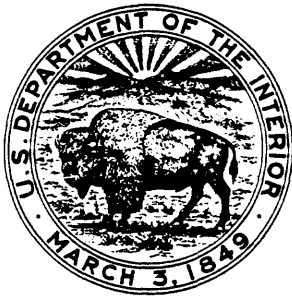


WATER-SURFACE PROFILES ALONG BAYOU METO AND
ROCKY BRANCH NEAR JACKSONVILLE, ARKANSAS

By Braxtel L. Neely, Jr.

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CONVERSION FACTORS

For use of readers who prefer to use metric units, conversion factors for terms used in this report are listed below:

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
foot (ft)	0.3048	meter (m)
foot per second (ft/s)	0.3048	meter per second (m/s)
cubic foot per second (ft ³ /s)	0.02832	cubic meter per second (m ³ /s)
mile (mi)	1.609	kilometer (km)
square mile (mi ²)	2.590	square kilometer (km ²)

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ABSTRACT

Water-surface profiles were computed along Bayou Meto and Rocky Branch for the 2-, 5-, 10-, 25-, and 50-year floods. These profiles were computed using the U.S. Geological Survey's stepbackwater computer program number J-635. Cross sections needed for the computation were picked from one-foot interval topographic maps furnished by the U.S. Environmental Protection Agency. Flood boundaries for the 2-, and 5-year floods were delineated on topographic maps.

INTRODUCTION

This report, prepared in cooperation with the U.S. Environmental Protection Agency, presents the results of a study to determine water-surface profiles of Bayou Meto and Rocky Branch for floods of selected recurrence intervals. A location map of the area is shown on figure 1.

Rocky Branch rises in the hill country and flows south near the western edge of Jacksonville, Arkansas where it enters the flatland just before emptying into Bayou Meto. The drainage area of Rocky Branch at the mouth is 2.54 square miles. Bayou Meto flows in a southeasterly direction from hill country and enters flatland about 2 miles upstream from the confluence with Rocky Branch. The drainage area of Bayou Meto at the confluence with Rocky Branch is about 115 square miles.

The Environmental Protection Agency furnished one-foot interval topographic maps prepared by Martinez Mapping and Engineering, Inc. These maps were used to determine cross sections of the streams.

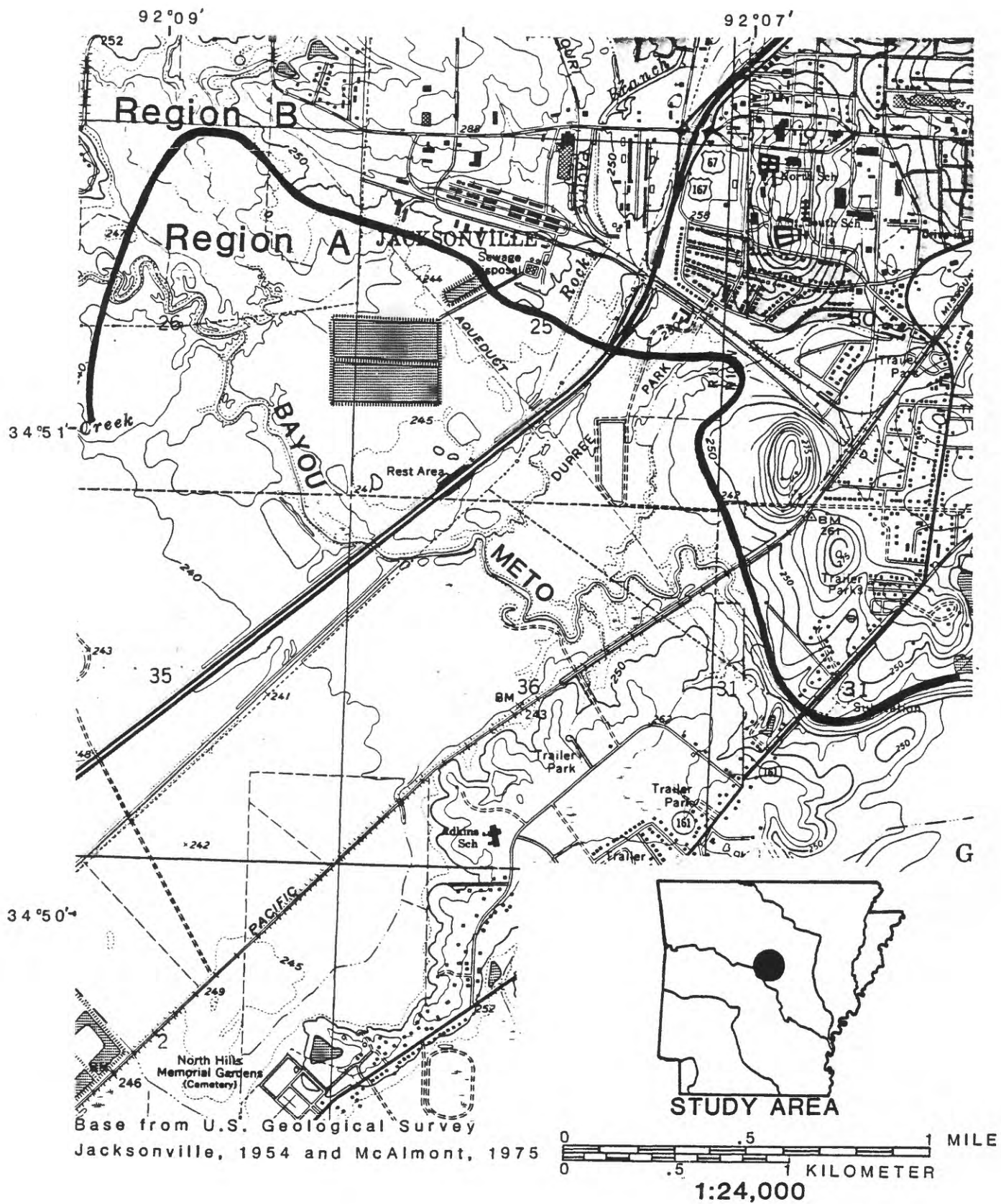


Figure 1.--Location of study area.

DISCHARGE FREQUENCY

Recurrence interval is the average number of years within which a given discharge will be equaled or exceeded once. Peak discharges for selected recurrence intervals used in developing the profiles were determined from regional regression equations for Arkansas developed by Patterson (1971). Patterson divides Arkansas into regions A and B. Region A has relatively flat terrain and discharges have slow velocities, whereas terrain in region B is steep and discharges have high velocities. This study is near the divide between the two regions (fig. 1). Discharges for Rocky Branch were computed using the equations (Patterson, 1971) applicable for region B. Bayou Meto drains from region B into region A. Most of the drainage area is in region B (fig. 1). Discharges for Bayou Meto at the divide between regions A and B were computed using the equations (Patterson, 1971) applicable for region B. Discharges for Bayou Meto at the gaging station near Lonoke were computed using station data and the equations applicable for region A. The gaging station near Lonoke is about 15 miles downstream from the divide between region A and B. The peak discharges on Bayou Meto are much lower near Lonoke than they are at the divide. The peak discharge leaving region B decreases as the flood wave moves downstream because of the abrupt decrease in channel slope and the increase in overbank storage. Subjective judgement was used in assigning discharges along Bayou Meto by interpolating between the discharges near Lonoke and at the divide between region A and B.

WATER-SURFACE PROFILES

Water-surface profiles along Bayou Meto for the 2-, 5-, 10-, 25-, and 50-year floods (fig. 2) were computed from about 2 miles downstream from Arkansas Highway 161 to about 2 miles upstream from U.S. Highway 67 (fig.4). The computed elevations are shown in table 1. Mannings "n" values (Barnes, 1967) were 0.035 in the main channel and 0.120 in the heavily vegetated flood plain. A Manning "n" of 0.045 was used in the open areas of the floodplain. Mean velocities on the floodplain during the 50-year flood are less than 1.0 foot per second except near Arkansas Highway 161 where a natural constriction exists (fig. 4).

Water-surface profiles along Rocky Branch (fig. 3) were computed from the mouth to about 2 miles upstream (fig. 4). The computed elevations are shown in table 2. Rocky Branch channel is steeper and discharges have higher velocities than Bayou Meto. Mannings "n" values were 0.035 in the main channel and 0.120 in the heavily vegetated floodplain.

FLOOD BOUNDARIES

The computed flood profiles for the 2- and 5-year floods were used to delineate flood boundaries (fig. 4) along Bayou Meto and Rocky Branch. Near the mouth of Rocky Branch, where the flood profiles for both streams overlap, the higher of the two was used.

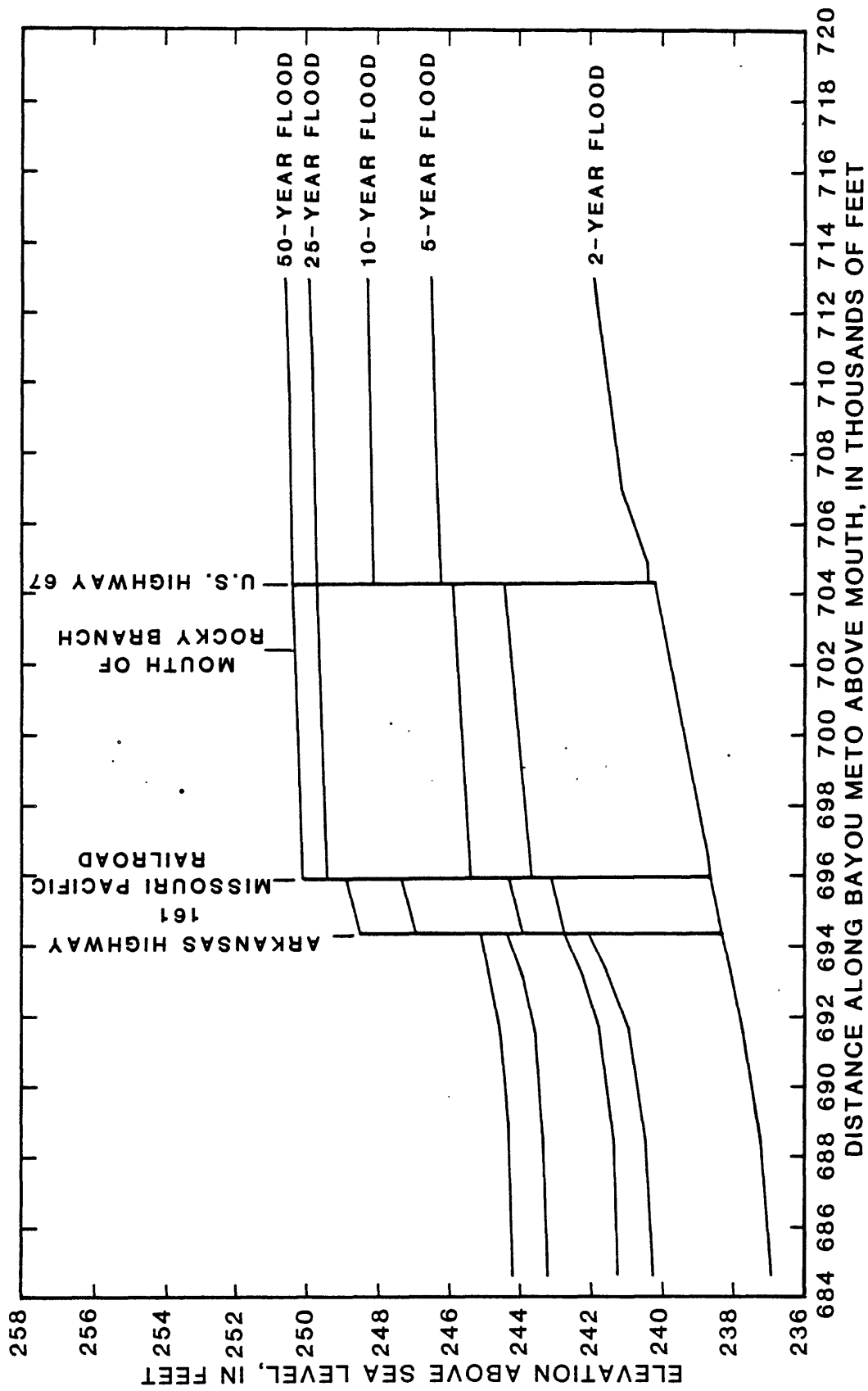


Figure 2.--Water-surface profiles for Bayou Meto, 2-, 5-, 10-, 25-, and 50-year floods.

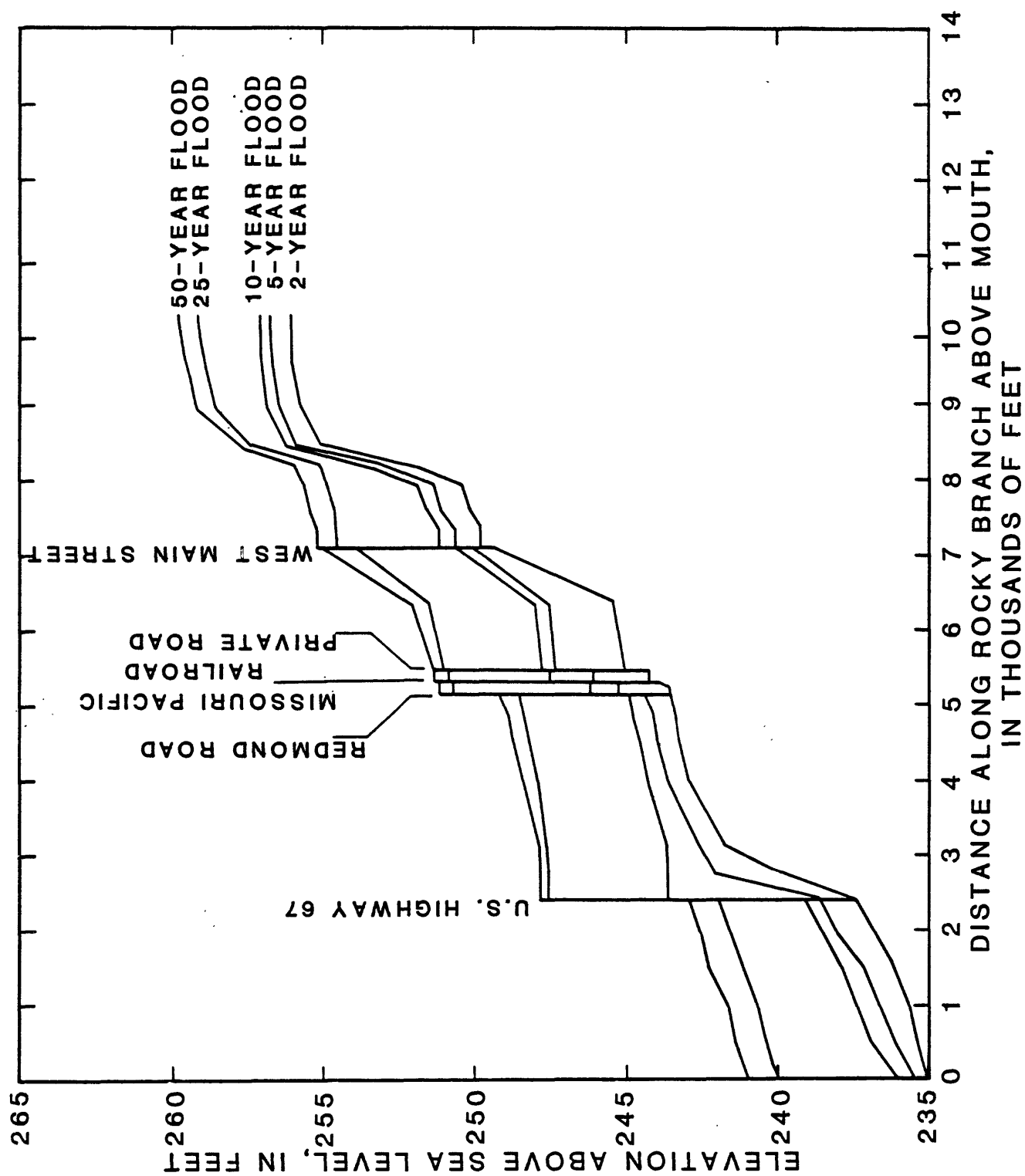


Figure 3.--Water-surface profiles for Rocky Branch, 2-, 5-, 10-, 25-, and 50-year floods.

Table 1.--Summary of backwater profiles on Bayou Meto

[Dashed line in elevation column indicates water surface is above lower part of bridge deck]

Cross- sec- tion	Stream stationing, (feet)	2-year flood		5-year flood		10-year flood		25-year flood		50-year flood	
		discharge (cubic feet per second)	eleva- tion (feet)	discharge (cubic feet per second)	eleva- tion (feet)	discharge (cubic feet per second)	eleva- tion (feet)	discharge (cubic feet per second)	eleva- tion (feet)	discharge (cubic feet per second)	eleva- tion (feet)
1	684,605	2,550	236.9	9,300	240.3	12,100	241.3	19,400	243.2	23,800	244.2
2	688,512	2,550	237.3	9,300	240.4	12,100	241.4	19,400	243.3	23,800	244.3
3	691,680	2,550	237.8	9,300	241.0	12,100	241.8	19,400	243.6	23,800	244.5
4	693,264	2,550	238.1	9,300	241.6	12,100	242.3	19,400	243.9	23,800	244.8
5	694,320	2,550	238.3	9,300	242.0	12,100	242.8	19,400	244.3	23,800	245.1
6	694,320	2,550	238.3	9,300	242.0	12,100	242.8	19,400	244.4	23,800	246.0
7	694,475	2,550	238.4	9,300	242.8	12,100	243.9	19,400	247.0	23,800	248.5
8	695,904	2,550	238.6	9,300	243.1	12,100	244.3	19,400	247.4	23,800	248.9
9	695,904	2,550	238.6	9,300	243.1	12,100	244.3	19,400	247.4	23,800	--
10	696,432	2,610	238.7	9,300	243.7	12,100	245.4	19,400	249.5	23,800	250.1
11	704,352	2,610	240.2	10,500	244.4	13,700	245.9	22,300	249.7	27,500	250.4
12	704,352	2,610	240.2	10,500	244.4	13,700	245.9	22,300	--	27,500	--
13	704,880	2,610	240.4	10,500	246.2	13,700	248.1	22,300	249.7	27,500	250.4
14	706,992	2,610	241.1	10,500	246.3	13,700	248.1	22,300	249.8	27,500	250.4
15	712,800	2,610	241.9	10,500	246.5	13,700	248.2	22,300	249.9	27,500	250.6

Table 2.--Summary of backwater profiles on Rocky Branch

[Dashed line in elevation column indicates water surface is above lower part of bridge deck]

Cross-section	Stream stationing, (feet)	2-year flood		5-year flood		10-year flood		25-year flood		50-year flood	
		discharge (cubic feet per second)	elevation (feet)	discharge (cubic feet per second)	elevation (feet)	discharge (cubic feet per second)	elevation (feet)	discharge (cubic feet per second)	elevation (feet)	discharge (cubic feet per second)	elevation (feet)
1	0	521	235.0	940	235.5	1,230	236.0	4,150	240.0	5,560	241.0
2	500	521	235.4	940	236.1	1,230	236.9	4,150	240.4	5,560	241.4
3	1,000	521	235.7	940	236.4	1,230	237.4	4,150	240.7	5,560	241.7
4	1,500	521	236.1	940	237.2	1,230	237.9	4,150	241.1	5,560	242.1
5	1,950	521	236.8	940	238.0	1,230	238.5	4,150	241.5	5,560	242.5
6	2,400	521	237.6	940	238.7	1,230	239.1	4,150	241.9	5,560	242.9
7	2,400	521	237.6	940	238.7	1,230	239.1	4,150	--	5,560	--
8	2,420	521	237.6	940	238.7	1,230	243.7	4,150	247.6	5,560	247.8
9	2,800	521	240.2	940	242.1	1,230	243.7	4,150	247.6	5,560	247.9
10	3,175	521	241.8	940	242.7	1,230	243.8	4,150	247.7	5,560	248.0
11	3,995	521	243.0	940	243.7	1,230	244.3	4,150	248.0	5,560	248.4
12	4,575	521	243.3	940	244.0	1,230	244.6	4,150	248.2	5,560	248.8
13	4,870	521	243.4	940	244.2	1,230	244.8	4,150	248.4	5,560	249.0
14	5,165	521	243.6	940	244.4	1,230	245.0	4,150	248.6	5,560	249.2
15	5,165	521	243.6	940	244.4	1,230	245.0	4,150	--	5,560	--
16	5,227	521	243.9	940	245.3	1,230	246.2	4,150	250.7	5,560	251.2
17	5,308	521	243.9	940	245.3	1,230	--	4,150	250.7	5,560	251.2
18	5,308	521	243.9	940	245.5	1,230	247.6	4,150	--	5,560	--
19	5,360	521	244.3	940	246.1	1,230	247.6	4,150	250.8	5,560	251.3
20	5,423	521	244.2	940	246.1	1,230	247.6	4,150	250.9	5,560	251.3
21	5,466	521	244.2	940	245.5	1,230	247.6	4,150	250.9	5,560	251.3
22	5,466	521	244.2	940	245.5	1,230	247.6	4,150	--	5,560	--
23	5,596	521	245.1	940	247.4	1,230	247.8	4,150	251.0	5,560	251.4
24	6,352	521	245.5	940	247.6	1,230	248.0	4,150	251.5	5,560	252.0
25	7,108	521	249.4	940	250.2	1,230	250.7	4,150	253.9	5,560	255.0

Table 2.--Summary of backwater profiles on Rocky Branch--Continued

[Dashed line in elevation column indicates water surface is above lower part of bridge deck]

Cross-section	Stream stationing, (feet)	2-year flood		5-year flood		10-year flood		25-year flood		50-year flood	
		discharge (cubic feet per second)	elevation (feet)	discharge (cubic feet per second)	elevation (feet)	discharge (cubic feet per second)	elevation (feet)	discharge (cubic feet per second)	elevation (feet)	discharge (cubic feet per second)	elevation (feet)
26	7,108	521	--	940	--	1,230	--	4,150	--	5,560	--
27	7,380	521	249.8	940	250.7	1,825	251.2	4,150	254.5	5,560	255.3
28	7,599	349	250.1	629	251.1	825	251.6	3,120	254.6	4,240	255.4
29	7,639	349	250.2	629	251.2	825	251.6	3,120	254.6	4,240	255.4
30	7,949	349	250.5	629	251.4	825	251.8	3,120	254.9	4,240	255.7
31	8,204	349	253.0	629	253.2	825	253.4	3,120	255.2	4,240	255.9
32	8,459	349	255.0	629	255.9	825	256.2	3,120	257.3	4,240	257.4
33	8,959	349	255.7	629	256.4	825	256.8	3,120	258.6	4,240	259.2
34	9,409	349	256.0	629	256.6	825	256.9	3,120	258.9	4,240	259.5
35	9,634	349	256.0	629	256.7	825	257.0	3,120	259.0	4,240	259.6
36	9,859	349	256.0	629	256.7	825	257.0	3,120	259.1	4,240	259.7
37	10,259	349	256.0	629	256.7	825	257.1	3,120	259.1	4,240	259.8

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- Patterson, J. L., 1971, Floods in Arkansas, magnitude and frequency characteristics through 1968: Arkansas Geological Commission Water Resources Circular 11, 246 p.
- Barnes, H. H., 1967, Roughness characteristics of natural channels: U.S. Geological Survey Water-Supply Paper 1849, 213 p.

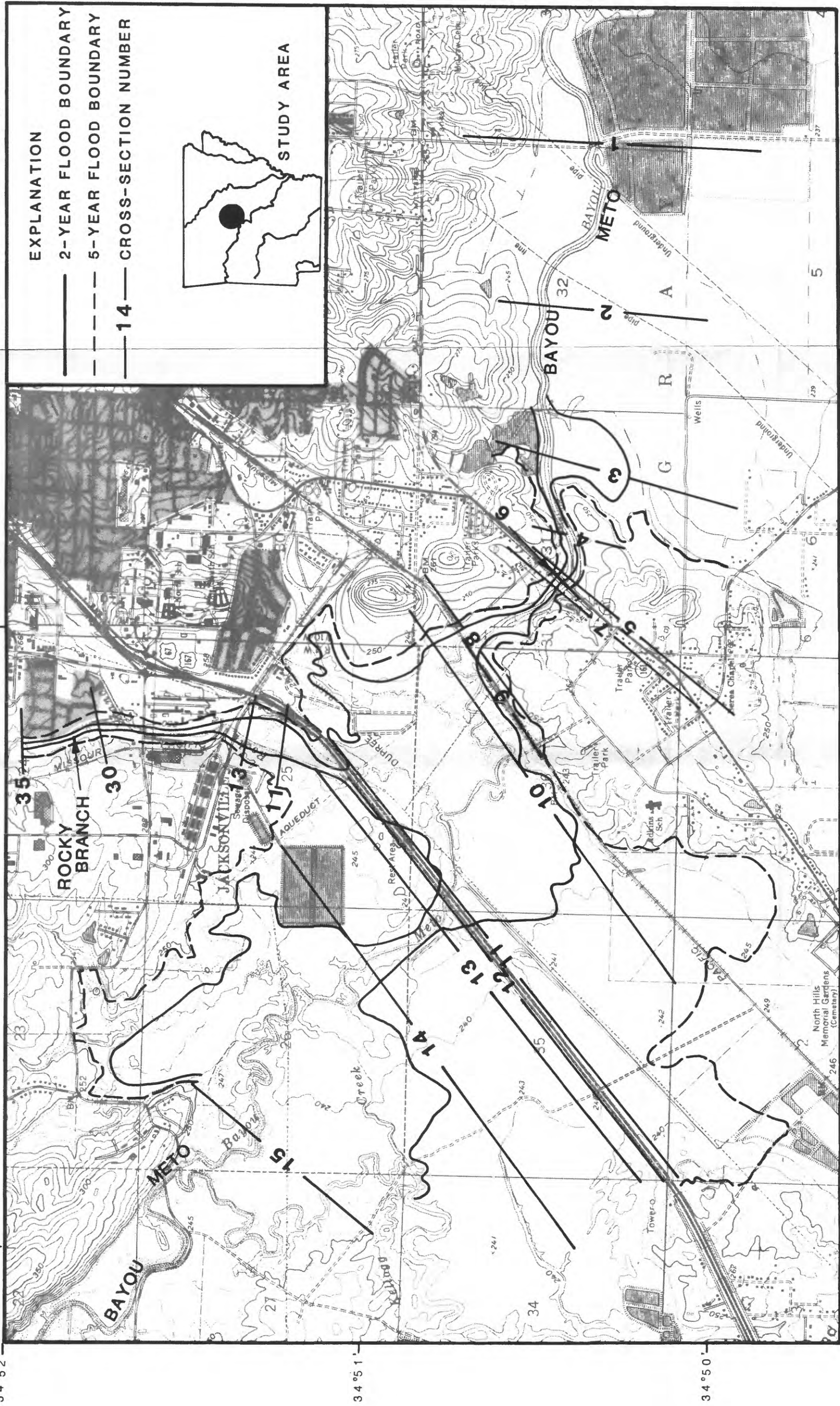


Figure 4.--Flood boundaries for the 2- and 5-year.



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