BASE-FLOW STUDIES, GUADALUPE RIVER COMAL COUNTY, TEXAS QUANTITY, MARCH 1962

TEXAS WATER COMMISSION
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COMAL COUNTY, TEXAS

Quantity, March 1962

By

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U. S. Geological Survey

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INTRODUCTION

This investigation was made under the provisions of the 1962 cooperative agreement between the Texas Water Commission and the U. S. Geological Survey, Water Resources Division, for the investigation of the water resources of Texas.

The purpose of this investigation was to study the interchange of surface and ground waters in the Guadalupe River Basin in Comal County, and to determine whether significant changes have occurred since the drought of 1955.

The 57-mile reach studied extends from a point 5.7 miles upstream from the gaging station near Spring Branch (8-1675) to the gaging station (8-1685) at New Braunfels. (See Plate 1.)

Seven investigations (Holland and Irelan, 1955, p. 10) were made between January and March 1955. In the detailed investigation made January 24-31, 1955, discharge measurements were made at 32 sites in the 57-mile reach. An analysis of the data showed that for comparative purposes, future studies could be made by remeasuring 11 of these sites; this was done in March 1955 and in March 1962 (Figure 1).

Eleven mainstream measurements and a measurement of the large spring at Crane's Mill were made March 7-8, 1962. There were no observed diversions, and tributary inflow was not measured. The flow at the Sattler gaging station (8-1678) was determined from the recording gage record, and Hueco Springs flow was determined by interpolation between discharge measurements made February 26 and March 28, 1962.

Supporting data not given in the text and table are available in the files of the U. S. Geological Survey in Austin, Texas.

RELATION OF BASE FLOW TO GEOLOGY

The results of a series of measurements made on March 7-8, 1962, are shown in Table 1. During this period the flow of the Guadalupe River was sustained entirely by ground water. There was a normal base-flow recession at both gaging stations during the investigation.

The geology of the reach investigated is complicated by the Balcones fault zone which, according to George (1952), is 20 miles wide in places and includes 7 major faults in Comal County. These 7 faults are roughly parallel and cross the Guadalupe River within the study reach; the uppermost, Spring Branch fault, crosses at about river mile 3 and the lowermost, Comal Springs fault, crosses at about river mile 55.

For about 50 miles of the study reach, from river mile 0 to 50, the flow is on rocks of the Trinity Group of the Comanche Series--from mile 0 to 3 on the Travis Peak Formation, and from mile 3 to 50 on the upper and lower members of the Glen Rose Limestone. In the reach from river mile 50 to 55 flow occurs on rocks of the Fredericksburg Group of the Comanche Series--the upper reach on the Comanche Peak Limestone and the lower reach on the Edwards Limestone. George (1952, p. 21) stated: "Hydrologically, in Comal County the Comanche Peak and Edwards limestones may be regarded as a single unit." In the lower 2 miles of the reach, river mile 55 to 57, the flow is on the gravel of the Leona Formation of the Pleistocene Series.

The Travis Peak Formation in Comal County is composed of fine sand, marl, and limestone. A few springs issue from the limestone of this formation, but it does not yield large supplies of water to wells.

The upper and lower members of the Glen Rose Limestone are composed of alternating beds of hard limestone and dark-blue marl with thick, massive limestone beds at the base of the lower member. The land surface of the outcrop is characterized by step terraces and rugged topography. Sinkholes are common and much honeycombed rock is found in the outcrop area. In parts of Comal County these limestones yield a considerable volume of water to springs, but the yield is small to a large number of ranch wells. George (1952, p. 18) says: "It is believed that the springs are fed through solution channels developed along fractures connecting sinkholes."

The Edwards and Comanche Peak Limestones are very similar so well drillers do not distinguish between them in Comal County. The Edwards is composed of hard white limestone with flint nodules, honeycombed and cavernous, with some chalky beds. The Comanche Peak is hard limestone similar to the Edwards but contains no flint. The land surface in the outcrop area of the Edwards and Comanche Peak Limestones is characterized by deep canyons along the streams; upland the surfaces are undulating and pitted with sinkholes. The sinkholes range in size from small openings to depressions 15 to 20 acres in extent. The Edwards Limestone yields more water to wells than any other formation in Comal County. George (1952, p. 30) says: "The Edwards limestone is exposed at the surface over most of the area between Hueco Springs and Bat Cave faults and together with the underlying Comanche Peak limestone is thick enough to transmit large volumes of water."

The Leona Formation in Comal County ranges in thickness up to 50 feet. It is composed of limestone gravel, sand, clay, and silt. The formation is arranged in terraces by the present streams in their valleys. George (1952, p. 28) says: "In the valleys above the escarpment formed by Comal Springs fault, the Leona fills old abandoned meander channels and is rarely used as a source of water, probably because of leakage into underlying rocks and drainage into the streams."

River measurements indicate a small increase in flow which comes from the Travis Peak Formation. Most of the increase indicated between mile 0 and mile 5.7 probably comes from this formation above Spring Branch fault (mile 3) and from springs on Spring Branch Creek. Below gaging station 8-1675 the flow decreases and drops from 99.5 to 73.5 cfs (cubic feet per second) at the lower end of Demijohn Bend (mile 18.0). In this 12-mile reach of Glen Rose Limestone (lower member) are crevices and caverns which carry lost water to the river below Demijohn Bend. A series of springs enter the river below the bend, 5 springs on Ben Wolle's Ranch at mile 21.0 to 21.7, Cranes Mill Spring (Big Spring) at mile 24.7, a large spring that boils up in midriver at the mouth of Sorrel Creek (mile 29.5), and other midriver springs in the vicinity of Tom Creek (mile 30.5). Holland and Irelan (1955, p. 10) stated, "Water from the various Wolle springs and Cranes Mill Spring was very similar in quality to the river water. The analyses suggest that gains in streamflow in some stretches of the Guadalupe River probably represent recoveries of water lost in other reaches upstream and not new water from distant sources." Below Tom Creek, at mile 32.3, the flow had increased to 104 cfs. In the remaining reach of Glen Rose Limestone (18 miles to mile 50) the flow varied but the lowermost measurement was only slightly higher than the uppermost. At mile 50 the channel crosses Bat Cave fault which is the contact between the Glen Rose Limestone upstream and the Edwards Limestone downstream. The flow increased to 115 cfs at mile 51.5 which is 1 mile above Hueco Springs. These springs were flowing 10.7 cfs. The amount of flow from Hueco Springs is indicative of the water level in the adjoining Edwards Limestone and also of the amount of water contributed to the river in the 5-mile reach of Edwards Limestone which the river crosses. High flows in Hueco Springs indicate a high water level in the Edwards which contributes water directly to the river as well as through Hueco Springs. When the springs are dry there is little or no water flowing into the river from the Edwards Limestone in this area. It is possible during extended drouth periods, as in 1955, that water levels in the Edwards could drop below river level which would allow water to flow from the river to the aquifer.

Between Comal Springs fault (mile 55) and the gaging station 8-1685 (mile 57) the channel crosses 2 miles of the Leona Formation. Measurements are not conclusive but it is likely that a small amount of water is contributed to the river by the Leona Formation.

SUMMARY AND CONCLUSIONS

This series of measurements indicates that no significant changes in the flow pattern have taken place since the 1955 investigation. Both investigations show that comparable amounts of water go underground above Demijohn Bend. This water flows through crevices and caverns in the porous lower member of the Glen Rose Limestone, and reappears as springflow farther downstream. In both studies there is a downstream progressive increase in flow. In 1955 this increase was slight owing to drouth conditions and low water levels in the Edwards Limestone in the vicinity of Hueco Springs. In 1962 the larger increases in flow can be attributed mainly to the Travis Peak Formation and Edwards Limestone, and although there were sectional gains and losses in the long reach of Glen Rose Limestone, a slight gain was found in the reach.

REFERENCES

George, W. O., 1952, Geology and ground-water resources of Comal County, Texas: U. S. Geol. Survey Water-Supply Paper 1138.

Holland, P. H., and Irelan, Burdge, 1955, Guadalupe and Blanco Rivers, Texas--seepage investigations: U. S. Geol. Survey open-file rept. 52.

Table 1.--Summary of discharge measurements

Site No.	Date 1962	Stream	Location	River miles	Water temp. (°F)	Discharge in cfs		Remarks
						Main stream	Tributary	
1	Mar. 7	Guadalupe River	At County road crossing 3.8 mi above bridge on U. S. Hwy. 281	0	55	92.1		Gravel streambed
5	7	Guadalupe River	At gaging station (8-1675) near Spring Branch	5.7	53	99.5		Rock streambed
11	7	Guadalupe River	At lower end of Demijohn Bend	18.0	53	73.5		Gravel streambed
-	7	Cranes Mill Spring	75 feet below spring	24.6	66		9.10	Gravel streambed
15	7	Guadalupe River	700 feet below Cranes Mill Spring	24.7	57	86.8		Gravel over rock streambed
17	8	Guadalupe River	1½ mi above Tom Creek	29.0	58	92.2		Rock streambed
19	8	Guadalupe River	2.0 mi below Tom Creek	32.3	60	104		Gravel streambed
22	7	Guadalupe River	3/4 mi below Canyon dam site	37.3	56	110		Rock streambed
-	8	Guadalupe River	At gaging station (8-1678) near Sattler	38.7	-	106		Rock streambed
26	8	Guadalupe River	2.0 mi below Sattler	42.8	57	107		Rock streambed
29	8	Guadalupe River	About 4.5 mi above Hueco Springs	48.0	64	106		Rock streambed
30	8	Guadalupe River	About 1.0 mi above Hueco Springs	51.5	64	115		Rock streambed
-	8	Hueco Springs	--	52.6			10.7	Discharge interpolated
33	8	Guadalupe River	¼ mi below gaging station (8-1685) at New Braunfels	57.0	59	135		Rock streambed

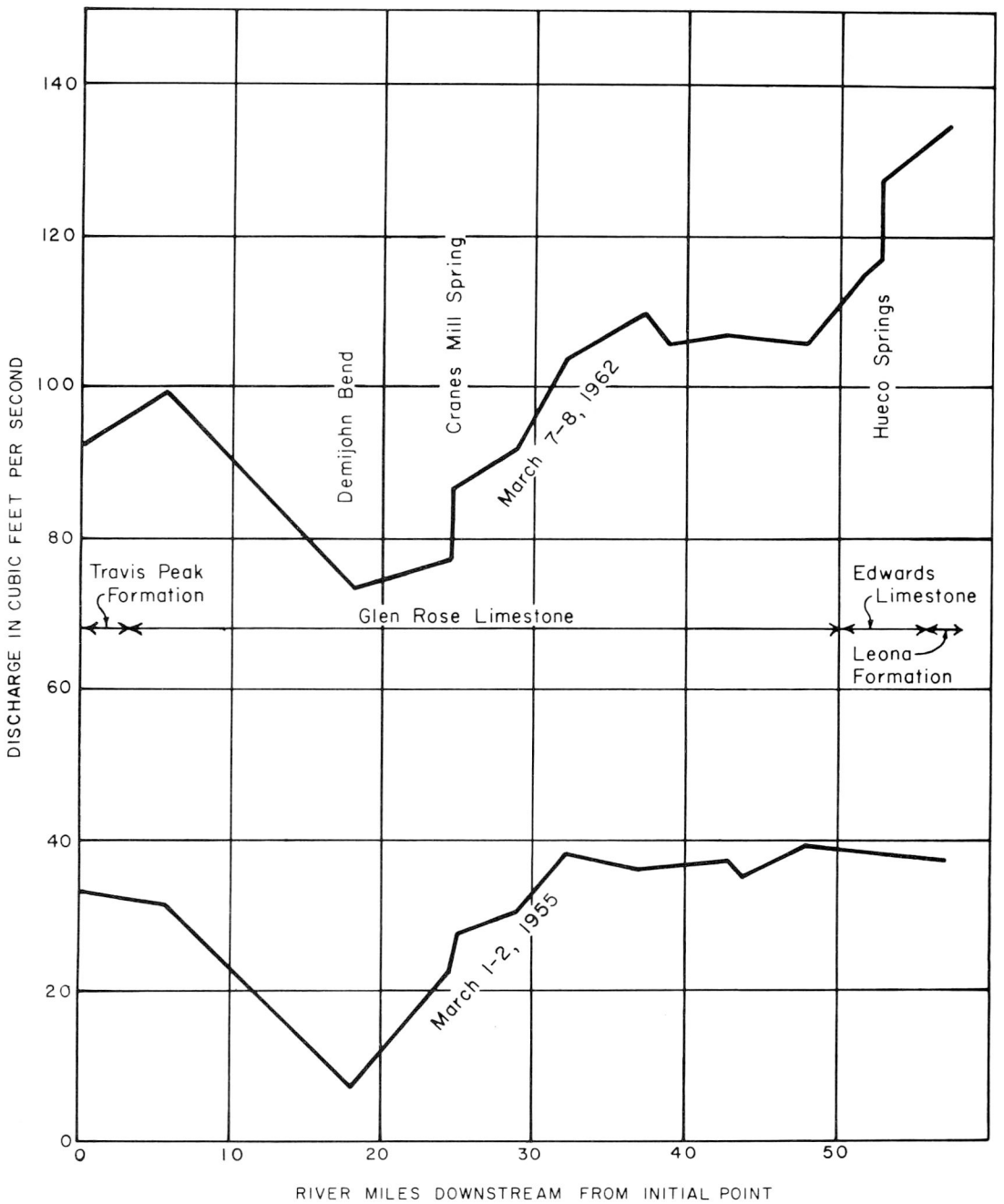

Figure 1

Discharge Profiles, Guadalupe River, Comal County

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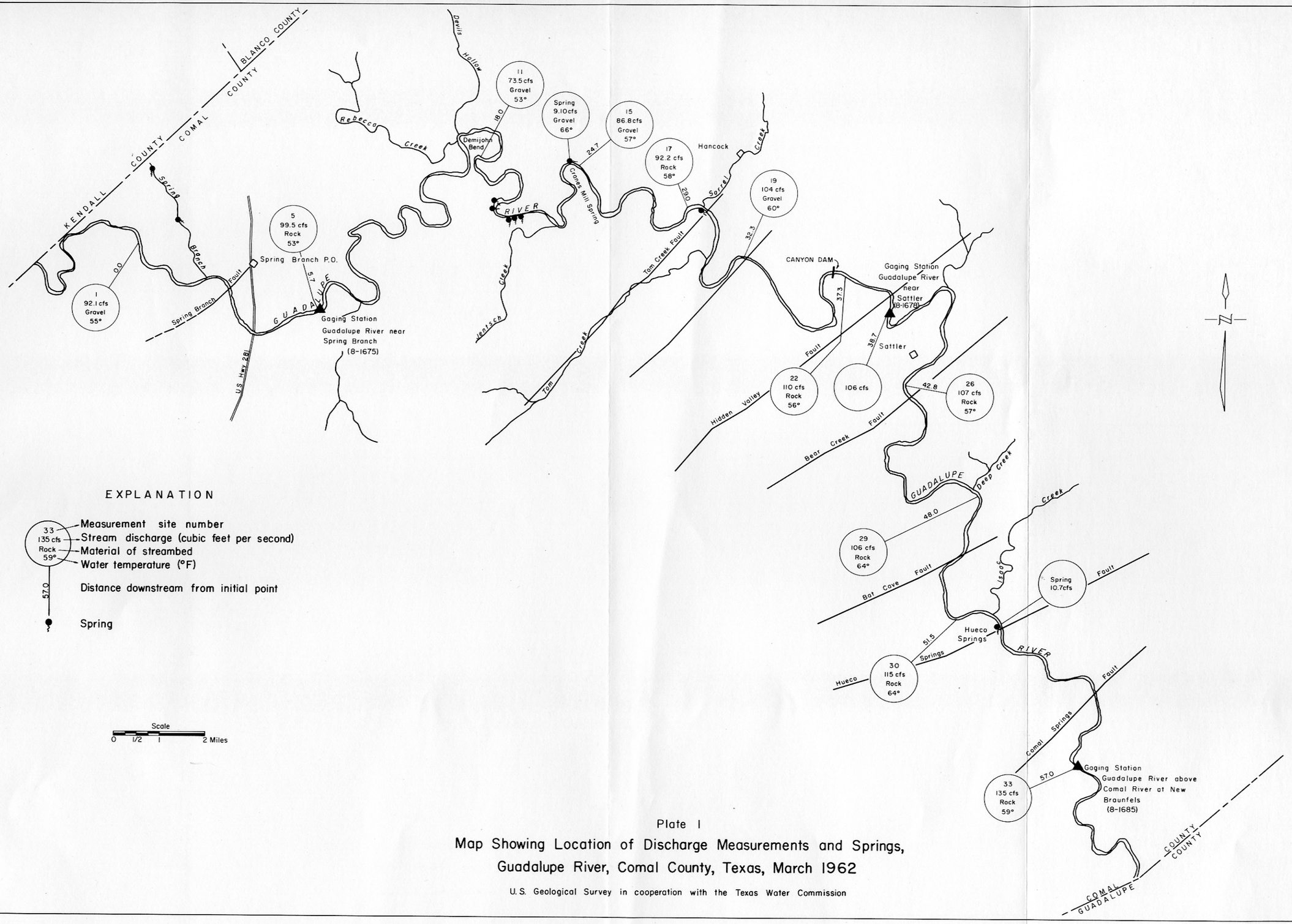

EXPLANATION

33 — Measurement site number
135 cfs — Stream discharge (cubic feet per second)
Rock — Material of streambed
59° — Water temperature (°F)
57.0 — Distance downstream from initial point
Spring

Scale
0 1/2 1 2 Miles

Plate I

Map Showing Location of Discharge Measurements and Springs, Guadalupe River, Comal County, Texas, March 1962

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