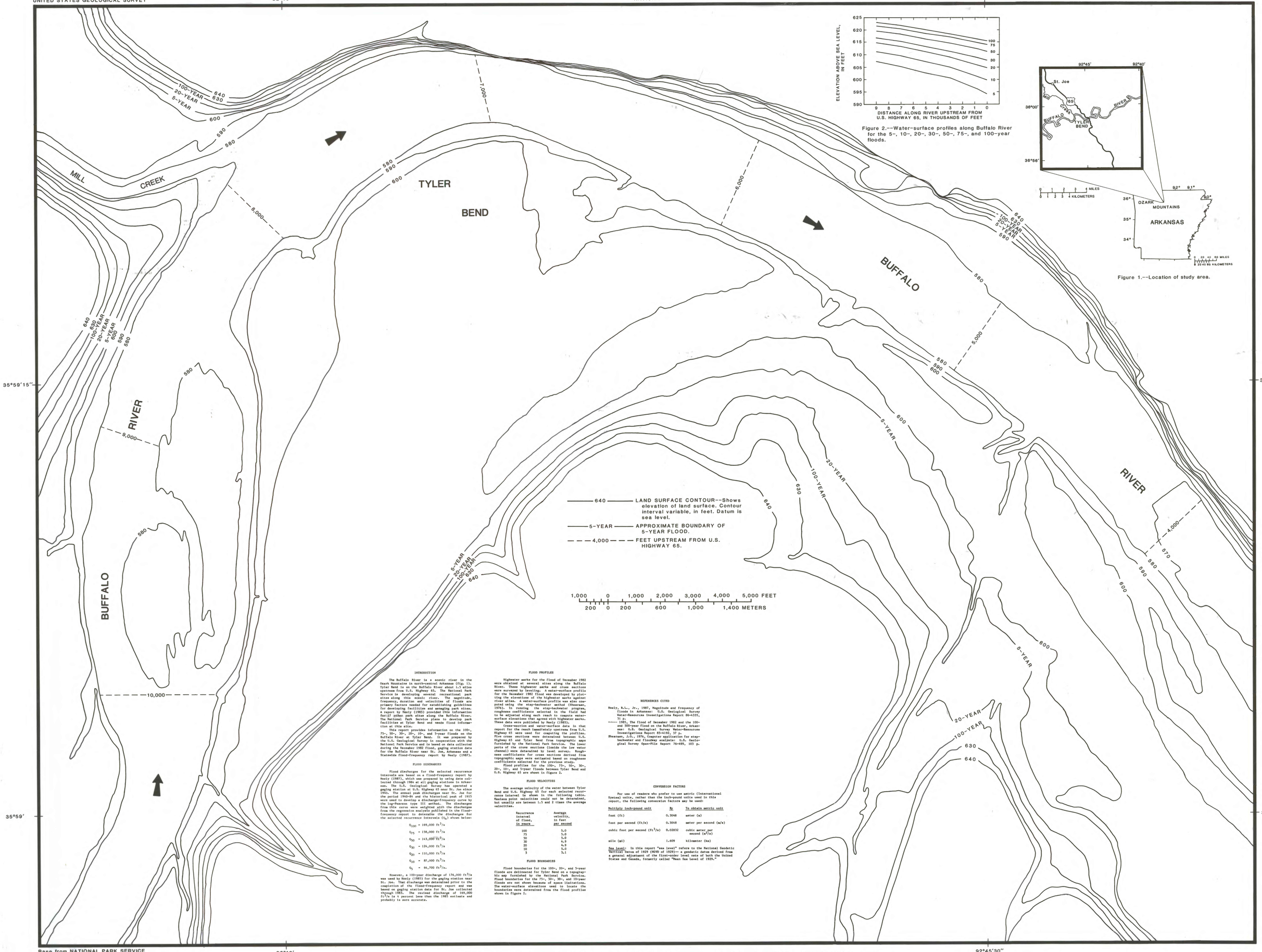
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared in cooperation with the
NATIONAL PARK SERVICE

WATER-RESOURCES INVESTIGATIONS REPORT 87-4180

Figure 2.--Water-surface profiles along Buffalo River for the 5-, 10-, 20-, 30-, 50-, 75-, and 100-year floods.

Figure 1.--Location of study area.



640 LAND SURFACE CONTOUR--Shows elevation of land surface. Contour interval variable, in feet. Datum is sea level.

5-YEAR APPROXIMATE BOUNDARY OF 5-YEAR FLOOD.

4,000 FEET UPSTREAM FROM U.S. HIGHWAY 65.

Base from NATIONAL PARK SERVICE
1:12,000

FLOOD CHARACTERISTICS OF THE BUFFALO RIVER AT TYLER BEND, ARKANSAS

By Braxtel L. Neely, Jr.

INTRODUCTION

The Buffalo River is a scenic river in the Ozark Mountains in north-central Arkansas (fig. 1). Tyler Bend is on the Buffalo River about 1.5 miles upstream from U.S. Highway 65. The National Park Service is developing several recreational park sites along this scenic river. The magnitude, frequency, duration and velocities of floods are primary factors needed for establishing guidelines for developing facilities and managing park sites. A report by Neely (1985) provided this information for 17 other park sites along the Buffalo River. The National Park Service plans to develop park facilities at Tyler Bend and needs flood information at this site.

This report provides information on the 100-, 75-, 50-, 30-, 20-, 10-, and 5-year floods on the Buffalo River at Tyler Bend. It was prepared by the U.S. Geological Survey in cooperation with the National Park Service and is based on data collected during the December 1982 flood, gaging station data for the Buffalo River near St. Joe, Arkansas and a Statewide flood-frequency report by Neely (1987).

FLOOD DISCHARGES

Flood discharges for the selected recurrence intervals are based on a flood-frequency report by Neely (1987), which was prepared by using data collected through 1985 at all gaging stations in Arkansas and 1986 at Geological Survey gaging station at U.S. Highway 65 near St. Joe since 1940. The annual peak discharges near St. Joe for the period 1940-86 and the historical peak of 1915 were used to develop a discharge-frequency curve by the log-Pearson type III method. The discharges from this curve were weighted with the discharges from the regression analysis published in the flood-frequency report to determine the discharges for the selected recurrence intervals (Q_T) shown below:

Q_{100} = 169,000 ft^3/s

Q_{75} = 158,000 ft^3/s

Q_{50} = 143,000 ft^3/s

Q_{30} = 124,000 ft^3/s

Q_{20} = 110,000 ft^3/s

Q_{10} = 87,000 ft^3/s

Q_5 = 64,700 ft^3/s.

However, a 100-year discharge of 176,000 ft^3/s was used by Neely (1985) for the gaging station near St. Joe. That discharge was determined prior to the completion of the flood-frequency report and was based on gaging station data for St. Joe collected through 1983. The revised discharge of 169,000 ft^3/s is 4 percent less than the 1985 estimate and probably is more accurate.

FLOOD PROFILES

Highwater marks for the flood of December 1982 were obtained at several sites along the Buffalo River. These highwater marks and cross sections were surveyed by leveling. A water-surface profile for the December 1982 flood was developed by plotting the elevations of the highwater marks against river miles. A water-surface profile was also computed using the step-backwater method (Shearman, 1976). In running the step-backwater program, roughness coefficients selected in the field had to be adjusted along each reach to compute water-surface elevations that agreed with highwater marks. These data were published by Neely (1985).

Cross-section and water-surface data in that report for the reach immediately upstream from U.S. Highway 65 were used for computing the profiles. Five cross sections were determined between U.S. Highway 65 and Tyler Bend from topographic maps furnished by the National Park Service. The lower parts of the cross sections (inside the low water channel) were determined by level survey. Roughness coefficients for cross sections derived from topographic maps were estimated based on roughness coefficients selected for the previous study.

Flood profiles for the 100-, 75-, 50-, 30-, 20-, 10-, and 5-year floods between Tyler Bend and U.S. Highway 65 are shown in figure 2.

FLOOD VELOCITIES

The average velocity of the water between Tyler Bend and U.S. Highway 65 for each selected recurrence interval is shown in the following table. Maximum point velocities could not be determined, but usually are between 1.5 and 2 times the average velocities.

Recurrence interval of flood, in years	Average velocity, in feet per second
100	5.0
75	5.0
50	5.0
30	4.9
20	4.9
10	5.0
5	5.1

FLOOD BOUNDARIES

Flood boundaries for the 100-, 20-, and 5-year floods are delineated for Tyler Bend on a topographic map furnished by the National Park Service. Flood boundaries for the 75-, 50-, 30-, and 10-year floods are not shown because of space limitations. The water-surface elevations used to locate the boundaries were determined from the flood profiles shown in figure 2.

REFERENCES CITED

Neely, B.L., Jr., 1987, Magnitude and frequency of floods in Arkansas: U.S. Geological Survey Water-Resources Investigations Report 86-4335, 51 p.

———— 1985, The flood of December 1982 and the 100- and 500-year flood on the Buffalo River, Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4192, 37 p.

Shearman, J.O., 1976, Computer application for step-backwater and floodway analysis: U.S. Geological Survey Open-File Report 76-499, 103 p.

CONVERSION FACTORS

For use of readers who prefer to use metric (International System) units, rather than the inch-pound units used in this report, the following conversion factors may be used:

Multiply inch-pound unit	By	To obtain metric unit
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)

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Mean Sea Level of 1929."