cfs 9 p.m. April 28 (gage height, 48.87 ft).
1923 to March 1957: Discharge, 153,000 cfs April 29, 1942 (gage height, 51.64 ft).
Maximum stage known since at least 1905, 52.2 ft June 4, 1908, present site and datum, from information by U. S. Weather Bureau (discharge, about 164,000 cfs).

Remarks.--Some regulation by reservoirs above Dallas and by Lavon Reservoir on East Fork Trinity River.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	2,190	80,700	40,600	11	3,430	32,300	38,800	21	4,750	35,000	20,900
2	2,440	80,300	47,800	12	1,560	31,800	35,500	22	11,100	32,300	19,700
3	4,900	78,500	56,400	13	913	28,400	34,000	23	15,300	30,200	18,700
4	7,470	72,500	63,600	14	693	26,600	31,600	24	25,700	28,600	17,400
5	9,700	66,900	66,400	15	601	25,400	29,800	25	59,200	27,100	16,000
6	10,900	63,200	65,000	16	595	25,100	28,200	26	73,200	26,800	14,700
7	12,000	56,800	61,200	17	527	26,500	26,700	27	87,700	32,900	13,500
8	12,000	48,100	56,700	18	469	34,300	25,400	28	90,600	41,000	12,500
9	10,800	41,600	51,100	19	441	38,700	24,100	29	87,300	41,000	11,800
10	6,910	36,400	44,400	20	457	37,800	22,600	30	83,000	39,200	11,300
								31		38,300	
Monthly mean discharge, in cubic feet per second.									20,890	42,070	33,550
Runoff, in acre-feet.									1,243,000	2,587,000	1,996,000

(43) Trinity River at Romayor, Tex.

Location.--Lat 30°25'30", long 94°51'05", near right bank on downstream side of pier of bridge on State Highway 105, 1.9 miles south of Romayor, Liberty County, 2.0 miles downstream from Gulf, Colorado & Santa Fe Railway bridge, 4.1 miles downstream from Big Creek, and at mile 94. Datum of gage is 35.92 ft above mean sea level, datum of 1929.

Drainage area.--17,192 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current meter measurements. Shifting-control method used May 20 to June 15 and June 19 to June 30.

Maxima.--April-June 1957: Discharge, 93,000 cfs 1 a.m. to 11 p.m. May 10 (gage height, 32.20 ft).
1924 to March 1957: Discharge, 111,000 cfs May 9, 1942 (gage height, 35.8 ft, from floodmarks, present site and datum).
Maximum stage known since at least 1908, that of May 9, 1942.

Remarks.--Some regulation by reservoirs above Dallas and by Lavon Reservoir on East Fork Trinity River.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	7,100	59,000	35,100	11	11,300	91,400	49,100	21	2,590	52,400	53,400
2	8,920	59,700	35,600	12	11,200	89,100	51,900	22	2,450	48,200	51,100
3	8,970	61,000	38,500	13	9,870	85,600	54,100	23	2,290	43,800	47,200
4	7,280	63,800	41,200	14	7,230	81,200	56,000	24	8,340	41,000	43,700
5	6,320	68,400	42,600	15	4,460	76,700	57,200	25	24,900	39,000	40,200
6	6,180	74,800	43,400	16	3,140	71,000	58,700	26	36,000	38,100	36,400
7	7,100	80,900	43,700	17	6,260	66,000	59,000	27	41,100	37,600	32,500
8	8,420	86,800	43,900	18	9,600	62,500	58,900	28	46,000	37,200	28,800
9	9,700	91,500	41,300	19	6,040	59,800	57,200	29	52,100	36,800	25,400
10	10,700	93,000	46,700	20	3,620	56,200	55,900	30	56,600	36,200	21,400
								31		35,400	
Monthly mean discharge, in cubic feet per second.									14,190	62,070	45,000
Runoff, in acre-feet.									844,500	3,816,000	2,678,000

(44) Brazos River at Seymour, Tex.

Location.--Lat 33°34', long 99°16', near left bank on downstream side of pier of bridge on U. S. Highways 277 and 283, three-quarters of a mile upstream from Wichita Valley Railway bridge, 1 mile southwest of courthouse in Seymour, Baylor County and at mile 832. Datum of gage is 1,240.97 ft above mean sea level, datum of 1929, supplementary adjustment of 1942.

Drainage area.--14,490 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except April 1, 2, June 25, 29 when no record was obtained.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 7-14, May 26 to June 1.

Maxima.--April-June 1957: Discharge, 28,000 cfs 7 p.m. May 19 (gage height, 10.10 ft).
1923 to March 1957: Discharge, 95,400 cfs Oct. 16, 1926, (gage height, 15.16 ft, from floodmarks), from rating curve extended above 48,000 cfs on basis of slope-area determination of peak flow.
Maximum stage known, 21.00 ft on Sept. 28, 1955. A flood in about 1906 reached about the same stage.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	7	5,690	10,400	11	12	2,830	795	21	288	2,910	2,180
2	6	2,650	13,400	12	6.4	8,990	671	22	680	1,780	1,370
3	8.0	1,620	11,000	13	4.5	14,800	804	23	750	1,670	904
4	11	1,670	6,730	14	4.0	6,490	1,950	24	866	1,640	1,350
5	24	1,260	4,790	15	4.5	2,500	1,390	25	762	3,810	850
6	49	714	3,520	16	3.0	1,590	990	26	1,130	4,570	580
7	30	573	2,390	17	2.2	1,040	662	27	2,800	1,810	565
8	36	439	1,760	18	1.5	8,370	488	28	4,710	1,130	496
9	28	2,870	1,360	19	1.0	22,200	5,900	29	9,600	750	350
10	18	3,990	1,060	20	1.0	7,280	4,770	30	11,600	511	263
								31		2,580	
Monthly mean discharge, in cubic feet per second.									1,115	3,894	2,791
Runoff, in acre-feet.									66,330	239,500	166,100

(45) Fort Phantom Hill Reservoir near Nugent, Tex.

Location.--Lat 32°37', long 99°40', at outlet gate tower near right bank, 120 ft upstream from dam on Elm Creek, 4 miles upstream from Clear Fork Brazos River and 5 miles south of Nugent, Jones County. Datum of gage is 1,580.0 ft above mean sea level.

Drainage area.--478 sq mi.

Gage-height record.--Once-daily staff gage reading.

Maxima.--April-June 1957: Contents, 95,080 acre-ft May 25 (gage height, 58.7 ft).
1940 to March 1957: Contents, 80,900 acre-ft Oct. 17, 1941 (gage height, 56.8 ft).

Remarks.--Reservoir is formed by earth-fill dam, rock faced. Dam completed and storage began in October 1938. Capacity 74,310 acre-ft at gage height 54.0 ft (crest of spillway). Sill of lowest outlet gate is at gage height 1.6 ft. Dead storage is negligible. Water is used for municipal supply for city of Abilene. Figures given herein represent total contents and are computed from daily gage reading at 8 a.m. An undetermined amount of flood flow was diverted by gravity ditch from Deadman Creek into the reservoir. During April 339 acre-ft were pumped into the reservoir from Clear Fork Brazos River. Beginning October 1955, figures of contents and capacities have been adjusted for sedimentation. Sedimentation survey made by the U. S. Department of Agriculture, Soil Conservation Service between July 1, 1953 and Oct. 2, 1953. Gage-height record and record of diversions furnished by city of Abilene.

Contents, in acre-feet, at 8 a.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	49,750	86,280	85,400	11	49,140	86,730	81,450	21	48,540	83,620	80,590
2	49,750	83,620	84,510	12	49,140	92,230	81,450	22	48,540	83,180	80,590
3	49,440	83,180	84,060	13	49,140	91,760	81,450	23	49,140	82,730	80,160
4	49,440	82,730	84,510	14	48,840	89,460	81,020	24	49,440	87,630	80,160
5	49,440	84,060	84,510	15	48,840	89,000	81,020	25	49,440	95,080	80,160
6	49,440	83,620	84,060	16	48,840	84,060	81,020	26	71,920	94,130	79,730
7	49,440	82,730	83,180	17	48,840	83,180	80,590	27	88,090	88,090	79,730
8	49,440	82,730	82,730	18	48,840	86,730	81,020	28	88,090	84,510	79,730
9	49,440	84,950	81,880	19	48,540	88,090	81,020	29	87,170	83,620	79,730
10	49,440	88,090	81,880	20	48,540	85,840	81,020	30	86,730	82,730	79,310
								31		82,730	
Change in contents during month.									+36,980	-4,000	-3,420

(46) Clear Fork Brazos River at Nugent, Tex.

Location.--Lat 32°41', long 99°40', on right bank 33 ft downstream from pier of county road bridge in Nugent, Jones County, 4 miles upstream from Deadman Creek. Datum of gage is 1,531.91 ft above mean sea level (levels by Brazos River Authority).

Drainage area.--2,220 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 24 to May 29 and June 1-5.

Maxima.--April-June 1957: Discharge, 19,500 cfs 9:30 a.m. May 26 (gage height, 24.17 ft).
1924 to March 1957: Discharge, 47,000 cfs Sept. 8, 1932 (gage height, 27.05 ft at site 625 ft downstream). Maximum stage known, about 30.0 ft in 1876, from information by local residents. Flood in 1900 and May 1923 reached stages of about 24 and 24.5 ft, respectively, from information by local residents.

Remarks.--Some regulation by reservoirs upstream from station.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	2.2	4,760	3,920	11	1.8	3,400	448	21	139	2,380	213
2	2.4	4,710	5,060	12	1.6	10,800	505	22	261	886	180
3	10	1,550	7,310	13	1.8	11,800	614	23	58	1,150	155
4	50	1,090	10,800	14	1.8	8,900	473	24	128	4,050	118
5	17	1,410	4,660	15	1.8	4,060	375	25	881	10,800	114
6	9.0	670	1,810	16	2.0	1,480	291	26	7,760	18,800	133
7	4.7	403	1,050	17	2.2	854	221	27	7,300	15,700	116
8	3.7	291	748	18	2.7	4,310	208	28	7,950	8,710	110
9	2.4	1,490	601	19	2.2	7,850	210	29	5,810	1,760	104
10	2.0	3,850	514	20	1.1	5,570	381	30	4,360	795	96
								31		1,220	
Monthly mean discharge, in cubic feet per second									1,159	4,694	1,385
Runoff, in acre-feet									68,960	288,600	82,390

(47) Brazos River near South Bend, Tex.

Location.--Lat 33°01'30", long 98°38'50", near left bank on left side of pier of bridge on State Highway 67, 0.3 mile upstream from Wichita Falls & Southern Railroad bridge, 1.6 miles downstream from Clear Fork Brazos River, 2.0 miles northeast of South Bend, Young County, and at mile 758. Datum of gage is 1,002.98 ft above mean sea level, datum of 1929.

Drainage area.--21,600 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except April 1-20, June 10-13, 17, 18, 23-25, 28-30 for which a graph was drawn based on once-daily wire-weight gage readings.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 2-9, June 5-30.

Maxima.--April-June 1957: Discharge, 66,000 cfs 10 p.m. Apr. 29 (gage height, 32.70 ft).
1938 to March 1957: Discharge, 87,400 cfs May 4, 1941 (gage height, 27.35 ft).
Maximum stage known, 36.2 ft in 1876, from information by State Highway Department and Corps of Engineers. Flood of Sept. 24, 1900, reached a stage of about 29.5 ft and flood of June 16, 1930, reached a stage of about 35.5 ft, from information by local residents.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	71	53,400	16,700	11	24	17,000	2,350	21	760	17,300	3,840
2	67	35,100	15,700	12	22	22,700	1,940	22	626	11,400	2,150
3	63	24,800	17,700	13	26	32,300	2,050	23	2,100	12,700	1,800
4	210	23,100	15,600	14	31	35,700	4,030	24	3,350	14,400	1,470
5	117	27,000	16,000	15	31	24,000	3,750	25	2,070	26,500	1,130
6	71	18,300	15,000	16	27	17,200	2,090	26	18,400	32,300	1,460
7	46	5,640	14,800	17	24	16,400	1,600	27	36,900	35,900	1,040
8	32	2,860	12,200	18	22	27,700	1,190	28	46,200	24,800	791
9	29	4,470	5,150	19	26	32,800	2,150	29	61,800	18,300	702
10	24	16,300	3,270	20	23	28,800	7,390	30	64,100	19,100	670
								31		19,600	
Monthly mean discharge, in cubic feet per second									7,910	22,510	5,857
Runoff, in acre-feet									470,700	1,384,000	348,500

(48) Possum Kingdom Reservoir near Graford, Tex.

Location.--Lat 32°52', long 98°26', in powerhouse at dam on Brazos River, 2.6 miles upstream from Loving Creek, 11.3 miles southwest of Graford, Palo Pinto County, and at mile 687. Datum of gage is 0.10 ft above mean sea level, datum of 1929 (levels by Brazos River Authority).

Drainage area.--22,550 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Indicating gage read twice daily.

Maxima.--April-June 1957: Contents observed, 741,800 acre-ft 12 noon April 30 (gage height, 1,000.9 ft).
1941 to March 1957: Contents observed, 743,900 acre-ft Oct. 5, 1941 (gage height, 1,001.0 ft).

Remarks.--Reservoir is formed by reinforced concrete dam of flat slab deck, massive buttress type, with 9 roof-weir (modified bear-trap-type) gates, 2 bulkhead sections, and earthen dike section. Dam completed and storage began March 21, 1941. Total capacity, 724,700 acre-ft (gage height, 1,000.0 ft, top of closed roof-weir gates). Usable capacity for power development, 698,900 acre-ft between gage height 911.5 ft (sill of powerhouse penstock) and gage height, 1,000.0 ft. Figures given herein represent total contents. Water used for power development, industry, and irrigation.

Contents in acre-feet at 12 p.m. 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	551,200	734,200	679,800	11	549,600	717,100	669,000	21	549,600	679,800	685,200
2	551,200	719,000	676,200	12	549,600	709,500	670,800	22	552,800	679,800	687,000
3	551,200	719,000	676,200	13	548,000	715,200	670,800	23	557,600	698,200	688,900
4	551,200	705,700	681,600	14	548,000	722,800	674,400	24	567,200	688,900	685,200
5	551,200	702,000	685,200	15	548,000	705,700	676,200	25	572,000	734,200	681,600
6	551,200	696,400	681,600	16	548,000	676,200	678,000	26	687,000	730,400	679,800
7	551,200	688,900	679,800	17	548,000	687,000	676,200	27	698,200	730,400	676,200
8	551,200	690,700	687,000	18	548,000	694,500	676,200	28	722,800	720,900	672,600
9	551,200	698,200	679,800	19	548,000	702,000	674,400	29	739,900	690,700	669,000
10	549,600	707,600	670,800	20	548,000	688,900	679,800	30	739,900	688,900	665,400
								31		683,400	
Change in contents during month.									+188,700	-56,500	-18,000

(49) Brazos River near Palo Pinto, Tex.

Location.--Lat 32°51'45", long 98°18'10", on right bank, 35 ft upstream from bridge on Palo Pinto-Graford highway, 300 ft downstream from Dark Valley Creek, 6-1/2 miles north of Palo Pinto, Palo Pinto County, 20 miles downstream from Possum Kingdom Dam, and at mile 667. Datum of gage is 831.23 ft above mean sea level, datum of 1929.

Drainage area.--22,760 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except 10 p.m. Apr. 28 to 2 p.m. Apr. 29, 8 p.m. May 28 to 2 a.m. May 30, and 5 p.m. June 7 to 10 a.m. June 13, for which graph was reconstructed on basis of high-water marks and record of releases from Possum Kingdom Dam.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used April 28 and May 3.

Maxima.--April-June 1957: Discharge 85,400 cfs 6 a.m. Apr. 29 (gage height, 28.87 ft).
1924 to March 1957: Discharge, 95,600 cfs June 16, 1930, at site 18 mi downstream near Mineral Wells.
According to information received from the Corps of Engineers in 1936, the greatest flood known prior to that date occurred in 1876 and was several feet higher than any other flood occurring between 1876 and 1936.

Remarks.--Flow since 1941 largely regulated by Possum Kingdom Reservoir and several smaller reservoirs in Clear Fork and other basins, having a combined capacity of about 946,500 acre-ft.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	36	71,000	20,200	11	410	19,700	3,140	21	559	29,200	3,250
2	51	56,400	19,600	12	193	27,300	2,960	22	101	12,100	2,360
3	323	57,200	19,100	13	89	35,300	2,780	23	529	14,100	3,010
4	484	43,000	19,100	14	49	35,600	2,580	24	266	21,100	3,140
5	76	34,100	20,200	15	35	39,600	2,960	25	511	37,500	3,140
6	40	28,500	20,300	16	32	34,600	2,960	26	11,300	39,900	3,160
7	33	15,700	17,500	17	33	16,400	3,030	27	38,700	38,500	3,160
8	31	4,550	12,200	18	33	25,600	3,050	28	52,300	37,800	3,160
9	400	4,220	11,400	19	40	33,800	3,050	29	81,700	33,700	3,140
10	481	7,570	7,010	20	105	40,500	3,030	30	77,500	21,300	3,140
								31		20,600	
Monthly mean discharge, in cubic feet per second.									8,881	30,210	7,560
Runoff, in acre-feet.									528,500	1,857,000	449,900

(50) Brazos River near Glen Rose, Tex.

Location.--Lat 32°15'40", long 97°41'50", on left bank, 2 miles upstream from Paluxy Creek, 2.4 miles downstream from bridge on U. S. Highway 67, 4 miles northeast of Glen Rose, Somervell County, and at mile 509. Datum of gage is 567.82 ft above mean sea level, datum of 1929.

Drainage area.--24,840 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph from flood gage 2.4 miles upstream at same datum except for 7 p.m. May 28 to 7 a.m. May 30, and 4 a.m. June 4 to 10 a.m. June 6 for which graph was reconstructed on basis of record for regular gage and on normal fall between flood gage and regular gage.

Discharge record.--Stage-discharge relation defined by current meter measurements. Backwater from Paluxy Creek and/or Squaw Creek at times on Apr. 26, 27, and May 3, 4, 23-26.

Maxima.--April-June 1957: Discharge, 87,400 cfs 4 p.m. May 27 (gage height, 33.89 ft at flood gage; 30.02 ft, by levels, at regular gage).
1923 to March 1957: Discharge, 97,600 cfs May 18, 1935 (gage height, 23.68 ft at regular gage), from rating curve extended above 68,000 cfs.
Maximum stage known prior to 1923, about 30.0 ft at regular gage May 8 or 9, 1922, from information by local residents.

Remarks.--Flow since 1941 largely regulated by Possum Kingdom Reservoir except during major flood, and by several smaller reservoirs in Clear Fork and other basins, having a combined capacity of about 946,000 acre-ft. Many diversions above station for irrigation, municipal supply, and oil field operation.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	378	85,100	23,000	11	186	8,570	11,800	21	1,170	36,700	2,330
2	324	82,500	23,100	12	170	20,000	6,940	22	1,010	37,600	2,240
3	396	77,500	25,000	13	156	45,400	3,670	23	2,950	23,200	2,360
4	324	82,200	22,100	14	170	45,800	3,300	24	3,980	34,200	2,210
5	238	82,400	24,000	15	396	44,800	2,700	25	3,820	38,300	1,900
6	226	58,800	27,800	16	312	39,000	2,390	26	2,740	60,900	2,260
7	194	37,100	23,500	17	280	39,800	2,340	27	25,500	85,100	2,300
8	214	24,800	19,900	18	246	31,400	2,370	28	40,800	67,800	2,270
9	265	11,800	13,400	19	1,170	30,400	2,320	29	49,400	44,800	2,270
10	214	9,100	12,300	20	592	33,700	2,310	30	66,500	39,300	2,250
								31		30,600	
Monthly mean discharge, in cubic feet per second									6,811	44,800	9,221
Runoff, in acre-feet									405,300	2,754,000	548,700

(51) Whitney Reservoir near Whitney, Tex.

Location.--Lat 31°52', long 97°22', on State Highway 22, in intake structure of Whitney Dam on Brazos River, 2.4 miles upstream from Coon Creek, 4.0 miles upstream from Iron Creek, 7.4 miles southwest of Whitney, Hill County, and at mile 442. Datum of gage is at mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--26,170 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 1,980,000 acre-ft at 7 a.m. May 29 (elevation, 570.25 ft).
1951 to March 1957: Contents, 525,100 acre-ft Oct. 3, 1955 (elevation, 527.66 ft).

Remarks.--Reservoir is formed by concrete gravity and rolled earth dam. Dam completed in December 1950 and storage began Dec. 10, 1951. Total capacity, 2,017,500 acre-ft (elevation 571.0 ft, top of seventeen 40 x 38 ft taintor gates). Capacity at spillway crest, 642,200 acre-ft (elevation 533.0 ft, bottom of taintor gates). In addition to the taintor gates, flood-control outlet works consists of sixteen 5 x 9 ft conduits, gate controlled. There are two 16 ft diameter penstocks. Reservoir used for flood control and power development. Records furnished by Corps of Engineers. Capacity above elevation 520.0 ft, amounting to 1,630,500 acre-ft, is allocated for flood-control storage.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	282,200	851,200	1,885,000	11	275,100	1,446,000	1,611,000	21	292,100	1,813,000	1,031,000
2	280,900	973,000	1,880,000	12	273,600	1,463,000	1,564,000	22	295,500	1,820,000	963,700
3	280,000	1,124,000	1,867,000	13	272,800	1,582,000	1,509,000	23	329,500	1,823,000	899,700
4	280,200	1,274,000	1,846,000	14	272,600	1,666,000	1,470,000	24	372,700	1,827,000	831,600
5	280,200	1,402,000	1,826,000	15	270,600	1,742,000	1,417,000	25	386,900	1,833,000	762,400
6	280,200	1,487,000	1,807,000	16	268,900	1,780,000	1,356,000	26	404,100	1,865,000	693,800
7	280,500	1,516,000	1,779,000	17	268,700	1,807,000	1,292,000	27	475,200	1,931,000	627,800
8	279,800	1,518,000	1,746,000	18	268,100	1,821,000	1,230,000	28	550,800	1,978,000	580,200
9	278,200	1,499,000	1,702,000	19	275,200	1,815,000	1,167,000	29	641,000	1,973,000	546,800
10	276,500	1,464,000	1,653,000	20	279,500	1,808,000	1,100,000	30	734,600	1,954,000	514,700
								31		1,928,000	
Change in contents during month									+452,800	+1,193,400	-1,413,300

(52) Brazos River near Whitney, Tex.

Location.--Lat 31°50'30", long 97°19'30", on right bank, 3,000 ft upstream from Iron Creek, 1.0 mile downstream from Coon Creek, 3.4 miles downstream from Whitney Dam, 7.5 miles south of Whitney, Hill County, and at mile 439. Datum of gage is 417.39 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--26,190 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting control method used Apr. 1-4, 8-12, 15-20, 22, 23, 25-29.

Maxima.--April-June 1957: Discharge, 58,200 cfs at 9 a.m. May 28 (gage height, 27.34 ft).
1938 to March 1957: Discharge, 71,800 cfs May 18, 1949 (gage height, 31.03 ft).
Maximum stage known since 1853, about 45 ft May 9, 1922, from information by local residents.

Remarks.--Flow regulated by Whitney Reservoir and by Possum Kingdom Reservoir on Brazos River, and several smaller reservoirs in Clear Fork and other basins, having a combined capacity of about 2,964,000 acre-ft. Many small diversions above station for irrigation, municipal supply, and oil field operations.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	1,140	17,600	50,500	11	1,020	23,300	36,100	21	166	36,200	38,800
2	1,570	20,200	28,800	12	1,100	12,700	34,200	22	532	37,200	39,100
3	1,240	14,900	34,500	13	333	9,760	33,900	23	1,180	37,500	38,000
4	591	8,350	36,300	14	130	5,920	24,600	24	402	36,500	39,100
5	174	17,600	36,000	15	1,280	7,330	30,700	25	1,180	40,400	39,800
6	48	21,900	39,400	16	1,270	19,600	34,800	26	1,900	48,300	40,000
7	25	24,600	43,400	17	634	27,300	37,200	27	4,040	53,800	38,900
8	560	24,600	40,000	18	582	32,400	38,100	28	4,200	55,700	28,400
9	1,080	26,000	39,400	19	769	33,600	34,500	29	4,340	54,000	20,000
10	1,170	27,400	39,000	20	297	38,900	38,500	30	11,200	53,100	19,200
								31		53,000	
Monthly mean discharge, in cubic feet per second.									1,472	29,670	35,710
Runoff, in acre-feet.									87,580	1,824,000	2,125,000

(53) Brazos River at Waco, Tex.

Location.--Lat 31°33'40", long 97°07'45", on right bank at downstream side of pier of Washington Avenue Bridge in Waco, McLennan County, 2-1/2 miles downstream from Bosque River, and at mile 404. Datum of gage is 356.80 ft above mean sea level, datum of 1929, supplementary adjustment of 1942.

Drainage area.--28,500 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except for Apr. 1-12 when graph was drawn on basis of gage readings furnished by the U. S. Weather Bureau.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting control method used Apr. 19 to June 30.

Maxima.--April-June 1957: Discharge, 101,000 cfs 10 a.m. Apr. 20 (gage height, 32.33 ft).
1898 to March 1957: Discharge, 246,000 cfs Sept. 27, 1936 (gage height, 40.90 ft, levee on left bank was overtopped and broken by flood).
Maximum stage 1854-97, 34.6 ft May 28, 1885. A stage of 39.7 ft was reached Dec. 3, 1913, when levee on left bank was broken by flood, from information by U. S. Weather Bureau.

Remarks.--Flow largely regulated by Possum Kingdom and Whitney Reservoirs on Brazos River, several small reservoirs in Clear Fork and other basins (combined capacity, 221,800 acre-ft), and Lake Waco on Bosque River (capacity, 22,000 acre-ft); total combined capacity of all reservoirs, about 2,986,000 acre-ft, of which 1,630,500 acre-ft is flood-control storage in Whitney Reservoir. Many small diversions above station for municipal supply, irrigation, and oil field operation do not appreciably affect flow.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	2,080	18,700	54,800	11	1,680	35,300	37,800	21	8,460	38,200	39,200
2	1,900	23,800	39,700	12	1,130	49,000	35,300	22	6,570	36,200	39,200
3	2,380	31,100	36,900	13	1,160	65,500	35,200	23	39,900	39,000	38,500
4	3,100	32,400	39,900	14	444	39,100	27,800	24	37,400	46,300	39,200
5	1,930	17,400	40,500	15	225	11,500	29,500	25	29,300	41,300	39,200
6	365	23,100	38,500	16	1,310	18,200	35,000	26	10,200	45,300	40,500
7	320	25,200	41,200	17	1,310	25,200	37,200	27	50,300	51,100	39,700
8	182	24,900	40,200	18	736	40,900	39,200	28	22,700	56,000	34,700
9	265	26,700	39,300	19	1,630	39,100	35,900	29	21,200	54,000	22,400
10	1,230	27,800	38,900	20	48,000	39,300	38,700	30	13,500	52,500	20,100
								31		52,300	
Monthly mean discharge, in cubic feet per second.									10,360	36,340	37,140
Runoff, in acre-feet.									616,700	2,234,000	2,210,000

(54) Leon River at Gatesville, Tex.

Location.--Lat 31°26'05", long 97°45'35", on right bank just downstream from pier of bridge on U. S. Highway 84, in Gatesville, Coryell County, 0.1 mile downstream from Dodds Creek and 5.3 miles upstream from Cotton Wood Creek. Datum of gage is 723.85 ft above mean sea level, datum of 1929.

Drainage area.--2,279 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 6-19, May 6-11, June 9-30.

Maxima.--April-June 1957: Discharge, 27,100 cfs 10 a.m. May 13 (gage height, 31.30 ft).
1951 to March 1957: Discharge 25,300 cfs May 1, 1956 (gage height, 31.06 ft).
Maximum stage known since at least 1854, 35 ft in May 1908.
Flood of December 1913 (stage unknown) was the second highest, from information by local residents.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	565	9,400	6,240	11	9.5	2,260	632	21	1,320	6,510	210
2	632	5,300	4,090	12	8.5	5,200	542	22	162	6,860	175
3	179	2,960	2,530	13	8.0	17,200	468	23	2,390	6,330	155
4	73	2,020	1,950	14	6.6	11,500	425	24	3,670	3,660	158
5	67	3,010	1,870	15	6.6	10,000	398	25	4,930	3,520	126
6	45	2,160	1,380	16	6.6	7,150	435	26	3,130	3,270	109
7	27	1,190	1,090	17	6.6	6,760	390	27	7,640	4,590	92
8	18	1,370	948	18	6.2	10,300	411	28	10,100	6,360	82
9	13	1,440	841	19	30	8,760	405	29	13,000	13,300	86
10	11	1,350	747	20	1,850	7,470	255	30	11,000	12,300	80
								31		9,440	
Monthly mean discharge, in cubic feet per second.									2,030	6,224	911
Runoff, in acre-feet.									120,800	382,700	54,190

(55) Belton Reservoir near Belton, Tex.

Location.--Lat 31°07', long 97°28', in intake structure at Belton Dam on Leon River, 1.4 miles upstream from bridge on State Highway 317, about 3.4 miles upstream from Nolan Creek, 4.2 miles north of Belton, Bell County, and 16.7 miles upstream from confluence with Lampasas River. Datum of gage is at mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--3,499 sq mi.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 870,300 acre-ft at 7:30 a.m. June 6 (elevation, 620.45 ft).
1954 to March 1957: Contents, 225,800 acre-ft May 5, 1956 (elevation, 571.00 ft).

Remarks.--Reservoir is formed by a rolled-earth fill dam with a 1,300 ft uncontrolled earthen spillway. Flood-control outlet works consists of a 22-ft diameter conduit controlled by three 7.0 x 22.0 ft electrically driven broome-type gates. Gates closed Mar. 8, 1954, and dam completed in April, 1954. Reservoir built for flood control and conservation. Capacity, 1,876,700 acre-ft at design water surface (elevation, 656.9 ft), 1,097,600 acre-ft at spillway crest (elevation, 631.0 ft), and 210,600 acre-ft at top of conservation pool (elevation, 569.0 ft). Records furnished by Corps of Engineers.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	140,800	467,800	845,200	11	145,300	506,300	813,900	21	181,900	797,000	718,500
2	142,200	479,100	858,700	12	145,400	537,400	805,900	22	188,500	801,000	703,500
3	143,500	488.600	868,100	13	145,200	654,100	807,200	23	229,200	804,300	689,000
4	144,500	492,700	869,900	14	145,200	698,200	808,000	24	285,800	807,200	673,900
5	144,700	490,200	870,100	15	145,400	721,700	801,900	25	303,600	805,000	658,800
6	144,700	487,900	866,700	16	145,500	738,600	789,100	26	325,700	804,100	644,300
7	145,100	485,100	858,900	17	145,600	746,800	775,700	27	385,600	804,400	629,900
8	145,100	480,400	849,100	18	145,600	761,700	761,700	28	412,000	809,500	616,900
9	145,200	478,600	838,500	19	154,200	776,700	748,000	29	433,600	813,400	602,700
10	145,200	475,200	826,400	20	178,500	789,500	733,200	30	453,700	828,500	589,700
								31		838,200	
Change in contents during month.									+315,600	+384,500	-248,500

(56) Leon River near Belton, Tex.

Location.--Lat 31°04'15", long 97°26'30", on left bank, 1,400 ft upstream from bridge on Farm to Market Road 817, about three quarters of a mile upstream from bridge on U. S. Highway 81, 2 miles east of Belton, Bell County, about 2 miles upstream from Nolan Creek, and about 2-1/2 miles downstream from Belton Reservoir. Datum of gage is 476.89 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--3,513 sq mi, of which 3,499 sq mi is above Belton Reservoir.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--April-June 1957: Discharge, 8,490 cfs from 9 p.m. June 18 to 3 a.m. June 20 (gage height, 9.12 ft).
1923 to March 1957: Discharge, 70,600 cfs Apr. 22, 1945 (gage height, 24.41 ft, prior to construction of Belton Reservoir), from rating curve extended above 45,000 cfs.
Maximum stage known, 25 ft in December 1913; flood of September 1921 reached a stage of 21 ft, from information by local residents.

Remarks.--Flow regulated by Belton Reservoir. Small diversions above station for irrigation, municipal supply, and oil field operation.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	6.8	3,650	6,230	11	3.6	4,310	7,690	21	3.8	4,780	8,440
2	5.0	4,370	104	12	3.2	2,040	6,100	22	4.1	5,420	8,390
3	5.3	3,640	820	13	2.6	189	96	23	207	5,830	8,340
4	4.4	2,800	2,610	14	2.4	76	78	24	422	5,830	8,340
5	3.4	4,390	2,600	15	2.6	70	3,480	25	36	5,810	8,300
6	3.4	4,390	3,990	16	3.4	1,660	7,340	26	28	5,810	8,270
7	3.6	4,370	5,420	17	3.4	4,020	7,630	27	87	3,840	8,020
8	3.0	4,370	6,810	18	3.2	4,880	8,000	28	95	2,150	7,340
9	2.6	4,350	6,780	19	7.4	4,450	8,490	29	679	4,290	7,320
10	3.2	4,350	7,290	20	12.0	2,770	8,440	30	2,680	6,110	7,300
								31		6,760	
Monthly mean discharge, in cubic feet per second									144	3,928	6,002
Runoff, in acre-feet									8,580	241,500	357,100

(57) Lampasas River at Youngsport, Tex.

Location.--Lat 30°57', long 97°43', on left bank, 500 ft upstream from county road bridge (destroyed May 13, 1957) and half a mile southeast of Youngsport, Bell County. Datum of gage is 633.46 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.--1,242 sq mi.

Gage-height record.--Water-stage recorder graph except 3 p.m. to 11 p.m. April 24, 7 a.m. April 27 to 1 p.m. April 29, and 7 a.m. May 13 to 1 a.m. May 14 when stage exceeded limits of recording gage.

Discharge record.--Stage-discharge relation defined by current-meter measurements and extended above 40,000 cfs on basis of measurements made 22 miles downstream.

Maxima.--April-June 1957: Discharge, 84,000 cfs 11 a.m. May 13 (gage height, 36.40 ft, from floodmark), from rating curve extended above 40,000 cfs.
1924 to March 1957: Discharge, 53,200 cfs Sept. 28, 1936 (gage height, 33.5 ft, from floodmarks), from rating curve extended above 40,000 cfs.
Flood in September 1873 reached a stage of 44.2 ft and that of Dec. 2, 1913 reached a stage of 33.6 ft, from information by local residents.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	225	1,680	1,060	11	16	1,020	372	21	268	897	249
2	203	885	3,800	12	16	6,890	417	22	288	741	207
3	106	700	1,390	13	15	49,600	926	23	9,480	643	181
4	68	1,040	956	14	15	9,130	390	24	18,300	569	169
5	44	1,110	1,140	15	14	1,750	309	25	5,100	526	157
6	31	652	1,340	16	15	1,220	278	26	1,410	2,410	145
7	26	517	702	17	15	1,000	258	27	26,000	823	138
8	22	462	571	18	16	3,340	254	28	5,980	1,060	134
9	20	586	490	19	25	3,170	580	29	5,990	1,030	120
10	17	1,000	428	20	2,610	1,200	377	30	1,540	461	109
								31		461	
Monthly mean discharge, in cubic feet per second									2,596	3,115	588
Runoff, in acre-feet									154,500	191,500	35,000

(58) Little River at Cameron, Tex.

Location.--Lat 30°50', long 96°57', on right bank, at site of old McCowan Bridge, 2,020 ft upstream from bridge on U. S. Highway 77, 1 mile upstream from Gulf, Colorado & Santa Fe Railway bridge, and 2 miles southeast of Cameron, Milam County. Datum of gage is 281.89 ft above mean sea level (levels by Corps of Engineers.).

Drainage area.--7,000 sq mi.

Gage-height record.--Water-stage recorder graph except 1 p.m. May 3 to 7 p.m. May 9 for which graph was constructed on basis of gage heights furnished by Corps of Engineers.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 15-30.

Maxima.--April-June 1957: Discharge, 116,000 cfs 1 p.m. Apr. 25 (gage height, 39.56 ft).
1916 to March 1957: Discharge, 647,000 cfs Sept. 10, 1921 (gage height, 53.2 ft, present datum, from floodmark), from rating curve extended above 90,000 cfs on basis of slope-area determination of peak flow.
Maximum stage known, that of Sept. 10, 1921; flood of 1852 reached about the same stage. Flood of December 1913 reached a stage of 49.0 ft. Stages based on information by local resident.

Remarks.--Some regulation by Belton Reservoir on Leon River.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	936	22,100	7,660	11	30	6,870	8,030	21	483	7,830	10,800
2	1,360	9,760	15,000	12	33	5,830	8,660	22	2,260	5,480	10,600
3	573	7,080	21,700	13	28	7,950	17,900	23	3,550	5,900	10,300
4	432	6,460	21,300	14	24	17,100	24,300	24	14,800	6,440	10,000
5	258	4,920	21,700	15	26	33,700	7,210	25	79,600	6,590	9,850
6	190	5,740	16,500	16	33	20,400	2,550	26	51,000	7,230	9,750
7	126	5,850	11,300	17	33	5,060	6,530	27	29,600	11,200	9,650
8	79	5,650	7,540	18	44	4,620	8,850	28	40,000	9,860	9,490
9	51	5,230	7,920	19	38	6,610	9,300	29	48,800	5,110	8,820
10	36	7,190	8,160	20	27	9,610	10,200	30	40,100	4,130	8,210
								31		5,700	
Monthly mean discharge, in cubic feet per second.									10,480	8,813	11,330
Runoff, in acre-feet.									623,900	541,900	673,900

(59) Brazos River near Bryan, Tex.

Location.--Lat 30°37', long 96°29', on left bank, 2.4 miles downstream from Little Brazos River, 5 miles downstream from Texas and New Orleans Railroad bridge, 9 miles southwest of Bryan, Brazos County, and at mile 285. Datum of gage is 192.33 ft above mean sea level, datum of 1929.

Drainage area.--38,400 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except for 8 p.m. Apr. 20 to 3 p.m. Apr. 21, 8 a.m. May 24 to 3 a.m. May 26, 11 a.m. May 26 to 2 p.m. May 27, and 9 a.m. June 9 to 11:30 a.m. June 14 for which gage-height chart was reconstructed on basis of twice-daily readings of staff gage furnished by Corps of Engineers.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 9-19.

Maxima.--April-June 1957: Discharge, 137,000 cfs 10 p.m. Apr. 26 (gage height, 42.08 ft).
1925 to March 1957: Gage height, 46.1 ft May 20, 1930, present site and datum (discharge not determined).
Maximum stage since at least 1899, about 54.0 ft Dec. 5, 1913, present site and datum.

Remarks.--Some regulation by reservoirs above Waco and by Belton Reservoir on Leon River.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	3,650	88,400	58,000	11	576	37,700	48,300	21	27,200	48,600	45,100
2	5,190	63,200	62,300	12	560	45,400	47,600	22	42,100	48,200	47,100
3	5,030	46,100	66,400	13	1,100	72,700	47,000	23	30,800	46,100	47,900
4	4,190	43,700	63,300	14	1,120	85,200	51,800	24	53,100	45,100	48,200
5	3,280	48,900	63,600	15	1,170	94,000	53,800	25	91,500	47,500	47,500
6	3,120	40,200	64,600	16	1,080	85,000	37,400	26	123,000	51,000	47,900
7	2,120	32,100	59,500	17	844	56,100	36,000	27	116,000	51,200	48,500
8	1,390	32,800	54,700	18	653	36,700	41,800	28	102,000	56,300	48,600
9	898	33,400	51,100	19	1,190	39,900	45,000	29	106,000	59,200	46,300
10	719	34,900	49,200	20	2,000	46,800	45,600	30	104,000	58,400	38,100
								31		57,200	
Monthly mean discharge, in cubic feet per second.									27,850	52,650	50,410
Runoff, in acre-feet.									1,657,000	3,237,000	2,999,000

(60) Brazos River at Richmond, Tex.

Location.--Lat 29°35', long 95°45', near right bank on downstream side of pier of bridge on U. S. Highway 59 in Richmond, Fort Bend County, 925 ft downstream from Texas and New Orleans Railroad bridge and at mile 93. Datum of gage is 40.94 ft above mean sea level, datum of 1929, Houston supplementary adjustment of 1943.

Drainage area.--44,020 sq mi, approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except 5 p.m. April 13 to 12 p.m. April 22, 8 p.m. May 14 to 9 a.m. May 16, 9 a.m. May 20 to 2 p.m. June 8, and 12 p.m. June 23 to 5 p.m. June 25 when graph was drawn on basis of wire-weight gage readings furnished by the U. S. Weather Bureau.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used April 1-7 and April 23 to May 16.

Maxima.--April-June 1957: Discharge, 119,000 cfs at 7 p.m. May 5 (gage height, 37.13 ft).
1903-06, 1931 to March 1957: Discharge, 117,000 cfs Nov. 28, 1940 (gage height, 38.40 ft).
Maximum stage known since at least 1884, 48.2 ft Dec. 19, 1913, present datum, from floodmarks on right bank 1,000 ft upstream from gage. From information by Southern Pacific Railroad, other floods at railroad bridge, present datum, are as follows: May 1884, stage 43.7 ft; June 13, 1885, stage 44.7 ft; July 1899, stage 45.6 ft; May 2, 1915, stage 43.3 ft; May 9, 1922, stage 40.9 ft. Flood of June 6, 1929, reached a stage of 40.6 ft, present site and datum, from floodmarks (discharge, 123,000 cfs).

Remarks.--Some regulation by reservoirs above Bryan.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	6,400	89,500	64,000	11	3,810	61,600	60,700	21	1,690	66,500	52,000
2	8,540	94,100	64,100	12	3,110	55,000	58,000	22	1,670	65,400	52,400
3	8,200	99,600	64,800	13	2,730	52,800	56,500	23	18,500	65,000	52,400
4	7,330	106,000	67,100	14	2,450	58,300	55,900	24	31,000	63,100	53,200
5	7,720	118,000	69,600	15	2,170	71,000	55,900	25	35,400	59,600	54,000
6	7,480	117,000	70,400	16	2,020	78,800	58,500	26	50,600	58,100	53,600
7	6,500	112,000	70,700	17	1,990	83,800	57,300	27	65,300	58,600	53,000
8	5,720	105,000	70,900	18	1,900	86,400	49,300	28	76,000	59,100	52,400
9	5,190	91,700	68,600	19	1,810	84,100	46,600	29	84,000	59,300	52,000
10	4,510	74,200	64,800	20	1,730	74,600	49,700	30	86,700	61,500	52,100
								31		63,400	
Monthly mean discharge, in cubic feet per second.									18,070	77,200	58,350
Runoff, in acre-feet.									1,075,000	4,747,000	3,472,000

(61) Brazos River at Brazoria, Tex.

Location.--Lat 29°03', long 95°33', on left bank at Dow Chemical Company's pumping plant at Brazoria, Brazoria County, about one quarter mile downstream from St. Louis, Brownsville and Mexico Railway bridge, and at about mile 21. Datum of gage unknown.

Drainage area.--Not determined. At site about 10 river miles upstream, 44,510 sq mi approximately, of which 9,240 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph furnished by Dow Chemical Company.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Records for low-water period April 1-22 not computed owing to effect of tides on stage-discharge relation. Discharge figures do not include flood water that by-passed this station through Oyster Creek and Buffalo Camp Bayou.

Maxima.--April-June 1957: Discharge, 88,100 cfs May 10 (gage height, 23.70 ft).

Remarks.--Flow partly regulated by reservoirs above Bryan. Brazos River flood water amounting to about 217,000 acre-ft flowed into the Oyster Creek channel between Richmond and Brazoria and did not return to the Brazos River. The maximum discharge of Oyster Creek at State Highway 35 was 10,800 cfs on May 10. Brazos River flood water amounting to about 78,000 acre-ft by-passed the Brazoria station through Buffalo Camp Bayou and returned to the Brazos River below Brazoria. The maximum discharge of Buffalo Camp Bayou at FM Road 332 was 3,840 cfs on May 11.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1		76,300	57,200	11		86,900	58,600	21		72,000	46,000
2		77,000	58,100	12		84,000	55,200	22		67,800	47,000
3		77,500	59,100	13		77,000	52,200	23	8,200	64,300	47,100
4		78,300	59,400	14		69,000	50,500	24	24,200	61,900	46,800
5		78,600	60,700	15		67,400	50,200	25	33,600	59,100	47,600
6		79,000	62,300	16		69,600	50,900	26	39,900	55,300	48,800
7		79,900	63,300	17		71,800	52,600	27	52,700	53,900	49,400
8		82,300	64,000	18		72,800	50,000	28	64,800	53,800	47,300
9		85,400	63,400	19		73,500	44,700	29	72,000	53,800	47,300
10		87,300	62,100	20		73,900	43,300	30	74,900	53,800	47,000
								31		55,700	
Monthly mean discharge, in cubic feet per second.									------	70,930	53,070
Runoff, in acre-feet.									734,500	4,361,000	3,158,000

(62) Lake J. B. Thomas near Vincent, Tex.

Location.--Lat 32°35'09", long 101°12'18", at Big Spring pump station on south side of reservoir, 4.0 miles upstream from dam on Colorado River, 7.3 miles north of Vincent, Howard County, 12.5 miles west of Ira, and at mile 845. Datum of gage is at mean sea level, datum of 1929.

Drainage area.--3,524 sq mi, of which 2,590 sq mi is probably noncontributing. Contributing area includes 363 sq mi above Bull Creek diversion dam.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 184,500 acre-ft June 13-16, 18-21, 23-26 (elevation, 2,255.5 ft).
1953 to March 1957: Contents, 186,000 acre-ft Oct. 5-7, 1955 (elevation, 2,255.7 ft).

Remarks.--There was no spill from reservoir during period April-June. Reservoir is formed by rolled-fill earthen dam, 14,500 ft long; storage began in July 1952; dam completed in September 1952. No appreciable storage prior to July 1953. The service spillway is a reinforced concrete structure of cloverleaf design, with two 14-by 14-foot uncontrolled openings designed to discharge a total of 10,000 cfs. Two emergency spillways, one 500 ft wide located at left end of dam and one 1,600 ft wide located at right end of dam, are designed to discharge 161,000 cfs at elevation 2,275.0 ft (maximum design level). Capacity of reservoir, 255,000 acre-ft at elevation 2,264.0 ft (top of lower emergency spillway); 204,000 acre-ft at elevation 2,258.0 ft (top of service spillway); 1,300 acre-ft at elevation 2,200.0 ft (lip of intake to service outlet). All flow of Bull Creek is diverted into Lake J. B. Thomas by means of a diversion dam across the creek and a gravity canal through the intervening ridge except that which will flow through the spillway at one end of the dam during extreme floods.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	137,500	139,300	177,900	11	135,700	148,000	180,000	21	135,100	161,100	184,500
2	137,500	139,300	179,300	12	135,700	152,500	183,700	22	134,500	161,100	183,700
3	136,900	139,900	180,000	13	135,700	155,800	184,500	23	134,500	161,800	184,500
4	136,900	139,300	180,000	14	135,700	156,400	184,500	24	134,500	167,900	184,500
5	136,900	139,300	180,800	15	135,100	156,400	184,500	25	135,100	170,800	184,500
6	136,900	139,300	180,800	16	135,100	156,400	184,500	26	135,700	170,800	184,500
7	136,300	139,300	180,800	17	135,100	159,100	183,700	27	135,700	170,800	183,700
8	136,300	139,300	180,800	18	135,100	161,100	184,500	28	136,900	170,800	183,700
9	136,300	139,300	180,800	19	135,100	161,100	184,500	29	138,700	170,000	183,700
10	136,300	139,900	180,000	20	135,100	161,100	184,500	30	139,300	170,800	183,700
								31		173,600	
Change in contents during month									+1,800	+34,300	+10,100

(63) Colorado River at Colorado City, Tex.

Location.--Lat 32°23'33", long 100°52'42", on right bank at Colorado City, Mitchell County, 3,517 ft upstream from bridge on U. S. Highway 80, 4,100 ft upstream from Texas & Pacific Railway bridge, 1.6 miles upstream from Lone Wolf Creek, and at mile 796. Datum of gage is 2,030.16 ft above mean sea level, datum of 1929, supplementary adjustment of 1942.

Drainage area.--4,082 sq mi, approximately, of which 2,590 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except for periods April 4-8, June 27-30, when graph was drawn on basis of one gage reading at end of each period.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--April-June 1957: Discharge, 13,000 cfs 10:30 a.m. May 25 (gage height, 19.72 ft).
1923-25, 1946 to March 1957: Discharge 24,900 cfs July 6, 1948 (gage height, 22.37 ft from floodmark).
Maximum stage known since at least 1910, 35.9 ft June 20, 1939, present site and datum, from floodmark (discharge, 66,000 cfs, by slope-area determination of peak flow at site 2.5 miles upstream from gage).

Remarks.--Flow partly regulated since July 1952 by Lake J. B. Thomas. Diversions from Lake J. B. Thomas for municipal use and oil field operation. There was no spill from Lake J. B. Thomas during April-June 1957.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	0.2	130	3,540	11	0.0	1,350	9.7	21	0.0	23	7.3
2	1.1	65	1,590	12	0	975	67	22	2.6	4.6	6.6
3	1.9	26	289	13	0	2,510	138	23	4.0	2.2	14
4	.1	19	90	14	0	304	58	24	.7	13	43
5	0	14	45	15	0	77	23	25	569	9,560	25
6	0	9.7	28	16	0	32	14	26	4,330	2,200	14
7	0	8.0	20	17	0	336	11	27	427	335	9.7
8	0	16	15	18	0	5,470	42	28	552	97	7.3
9	0	878	12	19	0	642	11	29	3,010	56	5.2
10	0	119	9.7	20	0	116	8.0	30	1,060	55	4.0
								31		7,030	
Monthly mean discharge, in cubic feet per second									332	1,048	205
Runoff, in acre-feet									19,750	64,410	12,210

(64) Lake Colorado City near Colorado City, Tex.

Location.--Lat 32°20'40", long 100°55'10", on left bank at municipal water-intake structure, 1.7 miles upstream from Lake Colorado City Dam on Morgan Creek, 2.2 miles downstream from Texas and Pacific Railway bridge, 2.5 miles upstream from mouth and 4.0 miles southwest of Colorado City, Mitchell County. Datum of gage is at mean sea level, datum of 1929.

Drainage area.--267 sq mi.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 38,500 acre-ft 3 to 9 p.m. May 13; elevation, 2,073.62 ft 6 p.m. May 13.
1949 to March 1957: Contents, 27,870 acre-ft July 1-4, 1954 (elevation, 2,068.13 ft).

Remarks.--There was flow through the service spillway in May and June. Reservoir is formed by a rolled-fill earthen dam, 4,800 ft long; storage began in April 1949; dam completed in September 1949. Reservoir is operated by Texas Electric Service Company for cooling purposes in operation of steam power-plant. Colorado City diverts water for municipal supply. Service spillway is of cloverleaf design, located 100 ft upstream from dam, having two uncontrolled openings 10 by 12 ft, designed to discharge a total of 5,000 cfs. An emergency spillway, 1,200 ft wide and designed to discharge 150,000 cfs directly into the Colorado River, is located 600 ft upstream and to left of dam. Capacity of reservoir, 38,700 acre-ft at elevation 2,073.7 ft (top of emergency spillway), 31,800 acre-ft at elevation 2,070.3 ft (top of service spillway), and 158 acre-ft dead storage at elevation 2,024.3 ft (bottom of service outlet conduit).

Contents in acre-feet at 12 p.m. 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	17,970	30,840	34,400	11	17,750	35,200	31,800	21	17,640	32,800	31,600
2	17,970	30,840	34,200	12	17,750	34,800	32,400	22	17,640	32,600	31,600
3	17,970	31,020	33,600	13	17,750	38,080	32,600	23	17,640	32,400	31,600
4	17,860	30,840	33,000	14	17,640	35,600	32,400	24	17,640	32,600	31,600
5	17,970	30,840	32,800	15	17,640	34,000	32,200	25	18,410	36,400	31,600
6	17,860	30,840	32,400	16	17,640	33,200	32,000	26	22,970	35,400	31,400
7	17,750	30,660	32,400	17	17,640	33,400	32,000	27	23,850	34,000	31,400
8	17,860	31,020	32,200	18	17,750	35,600	32,000	28	24,600	33,200	31,200
9	17,860	31,200	32,000	19	17,640	34,400	31,800	29	28,720	32,800	31,200
10	17,750	32,000	32,000	20	17,640	33,400	31,800	30	30,840	32,800	31,200
								31		33,400	
Change in contents during month.									+12,870	+2,560	-2,200

(65) Colorado River at Ballinger, Tex.

Location.--Lat 31°43'50", long 99°56'25", near left bank on downstream side of pier of bridge on U. S. Highway 83 in Ballinger, Runnels County, 2,000 ft upstream from Elm Creek, and at mile 659. Datum of gage is 1,593.74 ft above mean sea level, datum of 1929.

Drainage area.--16,840 sq mi, approximately, of which 11,600 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except for periods May 2, 21, 30, June 5-10, when graph was drawn on basis of trend of recession and engineer's gage readings.

Discharge records.--Stage-discharge relation defined by current meter measurements. Discharge affected by backwater from Elm Creek May 11-13, 18, 19, 25, 26, June 1, 2.

Maxima.--April-June 1957: Discharge 27,000 cfs 12 p.m. May 11 (gage height, 20.75 ft, backwater from Elm Creek).
1907 to March 1957: Discharge, 75,400 cfs Sept. 18, 1936 (gage height, 28.6 ft).
Maximum stage since at least 1882, about 36 ft some time in 1884, present site and datum, from information by local residents. Flood of Aug. 6, 1906 reached a stage of about 32.0 ft, present site and datum, from floodmarks (backwater from Elm Creek).

Remarks.--Small diversions above station for irrigation affect low flow. Flow slightly regulated by Lake J. B. Thomas, Lake Colorado City, and Oak Creek Reservoir.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	0.6	3,840	7,430	11	2.6	15,200	358	21	664	1,660	280
2	.4	1,010	20,200	12	.5	23,100	2,260	22	221	962	186
3	.6	455	21,200	13	.3	24,300	958	23	1,670	1,240	145
4	8.4	424	7,780	14	.2	11,200	665	24	349	4,510	122
5	21	178	2,150	15	1.2	3,530	636	25	109	2,000	106
6	79	125	1,460	16	2.6	1,670	508	26	174	9,550	95
7	48	95	1,020	17	3.2	1,080	373	27	6,380	9,540	86
8	29	81	736	18	2.6	13,500	621	28	6,370	4,000	81
9	15	98	562	19	3.6	12,000	659	29	5,050	1,730	86
10	6.8	1,820	439	20	2,760	5,230	466	30	5,180	1,020	81
								31		1,890	
Monthly mean discharge, in cubic feet per second.									972	5,066	2,392
Run-off, in acre-feet.									57,820	311,500	142,300

(66) South Concho River at Christoval, Tex.

Location.--Lat 31°13', long 100°30', near center of stream on downstream side of center pier of Panhandle and Santa Fe Railway bridge at Christoval, Tom Green County, and 12 miles upstream from Lake Nasworthy. Datum of gage is 2,010.22 ft above mean sea level, datum of 1929.

Drainage area.--434 sq mi.

Gage-height record.--Water stage recorder graph except 3 a.m. to 1 p.m. May 9, when graph was drawn on basis of peak mark.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 9,000 cfs and extended above on basis of slope-area determination at gage height 20.5 ft. Shifting-control method used April 23-26.

Maxima.--April-June 1957: Discharge, 84,000 cfs about 7:30 a.m. May 9 (gage height, 20.82 ft, from high-water mark inside recorder shelter).
1930 to March 1957: Discharge, 100,000 cfs July 23, 1938 (gage height, 21.95 ft, from floodmarks), from rating curve extended above 9,000 cfs on basis of slope-area determination at gage height 20.5 ft.
Maximum stage known since at least 1882, about 23 ft Aug. 6, 1906, from information by local residents.

Remarks.--Low flow materially affected by diversion 600 ft above station to South Concho Irrigation Co.'s canal.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	4.0	25	109	11	5.1	2,040	52	21	5.7	50	45
2	4.0	24	128	12	5.7	2,400	52	22	8.4	47	47
3	9.8	22	98	13	5.7	2,620	52	23	1,160	50	45
4	4.6	22	65	14	5.7	205	52	24	129	47	45
5	4.0	21	60	15	5.7	65	52	25	39	45	45
6	5.1	19	57	16	5.7	47	52	26	9,640	47	45
7	5.1	19	60	17	5.7	47	50	27	3,150	1,920	42
8	5.1	19	60	18	4.6	2,310	50	28	81	146	42
9	4.6	21,600	60	19	4.6	237	47	29	35	65	40
10	4.6	219	60	20	5.1	62	45	30	28	57	40
								31		85	
Monthly mean discharge, in cubic feet per second									479	1,116	56.6
Runoff, in acre-feet									28,520	68,590	3,370

(67) North Concho River near Carlsbad, Tex.

Location.--Lat 31°36', long 100°39', near left bank on downstream side of pier of county road bridge, 0.6 mile southwest of Carlsbad, Tom Green County, 1.5 miles upstream from Mule Creek, and 16.2 miles upstream from San Angelo Dam. Datum of gage is 1,968.02 ft above mean sea level, datum of 1929.

Drainage area.--1,533 sq mi, of which 123 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current meter measurements. Shifting-control method used April 1-19, 26, 27, May 4-10, June 17, 18, 20-30.

Maxima.--April-June 1957: Discharge, 8,180 cfs 10 p.m. April 28 (gage height, 14.75 ft).
1924 to March 1957: Discharge, 94,600 cfs Sept. 26, 1936 (gage height, 16.0 ft at former site, 29.1 ft at present site, from floodmarks) from rating curve extended above 11,000 cfs on basis of slope-area determinations at gage height 14.45 ft and of peak flow.
Maximum stage known since at least 1853, that of Sept. 26, 1936.

Remarks.--Diversions by pumping above station affect low flow (combined capacity of pumps, 40 cfs).

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	0.1	155	52	11	0.2	851	12	21	27	28	5.2
2	.1	58	3,060	12	.1	2,910	379	22	49	17	4.4
3	0	33	1,430	13	0	720	22	23	212	1,180	4.1
4	9.3	16	196	14	0	128	12	24	53	2,230	3.3
5	8.4	14	88	15	.1	46	9.0	25	21	552	3.1
6	4.6	12	206	16	.1	24	7.4	26	13	212	2.6
7	3.3	10	58	17	.1	19	6.8	27	118	62	1.7
8	1.5	9.8	30	18	.1	2,390	23	28	5,940	32	.8
9	.8	9.0	21	19	141	410	20	29	2,770	24	.2
10	.4	119	16	20	144	64	7.5	30	751	21	.2
								31		448	
Monthly mean discharge, in cubic feet per second									342	413	189
Runoff, in acre-feet									20,370	25,400	11,270

(68) San Angelo Reservoir at San Angelo, Tex.

Location.--Lat 31°29'04", long 100°28'53", at San Angelo Reservoir dam on North Concho River, 3.1 miles northwest of San Angelo, Tom Green County, 6.2 miles downstream from Dry Creek, and 10.1 miles downstream from Grape Creek. Datum of gage is at mean sea level, datum of 1929.

Drainage area.--1,790 sq mi, of which 123 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 93,240 acre-ft at 12 p.m. June 12 (elevation, 1,902.70 ft).
1952 to March 1957: Contents, 59,270 acre-ft June 8, 1954 (elevation, 1,893.34 ft).

Remarks.--Reservoir is formed by rolled-fill earthen-type dam. Dam completed May 3, 1951 and storage began Feb. 1, 1952. Flood-control outlet works consist of 6 gate controlled outlets at elevation 1,840.0 ft opening into two 18-foot diameter concrete conduits. Total controlled capacity 396,400 acre-ft at crest of spillway (elevation, 1,938.5 ft) and 119,200 acre-ft at top of conservation pool (elevation, 1,908.0 ft). Reservoir is operated for flood control and municipal water supply. Records furnished by Corps of Engineers. No water released from reservoir during the period April-June 1957.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	32,290	54,470	82,160	11	31,740	56,110	91,940	21	31,960	72,920	91,980
2	32,290	54,530	88,930	12	31,670	61,700	93,240	22	32,400	72,850	91,810
3	32,220	54,530	91,760	13	31,600	64,480	93,110	23	33,320	74,340	91,640
4	32,180	54,470	92,110	14	31,560	64,680	92,980	24	33,410	78,590	91,510
5	32,110	54,380	92,150	15	31,540	64,680	92,670	25	33,450	79,640	91,340
6	32,040	54,300	92,410	16	31,540	64,680	92,630	26	34,340	80,100	91,160
7	32,000	54,210	92,410	17	31,500	64,910	92,450	27	36,350	80,280	91,000
8	31,890	54,270	92,330	18	31,500	72,150	92,410	28	45,560	80,250	90,820
9	31,850	54,330	92,200	19	31,520	72,960	92,320	29	52,570	80,170	90,610
10	31,780	54,380	92,070	20	31,930	72,960	92,150	30	54,330	80,100	90,440
								31		81,700	
Change in contents during month									+21,980	+27,370	+8,740

(69) Concho River near San Angelo, Tex.

Location.--Lat 31°27'10", long 100°24'40", on right bank 0.5 mile downstream from confluence of North Concho and South Concho Rivers and 1.8 miles southeast of San Angelo, Tom Green County. Datum of gage is 1,776.79 ft above mean sea level, datum of 1929.

Drainage area.--4,492 sq mi, of which 275 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except 8 p.m. April 26 to 8 a.m. April 27, when graph was drawn based on peak mark and records for Lake Nasworthy.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used April 26.

Maxima.--April-June 1957: Discharge, 106,000 cfs 3 p.m. May 9 (gage height, 39.30 ft in gage well, 39.8 ft, from floodmarks).
1915 to March 1957: Discharge, 230,000 cfs Sept. 17, 1936 (gage height, 46.6 ft, from floodmarks), from rating curve extended above 51,000 cfs on basis of slope-area determinations at gage heights 42.6 and 46.6 ft.
Maximum stage known since 1854, 47.5 ft Aug. 6, 1906 (discharge, about 246,000 cfs), from information by local resident. Other large floods are known to have occurred in August 1882 and April 1900.

Remarks.--Maximum discharge during period was not materially affected by operation of reservoirs upstream. At times, low and medium flows are regulated by Lake Nasworthy on South Concho River. There was no spill during period from San Angelo Reservoir on North Concho River.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	5.1	526	4,070	11	12	12,000	227	21	10	1,220	23
2	5.1	422	2,070	12	11	12,700	1,020	22	58	64	23
3	5.1	317	233	13	10	18,700	61	23	260	55	23
4	5.4	51	1,260	14	10	1,210	34	24	288	198	23
5	6.6	36	58	15	10	65	27	25	101	1,440	34
6	8.0	33	43	16	13	55	25	26	9,280	1,670	175
7	9.0	30	36	17	12	158	25	27	24,700	6,230	71
8	8.0	27	152	18	12	17,900	25	28	5,550	85	53
9	12	39,500	168	19	11	6,060	24	29	3,700	50	69
10	12	888	175	20	11	98	23	30	2,910	43	58
								31		1,680	
Monthly mean discharge, in cubic feet per second									1,568	3,984	344
Runoff, in acre-feet									93,310	245,000	20,490

(70) Colorado River at Winchell, Tex.

Location.--Lat 31°28'05", long 99°09'45", near left bank on downstream side of pier of bridge on U. S. Highway 377, 0.3 mile south of Winchell, Brown County, 6.2 miles downstream from Home Creek, and at mile 561. Datum of gage is 1,264.86 ft above mean sea level, datum of 1929.

Drainage area.--24,580 sq mi, approximately, of which 11,900 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except for periods May 30, 31, June 6-11, when graph was drawn on basis of trend of recession and one gage reading.

Discharge.--Stage-discharge relation defined by current meter measurements. Shifting-control method used April 1, 4-9, 11-26, 29, 30, May 1-10, 15-18, 21-29, June 1, 2, 5, 12-30.

Maxima.--April-June 1957: Discharge, 63,000 cfs 7 p.m. May 13 (gage height, 46.00 ft).
1923-34, 1939 to March 1957: Discharge, 76,100 cfs Oct. 15, 1930 (gage height, 51.8 ft, present site and datum).
Maximum stages since 1882, 62.2 ft, Sept. 19, 1936, and 56.2 ft, Aug. 8, 1906, present site and datum, from information by Gulf, Colorado and Santa Fe Railway at railway bridge 1,000 ft upstream from gage.

Remarks.--Diversions above station for irrigation, municipal supply, and oil field operation. Some regulation by Lake J. B. Thomas, Lake Colorado City, Oak Creek Reservoir, Lake Nasworthy, and San Angelo Reservoir.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	38	9,050	6,480	11	41	30,100	1,120	21	2,390	7,430	750
2	32	5,210	21,400	12	39	32,700	2,220	22	1,110	3,600	910
3	26	1,910	27,600	13	434	56,000	6,100	23	6,970	7,080	537
4	922	2,150	25,000	14	345	58,300	2,400	24	5,910	19,000	383
5	345	1,440	9,810	15	151	34,000	1,320	25	1,450	6,540	303
6	172	725	3,250	16	89	5,530	1,210	26	3,010	7,920	264
7	98	446	1,760	17	69	3,050	1,040	27	32,200	15,100	224
8	64	333	1,380	18	53	15,100	816	28	32,200	20,500	198
9	43	1,980	1,240	19	3,740	27,400	705	29	21,000	6,470	180
10	32	18,900	1,190	20	1,940	29,100	1,160	30	10,100	2,790	252
								31		1,240	
Monthly mean discharge, in cubic feet per second.									4,167	13,910	4,040
Run-off in acre-feet.									248,000	855,100	240,400

(71) Brownwood Reservoir near Brownwood, Tex.

Location.--Lat 31°50', long 99°00', at outlet structure for irrigation canal, just upstream from right end of dam on Pecan Bayou, a quarter of a mile downstream from Jim Ned Creek, and 8 miles north of Brownwood, Brown County. Datum of gage is 0.50 ft below mean sea level, datum of 1929.

Drainage area.--1,535 sq mi.

Gage-height record.--Once daily staff gage readings.

Maxima.--April-June 1957: Contents observed, 172,800 acre-ft 6 p.m. May 26 (gage height, 1,429.4 ft).
1933-41, 1944 to March 1957: Contents observed, 192,300 acre-ft May 2, 1956 (gage height, 1,431.4 ft).

Remarks.--There was flow over the spillway most of the period April-June. Reservoir first filled during flood of July 3, 4, 1932. Dam completed in 1933 and operation began July 1933. Total capacity, 137,300 acre-ft (gage height, 1,425.1 ft, crest of emergency spillway). Reservoir is formed by earth-fill dam, 1,580 ft long. Uncontrolled emergency spillway consisting of broad-crested weir 479 ft long located 800 ft to left of dam. Reservoir can be drained by two 12-ft (horseshoe-shaped) reinforced concrete conduits with bottom of invert at gage height 1,330 ft. Water used for irrigation, municipal and industrial supply for city of Brownwood.

Contents in acre-feet at 6 p.m. 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	89,420	144,800	143,300	11	88,890	143,300	137,300	21	89,420	144,800	135,200
2	89,420	142,500	151,800	12	88,360	151,000	144,800	22	89,420	142,500	134,500
3	89,420	141,000	151,800	13	88,360	169,900	144,000	23	97,640	155,100	133,800
4	89,420	141,000	147,900	14	88,360	160,100	141,800	24	98,780	153,500	133,100
5	89,420	140,300	145,600	15	87,830	150,200	140,300	25	98,780	153,500	132,400
6	88,890	139,600	143,300	16	87,830	144,000	138,800	26	107,000	172,800	131,000
7	88,890	138,800	141,800	17	87,830	142,500	138,100	27	149,500	156,000	130,300
8	88,890	138,100	140,300	18	87,830	164,600	137,300	28	147,900	147,900	129,600
9	88,890	139,600	139,600	19	89,420	159,300	136,600	29	147,900	144,800	129,600
10	88,890	139,600	138,100	20	89,420	149,500	135,900	30	147,100	141,800	129,600
								31		141,000	
Change in contents during month.									+57,680	-6,100	-11,400

(72) Pecan Bayou at Brownwood, Tex.

Location.--Lat 31°44'10", long 98°58'30", on left bank at downstream side of pier of abandoned Gulf, Colorado & Santa Fe Railway bridge, 1 mile north of Brownwood, Brown County, 6 miles downstream from Salt Creek, and 10 miles downstream from Brownwood Reservoir. Datum of gage is 1,318.58 ft above mean sea level, datum of 1929.

Drainage area.--1,614 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--April-June 1957: Discharge, 17,400 cfs 11 p.m. April 26 (gage height, 14.78 ft).
1917-18, 1923 to March 1957: Discharge, 31,600 cfs Oct. 14, 1930 (gage height, 16.92 ft), from rating curve extended above 26,000 cfs.
Maximum stage known, 21.7 ft in September 1900, from information by Gulf, Colorado & Santa Fe Railway Co. Flood of July 3, 1932 probably the greatest known, reached a discharge of about 235,000 cfs as it entered Brownwood Reservoir (computed from rate of change of contents in reservoir; data furnished by engineers of Brown County Water Improvement District No. 1).

Remarks.--Flow largely regulated by Brownwood Reservoir. Diversion at Brownwood Reservoir to Brown County Water Improvement District No. 1 canal for irrigation and municipal supply. There was uncontrolled flow over spillway at Brownwood Reservoir from April 27 to June 18.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	0.5	2,440	1,260	11	.3	1,680	349	21	6.3	2,610	296
2	.4	1,520	3,840	12	.3	3,510	986	22	3.2	1,520	302
3	.6	1,050	5,510	13	.3	11,400	1,990	23	393	2,700	289
4	.6	1,690	3,430	14	.3	12,500	1,270	24	24	8,640	289
5	.6	970	2,470	15	.3	5,410	834	25	10	5,130	289
6	.5	726	1,710	16	.3	2,630	579	26	4,730	11,600	289
7	.4	520	1,140	17	.3	1,580	408	27	4,110	10,300	296
8	.5	356	816	18	.3	8,610	334	28	3,240	4,140	271
9	.4	356	587	19	348	11,000	302	29	3,220	2,220	26
10	.4	639	439	20	17	5,190	296	30	2,810	1,350	3.8
								31		1,010	
Monthly mean discharge, in cubic feet per second.									631	4,032	1,030
Runoff, in acre-feet.									37,520	247,900	61,290

(73) Brady Creek at Brady, Tex.

Location.--Lat 31°08'15", long 99°19'55", on left bank just upstream from bridge on U. S. Highway 377 on North Bridge Street in Brady, McCullough County, and 0.4 mile downstream from Live Oak Creek. Datum of gage is 1,646.50 ft above mean sea level, datum of 1929.

Drainage area.--575 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used throughout.

Maxima.--April-June 1957: Discharge, 8,940 cfs 6:30 p.m. May 12 (gage height, 13.97 ft).
1939 to March 1957: Discharge, 39,100 cfs Sept. 10, 1952 (gage height, 24.80 ft).
Maximum stage known, 29.1 ft July 23, 1938, present site and datum (discharge at site 5 miles downstream, 86,000 cfs by slope-area determination of peak flow).

Remarks.--City of Brady has permit to divert 730 acre-ft per year for municipal use. As of October 1956, the flow from 69.6 sq mi above this station was partly controlled by 13 floodwater detention reservoirs with a total combined capacity of 22,550 acre-ft below the flood spillway crests, of which 21,200 acre-ft is floodwater detention capacity and 1,350 acre-ft is sediment storage capacity.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	0.2	426	143	11	.2	2,210	17	21	115	130	5.0
2	.2	189	384	12	.2	4,360	13	22	38	271	4.9
3	.2	285	226	13	.2	4,650	11	23	2,740	1,010	4.5
4	.2	276	92	14	.2	962	10	24	413	135	5.0
5	.2	139	199	15	.2	434	8.8	25	86	448	7.0
6	.1	102	138	16	.2	339	7.4	26	1,170	637	6.0
7	.1	87	62	17	.2	220	6.4	27	4,550	2,270	5.0
8	.1	76	33	18	.2	1,500	7.4	28	471	447	4.8
9	.1	2,090	24	19	775	847	7.4	29	1,940	158	4.3
10	.1	1,400	18	20	1,660	215	5.5	30	493	90	3.1
								31		48	
Monthly mean discharge, in cubic feet per second.									482	853	48.8
Runoff, in acre-feet.									28,670	52,460	2,900

(74) San Saba River at San Saba, Tex.

Location.--Lat 31°12'50", long 98°42'40", on right bank at downstream side of pier of bridge on State Highway 16, 1.2 miles north of San Saba, San Saba County, 4.8 miles downstream from China Creek, 5.0 miles upstream from Simpson Creek, and 15.5 miles upstream from mouth. Datum of gage is 1,162.16 ft above mean sea level, datum of 1929, Fort Worth Supplementary Adjustment of 1942.

Drainage area.--3,042 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 5, 6, 8-10, 19.

Maxima.--April-June 1957: Discharge, 27,500 cfs 8:30 p.m. May 13 (gage height, 28.23 ft).
1904-6, 1915 to March 1957: Discharge, 203,000 cfs July 23, 1938 (gage height, 45.18 ft, from floodmarks, site and datum then in use), from rating curve extended above 41,000 cfs on basis of slope-area determination of peak flow.
Maximum stage known since at least 1899, that of July 23, 1938. Flood of June 6, 1899 reached a stage of 42.6 ft at former site and datum, from information by local resident.

Remarks.--Since 1954 flow affected slightly by several flood-detention reservoirs on Brady Creek.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	540	1,260	904	11	39	2,220	211	21	5,560	1,060	137
2	204	775	1,500	12	32	8,260	194	22	947	595	127
3	102	445	1,110	13	27	20,300	182	23	3,620	2,290	121
4	70	544	846	14	26	15,100	182	24	8,980	2,190	119
5	56	535	662	15	24	3,340	166	25	2,120	730	117
6	43	329	618	16	23	1,400	154	26	1,180	2,750	107
7	60	241	491	17	19	870	143	27	14,100	1,910	98
8	67	196	376	18	18	970	141	28	6,750	6,460	93
9	51	412	296	19	81	5,140	199	29	2,060	2,290	90
10	41	6,140	244	20	4,210	3,700	159	30	2,420	862	91
								31		640	
Monthly mean discharge, in cubic feet per second.									1,782	3,031	329
Runoff, in acre-feet.									106,100	186,400	19,590

(75) Colorado River near San Saba, Tex.

Location.--Lat 31°13'05", long 98°33'50", on left bank at downstream side of pier of bridge on U. S. Highway 190, 5.2 miles downstream from San Saba River, 9.2 miles east of San Saba, San Saba County, and at mile 474. Datum of gage is 1,096.22 ft above mean sea level, datum of 1929.

Drainage area.--30,600 sq mi, approximately, of which 11,900 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 2-19, June 20, 22, 24-30.

Maxima.--April-June 1957: Discharge, 66,200 cfs 9 a.m. May 14 (gage height, 37.34 ft).
1915-22, 1923 to March 1957: Discharge, 224,000 cfs July 23, 1938 (gage height, 63.2 ft, present site, based on floodmarks at site then in use).
Maximum stage known during period 1878 to July 22, 1938, 58.4 ft Sept. 25, 1900, present site, from floodmarks at former site (discharge, 184,000 cfs).

Remarks.--Diversions above station for irrigation and municipal use. Some regulation by five reservoirs in the Colorado and Concho Rivers and Oak Creek basins above Winchell, and by two reservoirs in the Pecan Bayou basin; combined capacity, 838,300 acre-ft.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	1,190	28,000	5,000	11	124	18,300	2,290	21	11,100	34,300	1,700
2	562	15,800	10,900	12	104	31,300	2,010	22	4,080	31,100	1,420
3	282	8,780	17,900	13	88	54,600	3,020	23	10,800	9,230	1,530
4	184	4,560	25,000	14	77	64,600	7,810	24	19,500	12,400	1,250
5	442	5,900	30,000	15	383	58,900	4,760	25	14,100	20,900	1,120
6	640	3,680	25,400	16	328	59,500	2,670	26	4,770	22,500	989
7	358	2,160	8,820	17	218	55,600	2,200	27	22,700	17,100	916
8	261	1,310	4,690	18	164	24,900	1,850	28	36,600	24,200	868
9	210	2,150	3,620	19	2,470	23,300	1,680	29	34,400	30,600	828
10	154	8,180	2,820	20	5,630	32,100	1,470	30	35,300	19,900	716
								31		6,270	
Monthly mean discharge, in cubic feet per second.									6,907	23,620	5,842
Runoff, in acre-feet.									411,000	1,452,000	347,600

(76) Buchanan Reservoir near Burnet, Tex.

Location.--Lat 30°45'05", long 98°25'00", in powerhouse at Buchanan Dam on Colorado River, 1 mile upstream from bridge on State Highway 29, 10 miles west of Burnet, Burnet County, and at mile 413. Datum of gage is 0.48 ft above mean sea level, datum of 1929 (levels by Lower Colorado River Authority).

Drainage area.--31,250 sq mi, approximately of which 11,900 sq mi is probably noncontributing.

Gage-height record.--Indicating gage.

Maxima.--April-June 1957: Contents observed, 1,001,000 acre-ft 12 p.m. June 6 (gage height, 1,020.45 ft).
1937 to March 1957: Contents observed, 1,006,000 acre-ft May 15, 1954 and May 21, 1955 (gage height, 1,020.6 ft).

Remarks.--Reservoir is formed by two reinforced concrete multiple-arch sections, 3 banks of taintor gates, and a 1,088-ft reinforced concrete spillway section. Dam completed and storage began May 20, 1937. Total capacity, 992,000 acre-ft (gage height, 1,020.0 ft, top of spillway section). Usable capacity for power development, 955,000 acre-ft between gage height 937.0 ft (sill of powerhouse penstock) and gage height, 1,020.0 ft (top of spillway section). Figures given herein represent total contents. Water used for power development and irrigation of rice in several districts below Columbus.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	779,000	985,100	998,900	11	785,000	994,300	989,700	21	822,300	996,600	982,800
2	781,000	996,600	996,600	12	785,000	998,900	987,400	22	830,700	998,900	982,800
3	783,000	1,001,000	996,600	13	785,000	1,001,000	987,400	23	855,900	985,100	982,800
4	783,000	998,900	996,600	14	785,000	1,001,000	992,000	24	891,000	982,800	982,800
5	783,000	1,001,000	1,001,000	15	785,000	994,300	989,700	25	926,200	996,600	980,500
6	783,000	998,900	998,900	16	787,000	989,700	987,400	26	950,600	992,000	978,200
7	785,000	996,600	992,000	17	787,000	987,400	987,400	27	973,600	980,500	975,900
8	785,000	992,000	994,300	18	787,000	969,000	987,400	28	978,200	987,400	973,600
9	785,000	989,700	994,300	19	801,300	982,800	987,400	29	923,600	1,001,000	969,000
10	785,000	978,200	992,000	20	822,300	996,600	985,100	30	975,900	996,600	969,000
								31		996,600	
Change in contents during month.									+198,900	+20,700	-27,600

(77) Llano River at Llano, Tex.

Location.--Lat 30°45', long 98°40', on right bank, in Llano, Llano County, 0.4 miles downstream from bridge on State Highway 16, and 7 miles upstream from Little Llano River. Datum of gage is 970.01 ft above mean sea level, datum of 1929.

Drainage area.--4,233 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting control method used Apr. 1 to May 28, June 1-3.

Maxima.--April-June 1957: Discharge, 47,200 cfs 9 p.m. May 27 (gage height, 16.39 ft).
1939 to March 1957: Discharge, 232,000 cfs Sept. 10,1952 (gage height, 32.6 ft), from rating curve extended above 129,000 cfs on basis of slope-area determination of peak flow.
Maximum stage known since at least 1899, 41.5 ft June 14, 1935 (discharge, 380,000 cfs), from information by local resident.

Remarks.--No large diversions above station.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	116	1,900	5,150	11	38	485	612	21	70	1,330	401
2	96	1,020	11,600	12	33	2,580	596	22	2,700	794	330
3	107	744	5,760	13	30	13,200	892	23	13,300	571	324
4	113	953	3,090	14	30	7,980	520	24	10,900	447	283
5	91	733	2,290	15	30	3,170	407	25	16,000	376	212
6	78	446	2,110	16	30	1,360	362	26	3,790	5,440	234
7	64	365	1,170	17	29	2,200	330	27	5,150	17,900	229
8	52	323	868	18	28	5,140	330	28	1,840	18,700	221
9	47	320	720	19	431	2,720	362	29	6,410	4,380	208
10	41	368	666	20	164	3,460	378	30	5,200	2,080	196
								31		2,370	
Monthly mean discharge, in cubic feet per second.									2,234	3,350	1,362
Runoff, in acre-feet.									132,900	206,000	81,030

(78) Pedernales River near Johnson City, Tex.

Location.--Lat 30°18', long 98°24', near center of span at downstream side of bridge on U. S. Highway 281, 0.2 mile downstream from Flat Creek, 1.2 miles northeast of Johnson City, Blanco County, and 2.0 miles downstream from Buffalo Creek. Datum of gage is 1,096.70 ft above mean sea level, datum of 1929, supplementary adjustment of 1942.

Drainage area.--947 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 42,000 cfs and extended above on basis of slope-area determinations at gage heights 27.6 and 42.5 ft.

Maxima.--April-June 1957: Discharge, 90,000 cfs 3:30 p.m. Apr. 24 (gage height, 24.10 ft).
1939 to March 1957: Discharge, 441,000 cfs Sept. 11, 1952 (gage height, 42.5 ft from floodmark), from slope-area determination of peak flow.
Maximum stage known since at least July 1869, that of Sept. 11, 1952; flood of July 1869 reached a stage of about 33 ft, from information by local residents.

Remarks.--Some diversions above station for irrigation.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	77	353	2,320	11	7.7	143	117	21	82	117	131
2	47	204	1,920	12	6.7	117	5,460	22	1,100	94	114
3	30	117	820	13	6.2	1,270	1,220	23	812	83	104
4	25	160	645	14	5.8	387	334	24	26,100	83	107
5	18	183	429	15	6.2	1,170	230	25	4,390	77	97
6	16	128	406	16	8.2	139	168	26	627	2,230	86
7	13	107	220	17	9.1	97	143	27	3,570	4,340	80
8	9.1	100	172	18	9.1	521	135	28	2,070	2,100	75
9	8.2	133	152	19	24	473	329	29	1,350	464	69
10	8.2	577	131	20	185	168	177	30	419	286	65
								31		1,360	
Monthly mean discharge, in cubic feet per second.									1,368	594	549
Runoff, in acre-feet.									81,400	35,270	32,640

(79) Lake Travis near Austin, Tex.

Location.--Lat 30°23'20", long 97°54'35", in powerhouse at Mansfield Dam on Colorado River, 7.3 miles downstream from Sandy Creek, 12 miles northwest of Austin, Travis County, and at mile 318. Datum of gage is 0.12 ft above mean sea level, datum of 1929 (levels by Bureau of Reclamation).

Drainage area.--38,130 sq mi, approximately, of which 11,900 sq mi is probably noncontributing.

Gage-height record.--Indicating gage.

Maxima.--April-June 1957: Contents, 1,770,000 acre-ft 11 p.m. May 18 (gage height, 707.38 ft).
1940 to March 1957: Contents observed, 1,377,000 acre-ft Oct. 23, 1942 (gage height, 691.2 ft).

Remarks.--Reservoir is formed by concrete gravity-type dam. Storage began Sept. 9, 1940; dam completed early in 1942. Total capacity, 1,950,000 acre-ft (gage height, 714.0 ft), top of spillway. Capacity between gage heights 681.0 and 714.0 ft is 778,000 acre-ft and is reserved for flood control. Usable capacity, 1,144,000 acre-ft between gage height 535.8 ft (bottom of 24 x 8-1/2 ft diameter Paradox gates) and 681.0 ft (maximum power pool). Bottom of penstocks, gage height 552.0 ft. Figures given herein represent total contents. Water used for power development and for irrigation of rice in several districts below Columbus.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	964,500	1,570,000	1,661,000	11	966,000	1,358,000	1,498,000	21	970,700	1,705,000	1,365,000
2	964,500	1,542,000	1,703,000	12	966,000	1,367,000	1,496,000	22	983,300	1,698,000	1,360,000
3	964,500	1,498,000	1,726,000	13	964,500	1,457,000	1,506,000	23	1,013,000	1,674,000	1,354,000
4	964,500	1,454,000	1,734,000	14	966,000	1,542,000	1,484,000	24	1,258,000	1,625,000	1,348,000
5	964,500	1,410,000	1,755,000	15	966,000	1,612,000	1,428,000	25	1,304,000	1,578,000	1,344,000
6	964,500	1,377,000	1,755,000	16	967,600	1,672,000	1,384,000	26	1,320,000	1,615,000	1,340,000
7	964,500	1,371,000	1,724,000	17	966,000	1,724,000	1,382,000	27	1,360,000	1,672,000	1,334,000
8	963,000	1,367,000	1,669,000	18	966,000	1,768,000	1,375,000	28	1,432,000	1,731,000	1,330,000
9	963,000	1,365,000	1,610,000	19	969,200	1,726,000	1,369,000	29	1,510,000	1,718.000	1,328,000
10	964,500	1,360,000	1,556,000	20	969,200	1,705,000	1,369,000	30	1,566,000	1,713,000	1,320,000
								31		1,677,000	
Change in contents during month.									+601,500	+111,000	-357,000

(80) Colorado River at Austin, Tex.

Location.--Lat 30°14'40", long 97°41'20", on right bank just upstream from Montopolis Bridge on U. S. Highway 183 at southeast edge of Austin, Travis County, 2.8 miles upstream from Walnut Creek, 3.8 miles downstream from Waller Creek, 5 miles downstream from Barton Creek, and at mile 290. Datum of gage is 407.28 ft above mean sea level, datum of 1929.

Drainage area.--38,400 sq mi, approximately, of which 11,900 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 38,000 cfs. Shifting-control method used May 19 to June 30.

Maxima.--April-June 1957: Discharge, 40,900 cfs 11:30 a.m. June 4 (gage height, 17.60 ft).
1898 to March 1957: Discharge, 481,000 cfs June 15, 1935 (gage height, 45.0 ft, present site and datum, from floodmark).
Maximum stage since at least 1843, 46.0 ft July 7, 1869, present site and datum (adjusted to present site on basis of record for flood of June 15, 1935), determined from information concerning stage at former site furnished by Dean T. U. Taylor.

Remarks.--Flow largely regulated by Buchanan Reservoir and Lake Travis, and other smaller reservoirs, having a combined capacity of 3,979,000 acre-ft.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	210	29,200	32,300	11	242	15,900	36,000	21	242	37,100	5,900
2	225	32,300	7,420	12	260	19,500	33,500	22	705	37,000	5,870
3	246	31,700	17,100	13	253	17,300	10,000	23	690	37,300	5,660
4	225	33,000	33,100	14	225	23,400	14,000	24	4,790	37,600	5,730
5	216	31,900	21,300	15	256	31,900	31,800	25	11,900	37,200	5,770
6	210	25,800	34,300	16	280	30,700	28,900	26	6,320	30,300	5,760
7	195	9,020	37,500	17	280	32,400	8,700	27	11,200	15,000	5,790
8	210	4,880	37,200	18	253	37,200	8,190	28	7,100	12,900	5,930
9	225	4,940	36,600	19	380	37,000	7,910	29	6,740	30,200	5,900
10	225	7,350	36,200	20	280	36,900	5,920	30	10,400	37,600	5,820
								31		38,100	
Monthly mean discharge, in cubic feet per second.									2,166	27,180	17,870
Runoff, in acre-feet.									128,900	1,671,000	1,063,000

(81) Colorado River at Smithville, Tex.

Location.--Lat 30°01', long 97°10', on right bank, 360 ft downstream from bridge on State Highway 71 in Smithville, Bastrop County, 850 ft downstream from Gazley Creek, 4 miles downstream from Alum Creek, and at mile 212. Datum of gage is 270.14 ft above mean sea level, datum of 1929.

Drainage area.--39,880 sq mi, approximately, of which 11,900 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 58,000 cfs and extended above. Shifting-control method used June 16-30.

Maxima.--April-June 1957: Discharge, 66,900 cfs 3 a.m. Apr. 28 (gage height, 24.20 ft).
1930 to March 1957: Discharge, 305,000 cfs June 16, 1935 (gage height, 42.5 ft, from floodmarks), from rating curve extended above 50,000 cfs on basis of slope-area determination of peak flow.
Maximum stage known since at least 1870, about 47.4 ft Dec. 4, 1913; flood of July 8, 1869, was several feet higher, from information by local residents.

Remarks.--Flow largely regulated by Buchanan Reservoir and Lake Travis, and other smaller reservoirs, having a combined capacity of 3,979,000 acre-ft.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	535	10,600	40,800	11	232	8,090	36,200	21	989	38,400	6,730
2	545	26,700	44,000	12	241	16,400	36,100	22	1,810	38,300	6,640
3	424	31,400	15,000	13	244	21,400	49,600	23	5,430	38,000	6,650
4	370	31,200	27,500	14	244	21,000	16,700	24	3,620	38,000	6,590
5	342	32,400	38,000	15	262	25,000	16,100	25	13,400	38,000	6,430
6	295	32,200	24,700	16	312	33,100	31,200	26	21,900	40,600	6,450
7	271	26,500	35,400	17	278	32,600	27,200	27	32,700	41,200	6,370
8	259	12,500	39,100	18	271	34,300	10,400	28	47,800	22,800	6,320
9	247	7,290	36,800	19	342	39,500	9,100	29	28,300	16,000	6,300
10	235	6,970	36,800	20	362	39,100	9,000	30	15,200	30,200	6,220
								31		37,600	
Monthly mean discharge, in cubic feet per second.									5,915	27,979	21,480
Runoff, in acre-feet.									352,000	1,720,000	1,278,000

(82) Guadalupe River near Spring Branch, Tex.

Location.--Lat 29°51'40", long 98°23'00", on right bank at downstream side of pier of county highway bridge, 4 miles southeast of Spring Branch, Comal County, 6 miles downstream from Curry Creek, and at mile 334. Datum of gage is 948.13 ft above mean sea level, datum of 1929.

Drainage area.--1,282 sq mi.

Gage-height record.--Water-stage recorder graph except 5 p.m. Apr. 3 to 10 a.m. Apr. 16, 3 to 7 a.m., 6:30 to 9:30 p.m. Apr. 22, 4:45 to 6:15 p.m. Apr. 24, 8 p.m. Apr. 24 to 12:30 a.m. Apr. 25.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 2-27 for stages below about 4.5 ft. Discharge Apr. 2-15 estimated on basis of recorded range in stage and weather records. Discharge Apr. 22, 24 based on reconstructed gage-height graph.

Maxima.--April-June 1957: Discharge, 25,600 cfs 7 p.m. Apr. 24 (gage height, 24.55 ft).
1922 to March 1957: Discharge, 121,000 cfs July 3, 1932 (gage height, 42.10 ft) from rating curve extended above 70,000 cfs by logarithmic plotting.
Maximum stage known since at least 1859, about 53 ft in 1869; flood of July 1900 reached a stage of about 49 ft, from information by local resident.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	415	917	2,830	11	40	610	435	21	230	335	261
2	132	575	3,310	12	35	363	407	22	5,720	295	247
3	74	466	1,530	13	35	754	534	23	925	261	226
4	70	411	1,080	14	30	1,280	431	24	6,180	236	212
5	65	395	912	15	30	2,060	375	25	15,900	216	202
6	60	258	900	16	33	507	339	26	1,950	222	194
7	55	149	685	17	34	315	311	27	5,040	1,390	184
8	50	117	600	18	34	444	295	28	2,110	2,910	174
9	50	117	530	19	847	812	275	29	2,310	1,200	161
10	45	2,120	476	20	678	427	268	30	1,170	786	146
								31		2,020	
Monthly mean discharge, in cubic feet per second.									1,478	741	618
Runoff, in acre-feet.									87,960	45,560	36,750

(83) Blanco River at Wimberley, Tex.

Location.--Lat 29°59', long 98°04', on left bank, 800 ft downstream from Cypress Creek, 1,200 ft upstream from bridge on State Highway 12, and a quarter of a mile south of Wimberley, Hays County. Datum of gage is 802.23 ft above mean sea level, datum of 1929.

Drainage area.--364 sq mi.

Gage-height record.--Water-stage recorder graph except 7 p.m. May 19 to June 30 when intake action was faulty.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 30,000 cfs and extended above on basis of slope-area determinations at 30.1 and 31.1 ft. Discharge for period May 20 to June 30 estimated on basis of record for Blanco River near Kyle.

Maxima.--April-June 1957: Discharge, 62,600 cfs 8 p.m. April 24 (gage height, 24.73 ft).
1924-26, 1928 to March 1957: Discharge, 113,000 cfs May 28, 1929 (gage height, 31.10 ft, from floodmark), from slope-area determination of peak flow.
Maximum stage known since at least 1869, that of May 28, 1929, from information by local residents.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	206	441	1,210	11	21	162	270	21	142	200	170
2	67	344	1,230	12	21	133	290	22	3,310	170	160
3	44	274	840	13	20	355	540	23	408	160	160
4	34	250	730	14	18	356	310	24	10,300	160	150
5	28	228	690	15	18	182	270	25	2,610	150	140
6	26	192	730	16	23	199	230	26	1,200	180	130
7	25	175	570	17	21	175	220	27	4,810	670	120
8	25	165	360	18	18	498	210	28	2,000	870	120
9	21	155	310	19	248	684	190	29	1,930	400	120
10	21	293	290	20	364	270	180	30	606	340	110
								31		1,540	
Monthly mean discharge, in cubic feet per second.									953	335	368
Runoff, in acre-feet.									56,700	20.570	21,920

(84) Guadalupe River at Victoria, Tex.

Location.--Lat 28°47', long 97°01', on left bank just upstream from pier of bridge on U. S. Highway 59 in Victoria, Victoria County, 1,300 ft upstream from Texas & New Orleans Railroad bridge, 10 miles upstream from Coleto Creek, and at mile 51.

Drainage area.--5,161 sq mi.

Gage-height record.--Water-stage recorder graph except 1:20 a.m. May 5 to 5 p.m. May 9, 9 a.m. to 2 p.m. May 15 when graph reconstructed on basis of once-daily wire-weight gage readings and recorded range in stage was used.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 4-21.

Maxima.--April-June 1957: Discharge, 35,300 cfs 10 p.m. May 2 (gage height, 29.92 ft).
1934 to March 1957: Discharge, 179,000 cfs July 3, 1936 (gage height, 31.22 ft).
Maximum stage known, that of July 3, 1936.

Remarks.--Some regulation by power plants above station.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	2,860	22,800	15,300	11	320	2,380	3,540	21	3,620	2,080	1,630
2	3,620	30,800	20,200	12	407	1,810	2,900	22	7,080	2,010	1,600
3	3,910	30,400	17,000	13	334	1,770	2,520	23	8,840	2,150	1,580
4	2,290	22,000	10,800	14	349	4,210	2,340	24	7,060	1,850	1,330
5	1,110	10,600	10,600	15	372	4,650	2,240	25	6,980	1,630	1,450
6	797	3,960	12,300	16	349	5,380	2,240	26	7,900	1,530	1,390
7	580	3,040	12,900	17	956	4,650	2,240	27	9,010	1,570	1,380
8	539	2,630	11,400	18	2,830	4,520	2,030	28	13,500	3,070	1,190
9	516	2,500	6,670	19	2,380	5,760	1,830	29	16,200	7,750	1,110
10	364	3,480	4,610	20	1,440	2,780	1,920	30	17,900	9,910	1,130
								31		11,700	
Monthly mean discharge, in cubic feet per second.									4,147	6,947	5,312
Runoff, in acre-feet.									246,800	427,200	316,100

(85) Medina River near Pipe Creek, Tex.

Location.--Lat 29°40', long 98°59', on left bank, 600 ft upstream from Bandera Falls, 0.8 mile upstream from Red Bluff Creek, and 4 miles southwest of town of Pipe Creek, Bandera County. Datum of gage is 1,067.37 ft above mean sea level, unadjusted.

Drainage area.--457 sq mi.

Gage-height record.--Water-stage recorder graph except 6 a.m. Apr. 1 to 6:30 p.m. Apr. 2, 1:30 to 3:30 p.m. Apr. 24, 5 p.m. Apr. 25 to 12:30 a.m. Apr. 26, 9:30 a.m. to 12 p.m. Apr. 26, 3 p.m. Apr. 27 to 2:30 p.m. Apr. 28, 12 p.m. Apr. 28 to 11 a.m. May 13, 2 p.m. May 13 to 11 p.m. May 14, 2 a.m. May 15 to 11:20 a.m. May 16, 12 M May 24 to 1:15 p.m. June 19, 12 p.m. June 20 to 12 p.m. June 30. Discharge for these periods estimated on basis of reconstructed gage-height chart, floodmark, or weather records and records for Red Bluff Creek near Pipe Creek.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 120 cfs and extended above on basis of slope-area determination at gage height 15.6 ft.

Maxima.--April-June 1957: Discharge, 26,000 cfs at 3 p.m. Apr. 24 (gage height, 23.0 ft, from floodmark).
1922-34, 1953 to March 1957: Discharge, 64,000 cfs July 1, 1932 (gage height, 33.8 ft, from floodmarks, datum then in use), by slope-area determination of peak flow.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	53	81	5,510	11	16	39	106	21	38	88	124
2	26	77	793	12	17	38	129	22	1,760	79	116
3	169	69	273	13	15	413	127	23	149	73	114
4	30	63	67	14	15	238	127	24	7,710	63	106
5	22	57	294	15	16	352	127	25	1,220	63	102
6	19	53	369	16	19	92	124	26	1,500	1,630	99
7	17	48	154	17	19	81	124	27	2,860	2,730	94
8	17	44	145	18	17	433	122	28	1,450	2,440	92
9	16	43	137	19	1,030	137	122	29	445	237	88
10	15	41	132	20	76	94	137	30	119	99	84
								31		360	
Monthly mean discharge, in cubic feet per second.									629	334	338
Runoff, in acre-feet.									37,440	20,540	20,110

(86) Medina Lake near San Antonio, Tex.

Location.--Lat 29°32', long 98°56', at gate operating platform, 576 ft from left end of Medina Dam on Medina River, 4 miles upstream from Medina Diversion Dam, 13 miles north of Castroville, and about 28 miles west of San Antonio, Bexar County. Datum of gage is 7.5 ft below mean sea level (levels by Corps of Engineers).

Drainage area.--587 sq mi.

Gage-height record.--Wire-weight gage read intermittently.

Maxima.--April-June 1957: Contents observed, 105,100 acre-feet June 26 (gage height, 1,036.7 ft).
1913 to March 1957: Contents observed, 288,800 acre-ft Sept. 16, 1919 (gage height, 1,078.0 ft).

Remarks.--Reservoir is formed by gravity-type concrete dam. Dam completed and storage begun May 7, 1913. Spillway section is located near right end of dam and is of natural rock, 880 ft long, with a 3-ft wide cutoff wall. Total capacity, 254,000 acre-ft (gage height, 1,072.0 ft, top of spillway section). Water used for irrigation; no power developed.

Contents, in acre-feet, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1		50,540	87,010	11		52,360	102,800	21	17,050	57,840	
2	13,880		94,740	12				22			104,200
3	13,940		95,890	13	14,290	52,360	103,300	23	20,440	58,200	
4		51,260	98,180	14				24	25,290		
5				15			103,600	25	34,680	58,200	
6	14,290		99,620	16		56,010		26	39,080	59,660	105,100
7				17				27	44,050	60,940	
8		51,810	101,300	18		56,380		28		78,180	
9			102,200	19	15,810	57,470	103,900	29	49,080	79,810	104,800
10				20	16,640			30	49,800		104,800
								31		79,340	
Change in contents during month.									+36,480	+29,540	+25,460

(87) Medina River near San Antonio, Tex.

Location.--Lat 29°15', long 98°28', near left bank on downstream side of pier of bridge on U. S. Highway 281, 5.2 miles upstream from mouth, and 9 miles south of San Antonio, Bexar County. Datum of gage is 439.0 ft above mean sea level (levels by Corps of Engineers).

Drainage area.--1,225 sq mi (587 sq mi is above dam forming Medina Lake).

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,200 cfs and extended above on basis of logarithmic plotting.

Maxima.--April-June 1957: Discharge, 4,020 cfs at 12 M. April 29 (gage-height, 22.83 ft).
1939 to March 1957: Discharge, 31,800 cfs August 29, 1946; maximum gage-height, 41.57 ft September 27, 1946 (backwater from San Antonio River).
Maximum stage known, about 55 ft sometime prior to construction of Medina Dam in 1913, from information by State Highway Department.

Remarks.--Flow slightly regulated by Medina Lake, 60 miles upstream, and diversion dam reservoir (capacity, 4,500 acre-ft).

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	60	457	1,150	11	10	103	120	21	643	222	59
2	22	260	2,240	12	11	59	105	22	181	86	57
3	17	141	1,110	13	10	100	97	23	48	63	51
4	17	106	495	14	10	122	90	24	113	48	48
5	13	86	103	15	10	77	88	25	1,040	41	46
6	12	74	326	16	14	54	80	26	816	34	43
7	12	68	247	17	14	65	74	27	2,770	358	41
8	10	67	234	18	12	217	71	28	2,050	1,820	39
9	10	60	154	19	753	1,220	73	29	2,960	1,160	37
10	10	63	142	20	1,540	524	66	30	1,090	442	33
								31		462	
Monthly mean discharge, in cubic feet per second.									476	279	251
Runoff, in acre-feet.									28,320	17,180	14,910

(88) San Antonio River at Goliad, Tex.

Location.--Lat 38°39', long 97°22', on right bank at upstream side of pier of bridge on U. S. Highway 183, 1.3 miles southeast of courthouse in Goliad, Goliad County, and 10 miles upstream from Manahuilla Creek. Datum of gage is 91.08 ft above mean sea level, datum of 1929, Houston supplementary adjustment of 1943.

Drainage area.--3,918 sq mi.

Gage-height record.--Water-stage recorder graph except 12 p.m. May 7 to 6 p.m. May 10, 4 p.m. May 13 to 8 a.m. May 14, 7 p.m. May 24 to 2:30 p.m. May 27, 1 a.m. to 2:20 p.m. June 13 for which recession graphs were drawn on basis of U. S. Weather Bureau readings of wire-weight gage.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 8-30.

Maxima.--April-June 1957: Discharge, 10,300 cfs 6 a.m. May 2 (gage height, 31.56 ft).
1924-29, 1939 to March 1957: Discharge, 33,800 cfs July 9, 1942 (gage height, 44.9 ft).
Floods of October 1913 and June 15, 1935, reached about same stage as that of July 9, 1942.

Remarks.--Flow slightly regulated by Medina Lake and Olmos flood-control reservoir (combined capacity, 269,500 acre-ft). Storage began in Medina Reservoir in 1913, and Olmos Dam was completed in 1926. Flow also slightly regulated by Soil Conservation Service floodwater detention reservoirs on Calaveras Creek and Escondido Creek.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	2,700	9,990	7,800	11	150	1,180	1,030	21	1,960	1,530	435
2	2,330	10,200	7,750	12	151	1,850	806	22	5,080	1,410	395
3	1,390	9,380	7,220	13	150	1,080	689	23	6,990	1,600	387
4	698	7,890	6,920	14	138	944	614	24	7,420	1,050	348
5	446	5,350	7,500	15	146	1,870	546	25	5,720	589	323
6	310	1,650	7,800	16	1,430	1,270	494	26	3,720	468	336
7	244	883	6,820	17	2,430	793	464	27	4,920	649	283
8	213	748	4,710	18	288	1,430	435	28	7,290	2,730	246
9	184	671	2,330	19	294	3,090	476	29	8,640	4,450	222
10	159	707	1,510	20	440	2,370	524	30	9,420	5,400	213
								31		6,800	
Monthly mean discharge, in cubic feet per second									2,515	2,904	2,321
Runoff, in acre-feet									149,700	178,600	138,100

(89) Nueces River near Asherton, Tex.

Location.--Lat 28°30', long 99°42', on right bank just downstream from bridge on Farm-to-Market Road 190 between Asherton and Brundage, 1.2 miles downstream from El Moro Creek, 5.5 miles northeast of Asherton, Dimmit County, and at mile 288. Datum of gage is 470.92 ft above mean sea level, datum of 1929.

Drainage area.--4,082 sq mi.

Gage-height record.--Water-stage recorder graph except for period 6 a.m. May 11 to 8:50 a.m. May 17, for which discharge was estimated on basis of normal recession.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 19 to June 30.

Maxima.--April-June 1957: Discharge, 7,750 cfs 5 a.m. June 2, (gage height, 27.82 ft).
1939 to March 1957: Discharge, 24,000 cfs Sept. 2, 1944 (gage height, 30.40 ft).
Maximum stage known, about 33 ft June 17, 1935 present site and datum (based on relation determined from levels to floodmarks of the June 17,1935, and Sept. 2, 1944, floods at farmhouse on left bank 0.8 mile upstream from gage).

Remarks.--Part of flow of Nueces River and its headwater tributaries enters Edwards limestone in Balcones fault zone which crosses basin just north of Uvalde; at low stages most of headwater flow enters this formation.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	0	5,660	7,100	11	0	34	151	21	1,720	1,180	5.1
2	0	5,600	7,460	12	0	25	106	22	3,410	2,470	5.1
3	0	4,810	6,520	13	0	18	78	23	3,980	2,630	4.2
4	0	2,880	6,400	14	0	12	57	24	3,700	1,610	2.8
5	0	968	6,250	15	0	8	43	25	4,020	527	1.7
6	0	298	5,280	16	0	5	28	26	4,630	198	.9
7	0	148	3,080	17	0	3.8	20	27	4,240	816	.6
8	0	95	1,040	18	0	4.2	15	28	3,130	3,860	.3
9	0	66	407	19	35	52	9.2	29	3,580	5,970	.1
10	0	47	240	20	86	1,330	5.9	30	5,150	6,280	0
								31		6,280	
Monthly mean discharge, in cubic feet per second.									1,256	1,738	1,477
Runoff, in acre-feet.									74,740	106,900	87,890

(90) Frio River near Derby, Tex.

Location.--Lat 28°44'10", long 99°08'45", near center of span at downstream side of pier of bridge on U. S. Highway 81, 150 ft upstream from International-Great Northern Railroad bridge, 750 ft downstream from Leona River, and 2.4 miles south of Derby, Frio County. Datum of gage is 449.47 ft above mean sea level, datum of 1929.

Drainage area.--3,493 sq mi.

Gage-height record.--Water-stage recorder graph, except 12 M June 18 to 12 p.m. June 27 when discharge was estimated on basis of 1 discharge measurement, reconstructed recession curve, and weather records.

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima.--April-June 1957: Discharge, 10,400 cfs 12 p.m. May 29 (gage height, 11.34 ft).
1915 to March 1957: Discharge, 230,000 cfs July 4, 1932 (gage height, 29.60 ft, present site, from floodmark at former site), from rating curve extended above 46,000 cfs on basis of slope-area determination of peak flow.
Maximum stage known since at least 1860, that of July 4, 1932.

Remarks.--Part of flow of Frio River and its headwater tributaries enter Edwards limestone in Balcones fault zone which crosses basin just north of Uvalde. At low stages most of headwaters flow enter this formation.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	47	2,360	1,880	11	0	95	78	21	2,950	2,250	13
2	145	1,260	5,190	12	0	54	56	22	4,710	633	9.4
3	33	441	6,460	13	0	22	43	23	3,140	422	6.2
4	9.4	177	6,170	14	0	169	36	24	2,960	174	3.2
5	3.2	58	2,430	15	0	489	30	25	768	62	1.4
6	.8	27	867	16	0	1,830	26	26	2,840	27	.3
7	.3	21	544	17	0	915	24	27	2,150	60	0
8	.1	17	348	18	0	142	22	28	3,700	1,010	0
9	0	7.8	184	19	5.7	1,610	18	29	3,920	7,430	0
10	0	3.2	126	20	777	5,280	16	30	4,010	7,790	0
								31		2,690	
Monthly mean discharge, in cubic feet per second.									1,072	1,211	819
Runoff, in acre-feet.									63,810	74,430	48,760

(91) Atascosa River at Whitsett, Tex.

Location.--Lat 28°37'20", long 98°17'05", on right bank 1,400 ft upstream from bridge on Farm to Market Road 99, 0.9 mile west of Whitsett, Live Oak County, and 4 miles downstream from LaParita Creek. Datum of gage is 159.04 ft above mean sea level, datum of 1929.

Drainage area.--1,171 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 22-27, May 8, 9, 25, 26, June 21-30.

Maxima.--April-June 1957: Discharge, 8,410 cfs 4 p.m. May 29 (gage height, 27.73 ft).
1924-26, 1932 to March 1957: Discharge, 39,300 cfs July 7, 1942 (gage height, 38.3 ft, from floodmark), from rating curve extended above 12,000 cfs on basis of slope-area determination at gage height 38.0 ft.
Maximum stage known, that of July 7, 1942.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	522	2,500	876	11	13	2,850	84	21	5,680	994	73
2	1,020	661	1,840	12	13	2,020	72	22	3,190	194	66
3	431	176	2,220	13	12	1,990	64	23	2,410	124	54
4	91	102	1,640	14	12	3,140	60	24	2,080	99	43
5	45	76	755	15	11	3,380	57	25	354	85	43
6	27	66	453	16	13	1,190	54	26	541	76	35
7	20	59	323	17	221	196	51	27	1,390	336	32
8	17	54	164	18	412	170	50	28	4,170	2,140	28
9	15	503	210	19	500	1,000	48	29	5,670	7,070	27
10	14	2,380	124	20	3,590	2,100	47	30	3,750	5,030	25
								31		1,540	
Monthly mean discharge, in cubic feet per second.									1,208	1,365	321
Runoff, in acre-feet.									71,870	83,900	19,080

(92) Nueces River near Three Rivers, Tex.

Location.--Lat 28°26'10", long 98°11'10", on left bank 100 ft downstream from San Antonio, Uvalde & Gulf (Missouri Pacific) Railroad bridge, half a mile downstream from Frio River, 2 miles south of Three Rivers, Live Oak County, and at mile 103. Datum of gage is 101.13 ft above mean sea level, datum of 1929, Houston Supplementary Adjustment of 1943.

Drainage area.--15,600 sq mi.

Gage-height record.--Water-stage recorder graph except 3 p.m. June 26 to 12 p.m. June 30 when graph was drawn based on once-daily staff-gage readings.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 19-30.

Maxima.--April-June 1957: Discharge, 22,200 cfs 3 a.m. May 3 (gage height, 39.20 ft).
1915 to March 1957: Discharge observed, 85,000 cfs Sept. 18, 1919 (gage height, 46.0 ft), from rating curve extended above 55,000 cfs.
Maximum stage known, that of Sept. 18, 1919.

Remarks.--Part of flow of Nueces and Frio Rivers and their headwater tributaries enters Edwards limestone in Balcones fault zone which crosses basin just north of Uvalde. At low stages, most of headwater flow enters this formation.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	258	15,100	15,600	11	31	11,800	9,200	21	5,990	4,900	607
2	1,150	20,200	18,700	12	24	9,990	7,720	22	8,540	3,880	965
3	1,290	21,500	19,700	13	19	8,740	6,870	23	8,320	2,260	1,300
4	436	17,700	17,900	14	15	11,300	6,220	24	8,120	2,820	1,080
5	106	12,900	16,000	15	14	11,200	5,510	25	8,610	3,640	816
6	68	10,200	15,000	16	15	8,620	4,670	26	8,680	3,010	701
7	60	8,730	15,100	17	25	4,050	3,680	27	8,350	2,420	389
8	76	7,310	15,200	18	398	1,460	1,690	28	10,900	5,000	308
9	51	6,230	14,300	19	294	2,610	735	29	14,000	7,780	236
10	38	10,200	11,800	20	2,330	4,340	575	30	14,000	12,100	160
								31		16,000	
Monthly mean discharge, in cubic feet per second.									3,407	8,645	7,091
Runoff, in acre-feet.									202,700	531,600	421,900

(93) Lake Corpus Christi near Mathis, Tex.

Location.--Lat 28°02'52", long 97°52'16", near left end of Mathis Dam on Nueces River, three quarters of a mile upstream from bridge on U. S. Highway 96, 4 miles southwest of Mathis, San Patricio County, and at mile 48. Datum of gage is 0.52 ft above mean sea level, datum of 1929.

Drainage area.--16,656 sq mi.

Gage-height record.--Wire-weight gage read once daily except Apr. 13, 14, when no readings obtained due to high winds.

Maxima.--April-June 1957: Contents observed, 54,960 acre-ft May 6, June 5, 6; maximum gage height, 76.68 ft May 6.
1948 to March 1957: Contents observed, 57,000 acre-ft Apr. 30, 1949 (gage height, 77.05 ft).

Remarks.--Reservoir is formed by a rolled-fill earthen-type dam containing an unregulated concrete service spillway 1,043 ft long, and five taintor gates, each 35 ft wide. Dam completed and storage began July 24, 1934. Capacity, 39,400 acre-ft at gage height 74 ft (top of taintor gates and service spillway). Dead storage is negligible. Reservoir used for municipal supply for city of Corpus Christi. Figures given herein represent total storage. Capacity curve furnished by Soil Conservation Service, U. S. Department of Agriculture. Gage height record furnished by city of Corpus Christi.

Contents, in acre-feet, at 8 a.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	39,400	49,630	50,200	11	38,890	47,920	52,240	21	39,400	43,990	40,420
2	39,400	50,200	53,600	12	38,380	48,490	51,560	22	43,480	44,500	40,930
3	39,910	50,880	54,280	13		49,060	50,200	23	45,640	44,500	40,420
4	41,440	52,240	54,280	14		50,880	48,490	24	46,780	43,480	40,420
5	40,930	52,920	54,960	15	37,870	50,200	47,920	25	47,350	42,970	40,420
6	40,420	54,960	54,960	16	37,870	50,200	47,350	26	47,350	43,480	40,420
7	39,400	52,920	54,280	17	37,870	50,200	45,640	27	47,920	45,070	40,420
8	39,400	50,880	52,920	18	37,360	49,630	44,500	28	48,490	49,060	39,910
9	39,400	49,630	52,240	19	37,870	44,500	43,480	29	50,200	48,490	39,910
10	38,890	48,490	51,560	20	37,870	42,970	40,930	30	49,630	47,350	39,400
								31		47,920	
Change in contents during month									+10,230	-1,710	-8,520

(94) Nueces River near Mathis, Tex.

Location.--Lat 28°02'17", long 97°51'36", on left bank, 6 ft downstream from pier of bridge of State Highway 359, 200 ft downstream from Texas & New Orleans Railroad bridge, 0.8 mile downstream from Mathis Dam, 4 miles southwest of Mathis, San Patricio County, and at mile 47. Datum of gage is 27.53 ft above mean sea level, datum of 1929.

Drainage area.--16,660 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Shifting-control method used Apr. 1-6, 13-17, 22, 23, Apr. 26 to May 11, June 18-30.

Maxima.--April-June 1957: Discharge, 17,000 cfs 8 p.m. June 2 (gage height, 28.86 ft); maximum gage height, 29.05 ft 12 p.m. May 5.
1939 to March 1957: Discharge, 49,400 cfs July 12, 1942 (gage height, 37.38 ft).
Maximum stage known, 39.9 ft in September 1919 (from floodmark) at railroad bridge, 200 ft upstream, from information by Texas & New Orleans Railroad.

Remarks.--Flow slightly regulated by Lake Corpus Christi. During April-June 1957, there was uncontrolled flow over Mathis Dam April 3-6, 22-30, May 1 to June 29.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	148	11,100	11,700	11	79	9,370	13,300	21	653	3,580	956
2	227	11,800	15,900	12	79	9,890	12,200	22	3,180	4,300	624
3	570	12,500	16,300	13	114	11,200	10,600	23	6,080	4,170	658
4	1,000	14,200	15,800	14	97	12,400	9,260	24	7,320	2,750	854
5	872	16,200	16,600	15	91	11,700	8,180	25	8,060	2,500	750
6	403	16,400	16,600	16	126	11,100	7,150	26	8,380	3,010	582
7	204	14,400	15,700	17	175	11,000	6,020	27	8,830	5,430	379
8	292	12,200	14,600	18	78	9,800	4,520	28	9,600	10,300	228
9	116	10,500	13,900	19	153	5,130	2,590	29	10,800	9,280	171
10	72	9,640	13,700	20	133	2,810	1,360	30	10,800	7,740	132
								31		8,870	
Monthly mean discharge, in cubic feet per second									2,624	9,202	7,710
Runoff, in acre-feet									156,200	565,800	458,800

(95) Pecos River near Shumla, Tex.

Location.--Lat 29°49', long 101°25', about 4 miles northwest of Shumla, Valverde County, 13 miles upstream from Pecos High B idge of the Southern Pacific Railroad and 18.5 miles above mouth. Datum of gage is 1,159.52 ft above mean sea level.

Drainage area.--35,162 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge reco d.--Furnished by International Boundary and Water Commission, United States Section.

Maxima.--April to June 1957: Discharge, 38,400 cfs at 10:40 p.m. May 10 (gage height 22.22 ft).
1898, 1900 to March 1957: Discharge, 948,000 cfs June 27, 1954 (gage height, 121.7 ft), by slope area determination of peak flow at gaging station Pecos River near Comstock, Tex., 13 miles downstream.

Remarks.--Records furnished by International Boundary and Water Commission, United States Section.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	142	1,240	1,840	11	123	3,550	554	21	147	983	482
2	132	863	1,240	12	1,720	2,240	544	22	155	912	465
3	134	673	1,030	13	1,150	22,100	1,180	23	144	859	454
4	127	553	902	14	325	11,300	1,290	24	142	810	458
5	127	472	842	15	253	2,360	745	25	280	753	429
6	126	393	795	16	208	1,230	634	26	336	1,000	419
7	124	327	743	17	182	1,040	574	27	396	5,850	404
8	127	297	697	18	260	5,470	532	28	2,320	3,910	390
9	121	268	647	19	388	7,070	567	29	7,130	1,460	376
10	121	3,940	598	20	158	1,720	613	30	3,030	1,300	362
								31		2,430	
Monthly mean discharge, in cubic feet per second.									671	2,818	694
Runoff, in acre-feet.									39,920	173,300	41,270

(96) Devils River near Del Rio, Tex.

Location.--Lat 29°29', long 101°00', at bridge on U. S. Highway 90, 4.5 miles upstream from mouth and about 12 miles northwest of Del Rio, Val Verde County. Datum of gage is 951.80 ft above mean sea level.

Drainage area.--4,185 sq mi.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Furnished by International Boundary and Water Commission, United States Section.

Maxima.--April-June 1957: Discharge, 50,700 cfs at 3 p.m. May 13 (gage height, 9.95 ft).
1900-14, 1923 to March 1957: Discharge, 597,000 cfs Sept. 1, 1932 (gage height, 36.60 ft).

Remarks.--Records furnished by International Boundary and Water Commission, United States Section.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	299	816	15,500	11	130	15,300	614	21	179	1,290	541
2	101	592	2,800	12	208	9,700	614	22	202	903	529
3	107	512	1,280	13	416	30,800	603	23	587	746	526
4	193	477	939	14	174	21,000	592	24	163	679	514
5	146	424	803	15	152	2,870	583	25	216	648	511
6	142	309	745	16	174	1,300	573	26	181	668	508
7	149	351	699	17	176	1,560	563	27	267	22,700	478
8	165	348	678	18	238	7,070	612	28	2,360	18,000	494
9	102	380	646	19	748	17,700	591	29	3,520	2,410	482
10	140	500	624	20	195	3,370	544	30	1,630	1,170	470
								31		3,850	
Monthly mean discharge, in cubic feet per second.									449	5,434	1,189
Runoff, in acre-feet.									26,700	334,100	70,720

(97) Rio Grande at Laredo, Tex.

Location.--Lat 27°30', long 99°30', at downstream side of railroad bridge between Laredo, Webb County and Nuevo Laredo, Tamaulipas, Mexico, 0.9 mile downstream from bridge on highway between the two cities, and at mile 357.4. Datum of gage is 347.90 ft above mean sea level.

Drainage area.--135,976 sq mi (contributing area), of which 85,718 sq mi are in the United States and 50,258 sq mi in Mexico.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Furnished by International Boundary and Water Commission, United States Section.

Maxima.--April-June 1957: Discharge, 64,700 cfs at 10 a.m. May 30 (gage height, 22.05 ft).
1900-13, 1922 to March 1957: Discharge, 716,900 cfs June 30, 1954 (gage height, 61.35 ft).
Flood of June 1865 reached a stage of 62.5 ft at site of present gage (discharge about 950,000 cfs).

Remarks.--Records furnished by International Boundary and Water Commission, United States Section.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	632	34,400	11,000	11	463	3,370	3,670	21	11,500	33,300	4,340
2	639	13,200	30,200	12	463	7,350	3,470	22	4,350	13,800	3,180
3	1,750	7,310	36,000	13	413	40,300	3,430	23	19,700	7,130	2,630
4	1,110	5,160	13,400	14	742	38,100	3,530	24	7,060	5,230	3,000
5	766	4,340	8,090	15	6,000	38,800	3,100	25	3,130	4,240	3,470
6	632	3,880	6,500	16	3,280	51,600	2,910	26	2,840	3,740	2,860
7	533	3,430	5,370	17	2,220	25,200	3,570	27	26,200	29,300	2,510
8	533	3,200	4,630	18	1,520	41,700	3,140	28	37,800	56,500	2,260
9	533	3,000	4,340	19	1,170	39,600	2,770	29	29,800	49,400	1,890
10	463	5,300	3,960	20	18,600	34,300	3,880	30	49,100	58,300	1,750
								31		16,500	
Monthly mean discharge, in cubic feet per second.									7,798	21,967	6,162
Runoff, in acre-feet.									464,000	1,351,000	366,600

(98) International Falcón Reservoir

Location.--Lat 26°33', long 99°10', on Rio Grande, 19.6 miles upstream from Roma, Starr County, Tex., 86 miles downstream from Laredo, Tex., and Nuevo Laredo, Tamaulipas, Mex., and at mile 270.5. Datum of gage is at mean sea level.

Drainage area.--164,482 sq mi (contributing area) of which 87,760 sq mi are in the United States and 76,722 sq mi are in Mexico.

Gage-height record.--Water-stage recorder graph.

Maxima.--April-June 1957: Contents, 1,974,000 acre-ft June 27, 30 (elevation, 290.01 ft).
1953 to March 1957: Contents, 2,423,000 acre-ft Nov. 14, 1954 (elevation, 296.18 ft).

Remarks.--During the period April-June 1957, there was no flow over the spillway; however, 401,000 acre-ft of water was released during this period. Dam is formed by a compacted earth and rock-fill structure having a length of 26,294 ft with a 350 ft reinforced concrete spillway having six 50 x 50 ft fixed wheel gates. Permanent storage began August 25, 1953. Capacity at top of spillway gates, 3,349,000 acre-ft. Records furnished by International Boundary and Water Commission, United States Section. Figures shown herein are rounded to four significant figures.

Contents, in acre-feet, at 12 p.m., 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	258,800	743,600	1,773,000	11	263,200	841,400	1,941,000	21	334,200	1,360,600	1,955,700
2	258,200	778,300	1,835,300	12	263,500	845,500	1,939,000	22	344,800	1,384,100	1,961,100
3	258,300	795,400	1,901,100	13	263,800	890,900	1,937,000	23	359,400	1,379,900	1,964,500
4	258,800	806,300	1,934,300	14	263,800	964,200	1,934,300	24	390,700	1,367,900	1,967,900
5	259,200	810,700	1,942,300	15	266,800	1,019,500	1,931,000	25	395,200	1,353,300	1,970,600
6	259,800	818,000	1,942,300	16	275,600	1,097,600	1,929,000	26	398,200	1,339,400	1,973,300
7	261,000	824,300	1,941,000	17	281,400	1,150,700	1,924,300	27	429,200	1,376,800	1,973,900
8	261,600	829,100	1,940,300	18	285,100	1,207,000	1,931,600	28	515,600	1,502,900	1,973,300
9	261,900	832,800	1,942,300	19	289,000	1,252,300	1,941,000	29	586,700	1,606,600	1,973,300
10	262,800	836,900	1,943,000	20	300,700	1,308,700	1,949,700	30	661,100	1,715,200	1,973,900
								31		1,757,300	
Change in contents during month.									+402,500	+1,096,200	+216,600

(99) Rio Grande at Chapeno, Tex.

Location.--Lat 26°32', long 99°09' at Chapeno, Starr County, 2.5 miles downstream from Falcon Dam, 11.2 miles upstream from Rio Alamo and at mile 268. Datum of gage is 171.52 ft above mean sea level.

Drainage area.--164,538 sq mi (contributing area) of which 87,762 sq mi are in the United States and 76,776 sq mi in Mexico.

Gage-height record.--Water-stage recorder graph.

Discharge record.--Furnished by International Boundary and Water Commission, United States Section.

Maxima.--April-June 1957: Discharge 13,100 cfs at 3 a.m. May 26 (gage height, 7.35 ft).
1952 to March 1957: Discharge, 22,600 cfs Aug. 27, 1953 (gage height, 7.98 ft).

Remarks.--Flow regulated by Falcon Reservoir (Capacity, 3,349,000 acre-ft). Records furnished by International Boundary and Water Commission, United States Section.

Mean discharge, in cubic feet per second, 1957

Day	April	May	June	Day	April	May	June	Day	April	May	June
1	576	6.2	9,380	11	3.8	518	3,080	21	1,590	7,310	772
2	625	5.1	2,590	12	4.1	926	2,960	22	102	8,170	623
3	660	4.9	38	13	169	909	3,070	23	464	9,120	610
4	660	4.7	2,210	14	620	1,290	4,320	24	44	10,400	776
5	670	3.9	7,380	15	96	2,540	4,320	25	680	11,300	837
6	104	106	6,610	16	9.6	4,320	4,690	26	1,670	13,000	753
7	9.6	109	7,140	17	6.2	5,120	3,540	27	2,630	4,830	691
8	5.9	305	4,850	18	4.6	5,880	2,830	28	615	41	713
9	3.8	406	3,010	19	4.5	9,520	495	29	342	18	697
10	3.8	411	2,730	20	4.6	8,230	620	30	15	19	646
								31		4,700	
Monthly mean discharge, in cubic feet per second.									413	3,530	2,770
Runoff, in acre-feet.									24,600	217,000	165,000

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TEXAS FLOODS OF APRIL, MAY AND JUNE 1957

SECTION III

HYDRAULIC AND HYDROLOGIC ANALYSES

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TEXAS FLOODS OF APRIL, MAY AND JUNE 1957

SECTION III

HYDRAULIC AND HYDROLOGIC ANALYSES

INTRODUCTION

The storms and floods of April to June 1957 are noteworthy because of the large area covered, the persistent recurrence of the storms, and the large volumes of runoff experienced. At many points total rainfall, as well as total runoff, was greater than any previously known for a similar period; however, in only a few cases did peak flows exceed those previously known.

Hydrologic data such as streamflow, reservoir, and rainfall records collected during this period provide information necessary to perform numerous hydraulic and hydrologic analyses.

For this report, flood-routing studies were made on the Brazos River from Glen Rose to Bryan to determine the possible effects of storage on the floods during the period April to June 1957, together with a discussion of frequency relationships of these floods. Also rainfall-runoff relationship analyses were made on four watersheds across the State to indicate in general, the rainfall-runoff relation experienced during this period of outstanding flood runoff.

FLOOD-ROUTING STUDIES

The effect of flood-control structures and/or operations can be determined by a flood-routing study. Flood routing is the procedure by which the hydrograph at any point on a stream is determined from a known hydrograph upstream. A hydrograph is a graph showing flow, or discharge with respect to time. A flood hydrograph is said to be routed from one point to

another when the hydrograph at the downstream point has been determined. The hydrograph at the downstream point is also modified to account for additional flow which enters the river between the two points. Although there were many streams in the State for which a flood-routing study could be made, the reach of the Brazos River from Glen Rose to Bryan was selected because of the importance of this flood as a design flood for future operation.

Discharge hydrographs were routed omitting the storage afforded by Whitney Reservoir on the Brazos River, and Belton Reservoir on the Leon River. In other words, the routed flow is the flow that would have occurred if those two reservoirs had not been built.

Although there are many different methods of routing flood waves through river reaches, the Muskingum method seems to have survived many of them and has been selected because of its straight-forward technique. The Muskingum method was developed by G. T. McCarthy, formerly with the Corps of Engineers, U. S. Army. The basic equation for the method is:

$$\text{Storage} = K\left[xI - (1-x)D\right]$$

Where

I = Inflow rate at given time
D = Outflow rate at given time
K = Time between center of mass of flood wave at upstream and downstream end of reach
x = A dimensionless constant which weights inflow and outflow.

In order to compute values of K and x, as well as to demonstrate the degree of accuracy of the method, several observed floods (floods occurring before the construction of Whitney and Belton reservoirs) were routed through

the reach. The results were good, and it was concluded that the method may be used with confidence for this flood. As no major floods occurred in this reach during June, the flood routing is shown for the period April 18 to May 31, 1957. The comparison between hydrographs of measured discharge and routed discharge (omitting storage) is shown in figures III-1 to III-3 for the stations Brazos River near Whitney, at Waco, and near Bryan.

As indicated on figure III-1, if the flood had occurred before Whitney Reservoir was built, a peak discharge of 86,000 cfs would have occurred on May 5 at the Whitney gage; however, this peak was completely absorbed by the existing reservoir. The highest peak that actually occurred was 58,200 cfs on May 28.

The routing study also shows that if Whitney Reservoir had not been built at this time, the peak discharge at Waco would have been 123,000 cfs on May 4, 1957, as compared with the actual peak flow on May 3 of 47,400 cfs. The highest peak that actually occurred during this period was 101,000 cfs on April 20, 1957. Nearly all of the water which caused the flood on April 20 originated below Whitney Reservoir. The effect of the reservoir storage was to change the time of distribution and concentration of the principal flood wave. Figure III-2 shows the comparison between actual flow and that which would have occurred without the upstream storage.

Without the storage afforded by Whitney and Belton reservoirs, the peak discharge of the Brazos River near Bryan would have been 156,000 cfs on April 26. The actual peak was 137,000 cfs on April 26. The storage materially reduced the peak discharge of the major floods on April 30 and May 16, as shown by the graphs on figure III-3.

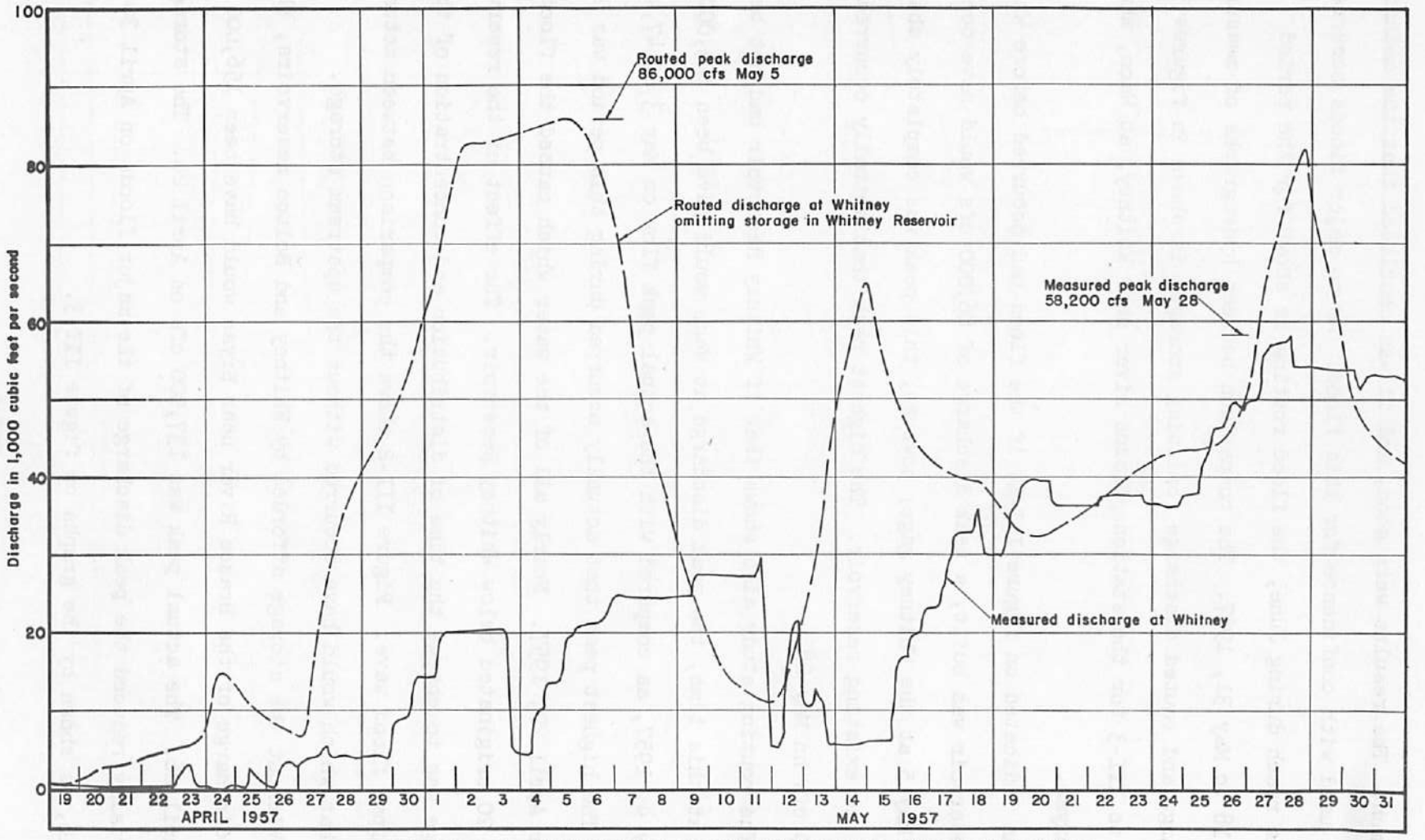

FIGURE III - 1. - COMPARISON BETWEEN HYDROGRAPHS OF MEASURED AND ROUTED DISCHARGE OF BRAZOS RIVER NEAR WHITNEY, TEXAS

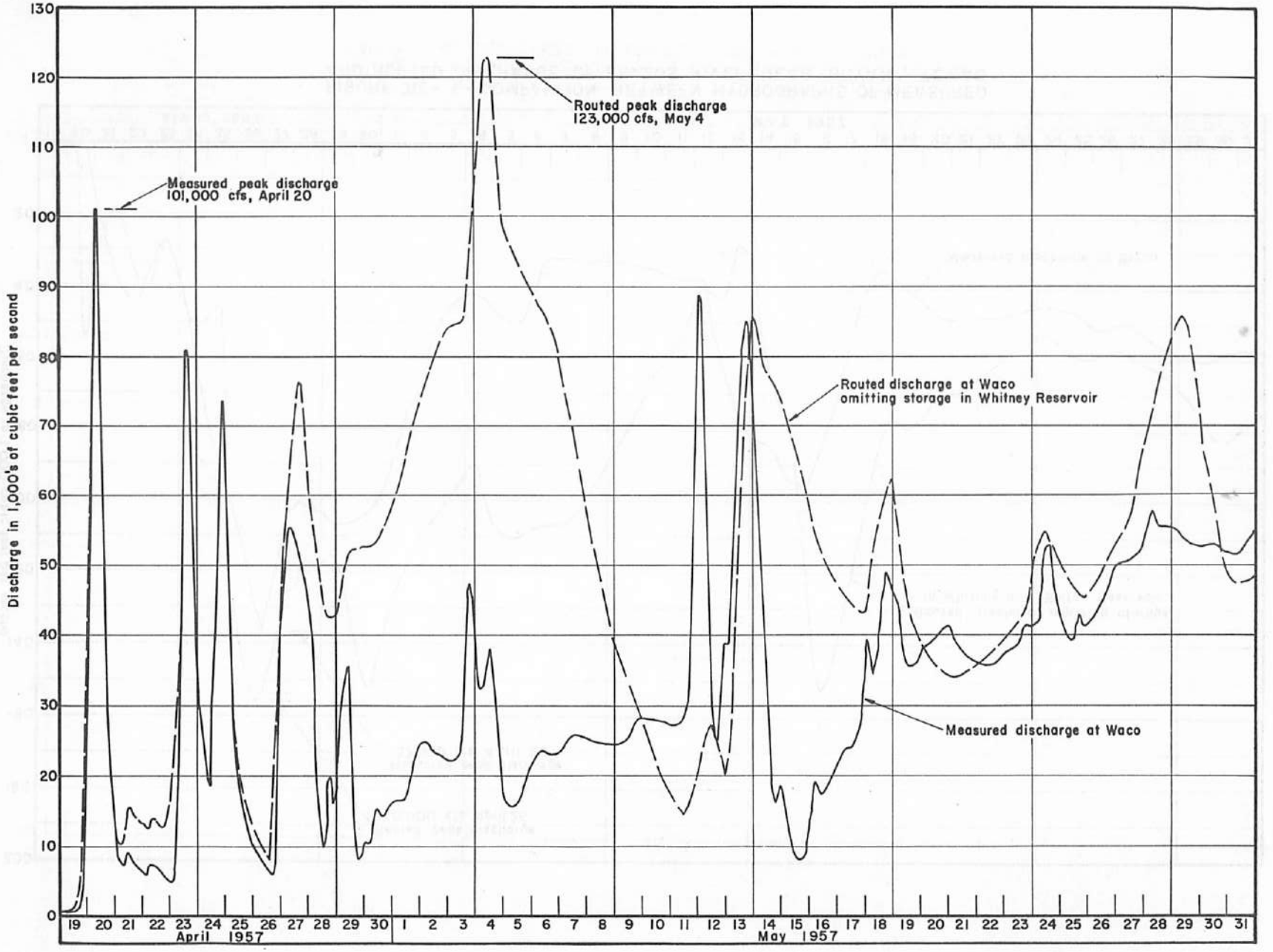

FIGURE III-2. COMPARISON BETWEEN HYDROGRAPHS OF MEASURED AND ROUTED DISCHARGE OF BRAZOS RIVER AT WACO, TEXAS

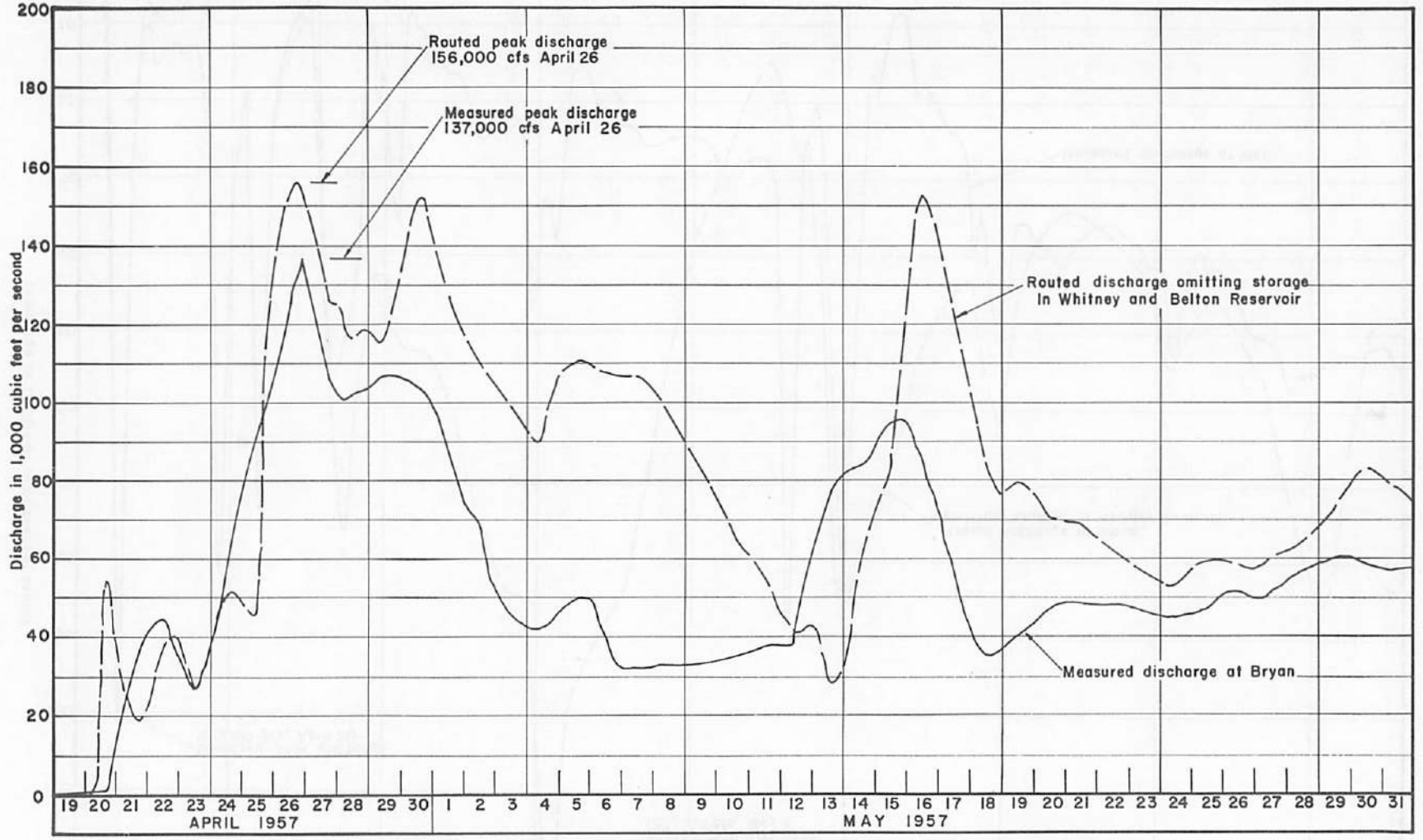

FIGURE III - 3, - COMPARISON BETWEEN HYDROGRAPHS OF MEASURED AND ROUTED DISCHARGE OF BRAZOS RIVER NEAR BRYAN, TEXAS

FLOOD-FREQUENCY RELATION

A knowledge of extreme floods on the Brazos River at Waco extends back to about 1854, and a continuous record of stages and discharges begins in 1899. With this data, a preliminary flood-frequency study was made for the Waco gaging station. The greatest flood in the 104-year period, 1854-1957, was the flood of September 27, 1936, which crested at 246,000 cfs. The recurrence interval of the 1936 flood is probably in excess of 100 years, the recurrence interval of the routed 1957 flood is about 10 years, and the recurrence interval of the peak discharge on April 20, 1957, is about six years. Recurrence interval is defined as the average number of years within which a given event will be equalled or exceeded. These intervals are not to be considered regular, for a flood with a given recurrence interval may occur in successive years. In fact several engineers have advocated the use of a percentage term to avoid the possible inference of regularity of occurrence. Thus, a flood with a 100-year recurrence interval would have a one percent chance of occurrence in any year; a flood with a 25-year recurrence interval would have a four percent chance of occurrence in any year.

As mentioned earlier, the floods in 1957 were outstanding not because of extreme high peak discharges but because of long duration and large volumes of flood flows. Although the recurrence interval of the peak discharge of the flood in September 1936 at Waco was probably in excess of 100 years as compared with a 10-year recurrence interval for the routed 1957 flood peak, the volume of the 1957 flood runoff was three times the volume of the 1936 flood.

RAINFALL AND RUNOFF STUDIES

Comparisons of rainfall with associated runoff are of great importance in the appraisal and understanding of the effect of the prevailing hydrologic conditions on the magnitude and concentration of flood runoff. In the interest of advancing such understanding, the significant relationships of rainfall and runoff on four watersheds across the State during the floods of April to June 1957 are presented and analyzed in this report.

In general, there were four distinct storm periods which produced large flood runoff within this period. As these storms followed one another so closely, an excellent opportunity was offered to study the rainfall-runoff characteristics of selected basins within the State for different antecedent conditions.

Four areas were selected which would give a good representative view of rainfall-runoff relationships across the State. The areas selected were: The Sabine River basin above Emory, the West Fork of the Trinity River basin above Jacksboro, the San Saba River basin above Menard, and the Guadalupe River basin above Spring Branch, the drainage areas of which vary from 683 to 1,282 square miles. The total rainfall for the three-month period in these areas varied from 15.68 inches in the San Saba River basin to 26.47 inches in the Sabine River basin.

Runoff in inches was computed from daily discharges for the streamflow station at the lower end of each basin being studied. These figures were accumulated for the three-month period, April to June 1957, and the period of storm runoff for a particular storm period was determined from a

plot of the accumulated rainfall and accumulated runoff.

Figures III-4 to III-7 show the accumulated rainfall and runoff for the three-month period with a table included giving dates of the major storms, the total rainfall, the total runoff, and the percent runoff for each of the storm periods. The dates of the flood periods have not been indicated; however, they begin shortly after the rainfall began and continue from two to five days after the rainfall ceased, the exact time varying with the nature of the storm, the topography, and the size of the drainage area.

Descriptive Notes

The average rainfall for each basin was determined by averaging rainfall at five to eight rain gages located in or immediately surrounding each basin. At least one gage in each basin was a recording gage which provided an index of the intensity of the rainfall. Daily readings are reported by U. S. Weather Bureau observers with the reading usually being taken at 7 a.m. In some cases several daily readings were grouped together to determine the average for a storm period. Because of sparse coverage by rain gages, heavy rainfalls may have occurred which were not shown by rainfall records.

Because of the condensed form in which the data in the figures are presented it has not been feasible to include sufficient descriptive notes for each basin. As such notes and explanations are desirable, they are given for each basin in the following paragraphs.

Sabine River basin above Emory, Tex.

The Sabine River basin above Emory, drainage area 965 square miles, has an average annual precipitation between 35 and 40 inches. During the period April to June 1957, an average of 26.47 inches of rain fell in this basin. During the month of March 1957, the total amount of rainfall within

the basin varied from 5.02 to 7.17 inches which was 1-1/2 to 3-1/2 inches above normal for that area. This indicates that in general the land was already wet at the time of the heavy rains of April, May, and June, and that the percentage runoff should be fairly high.

The density of rain gages for the area is one for every 120 square miles. Some variation in the rain gage totals is to be expected, and in this case the totals for the period April to June 1957 varied from 19.79 to 36.95 inches with an average of 26.47 inches.

Runoff in inches was computed from daily discharges for the stream-flow station near Emory.

The rainfall, runoff, and percent runoff for four storm periods are given together with the monthly totals and the total for the April to June 1957 period on figure III-4. An examination of these data indicates that the highest percent runoff occurred during the storm period April 20-27, 1957. This was probably due to three factors: (1) the large quantity of rain which fell each day during the period April 20-27, (2) the above normal rainfall during February and March, and (3) the heavy rains during the first week in April. Rain of greater intensity fell on May 13, but the storm period was of shorter duration and of a spotty nature, as the totals for that day varied from 0.22 to 3.85 inches in eight rain gages in the watershed.

An interesting fact is that with a monthly variation of rainfall from 2.79 to 13.08 inches for the three-month period, the percent runoff, or ratio of runoff to rainfall, remained almost constant for each month even though some storm periods indicated higher rates of runoff than others.

SABINE RIVER NEAR EMORY, TEX.
RAINFALL-RUNOFF FOR APRIL-JUNE, 1957

Period	Total Rainfall for period in inches	Total Runoff for period in inches	Ratio of Runoff to rainfall in percent
April 20-27, 1957	9.44	7.38	78.2
May 12-14, 1957	3.14	1.68	53.5
May 20-28, 1957	5.19	3.03	58.4
May 30-June 6, 1957	2.60	1.84	70.8
Month of April	13.08	8.88	68.0
Month of May	10.60	7.13	67.2
Month of June	2.79	1.93	69.2
Total April-June 1957	26.47	17.94	67.8

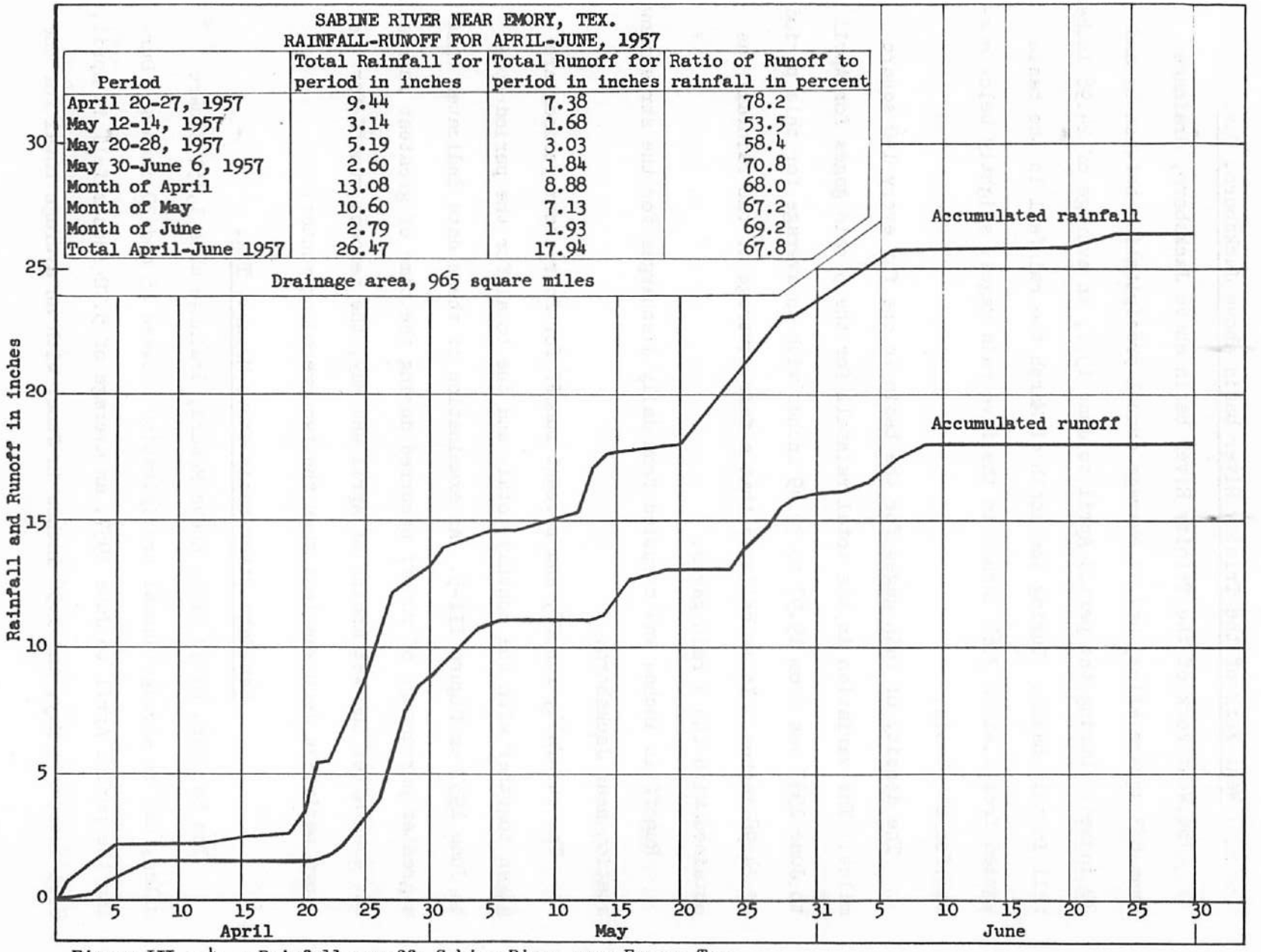

Figure III - 4. - Rainfall-runoff, Sabine River near Emory, Tex.

West Fork of the Trinity River basin above Jacksboro, Tex.

The West Fork of the Trinity River basin above Jacksboro, drainage area 683 square miles, has an average annual precipitation between 25 and 30 inches. During the period April to June 1957, an average of 24.98 inches fell in this basin. During the month of March the rainfall in the basin varied from 1.41 to 2.68 inches in the five rain gages, slightly below normal for the basin.

The density of rain gages for the basin is one for every 140 square miles. The variation in the total rainfall for the 5 rain gages for April to June 1957 was from 19.97 to 30.49 inches with an average for this period of 24.98 inches. It is believed that a fair coverage of the rainfall was obtained with the 5 rain gages.

Runoff in inches was computed from daily discharges for the streamflow station near Jacksboro.

The rainfall, runoff, and percent runoff for four storm periods are given together with the monthly totals and the total for the period April to June 1957 on figure III-5. An examination of these data indicates that a greater percentage of runoff occurred during the time of greatest rainfall, but even after the wet months of April and May, the percent runoff for the storm period in June was less than the two preceding months.

San Saba River basin above Menard, Tex.

The San Saba River basin above Menard, drainage area 1,151 square miles, has an average annual precipitation between 25 and 30 inches. During the period April to June 1957, an average of 5.72 inches fell in April, 8.11 inches in May, and 1.56 inches in June, with an average total for the

WEST FORK TRINITY RIVER NEAR JACKSBORO, TEX.
RAINFALL-RUNOFF FOR APRIL-JUNE 1957

Period	Total Rainfall for period in inches	Total Runoff for period in inches	Ratio of Runoff to Rainfall in percent
April 19-29, 1957	10.97	5.33	48.6
May 9-18, 1957	4.53	1.54	34.0
May 22-25, 1957	2.86	.69	24.1
May 30-June 5, 1957	2.86	.59	20.6
Month of April	11.77	5.19	44.1
Month of May	10.11	4.02	39.8
Month of June	3.10	.89	28.7
Total April-June 1957	24.98	10.10	40.4

Drainage area, 683 square miles

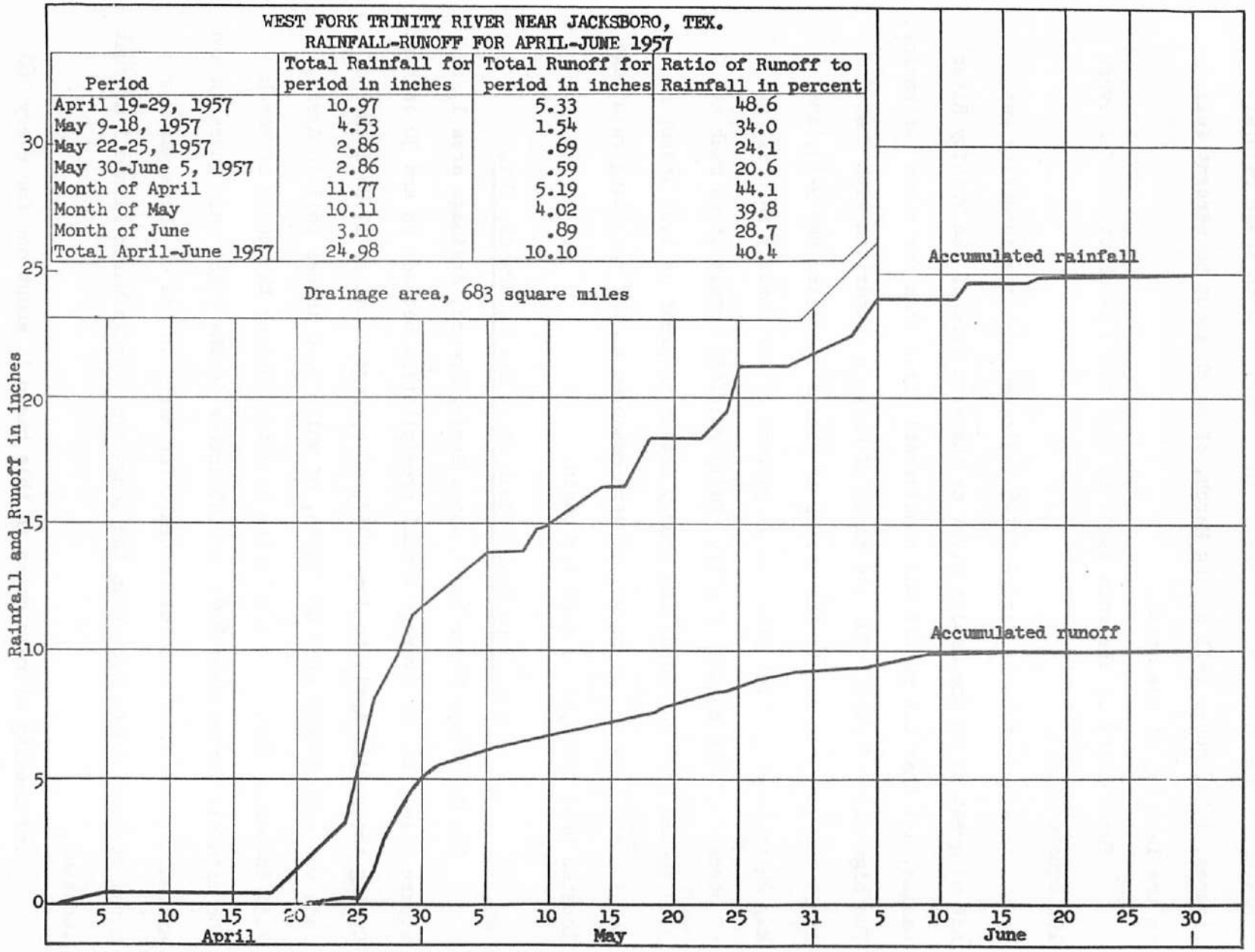

Figure III - 5. - Rainfall-runoff, West Fork Trinity River near Jacksboro, Tex.

three-month period of 15.39 inches. In comparison with these rainfall figures, 1.33 inches fell during March, of which about 50 percent fell on the last day of the month.

The density of the rain gages in this basin is about one for every 190 square miles.

An examination of figure III-6 indicates that the intensity was not as great as in the Sabine River or the West Fork of the Trinity River basins, and that the runoff was considerably less than for those two basins. The high rate of runoff for the month of May, in comparison with that for April and June, is due to the series of storms occurring May 9-13, and May 24 to June 1, which produced 74 percent of the monthly rainfall and 67 percent of the monthly runoff. Daily rainfall totals of as much as 3.00 inches were recorded, and hourly totals as great as 1.05 inches on May 13, and 1.34 inches on May 26 were measured at the recording rain gage located near the upper end of the basin.

Guadalupe River basin above Spring Branch, Tex.

The Guadalupe River basin above Spring Branch, drainage area 1,282 square miles, has an average annual precipitation between 25 and 30 inches. During the period April to June 1957, an average total of 17.04 inches of rain was experienced over the basin, of which 7.50 inches fell in April, 7.31 inches in May, and 2.23 inches in June. During the month of March the rainfall varied from 2.87 to 4.47 inches in the eight rain gages in and around the basin. The total rainfall for March in one of these gages was equal to 2.62 inches more than the long-term average March rainfall at that location.

The density of rain gages in this basin is about one for every 160

SAN SABA RIVER AT MENARD, TEX.
RAINFALL-RUNOFF FOR APRIL-JUNE 1957

Period	Total Rainfall for period in inches	Total Runoff for period in inches	Ratio of Runoff to Rainfall in percent
April 19-30, 1957	5.13	0.82	16.0
May 9-13, 1957	3.49	.79	22.6
May 24-June 1, 1957	2.55	.30	11.8
June 1-6, 1957	.63	.03	.5
Month of April	5.72	.82	14.3
Month of May	8.11	1.63	20.1
Month of June	1.56	.09	5.8
Total April-June 1957	15.39	2.54	16.2

Drainage area, 1,151 square miles

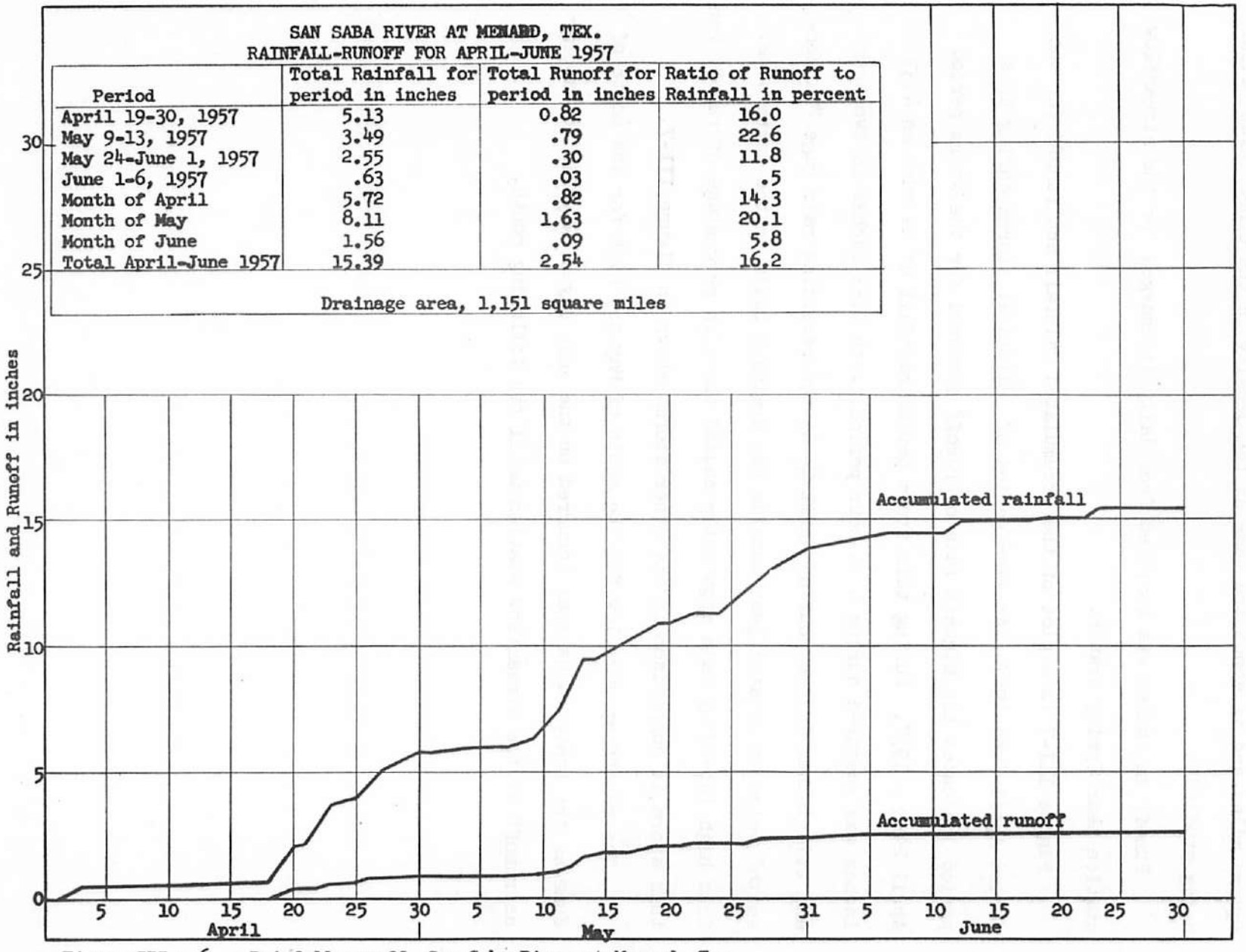

Figure III - 6. - Rainfall-runoff, San Saba River at Menard, Tex.

square miles and is about the same as the density in the other three basins being studied.

Runoff in inches was computed from daily discharges for the streamflow station near Spring Branch.

Figure III-7 is a plot of the accumulated rainfall and runoff for the period April-June 1957. An examination of individual storms during this period indicates the highest rate of runoff occurred for the storm period April 24-30, 1957. During this storm period rainfall of as much as 4.33 inches was measured during a 24-hour period, with 2.53 inches in two hours and 1.72 inches in one hour on April 24 at the recording rain gage "Bankersmith" which is located just outside the drainage basin on the north side. This high intensity rain apparently caused the high percentage of runoff for this storm in comparison to the other storms shown in figure III-7.

The runoff appears low for the month of May and high for the month of June as the heavy rains that occurred on the last day of May did not appear as runoff at the streamflow station until the following month.

GUADALUPE RIVER NEAR SPRING BRANCH, TEX.
RAINFALL-RUNOFF FOR APRIL-JUNE 1957

Period	Total Rainfall for period in inches	Total Runoff for period in inches	Ratio of Runoff to Rainfall in percent
April 24-30, 1957	4.18	1.08	25.8
May 8-10, 1957	1.08	.09	8.3
May 25-28, 1957	2.75	.18	6.5
May 30-June 3, 1957	2.30	.36	15.6
Month of April	7.50	1.28	17.1
Month of May	7.31	.67	9.2
Month of June	2.23	.54	24.2
Total April-June 1957	17.04	2.49	14.6

Drainage area, 1,282 square miles

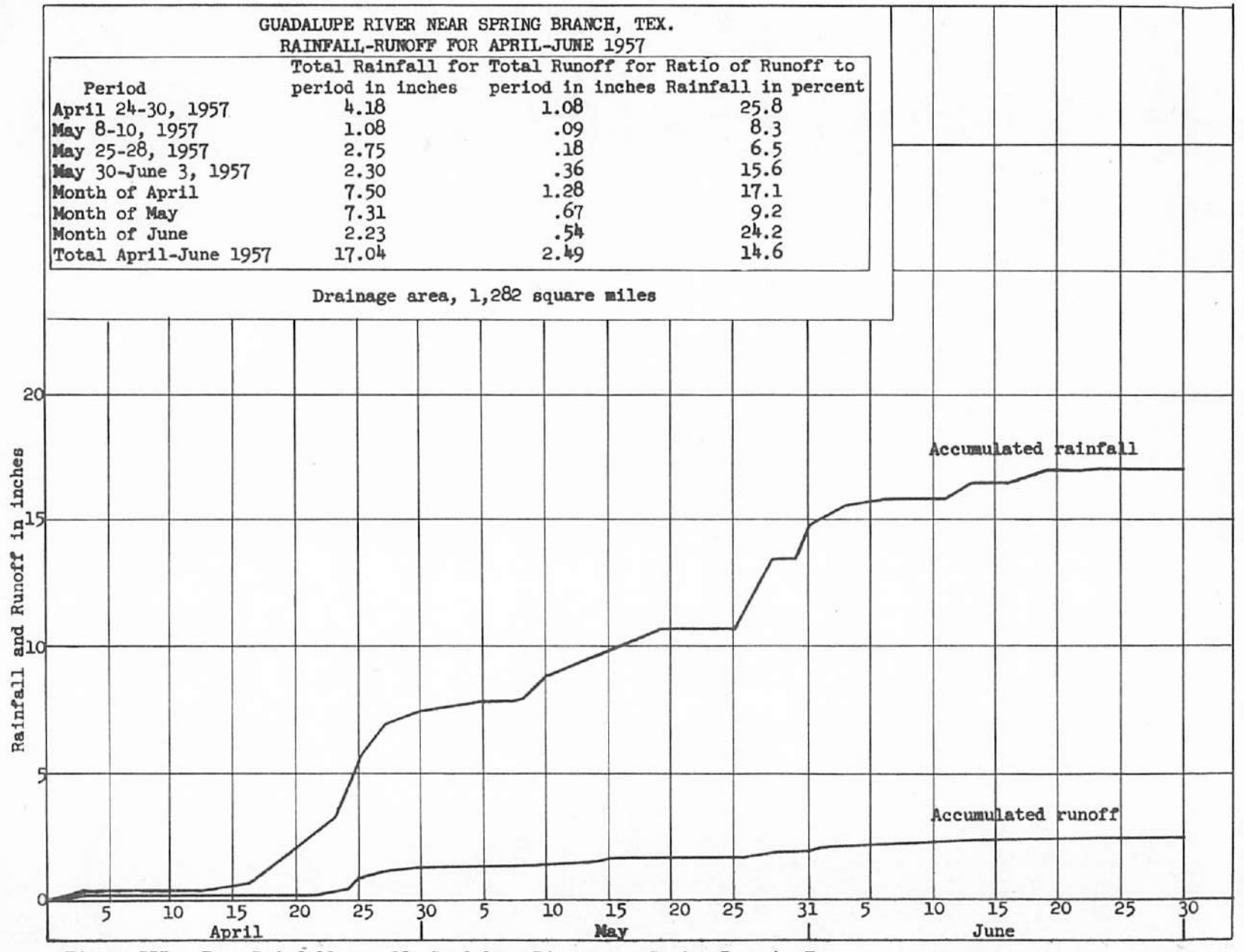

Figure III - 7. - Rainfall-runoff, Guadalupe River near Spring Branch, Tex.