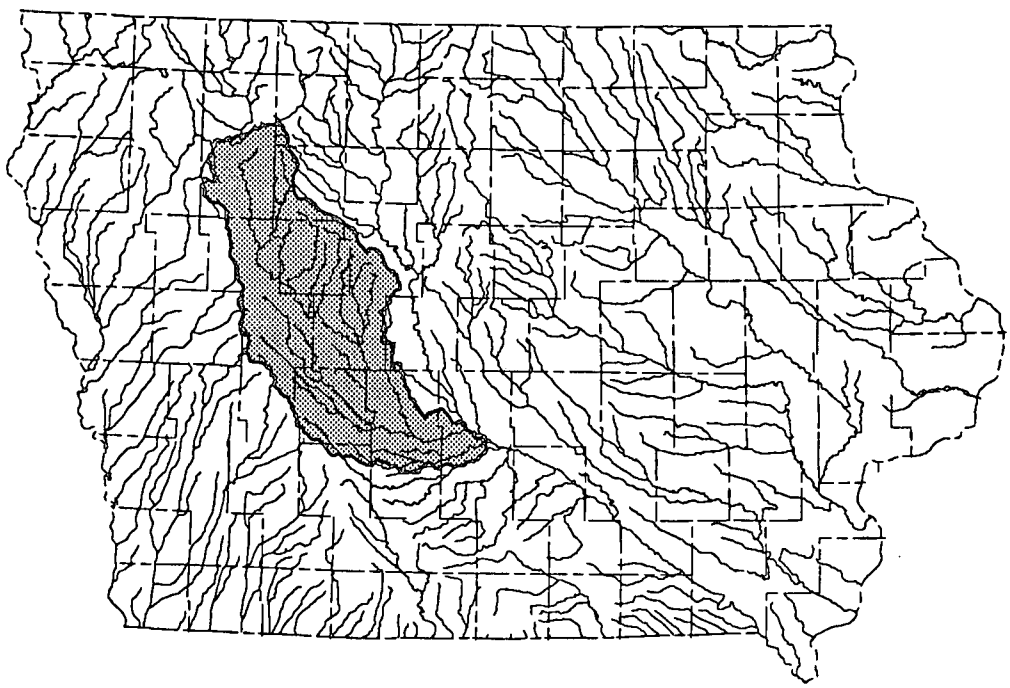
FLOODS OF 1986 AND 1990 IN THE RACCOON RIVER BASIN, WEST-CENTRAL IOWA

U.S. GEOLOGICAL SURVEY
Open-File Report 92-94



Prepared in cooperation with the
HIGHWAY RESEARCH ADVISORY BOARD,
HIGHWAY DIVISION, IOWA DEPARTMENT
OF TRANSPORTATION
(Research Project HR-140)

FLOODS OF 1986 AND 1990 IN THE RACCOON RIVER BASIN, WEST-CENTRAL IOWA

By Robert W. Baebenroth and Bryan D. Schaap

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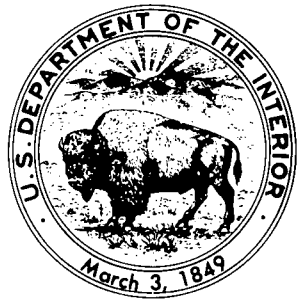

Iowa City, Iowa
1992

U.S. DEPARTMENT OF THE INTERIOR

MANUEL LUJAN, JR., Secretary

U.S. GEOLOGICAL SURVEY

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	*By*	*To obtain*
	Length	
inch (in.)	25.40	millimeter
foot (ft)	0.3048	meter
yard (yd)	0.9144	meter
mile (mi)	1.609	kilometer
	Area	
square foot (ft^2)	0.09290	square meter
acre	4,047	square meter
acre	0.4047	square hectometer
acre-foot per year (acre-ft/yr)	1,233	cubic meter per year
square mile (mi^2)	2.590	square kilometer
	Volume	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
cubic foot per second per square mile [$(ft^3/s)/mi^2$)	0.01093	cubic meter per second per square kilometer
	Mass	
ton, short (2,000 pounds)	0.9072	megagram
ton per acre (ton/acre)	2.241	megagram per square hectometer

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

FLOODS OF 1986 AND 1990 IN THE RACCOON RIVER BASIN, WEST-CENTRAL IOWA

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ABSTRACT

Water-surface-elevation profiles and peak discharges for the floods of 1973 and 1979 are compared to those of 1986 and 1990 in the Raccoon River basin, west-central Iowa. The profiles illustrate the 1979 and 1986 floods on the Raccoon, South Raccoon, and Middle Raccoon Rivers, the 1973 and 1986 floods on Walnut Creek, and the 1986 flood on Willow Creek and Mosquito Creek. The 1986 flood is the largest on record at U.S. Geological Survey streamflow-gaging stations on the Middle Raccoon River tributary at Carroll, Middle Raccoon River near Bayard, Middle Raccoon River at Panora, and Walnut Creek at Des Moines. The 1990 flood discharge is the largest on record at U.S. Geological Survey crest-stage gaging stations on Hardin Creek near Farlin and on East Fork Hardin Creek near Churdan. The flood history given in this report describes rainfall conditions for floods that occurred during 1986 and 1990. Discharge for the 1990 flood on East Fork Hardin Creek near Churdan was 1.01 times larger than the 100-year recurrence-interval discharge.

INTRODUCTION

Evaluation of flood hazards and the planning, design, and operation of various structures on flood plains require information about floods. Flood reports supply specific information for selected floods and are used by planners and engineers to evaluate the magnitude and frequency of floods in a river basin.

Purpose and Scope

This report primarily provides information on flood stages and discharges, flood magnitude and frequency, and bench-mark and reference-point data for the 1986 and 1990 floods that occurred in the Raccoon River basin. It also presents water-surface-elevation profiles for the 1973, 1979, and 1986 floods. The 1973 profile is for 3 mi on Walnut Creek. The 1979 profiles are for 29 mi on the Raccoon River, 25 mi on the South Raccoon River, and 48 mi on the Middle Raccoon River. The 1986 profiles are for 29 mi on the Raccoon River, 20 mi on the South Raccoon River, 48 mi on the Middle Raccoon River, 14 mi on Walnut Creek, 9 mi on Mosquito Creek, and 3 mi on Willow Creek. The flood history describes rainfall conditions for floods that occurred during 1986 and 1990.

A report by Heinitz (1980), "Floods in the Raccoon River Basin, Iowa," provides information on flooding that occurred in the basin prior to and during 1979. Some of the information presented in the 1980 report is also included in this report for comparison.

Acknowledgments

This report is prepared in cooperation with the Highway Research Advisory Board, Highway Division, Iowa Department of Transportation. Various Federal, State, and local agencies cooperated in the collection of streamflow data used in this report, acknowledgment of which is contained in the annual water-data reports of the U.S. Geological Survey (USGS).

STUDY AREA

The Raccoon River basin is located in west-central Iowa, and the Raccoon River flows into the Des Moines River within the city of Des Moines (figs. 1 and 2). The basin is located entirely within Iowa, drains 3,629 mi^2, and includes parts of 17 counties. Three major rivers in the basin, the North, Middle, and the South Raccoon Rivers, flow generally northwest to southeast and converge west of the city of Van Meter to form the Raccoon River.

The Middle Raccoon River marks the southernmost advance of the Wisconsin glacier during the last period of glaciation in Iowa, which ended about 14,000 years ago (Ruhe, 1969). North of the Middle Raccoon River, the larger part of the Raccoon River basin has an immature topography with an ill-defined

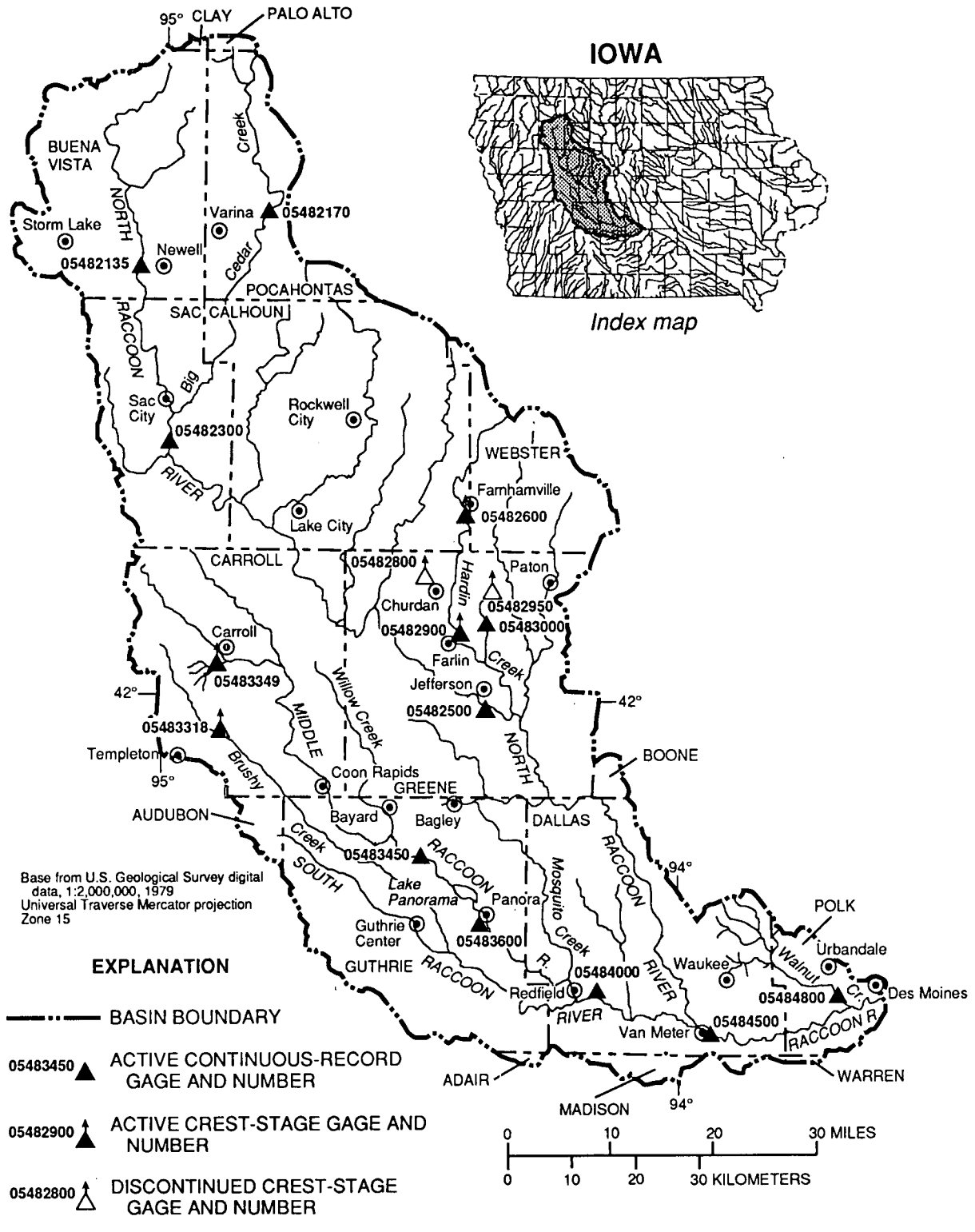

Figure 1. Location of active and discontinued U.S. Geological Survey streamflow-gaging stations in the Raccoon River basin.

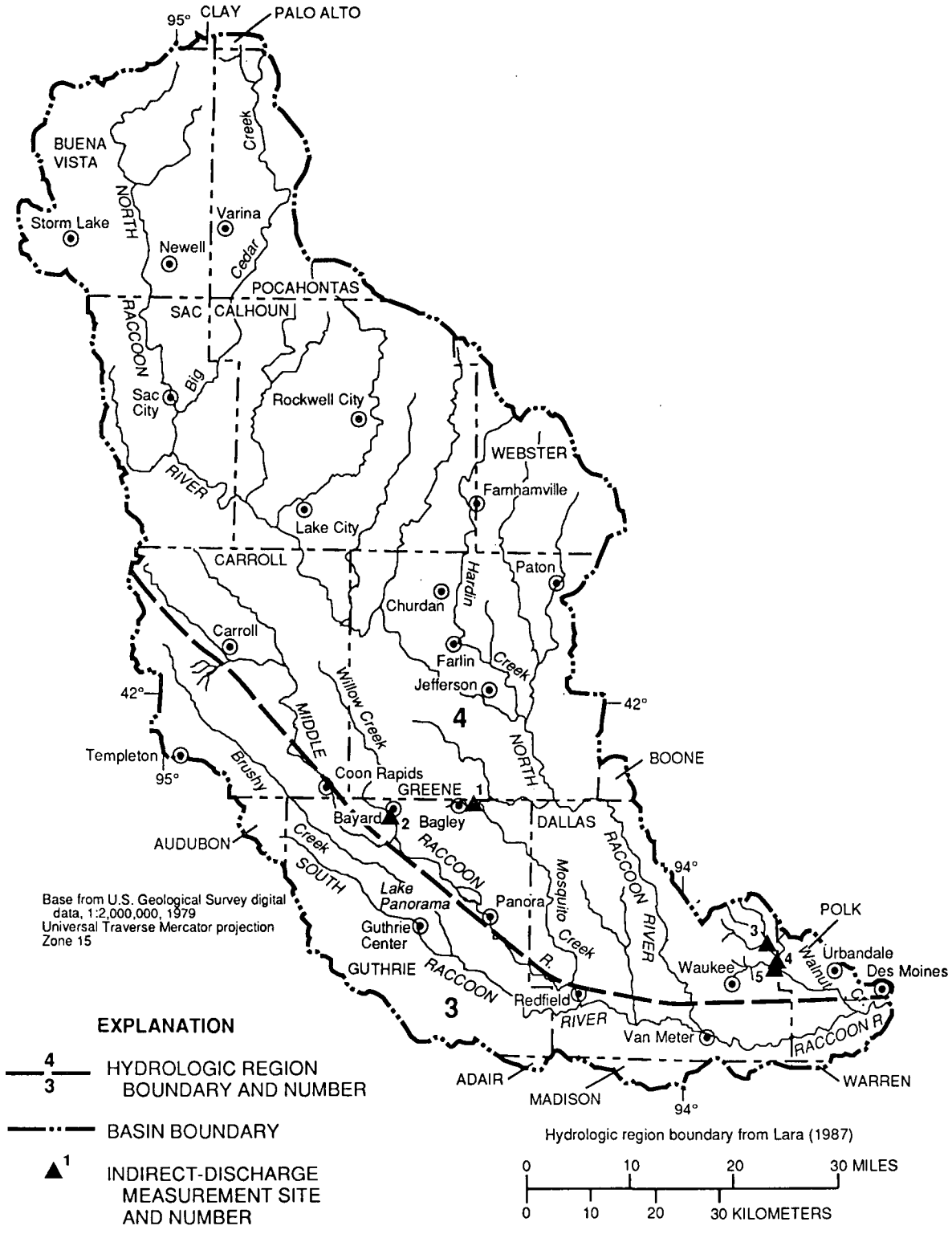

Figure 2. Location of hydrologic regions and indirect-discharge measurement sites in the Raccoon River basin.

drainage system. The level terrain is characterized by ponds and marshes without drainage outlets, and the small streams are shallow and sluggish. In the smaller part of the basin south of the Middle Raccoon River, the topography is well-developed, the streams are much more graded, and the uplands are well-drained (Lara, 1987). In the basin, land is used primarily for agriculture.

Mean annual precipitation (1951-80) for the Raccoon River basin varies from 29.1 in. in the upper part of the basin to 30.8 in. in the lower part (Harry Hillaker, State Climatologist, oral commun., July 1991). Records of the USGS show that the mean annual runoff in the basin varies from 5.6 in. at the USGS streamflow-gaging station on the Raccoon River at Van Meter to 10.5 in. at the USGS streamflow-gaging station on Walnut Creek at Des Moines.

HYDROLOGIC DATA

Gaging-station records are the primary source of data for analyzing and understanding the flood hydrology of a river basin. Flood information is obtained from complete-record gaging stations which provide a continuous chronology of streamflow, and from partial-record, crest-stage gaging stations, which provide a chronology of annual peak flows. The location of the active and discontinued USGS gaging stations used in this report is shown in figure 1. Specific location, annual peak stages and discharges, and other information pertaining to these gaging stations in the Raccoon River basin are given in Appendix 1. Supplemental flood information also is obtained from indirect-discharge measurement sites, which provide streamflow data at sites where gaged data are not available. The location of the indirect-discharge measurement sites used in this report is shown in figure 2. Specific location for these sites and flood-peak discharges computed from indirect-streamflow measurements are given in table 1. Discharge records for these gaging stations and indirect-discharge measurement sites are published in the annual water-data reports of the USGS (U.S Geological Survey 1907-60, 1961-90).

The computation of discharge records at a gaging station is dependent upon the development of a relation between water-surface elevations (stages) and the corresponding flow rates (discharges). The high-water part of the stage-discharge relation, or rating curve as it is sometimes called, generally remains stable if the channel downstream from the gaging station remains unchanged. Changes in the stage-discharge relation occur from time to time, either gradually or abruptly, due to changes in the river channel that result from scour, deposition, or the growth of vegetation (Rantz and others, 1982, p. 328-360).

FLOOD HISTORY

For a more complete representation of the 1979 and prior floods in the Raccoon Basin, the reader is referred to the report, "Floods in the Raccoon River Basin, Iowa," (Heinitz, 1980). A report by Carpenter and Appel (1966) presents water-surface profiles and rating curves for a 4-mi reach of the Raccoon River upstream from the mouth. The purpose of the 1966 study was to show the effect on water-surface profiles of raising the Fleur Drive roadway in Des Moines.

The location of active and discontinued USGS streamflow-gaging stations used in this report are shown in figure 1. Continuous records of streamflow have been collected since 1915 at the USGS streamflow-gaging station on the Raccoon River at Van Meter (station number 05484500). Selected discharges and recurrence intervals for each of the major floods described in this section and maximum known flood-peak discharges for each gaging station are listed in table 2. Known flood peaks at indirect-discharge measurement sites are listed in table 1, and the location of these sites is shown in figure 2. Graphs of the annual peak discharges are shown in figures 3-16. The graphs illustrate that the 1986 and 1990 flood peaks are among the largest on record for these gaging stations.

Flood of May 10, 1986

During the evening of May 9, 1986, severe thunderstorms, intense rainfall, and flash flooding were reported in parts of Polk and Dallas Counties. The most intense local storm of the month occurred on this evening when 6.09 in. of rain fell in about 2 1/2 hours at Waukee in the headwaters of the Walnut Creek

Table 1. *Flood-peak discharges at miscellaneous, indirect-discharge measurement sites in the Raccoon River basin*

[mi^2, square mile; ft^3/s, cubic foot per second; $(ft^3/s)/mi^2$, cubic foot per second per square mile]

Site number (fig. 2)	Stream	Location	Drainage area (mi^2)	Date	Discharge (ft^3/s)	Unit runoff [$(ft^3/s)/mi^2$]
1	Mosquito Creek near Bagley	Lat 41°51'15", long 94°24'21", in SE1/4 sec. 1, T. 81N., R. 31W., Guthrie County, at bridge on county road, about 1 mi northeast of Bagley.	33[a]	06-29-86	7,880	239
2	Willow Creek at Bayard	Lat 41°50'33", long 94°33'40", in NE1/4 sec. 10, T. 81N., R. 32W., Guthrie County, at bridge on county road N70, about 0.25 mi south of Bayard.	100[a]	06-29-86	6,200	62
3	Walnut Creek tributary near Grimes	Lat 41°39'41", long 93°51'09", in SW1/4 sec.11, T. 79N, R. 26W., Dallas County, at culvert on county road, about 3 mi southwest of Grimes.	12.2	05-10-86	3,770	309
4	Walnut Creek near Urbandale	Lat 41°38'38", long 93°49'28", in NW1/4 sec. 24, T. 79N, R. 26W., Dallas County, at bridge on Meredith Road extended, about 4 mi west of Urbandale.	30.0	05-10-86	7,840	261
5	Little Walnut Creek near Urbandale	Lat 41°38'00", long 93°50'00", in SW1/4 sec. 24, T. 79N, R. 26W., Dallas County, at bridge on county road, about 5 mi west of Urbandale.	11.8	05-10-86	5,840	495

[a]Approximate.

basin (National Oceanic and Atmospheric Administration, 1986). The storm was reported to be very intense and slow moving. As a result, the USGS streamflow-gaging station on Walnut Creek at Des Moines recorded the largest peak on record at that site on May 10, 1986. This flood had an approximate recurrence interval of 35 years (table 2).

Peak discharges were obtained by indirect methods at three locations in the basin for this storm (table 1). The three sites are located in the upper part of the Walnut Creek basin (fig. 2). The discharges and unit runoffs listed in table1 indicate the magnitude of the storm. The relation between these discharges and the 100-year flood-discharge curves for specific drainage areas in hydrologic regions 3 and 4 is illustrated in figure 17.

Flood of June 29-July 1, 1986

Reported rainfall amounts of 8 to 12 in. occurred in central and north-central Iowa during June 28-30, 1986, primarily in the headwaters of the Middle Raccoon River basin (National Oceanic and Atmospheric Administration, 1986). As a result, record flood peaks were recorded at the USGS gaging stations on the Middle Raccoon River tributary at Carroll and along the main stem of the Middle Raccoon River at Bayard and Panora. The record discharge at Carroll had a 73-year recurrence interval (table 2).

Table 2. *Selected flood-peak discharges, recurrence intervals, and unit runoff at active and discontinued streamflow-gaging stations in the Raccoon River basin*

[mi^2, square mile; ft^3/s, cubic foot per second; $(ft^3/s)/mi^2$, cubic foot per second per square mile; *, maximum flood-peak discharge known for site; --, insufficient record to compute discharge or flood frequency using Bulletin 17B (Interagency Advisory Committee on Water Data, 1981) or unit runoff]

Station number (fig. 1)	Station name and location	Period of flood record[a]	Drainage area (mi^2)	Date	Gage height (feet)[b]	Discharge (ft^3/s)	Recurrence interval (years)[c]	Unit runoff [$(ft^3/s)/mi^2$]
05482135	North Raccoon River near Newell	1983-90	233	06-21-83	16.30	2,450	--	10.5
				06-17-84	16.73	*2,850	--	12.2
05482170	Big Cedar Creek near Varina	1960-90	80.0	08-31-62	13.68	*2,080	18	26.0
				03-24-79	16.29	2,050	17	25.6
05482300	North Raccoon River near Sac City	1954, 1958-90	700	09-01-62	18.12	10,800	12	15.4
				03-23-79	18.02	*13,100	21	18.7
05482500	North Raccoon River near Jefferson	1940-90	1,619	06-23-47	22.3	*29,100	100	18.0
				06-22-54	19.52	21,300	24	13.2
				03-31-60	19.43	18,600	15	11.5
				06-19-90	18.61	18,400	15	11.4
05482600	Hardin Creek at Farnhamville	1952-90	43.7	08-26-54	10.48	*2,000	29	45.8
				06-16-90	10.39	1,980	28	45.3
05482800	Happy Run at Churdan	1951-89	7.58	06-13-67	9.37	--	--	--
05482900	Hardin Creek near Farlin	1951-90	101	03-19-79	12.69	2,330	25	23.1
				06-16-90	12.89	*2,470	31	24.5
05482950	East Fork Hardin Creek near Paton	1952-55	7.57	03-24-53	7.77	68	--	8.98
05483000	East Fork Hardin Creek near Churdan	1952-90	24.0	06-30-86	10.78	737	95	30.7
				06-17-90	10.20	*754	1.01[d]	31.4
05483318	Brushy Fork Creek near Templeton	1966-90	45.0	06-23-74	90.96	*5,330	--	118
				06-16-90	90.58	--	--	--

Table 2. *Selected flood-peak discharges, recurrence intervals, and unit runoff at active and discontinued streamflow-gaging stations in the Raccoon River basin*--Continued

Station number (fig. 1)	Station name and location	Period of flood record[a]	Drainage area (mi^2)	Date	Gage height (feet)[b]	Discharge (ft^3/s)	Recurrence interval (years)[c]	Unit runoff [$(ft^3/s)/mi^2$]
05483349	Middle Raccoon River tributary at Carroll	1966-90	6.58	06-29-86	24.81	*3,350	73	509
				08-12-87	24.68	3,130	59	476
				06-13-90	23.97	1,580	11	240
05483450	Middle Raccoon River near Bayard	1979-90	375	06-30-86	24.70	*12,300	18	32.8
				06-17-90	23.23	9,570	9	25.5
05483600	Middle Raccoon River[e] at Panora	1953, 1958-90	440	06-10-53	14.3	14,000	27	31.8
				05-19-74	14.80	14,000	27	31.8
				06-30-86	15.50	*15,300	40	34.8
05484000	South Raccoon River at Redfield	1940-90	994	07-02-58	29.04	*35,000	1.08[d]	35.2
				07-01-86	25.15	26,300	30	26.5
				06-16-90	19.05	19,100	8	19.2
05484500	Raccoon River at Van Meter	1915-90	3,441	06-13-47	21.37	*41,200	38	12.0
				07-01-86	22.69	40,200	34	11.7
				06-16-90	21.39	34,600	18	10.1
05484800	Walnut Creek at Des Moines	1972-90	78.4	05-10-86	18.32	*12,500	35	159
				06-16-90	18.00	7,780	12	99.2

[a] Water years (Oct. 1-Sept. 30) listed in Appendix 1 with flood peaks.

[b] Gage datum in sea level for continuous-record streamflow-gaging stations is listed in Appendix 1.

[c] Flood frequency computed using Bulletin 17B (Interagency Advisory Committee on Water Data, 1981).

[d] Ratio of flood discharge to that of the 100-year flood, Bulletin 17B (Interagency Advisory Committee on Water Data, 1981).

[e] Flood frequency computed using the combined unregulated and regulated period of record. Flow became regulated by Lake Panorama in 1970.

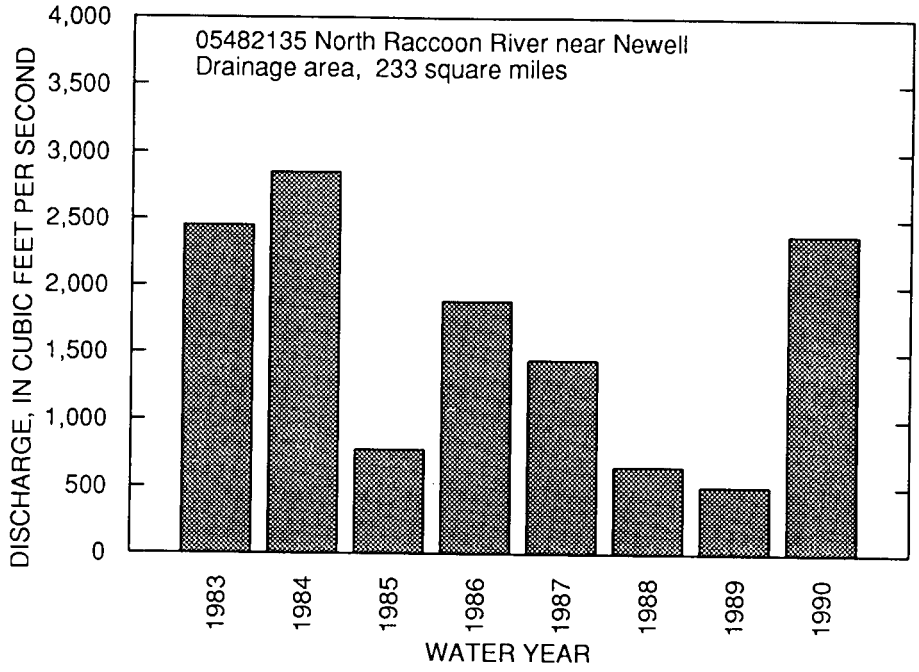

Figure 3. Annual peak discharges for period of record for North Raccoon River near Newell gaging station.

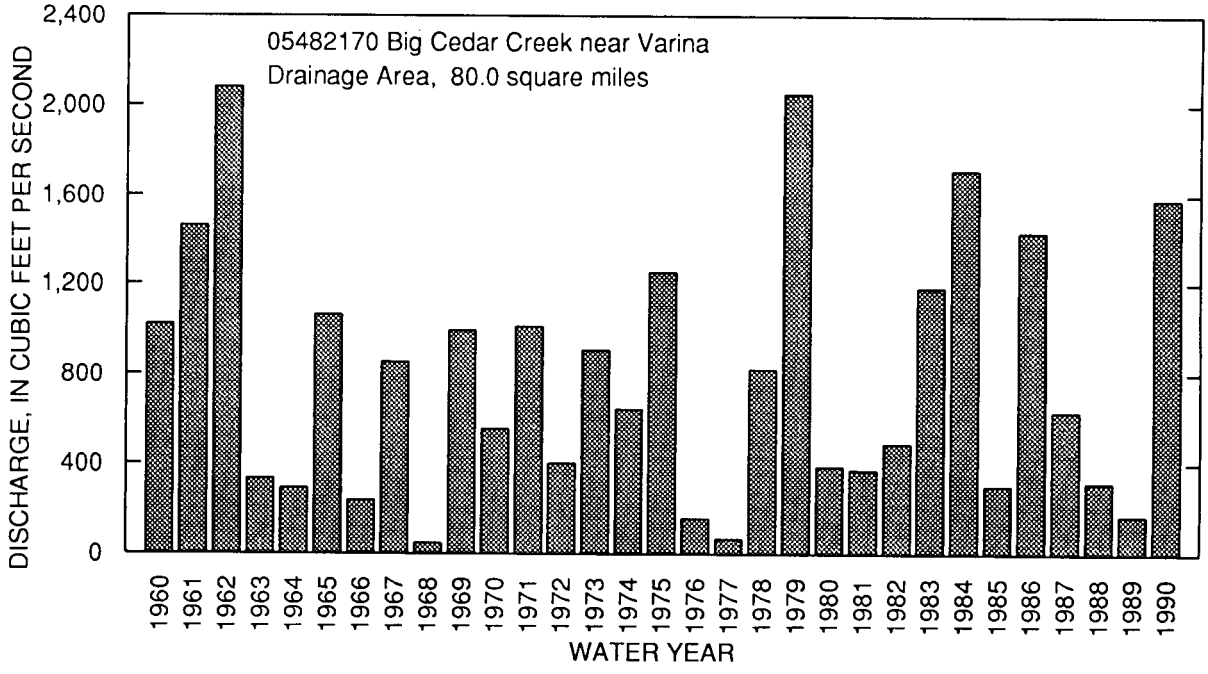

Figure 4. Annual peak discharges for period of record for Big Cedar Creek near Varina gaging station.

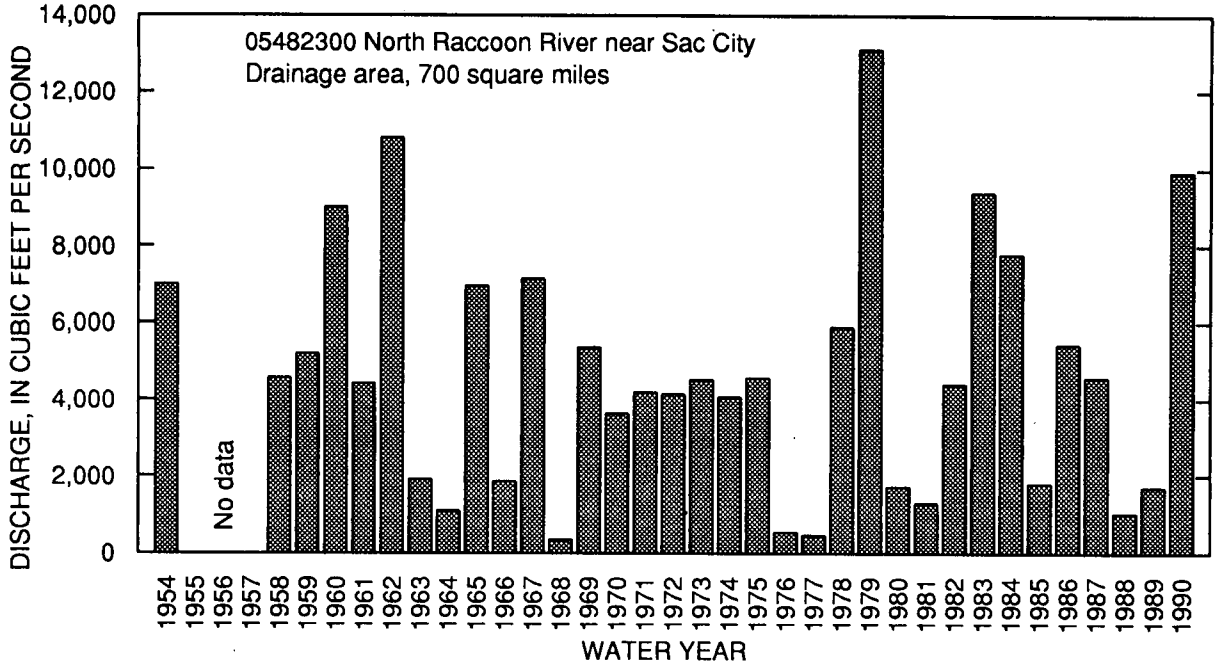

Figure 5. Annual peak discharges for period of record for North Racoon River near Sac City gaging station.

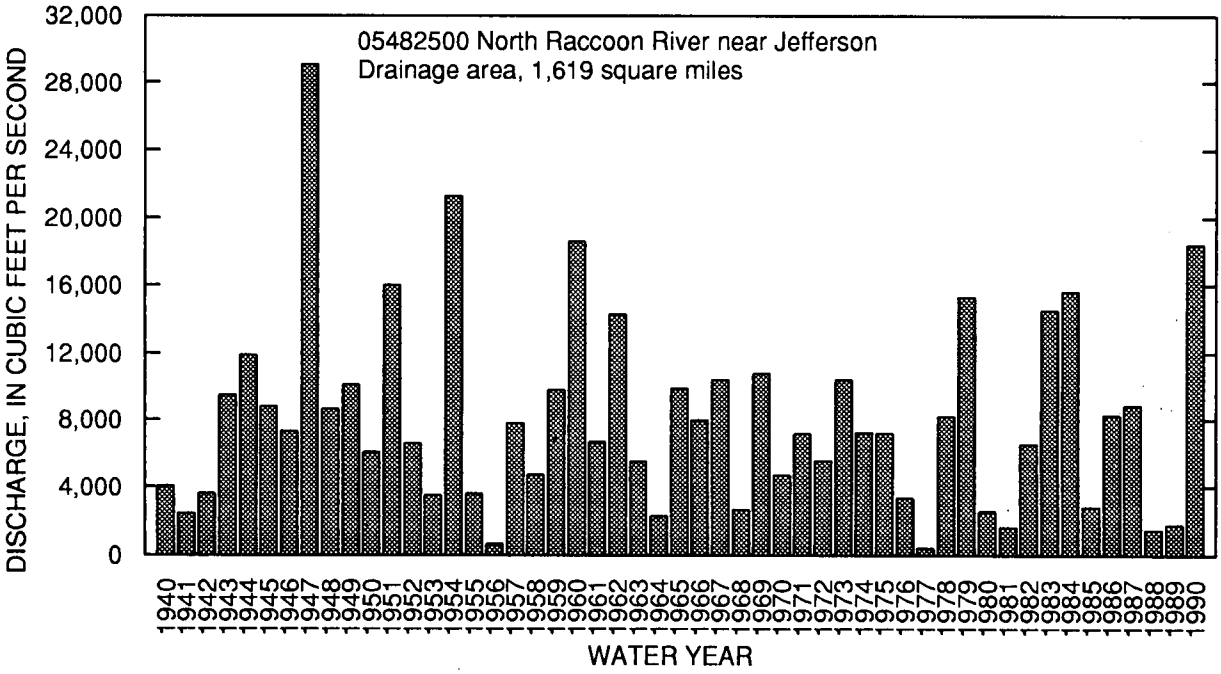

Figure 6. Annual peak discharges for period of record for North Raccoon River near Jefferson gaging station.

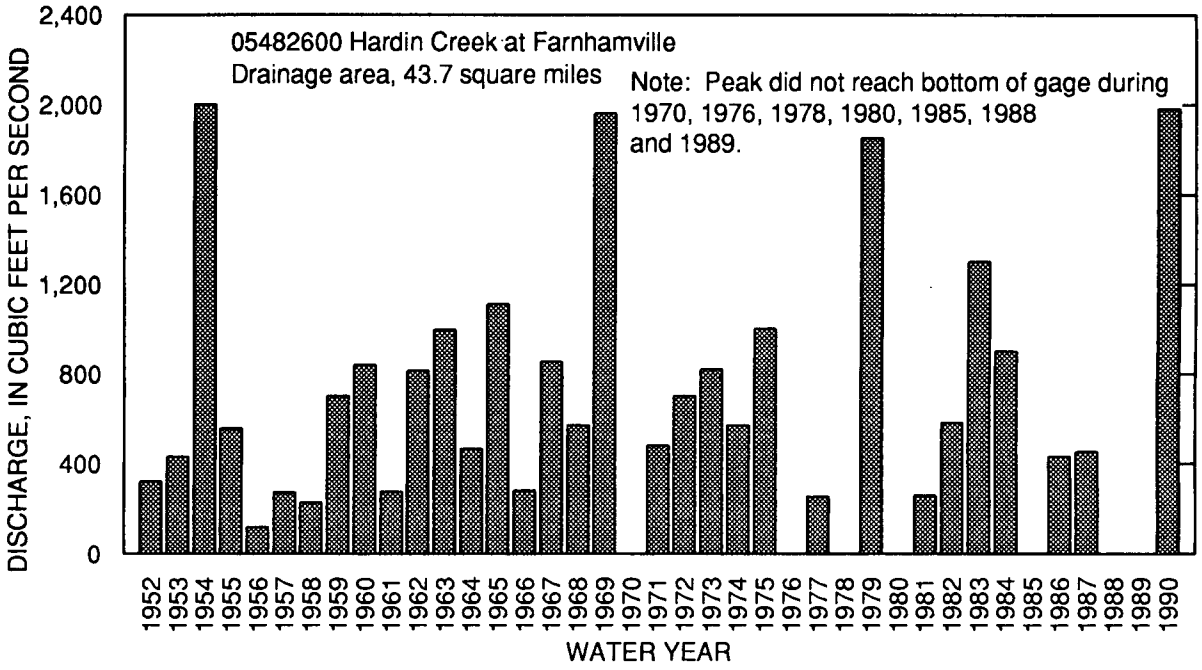

Figure 7. Annual peak discharges for period of record for Hardin Creek at Farnhamville crest-gage station.

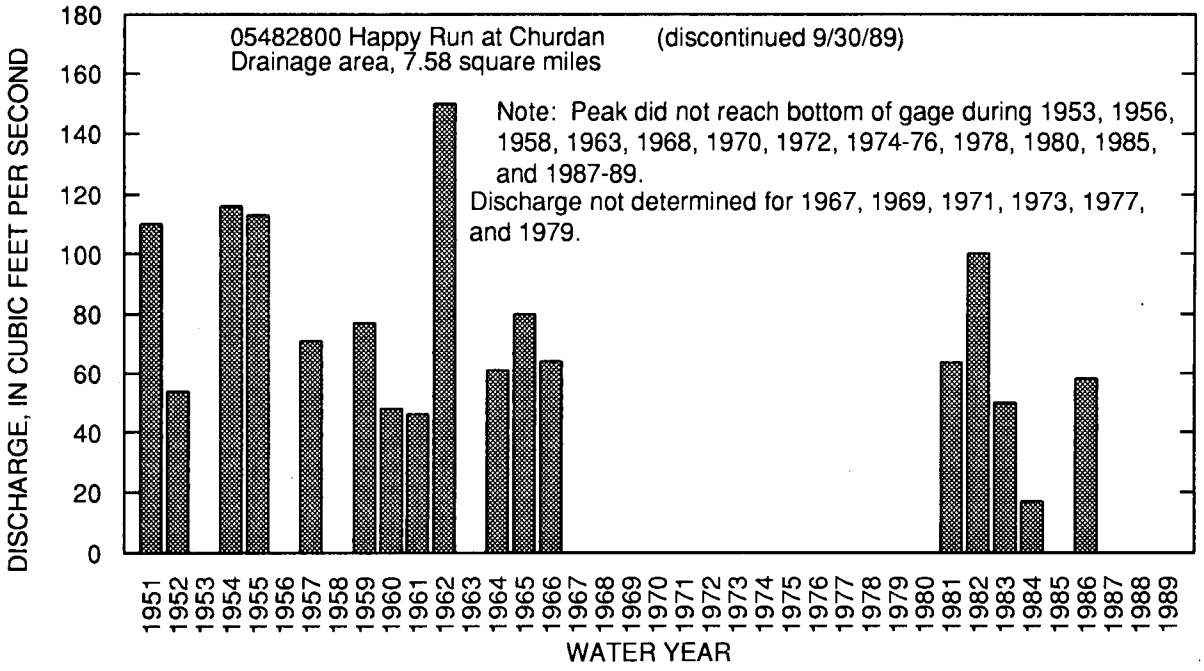

Figure 8. Annual peak discharges for period of record for Happy Run at Churdan crest-gage station.

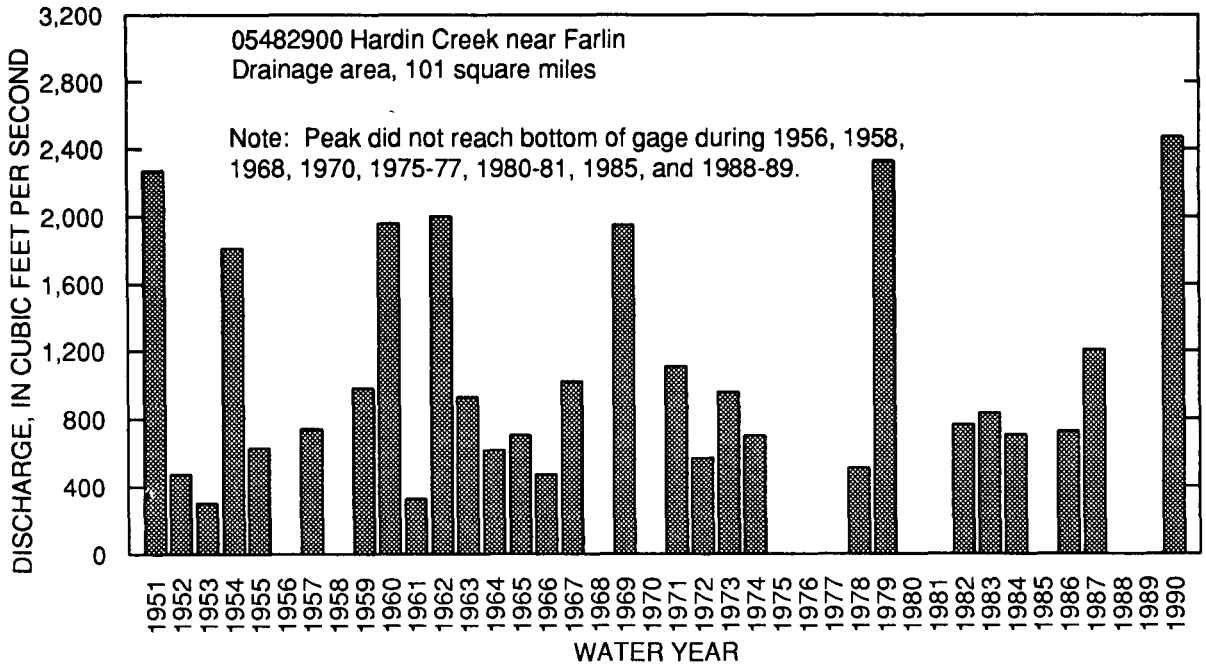

Figure 9. Annual peak discharges for period of record for Hardin Creek near Farlin crest-gage station.

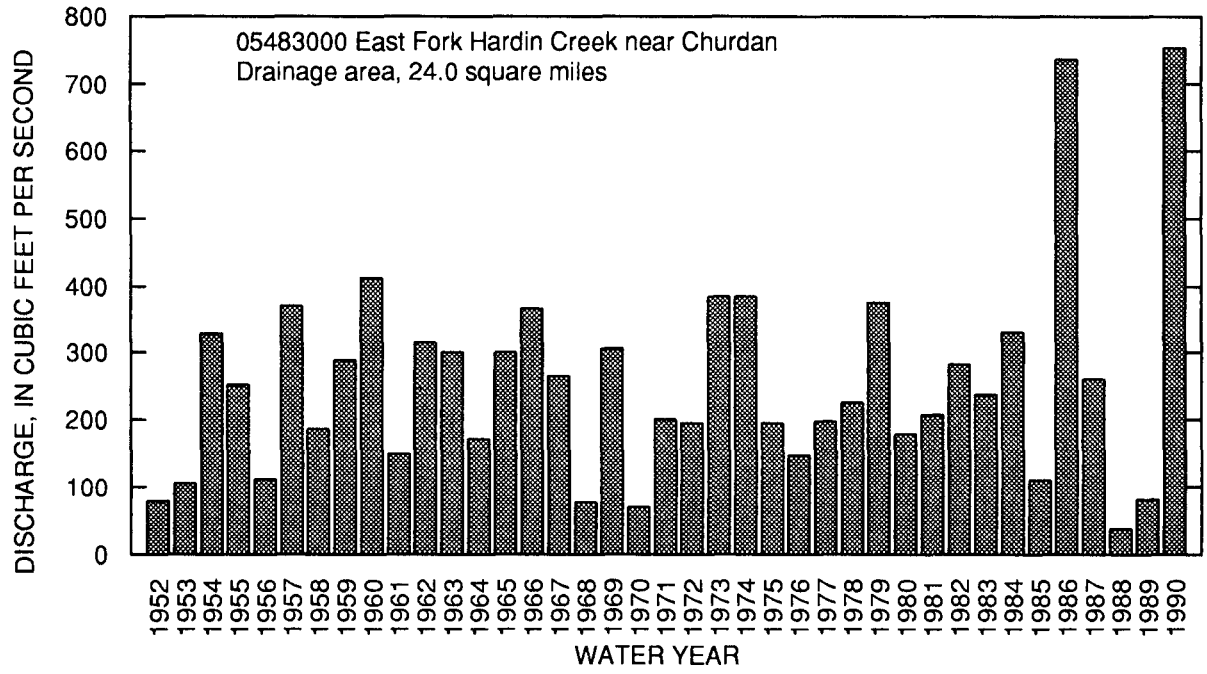

Figure 10. Annual peak discharges for period of record for East Fork Hardin Creek near Churdan gaging station.

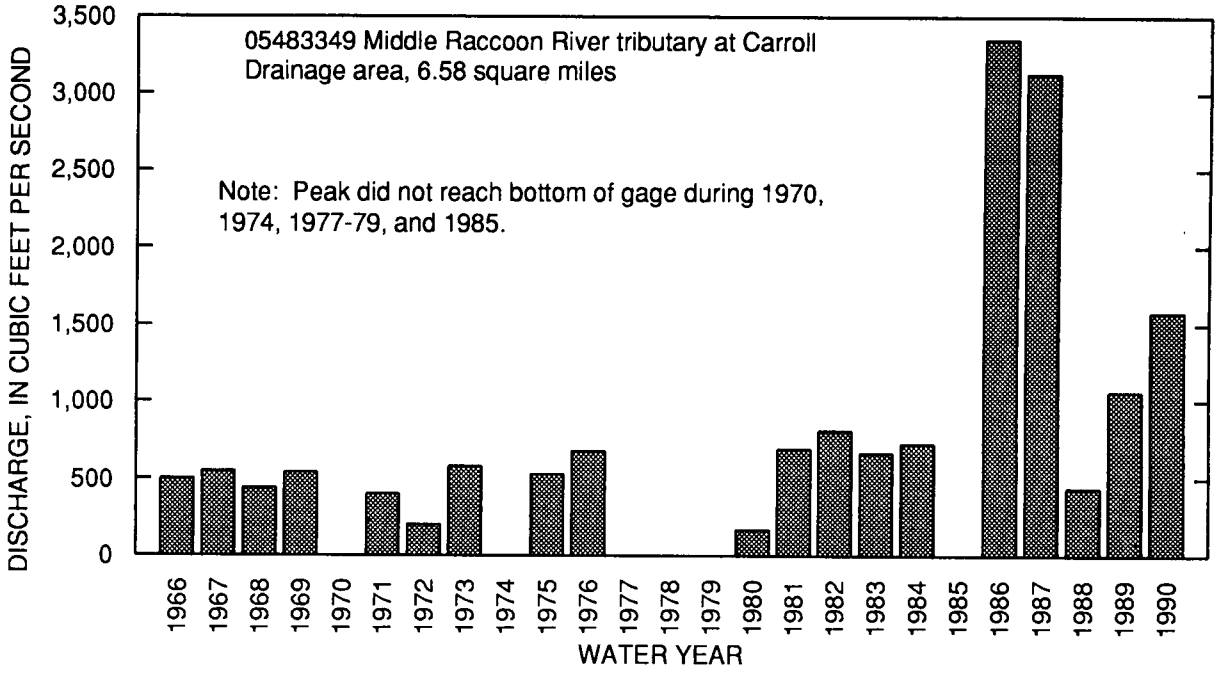

Figure 11. Annual peak discharges for period of record for Middle Raccoon River tributary at Carroll crest-gage station.

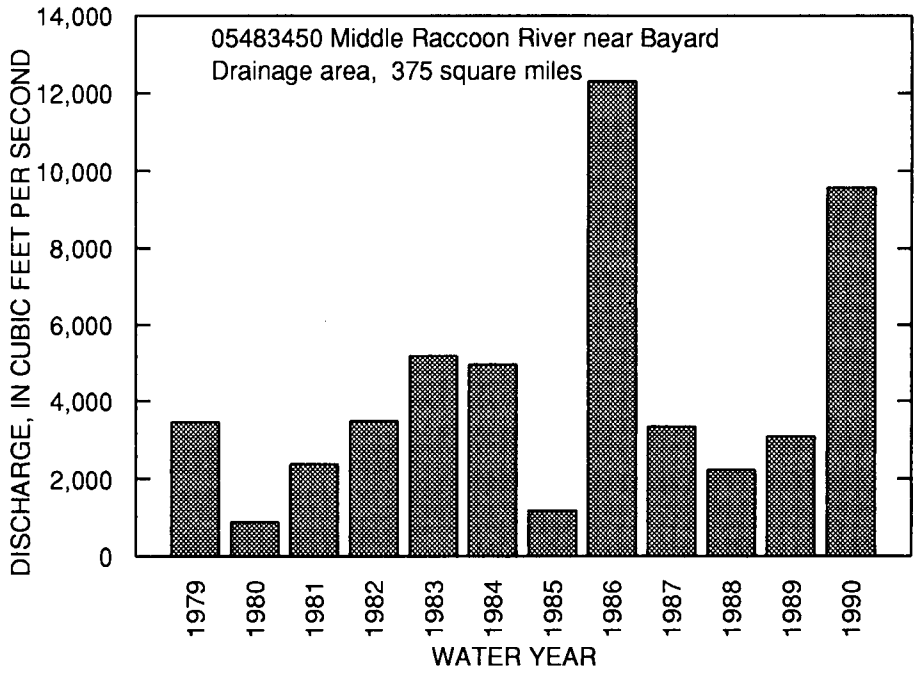

Figure 12. Annual peak discharges for period of record for Middle Raccoon River near Bayard gaging station.

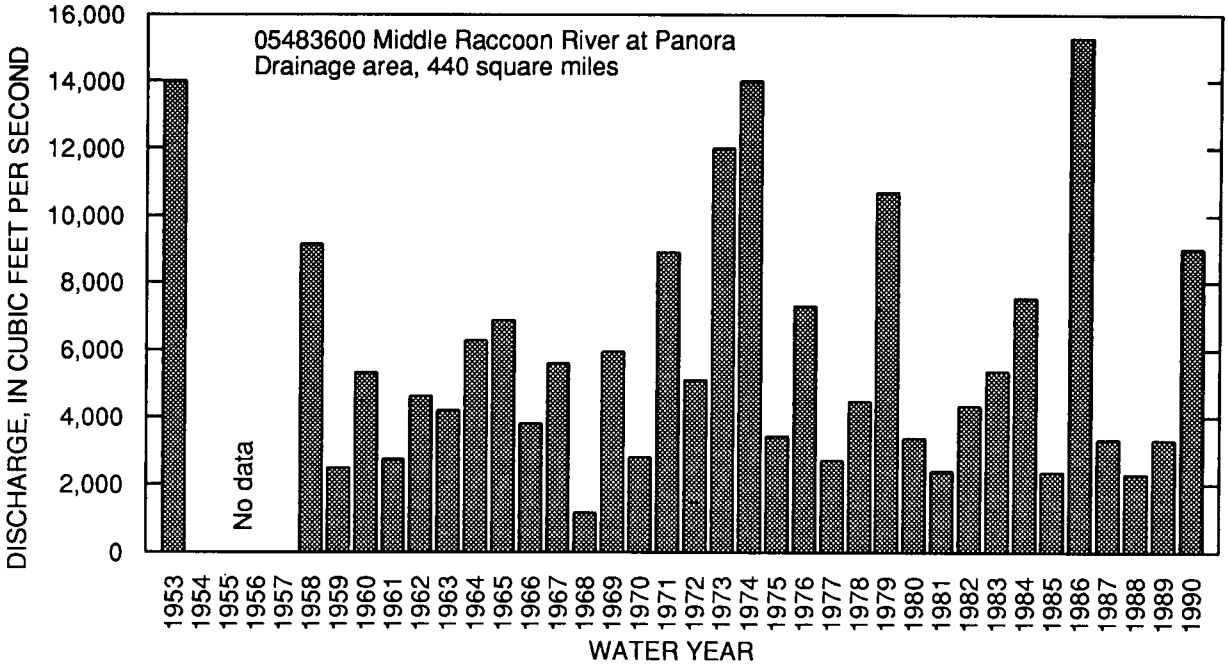

Figure 13. Annual peak discharges for period of record for Middle Raccoon River at Panora gaging station.

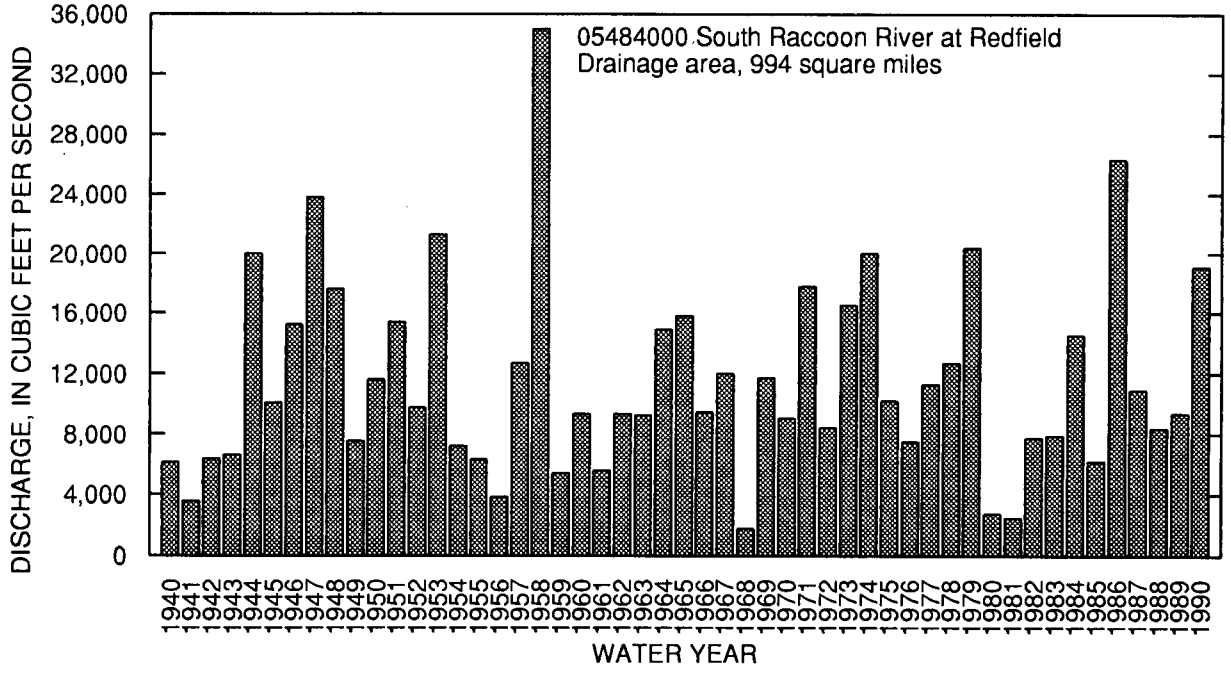

Figure 14. Annual peak discharges for period of record for South Raccoon River at Redfield gaging station.

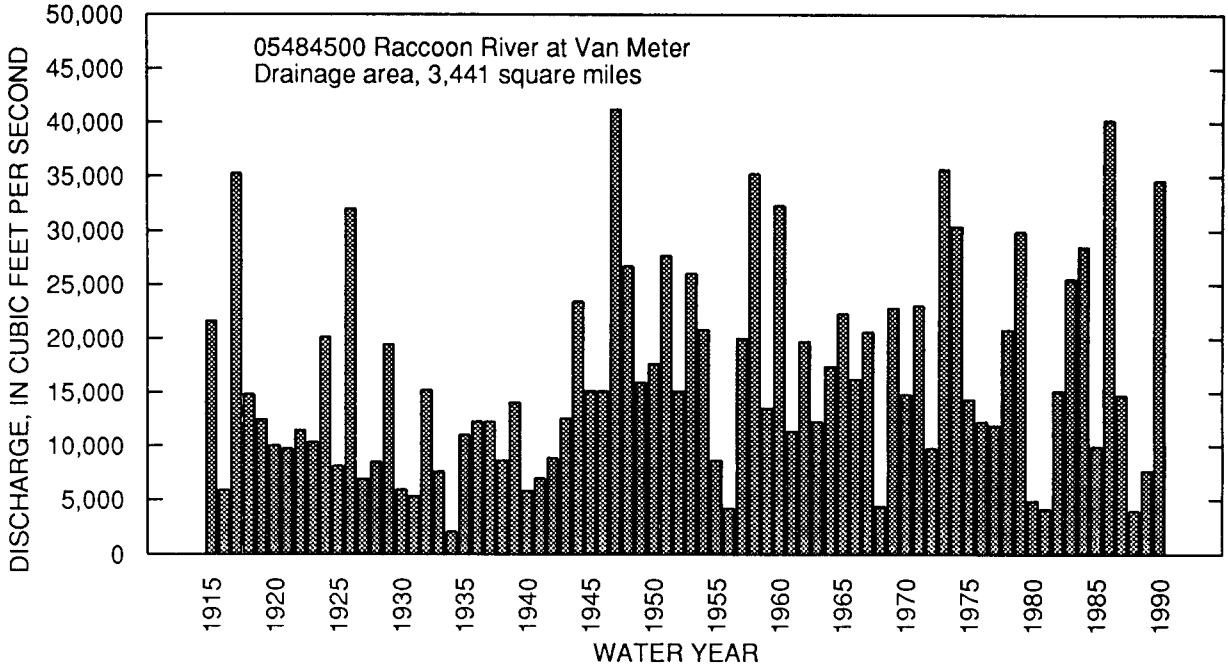

Figure 15. Annual peak discharges for period of record for Raccoon River at Van Meter gaging station.

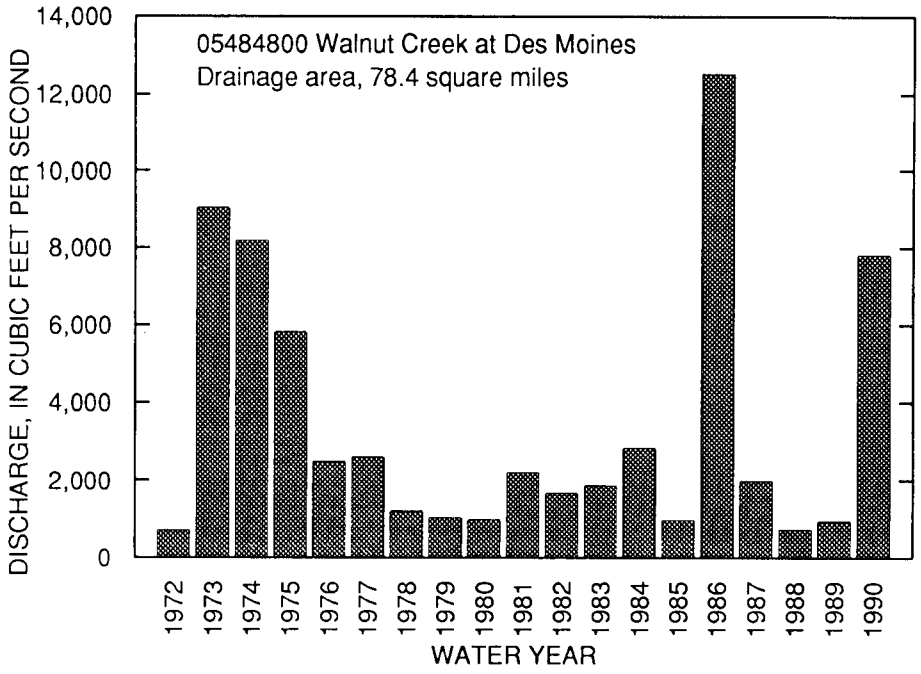

Figure 16. Annual peak discharges for period of record for Walnut Creek at Des Moines gaging station.

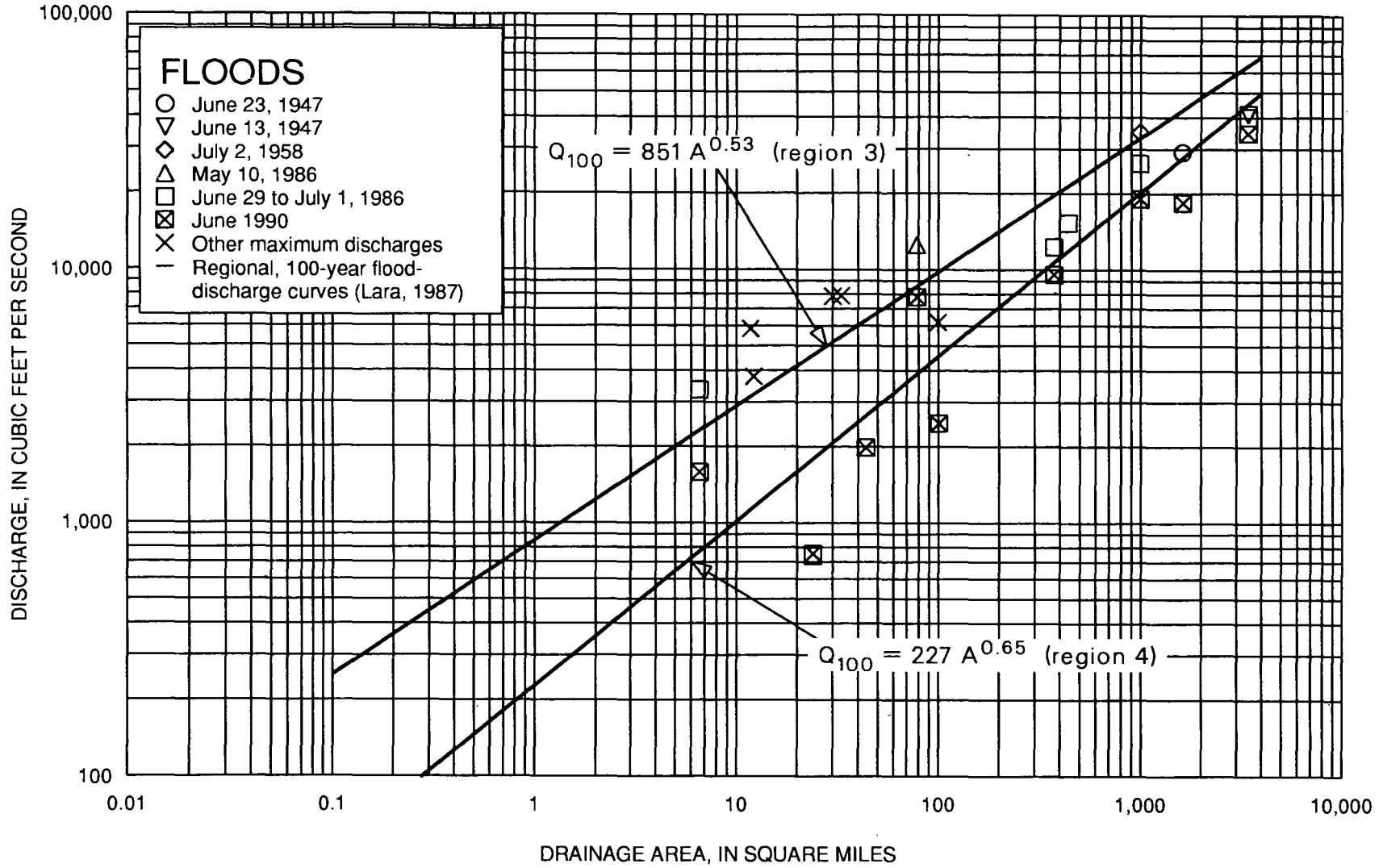

Figure 17. Relation of maximum discharges and regional, 100-year flood discharges (Q_{100}) with drainage area (A) for active and discontinued streamflow-gaging stations and indirect-discharge measurement sites in the Raccoon River basin.

Flood of June 16-17, 1990

Statewide, antecedent wet conditions and intense thunderstorms that began on June 13, 1990, contributed to major floods across the southern two-thirds of the State. Widespread rains over the entire Raccoon River basin caused significant peak discharges at several USGS gaging stations. The flood peak on East Fork Hardin Creek near Churdan was 1.01 times greater than the 100-year recurrence interval and is the largest on record for that station (table 2).

FLOOD FREQUENCY AND MAGNITUDE

A flood of a magnitude that is expected to be equalled or exceeded once, on the average, during any 100-year period (recurrence interval) commonly has been used as a standard against which flood peaks are measured. This flood, commonly termed the 100-year flood, has a 1-percent chance of being equalled or exceeded during any year. The recurrence interval represents the long-term average period between floods of a specific magnitude. Therefore, 100-year floods could occur in less than 100 years or even within the same year.

The method for determining flood-flow frequency discharges is outlined by the U.S. Water Resources Council (Interagency Advisory Committee on Water Data, 1981, p. 1-28). The Water Resources Council recommends using the Pearson type-III distribution with log transformation of the data as a base method for determining flood-flow frequency discharges. In this report, this method for determining flood-flow frequency discharges is referred to as "Bulletin 17B."

Recurrence intervals for selected flood peaks and discharges for specific peak frequencies are statistics that can change when re-calculated as more data become available. As more data are collected and used in the computations, the resulting statistics become more reliable. USGS streamflow-gaging stations are the primary source of the streamflow data used in the computations.

Another method for determining flood-flow frequency discharges at sites in Iowa, including those not gaged, is described by Lara (1987, p. 2-19). Lara used the physiographic characteristics of Iowa as a guide in defining the boundaries of five hydrologic regions. Regional equations were developed by using the annual flood-peak discharges for all gaged stations in a hydrological, homogeneous area, thereby reducing potential errors associated with nonrepresentative, short-term stations. For this reason, regional analysis also may produce improved estimates of the flood characteristics at gaged sites. Lara (1987) also used the Pearson type-III distribution with log transformation as the base method for developing the regional equations.

The relation of maximum discharges and regional, 100-year flood discharges with drainage area for active and discontinued gaging stations and for indirect-discharge measurement sites in the Raccoon River basin are shown in figure 17. The curves shown in figure 17 represent the 100-year, flood-frequency equations developed by Lara for the two hydrologic regions delineated in figure 2. The maximum discharges shown in figure 17 represent the floods discussed in the "Flood History" section in addition to other floods listed in tables 1 and 2.

The flood-peak discharges computed using the Bulletin 17B method and the regional method (Lara, 1987) for selected recurrence intervals for the gaging stations in the Raccoon River basin are listed in table 3. All discharges use data that were collected through the 1990 water year.

The Raccoon River basin has parts of its drainage area in two of the hydrologic regions defined by Lara (1987); approximately 18 percent of the drainage area is in region 3, and 82 percent is in region 4 (fig. 2). Therefore, regional flood-frequency estimates for intra-basin sites in the Raccoon River basin may use more than one regional, flood-frequency equation. For stations listed in table 3 with basins situated in more than one hydrologic region, weighted averages were used based on drainage-area ratios to compute the regional flood-peak discharges.

Table 3. *Discharge and frequency of flood-peak discharges for active and discontinued streamflow-gaging stations in the Raccoon River basin*

[17B, Bulletin 17B (Interagency Advisory Committee onWater Data, 1981); --, insufficient record to compute flood frequency using Bulletin 17B; Lara, flood-frequency equations for hydrologic regions 3 and 4 (Lara, 1987, p.28). For stations with basins situated in more than one hydrologic region, weighted averages were used based on drainage-area ratios]

Station number (fig. 1)	Station name	Method	Discharge, in cubic feet per second, for indicated recurrence interval, in years					
			2	5	10	25	50	100
05482135	North Raccoon River near Newell	17B	--	--	--	--	--	--
		Lara	2,060	3,390	4,450	5,900	6,570	7,850
05482170	Big Cedar Creek near Varina	17B	640	1,260	1,720	2,330	2,780	3,240
		Lara	905	1,570	2,110	2,850	3,250	3,920
05482300	North Raccoon River near Sac City	17B	3,620	7,370	10,200	13,900	16,700	19,500
		Lara	4,810	7,490	9,610	12,500	13,600	16,000
05482500	North Raccoon River near Jefferson	17B	6,770	12,400	16,400	21,500	25,300	29,000
		Lara	9,170	13,700	17,300	22,100	23,600	27,700
05482600	Hardin Creek at Farnhamville	17B	503	992	1,380	1,910	2,340	2,780
		Lara	568	1,020	1,380	1,890	2,180	2,640
05482800	Happy Run at Churdan	17B	--	--	--	--	--	--
		Lara	147	288	405	575	685	847
05482900	Hardin Creek near Farlin	[a]17B	648	1,230	1,690	2,330	2,840	3,370
		Lara	1,080	1,860	2,480	3,340	3,790	4,560
05482950	East Fork Hardin Creek near Paton	17B	--	--	--	--	--	--
		Lara	147	288	404	574	685	846
05483000	East Fork Hardin Creek near Churdan	17B	227	362	455	572	658	744
		Lara	358	660	907	1,260	1,470	1,790
05483318	Brushy Fork Creek near Templeton	17B	--	--	--	--	--	--
		Lara	1,370	2,500	3,340	4,500	5,430	6,400
05483349	Middle Raccoon River tributary at Carroll	17B	487	1,040	1,530	2,290	2,960	3,720
		Lara	415	805	1,120	1,560	1,920	2,310
05483450	Middle Raccoon River near Bayard	17B	3,760	7,240	10,000	13,900	17,100	20,500
		Lara	3,550	5,860	7,560	9,870	11,200	13,100
05483600	Middle Raccoon River[b] at Panora	17B	5,000	8,220	10,600	13,700	16,100	18,600
		Lara	3,960	6,480	8,340	10,900	12,300	14,400
05484000	South Raccoon River at Redfield	17B	10,400	16,400	20,400	25,400	29,000	32,500
		Lara	7,860	12,700	16,000	20,400	23,200	26,800
05484500	Raccoon River at Van Meter	17B	14,400	23,400	29,700	37,700	43,700	49,700
		Lara	17,100	25,200	31,200	39,000	42,000	48,500

Table 3. *Discharge and frequency of flood-peak discharges for active and discontinued streamflow-gaging stations in the Raccoon River basin*--Continued

Station number (fig. 1)	Station name	Method	Discharge, in cubic feet per second, for indicated recurrence interval, in years					
			2	5	10	25	50	100
05484800	Walnut Creek at Des Moines	17B	2,270	4,890	7,250	11,000	14,300	18,100
		Lara	890	1,550	2,080	2,820	3,200	3,870

[a] Flood frequency computed with 60 percent of annual peak discharges above base. Bulletin 17B (Interagency Advisory Committee on Water Data, 1981) recommends the use of 75 percent of annual peak discharges above base.

[b] Flow regulated by dam on Lake Panorama since August 1970. A comparison of flood-frequency analyses for both the unregulated and regulated periods of record indicates that the dam does not appear to affect annual peak floods significantly. This flood frequency was computed using a combined unregulated and regulated period of record, 1953 and 1958-90, as recommended computation for calculation of recurrence intervals.

The relation of 100-year flood discharges computed using Bulletin 17B and hydrologic regions 3 and 4, with drainage area for the majority of active and discontinued streamflow-gaging stations in the Raccoon River basin is shown in figure 18. Data in table 3 can be used to plot comparisons of the regional 2-, 5-, 10-, 25-, and 50-year flood discharges to those defined using the Bulletin 17B method, as was done for the 100-year discharges shown in figure 18.

Several Bulletin 17B estimates of 100-year discharges plot significantly above or below the hydrologic region 3 and 4 regression-equation curves for 100-year discharges in figure 18. These variations can be attributed to differences in individual basin topographic features, flood attenuation, length of record used to compute Bulletin 17B recurrence-interval discharges, and other differences.

FLOOD PROFILES

Water-surface-elevation profiles for the 1979 and 1986 floods on the Raccoon, Middle Raccoon, and South Raccoon Rivers are shown in figures 19-26, 27-32, and 33-45, respectively (Appendix 2). Elevation profiles for the 1973 and 1986 floods on Walnut Creek are shown in figures 46-49 (Appendix 2). The elevation profile for the 1986 flood on Mosquito Creek is shown in figures 50-52 (Appendix 2). The elevation profile for the 1986 flood on Willow Creek is shown in figure 53 (Appendix 2). The profiles were defined by data obtained by the USGS. Flood marks located both downstream and upstream from bridges were identified within a few days of passage of the flood peaks and were referenced to a common datum by leveling (table 4). Profiles between the bridges are straight-line interpolations, which only provide an approximation of water-surface elevations.

An August 7, 1979, low-water profile also is shown in figures 19-45 (Appendix 2) to indicate the approximate range of stage that can occur within the profiled reaches. In figures 46-49 (Appendix 2), the approximate channel bed that is plotted on the Walnut Creek profiles was determined from a USGS 7 1/2-minute quadrangle map (Grimes). It approximates the elevation of the topographic contour crossing the stream and shows the approximate depth of flow along the channel.

Bridge-deck and low-bridge-chord elevations are shown in figures 46-49 (Appendix 2) to indicate the relation between the elevation of the bridges and the elevations of the profiled floods and the low-water profiles. For sloping bridges, the profiled bridge-deck and low-bridge-chord elevations represent the lower ends of the bridges.

In order to reference all the points along the profiles to a common datum, extensive leveling work was performed. At least one bench mark

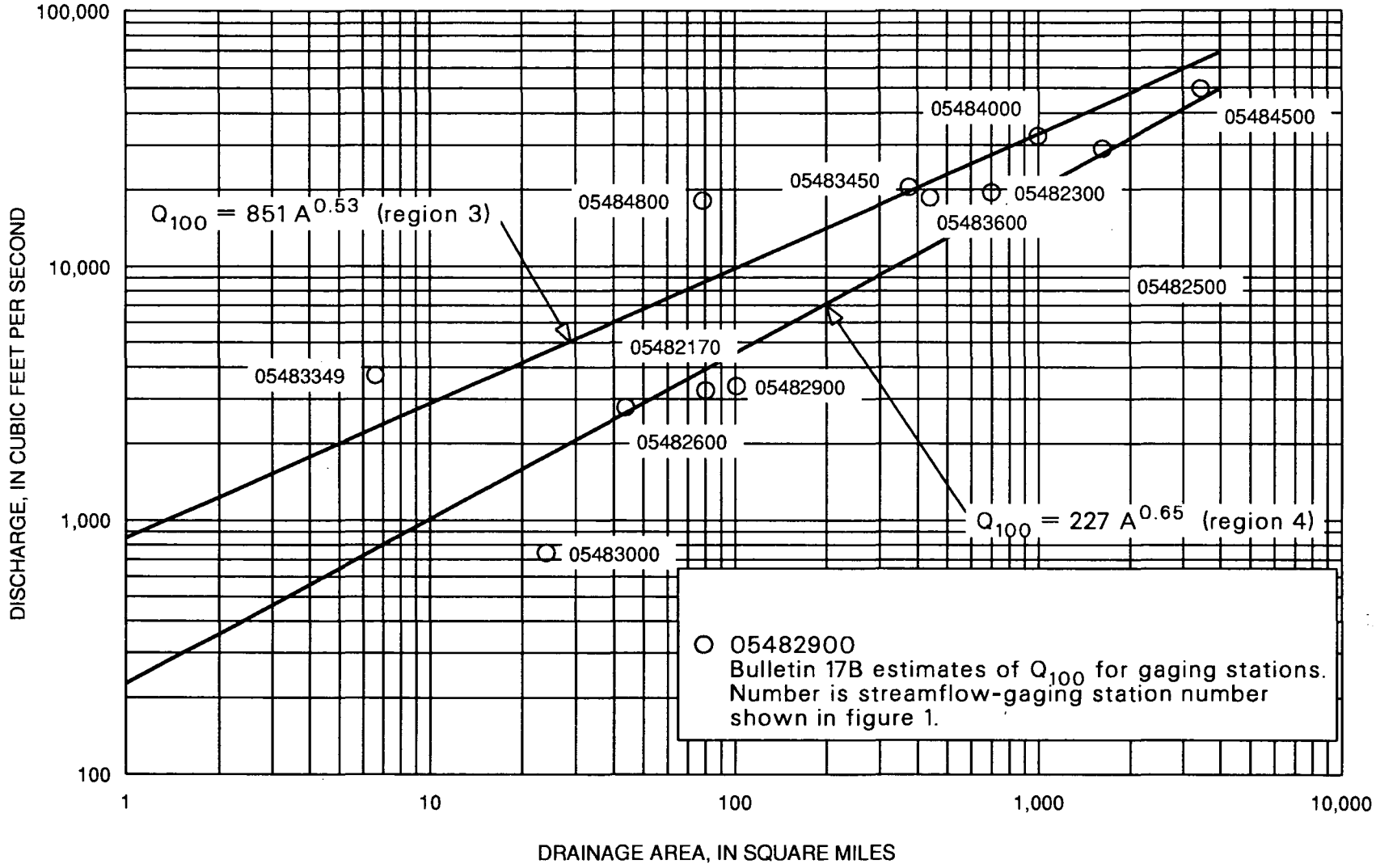

Figure 18. Relation of 100-year flood discharges (Q_{100}) computed using Bulletin 17B (Interagency Advisory Committee on Water Data, 1981) and hydrologic regions 3 and 4 (Lara, 1987), with drainage area (A) for active and discontinued streamflow-gaging stations in the Raccoon River basin.

Table 4. *Selected low-water and flood-peak elevations for river profiles in the Raccoon River basin*

[--, no data]

Stream	Location number (township range-section)	River mile[a]	Low-water elevation[b] (feet) Aug. 7, 1979	Flood-peak elevation[b] (feet) March 1979 Down-stream	March 1979 Up-stream	June 29-July 1, 1986 Down-stream	June 29-July 1, 1986 Up-stream
Raccoon River	Mouth	201.50	Confluence of Raccoon and Des Moines Rivers				
	7824 - 10NW	201.59	779.25	788.94	--	--	792.05
	7824 - 09NE	201.94	779.34	790.40	--	793.42	--
	7824 - 09SW	202.60	780.31	--	--	--	--
	7824 - 08NE	204.12	782.47	--	--	800.08[c]	--
		207.17	Mouth of Walnut Creek				
	7825 - 14NE	210.13	796.78	811.23	--	812.58	--
	7825 - 30SE	215.44	810.88	825.38	--	826.74	--
	7826 - 30SE	225.66	835.60	849.88	--	851.48	851.52
	7827 - 22SW	230.47	845.33	861.55	--	863.85	--
		231.60	Confluence of North and South Raccoon Rivers				
South Raccoon River	Mouth	231.60	Confluence of North and South Raccoon Rivers				
	7827 - 21SW	231.83	846.30	--	864.20	--	--
	7827 - 21SW	232.11	--	--	--	867.09	867.83
	7827 - 20NW	233.07	851.86	868.74	869.86	--	--
	7827 - 18NW	235.07	858.35	874.67	875.25	876.94	877.90
	7828 - 16NE	239.17	871.64	889.07	890.18	890.49	891.51
	7829 - 02NE	245.66	--	908.97	908.94	911.12	911.12
	7829 - 03SW	248.03	899.82	919.18	919.18	921.58	921.58
	7829 - 09NE	248.96	903.11	921.53	922.26	923.65	924.36
		249.00	Mouth of Middle Raccoon River				
	7829 - 07SE	251.80	918.16	933.30	934.23	--	933.12
	7830 - 12SE	252.78	922.95	938.28	939.46	--	--
	7830 - 10SE	256.90	938.26	954.09	954.98	--	--
Middle Raccoon River	Mouth	249.00	Confluence of Middle and South Raccoon Rivers				
		249.00	903.11	--	922.26	--	924.36
	7829 - 04NW	250.54	909.79	924.28	925.08	928.40	929.10
	Redfield Dam	250.58	918.25	--	925.93	--	--
		251.90	Mouth of Mosquito Creek				
	7929 - 34SW	251.90	919.27	931.64	--	935.97	--
	7929 - 30SE	256.44	943.67	954.28	954.28	955.51	957.61
	7930 - 25SE	258.00	953.18	962.55	962.69	965.26	965.77
	7930 - 15SE	261.87	969.33	983.15	983.51	986.01	986.68
	7930 - 09NW	265.04	980.49	993.63	993.68	996.91	997.78
	7930 - 05NW	267.20	989.37	1,004.18	1,004.27	1,006.30	1,007.06
		267.20	995.61[d]	--	--	--	--
	7930 - 06NE	268.30	995.69	1,009.27	--	1,011.10	--
	Lake Panorama	268.80	995.69	--	--	--	--
		268.80	1,045.51[c]	--	1,047.00	--	1,050.10
	8031 - 09SE	275.60	1,045.64	1,048.80	--	--	--
	8131 - 32SW	279.24	1,048.04	1,060.81	1,061.37	1,064.40	1,064.94
		285.28	Mouth of Willow Creek				
	8132 - 27NE	286.26	1,072.78	1,085.10	1,085.50	1,086.18	1,086.58
	8132 - 27SW	286.98	1,076.37	1,088.25	--	--	--
	8132 - 29NW	289.53	1,087.28	1,098.16	1,098.43	1,098.38	--
	Riffle	292.55	1,100.00	--	--	--	--
	8133 - 24NW	293.04	1,105.02	--	1,114.65	1,114.12	1,114.12
	8133 - 11NW	296.17	1,111.43	--	--	--	--
	8133 - 02NW	297.26	1,115.18	1,128.11	1,128.51	1,129.83	1,130.32

Table 4. *Selected low-water and flood-peak elevations for river profiles in the Raccoon River basin--Continued*

Stream	Location number (township range-section)	River mile[a]	Approximate contour elevation[b,e] (feet)	Flood-peak elevation[b] (feet)			
				July 1, 1973		May 10, 1986	
				Down-stream	Up-stream	Down-stream	Up-stream
Walnut Creek	Mouth	0.00	Confluence of Walnut Creek and Raccoon River				
	7825 - 11SE	1.36	800	810.74	811.35	--	--
	7825 - 11NE	2.02	--	816.98	--	816.64	818.57
	7825 - 02SE	2.35	--	818.76	819.24	819.14	820.24
	7825 - 02NE	3.08	--	823.34	823.59	825.36	825.96
		3.20	810	--	--	--	--
	7825 - 03NE	3.62	--	826.38	827.28	827.74	828.72
		3.65	Mouth of North Walnut Creek				
		4.28	820	--	--	--	--
	7825 - 35SW	4.68	--	836.65	837.42	835.74	836.54
	92nd Street[f]	5.75	--	--	--	845.67	--
		6.34	830	--	--	--	--
	7925 - 34NW	6.60	--	--	--	852.50	852.59
		7.06	840	--	--	--	--
		8.05	850	--	--	--	--
	7925 - 33NW	8.10	--	--	--	861.75	863.78
	7925 - 32NE	8.23	--	--	--	864.78	864.96
		9.40	860	--	--	--	--
	7925 - 31NE	9.84	--	--	--	877.28	878.68
		11.53	870	--	--	--	--
	7926 - 25NE	12.18	880	--	--	892.89	892.89
		12.60	Mouth of Little Walnut Creek				
		13.60	890	--	--	--	--
	7926 - 24NW	14.00	--	--	--	903.70	906.50
	7926 - 13NW	15.24	--	--	--	912.61	913.26
		15.40	900	--	--	--	--
	7926 - 14NE	16.00	--	--	--	--	917.16
		16.65	910	--	--	--	--
						June 29-July 1, 1986	
Mosquito Creek	Mouth	0.00	Confluence of Mosquito Creek and Middle Raccoon River				
	7929 - 34SE	0.03	--	--	--	935.97	936.19
	7929 - 22SE	1.84	--	--	--	--	--
	7929 - 15SE	3.05	--	--	--	950.29	950.66
	7929 - 15NW	4.40	--	--	--	--	--
	7929 - 08SE	6.35	--	--	--	--	--
	7929 - 08NE	6.95	--	--	--	--	--
	7929 - 08NW	7.20	--	--	--	--	--
	7929 - 06NE	8.87	--	--	--	985.51	986.18
Willow Creek	Mouth	0.00	Confluence of Willow Creek and Middle Raccoon River				
	8132 - 23NW	1.25	--	--	--	1,086.72	1,086.97
	8132 - 10NE	3.40	--	--	--	1,089.06	1,089.87

[a] Upstream from mouth of Des Moines River, Walnut Creek, Mosquito Creek, or Willow Creek.
[b] Measured from sea level datum, downstream and upstream of bridges.
[c] Upstream of dam.
[d] Upstream of gage.
[e] From U.S. Geological Survey 7.5-minute topographic quadrangle (Grimes).
[f] No bridge at this location.

and one reference point were established at each bridge in the profiled reaches. Bench-mark and reference-point descriptions and elevations are listed in Appendix 3.

River miles, determined from the best available USGS maps, are referenced to the mouth of the Des Moines River for the Raccoon, South Raccoon, and Middle Raccoon Rivers, and to the mouth of each creek for Walnut, Mosquito, and Willow Creeks. Bridges, and a few other points, are designated by an index number that helps to identify their location. For example, 7824-10NW refers to a location in township 78 north, range 24 west, northwest 1/4 section 10.

DISCUSSION

The user of this report is cautioned that the stage-discharge data presented herein are representative of the physical conditions of the basin at the time of the floods shown. Changes in the basin can alter the flood magnitude for a given frequency. Examples of these basin changes include, but are not limited to, extensive urbanization, implementation of agricultural conservation practices, installation of drainage systems, and construction of reservoirs. Changes in the channel conditions immediately downstream from a site can substantially affect the stage-discharge relation. Examples of such changes include the construction of dams, bridges, or levees; changes in the flood-plain vegetative cover; straightening of the channel; and natural scour and fill. Temporary changes can be caused by ice and debris jams that produce backwater conditions and may cause the water-surface elevations to plot higher than the normal profile.

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Appendix 1

PEAK STAGES AND DISCHARGES FOR GAGING STATIONS IN THE RACCOON RIVER BASIN, WEST-CENTRAL IOWA

The peak-stage and discharge data for this report were compiled through September 30, 1990, for the 16 active and discontinued streamflow-gaging stations located in the Raccoon River basin. The floods, designated by calendar date, are in chronological order and grouped by water year (October 1 - September 30). In general, independent flood peaks above a pre-selected base (partial-duration series) are listed for the continuous-record gaging stations. The magnitude of the selected base discharge, given in the "Remarks" section of the headnote, was determined so that it would be equaled or exceeded on the average of about three times per year. Two flood peaks are considered independent if a plot of the recorded stages indicates a well-defined trough between the peaks and if the instantaneous discharge of the trough is 25 percent or more below that of the lower peak (Novak, 1985, p. 93). Only the annual flood peaks are listed for the crest-stage gaging stations.

The gaging-station records are arranged in downstream order as explained in the annual streamflow reports of the U.S. Geological Survey (see "Selected References"). Each gaging station is identified by a permanent number that is also used in figure 1 and in tables 2 and 3 of this report. The datum of the gage, when given, is sea level. Flood stage, as determined by the National Weather Service, is the stage at which overflow of the natural banks of the stream begins to cause damage in the reach in which the elevation is measured.

The following notations are used in the gaging-station records:

1. A dashed line in the "water year"column denotes a break or gap in the record of peaks.
2. A dashed line beginning at the "date" column and continuing through the "discharge" column indicates a change in site and datum.
3. A dashed line in the "date" and "discharge"columns indicates a change in site without a change in datum.
4. A dashed line in the "gage height" column denotes a change in datum only.
5. ft^3/s, cubic feet per second.

The remainder of the information given is self-explanatory.

05482135 North Raccoon River near Newell, Iowa

Location.--Lat 42°36'16", long 95°02'42" in NE1/4 NW1/4sec. 24, T.90 N., R.36 W., Buena Vista County, hydrologic unit 07100005, on left bank 40 ft downstream from bridge on State Highway 7, 0.8 mi upstream from Outlet Creek, 2.2 mi west of Newell, and at mile 398.6 upstream from mouth of Des Moines River.

Drainage area.--233 mi^2.

Gage.--Water-stage recorder. Datum is 1,235.50 ft above sea level.

Stage-discharge relation.--Defined by current-meter measurements.

Remarks.--Base for partial-duration series, 750 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1983	Oct. 2, 1982	(L)	1,200
	Oct.9, 1982	(L)	1,300
	Feb. 22, 1983	14.51	811
	Mar. 7, 1983	15.40	1,740
	Mar. 17, 1983	13.52	947
	Apr. 2, 1983	14.76	1,400
	Apr. 13, 1983	14.72	1,380
	May 3, 1983	13.95	1,080
	June 14, 1983	13.59	967
	June 21, 1983	16.30	2,450
	June 30, 1983	16.17	2,320
1984	Feb. 17, 1984	(b)	1,020[c]
	Apr. 9, 1984	14.20	1,170
	Apr. 13, 1984	14.49	1,290
	Apr. 23, 1984	13.91	1,070
	May 28, 1984	13.36	906
	June 2, 1984	14.83	1,440
	June 6, 1984	(L)	1,800
	June 12, 1984	(L)	2,400
	June 17, 1984	16.73	2,850
1985	Dec. 29, 1984	12.94[b]	(k)
	May 15, 1985	12.87	776
1986	Mar. 20, 1986	14.76	1,410
	Apr. 5, 1986	13.86	1,060
	Apr. 28, 1986	15.45	1,780
	May 13, 1986	15.61	1,880
	June 5, 1986	13.00	805

05482135 North Raccoon River near Newell, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1987	Oct. 12, 1986	14.22	1,190
	July 12, 1987	14.13	1,160
	July 22, 1987	13.49	974
	Sept.17, 1987	14.81	1,440
1988	Aug. 22, 1988	12.20	649
1989	Mar. 10, 1989	13.90[b]	(k)
	May 24, 1989	11.50	504
1990	June 2, 1990	13.31	917
	June 13, 1990	14.22	1,130
	June 17, 1990	16.33	2,380

[b] Affected by ice.
[c] Approximate.
[k] Discharge not determined.
[L] Gage height not determined.

05482170 Big Cedar Creek near Varina, Iowa

Location.--Lat 42°41'16", long 94°47'52", in NE1/4 NE1/4 sec. 24, T.91 N., R.34 W., Pocahontas County, hydrologic unit 07100006, on left bank 2 ft downstream from bridge on county highway N33, 2.0 mi downstream from drainage ditch 21, 3.5 mi upstream from drainage ditch 74, and 5.5 mi northeast of Varina.

Drainage area.--80.0 mi^2.

Gage.--Water-stage recorder. Datum is 1,225.12 ft above sea level.

Stage-discharge relation.--Defined by current-meter measurements.

Remarks.--Base for partial-duration series, 400 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1960	Mar. 27, 1960	13.13[b]	(k)
	Mar. 27, 1960	11.42	1,020
	June 16, 1960	8.27	466
1961	Mar. 2, 1961	(b)	400[c]
	Mar. 25, 1961	11.88[a]	1,460
1962	Mar. 29, 1962	14.49[b]	(k)
	Mar. 31, 1962	(b)	1,000[c]
	July 2, 1962	8.91	665
	July 4, 1962	10.15	960
	July 28, 1962	7.89	452
	Aug. 31, 1962	13.68	2,080
1963	Mar. 15, 1963	7.51[b]	(k)
	June 2, 1963	6.57	333
1964	May 6, 1964	6.23	291
1965	Apr. 6, 1965	15.05[b]	(k)
	Apr. 8, 1965	10.17	1,060
	June 6, 1965	7.00	404
1966	Oct. 1, 1965	6.31[h]	257
	Mar. 31, 1966	5.84	237
1967	June 10, 1967	7.82	548
	June 15, 1967	9.28	852
1968	July 19, 1968	3.99	45

05482170 Big Cedar Creek near Varina, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1969	Mar. 24, 1969	10.44[b]	700[c]
	Apr. 4, 1969	8.89	744
	June 23, 1969	8.04	506
	June 25, 1969	10.76	992
	June 29, 1969	7.37	412
	July 27, 1969	10.49	938
1970	May 13, 1970	8.02	554
1971	Feb. 19, 1971	11.18[b]	800[c]
	Mar. 13, 1971	(b)	880[c]
	Mar. 28, 1971	8.25	595
	June 7, 1971	10.66	1,010
1972	Aug. 6, 1972	7.37	400
1973	Mar. 11, 1973	7.43	485
	Mar. 14, 1973	7.25	459
	Apr. 16, 1973	6.84	404
	May 28, 1973	7.78	530
	Aug. 23, 1973	9.82	904
	Sept. 26, 1973	9.25	850
1974	Oct. 11, 1973	7.75	573
	Nov. 21, 1973	8.11	642
1975	Apr. 9, 1975	(L)	800[c]
	Apr. 12, 1975	(L)	600[c]
	Apr. 28, 1975	10.88	1,250
	May 11, 1975	6.78	413
	June 18, 1975	7.04	452
1976	June 29, 1976	4.71	157
1977	Mar. 9, 1977	3.91[b]	64[c]
1978	July 6, 1978	10.39	818
	Sept.14, 1978	10.02	788
1979	Mar. 24, 1979	16.29[b]	2,050[c]
	June 27, 1979	8.06	509
	July 30, 1979	8.49	573
	Aug. 20, 1979	7.46	424
	Aug. 21, 1979	12.29	1,220

05482170 Big Cedar Creek near Varina, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1980	Mar. 15, 1980	8.44[b]	(k)
	Apr. 3, 1980	6.59	385
1981	June 13, 1981	6.87	372
1982	July 6, 1982	7.48	459
	July 10, 1982	7.71	488
1983	Oct. 1, 1982	8.15	551
	Oct. 9, 1982	7.97	533
	Dec. 25, 1982	7.02	449
	Dec. 29, 1982	7.14	468
	Feb. 23, 1983	7.54	535
	Feb. 27, 1983	7.05	454
	Mar. 6, 1983	9.53	937
	Mar. 16, 1983	6.72	404
	Apr. 1, 1983	7.91	603
1983	Apr. 13, 1983	8.29	678
	Apr. 16, 1983	7.47	523
	May 3, 1983	6.91	432
	June 20, 1983	11.03	1,180
	June 30, 1983	9.52	868
1984	Feb. 16, 1984	(b)	750[c]
	Feb. 23, 1984	(b)	860[c]
	Apr. 9, 1984	7.27	457
	Apr. 23, 1984	7.37	472
	May 1, 1984	9.29	834
	June 7, 1984	9.32	841
	June 13, 1984	9.62	910
	June 16, 1984	12.77	1,710
	June 23, 1984	8.15	610
1985	Dec. 28, 1984	7.24[b]	(k)
	May 24, 1985	5.90	302
1986	Mar. 3, 1986	(b)	550[c]
	Mar. 18, 1986	10.05	1,010
	Apr. 5, 1986	8.21	659
	Apr. 28, 1986	7.58	533
	May 11, 1986	7.07	456
	May 13, 1986	11.80	1,430
	Aug. 13, 1986	7.13	467

05482170 Big Cedar Creek near Varina, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1987	Oct. 12, 1986	8.09	632
	May 26, 1987	7.40	528
1988	Mar. 1, 1988	5.78[b]	(k)
	Aug. 22, 1988	5.74	316
1989	Mar. 10, 1989	6.83[b]	(k)
	May 24, 1989	4.40	168
1990	June 3, 1990	7.07	482
	June 17, 1990	11.50	1,410
	June 19, 1990	12.09	1,580
	Aug. 25, 1990	7.47	538

[a] From high-water mark.
[b] Affected by ice.
[c] Approximate.
[h] Stage decreasing.
[k] Discharge not determined.
[L] Gage height not determined.

05482300 North Raccoon River near Sac City, Iowa

Location.--Lat 42°21'16", long 94°59'26", in NW1/4 NW1/4 sec. 13, T.87 N., R.36 W., Sac County, hydrologic unit 07100006, on right bank 5 ft downstream from bridge on county highway, 2.1 mi upstreamfrom Indian Creek, 0.3 mi upstream from drainage ditch 73, 4.6 mi south of Sac City, and at mile 367.6 upstream from mouth of Des Moines River.

Drainage area.--700 mi^2.

Gage.--Water-stage recorder. Datum is 1,146.03 ft above sea level (levels by Iowa Natural Resources Council).

Stage-discharge relation.--Defined by current-meter measurements.

Remarks.--Base for partial-duration series, 2,000 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1954	June 21, 1954	15.61[a]	7,000
.....			
1958	June 4, 1958	13.44	4,560[g]
1959	May 31, 1959	14.51	5,200
1960	Mar. 30, 1960	16.73	9,020
	May 22, 1960	9.68	2,100
	May 26, 1960	10.94	2,840
	June 19, 1960	10.47	2,640
1961	Mar. 28, 1961	13.16	4,420
1962	Mar. 29, 1962	15.83	7,730
	June 9, 1962	9.96	2,010
	July 5, 1962	10.32	2,160
	Sept. 1, 1962	18.12	10,800
1963	June 3, 1963	9.32	1,910
1964	May 7, 1964	7.47	1,100
1965	Apr. 6, 1965	15.59	6,960
	Sept. 28, 1965	9.82	2,020
1966	June 12, 1966	9.49	1,860
1967	June 9, 1967	12.06	3,230
	June 16, 1967	15.73	7,150
1968	June 25, 1968	4.89	354

05482300 North Raccoon River near Sac City, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1969	Oct. 18, 1968	10.57	2,110
	Mar. 26, 1969	12.94	3,790
	Apr. 5, 1969	14.65	5,370
	June 7, 1969	10.69	2,430
	June 27, 1969	13.93	4,850
	July 28, 1969	12.72	3,780
1970	May 14, 1970	12.75	3,630
1971	Feb. 19, 1971	14.25[b]	4,000[c]
	Mar. 14, 1971	13.40	4,200
	Mar. 29, 1971	10.62	2,490
	June 10, 1971	11.82	3,070
1972	July 17, 1972	13.43	4,140
1973	Nov. 3, 1972	9.73	2,010
	Mar. 4, 1973	12.18[b]	2,680[c]
	Mar. 14, 1973	11.54	2,890
	Mar. 26, 1973	10.46	2,360
	Apr. 16, 1973	10.22	2,240
	May 28, 1973	(L)	2,790[c]
	July 2, 1973	13.16	3,930
	July 9, 1973	(L)	3,190[c]
	Aug. 24, 1973	12.62	3,550
	Sept. 27, 1973	13.90	4,520
1974	Oct. 12, 1973	13.33	4,060
	Nov. 21, 1973	12.11	3,250
	May 19, 1974	11.21	2,400
1975	Apr. 28, 1975	14.35	4,570
	May 12, 1975	10.37	2,160
	June 19, 1975	11.12	2,590
1976	May 25, 1976	5.73	557
1977	Mar. 12, 1977	5.94[b]	(k)
	Aug. 9, 1977	5.43	479
1978	June 18, 1978	11.53	2,890
	July 7, 1978	13.47	4,180
	Sept. 14, 1978	15.23	5,880

05482300 North Raccoon River near Sac City, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1979	Mar. 23, 1979	18.02	13,100
	Mar. 30, 1979	16.64	7,750
	June 28, 1979	15.43	5,930
	Aug. 24, 1979	13.22	3,980
1980	Apr. 4, 1980	8.90	1,720
1981	June 14, 1981	7.96	1,290
1982	Mar. 20, 1982	10.92	2,610
	May 27, 1982	11.52	2,980
	July 7, 1982	13.64	4,410
	July 11, 1982	12.50	3,560
	July 18, 1982	13.25	4,100
	Sept. 14, 1982	9.66	2,110
1983	Oct. 3, 1982	12.25	3,360
	Oct. 9, 1982	12.95	3,840
	Feb. 23, 1983	12.22[a]	3,380
	Mar. 7, 1983	16.16[i]	7,200
	Mar. 16, 1983	11.98[j]	3,250
	Apr. 2, 1983	13.72	4,510
	Apr. 14, 1983	13.54	4,370
	May 3, 1983	12.50	3,590
	June 15, 1983	10.27	2,400
	June 21, 1983	17.31[j]	9,390
	June 30, 1983	16.31	7,230
1984	Feb. 17, 1984	10.64	2,580
	Feb. 23, 1984	9.82	2,210
	Apr. 4, 1984	10.25	2,410
	Apr. 9, 1984	12.27	3,460
	Apr. 14, 1984	12.20	3,410
	Apr. 23, 1984	11.87	3,210
	Apr. 27, 1984	11.27	2,890
	May 1, 1984	13.78	4,540
	May 28, 1984	11.94	3,250
	June 8, 1984	16.47	7,790
	June 13, 1984	14.62	5,270
	June 18, 1984	15.70	6,460
1985	May 15, 1985	9.12[c,f]	1,800[c]

05482300 North Raccoon River near Sac City, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1986	Mar. 19, 1986	14.82	5,430
	Apr. 5, 1986	12.69	3,690
	Apr. 28, 1986	13.55	4,160
	May 11, 1986	12.52	3,580
	May 13, 1986	14.12	4,790
	Sept. 21, 1986	12.19	3,290
	Sept. 25, 1986	10.45	2,370
1987	Oct. 12, 1986	12.85	3,670
	Apr. 15, 1987	10.61	2,460
	May 27, 1987	11.64	2,930
	July 12, 1987	14.01	4,570
	Sept. 17, 1987	11.25	2,740
1988	Feb. 20, 1988	10.63[b]	(k)
	Aug. 23, 1988	10.12	1,040
1989	Mar. 11, 1989	12.67[b]	1,700[c]
1990	May 20, 1990	14.05	2,890
	May 26, 1990	12.77	2,210
	June 3, 1990	13.68	2,640
	June 14, 1990	14.60	3,280
	June 17, 1990	20.14	9,930
	June 28, 1990	14.41	3,140
	Aug. 26, 1990	15.77	4,430

[a] From high-water mark.
[b] Affected by ice.
[c] Approximate.
[f] Affected by backwater.
[g] Maximum for period June to September 1958.
[i] From graph based on outside gage reading.
[j] From outside gage.
[k] Discharge not determined.
[L] Gage height not determined.

05482500 North Raccoon River near Jefferson, Iowa

(Published as "Raccoon River near Jefferson," 1940-55)

Location.--Lat 41°59'17", long 94°22'36", in SW1/4 NW1/4 sec. 20, T.83 N., R.30 W., Greene County, hydrologic unit 07100006, on right bank 5 ft downstream from bridge on State Highway 4, 0.1 mi downstream from drainage ditches 33 and 40, 1.9 mi south of Jefferson, 4.2 mi upstream from Hardin Creek, and at mile 292.5 upstream from mouth of Des Moines River.

Drainage area.--1,619 mi^2.

Gage.--Water-stage recorder. Datum is 967.09 ft above sea level. Prior to Apr. 22, 1946, nonrecording gage at site 4 mi upstream at different datum. Apr. 22 to June 25, 1946, nonrecording gage; June 26, 1946, to Sept. 30, 1955, water-stage recorder; Oct. 1, 1955, to Apr. 30, 1958, nonrecording gage, at present site and datum.

Stage-discharge relation.--Defined by current-meter measurements.

Flood stage.--10 ft.

Remarks.--Base for partial-duration series, 4,000 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1940	Aug. 28, 1940	10.9	4,030
1941	June 14, 1941	9.1	2,420
1942	July 15, 1942	10.5	3,590
1943	Aug. 13, 1943	15.5	9,480
1944	May 22, 1944	15.4	9,860
	June 14, 1944	16.2	11,900
1945	Mar. 12, 1945	12.9	6,880
	Apr. 18, 1945	10.6	4,130
	Apr. 25, 1945	14.2	8,700
	May 24, 1945	13.1	7,120
	June 3, 1945	14.3	8,780
	June 10, 1945	13.5	7,630
	Aug. 8, 1945	10.7	4,230
1946	Mar. 16, 1946	11.5	5,160
	May 28, 1946	13.4	7,310
1947	June 14, 1947	12.4	5,780
	June 23, 1947	22.3	29,100
	July 8, 1947	11.6	5,420

05482500 North Raccoon River near Jefferson, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1948	Mar. 20, 1948	13.8	8,630
1949	Mar. 7, 1949	14.8	10,100
1950	June 19, 1950	12.0	6,050
	June 23, 1950	11.1	4,710
1951	Mar. 29, 1951	17.39	16,000
	May 3, 1951	15.62	11,800
	June 3, 1951	12.88	6,720
	June 21, 1951	12.25	5,800
	July 4, 1951	12.58	6,320
	Aug. 18, 1951	12.41	6,060
	Aug. 30, 1951	12.97	6,860
1952	Apr. 1, 1952	12.80	6,580
	July 11, 1952	12.51	6,190
1953	July 1, 1953	10.10	3,490
1954	June 13, 1954	11.09	4,670
	June 22, 1954	19.52	21,300
	Aug. 29, 1954	14.19	9,360
1955	Apr. 26, 1955	9.78	3,580
1956	May 13, 1956	5.4	650
1957	June 16, 1957	13.49	7,800
1958	June 7, 1958	11.70	4,720
1959	June 3, 1959	15.06	9,800
1960	Mar. 31, 1960	19.43	18,600
	May 28, 1960	13.45	6,960
1961	Mar. 29, 1961	13.19	6,680
1962	Mar. 30, 1962	17.60	14,300
	June 10, 1962	11.90	5,050
	Sept. 4, 1962	16.33	11,700
1963	May 14, 1963	12.34	5,510
1964	May 8, 1964	8.61	2,280

05482500 North Raccoon River near Jefferson, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1965	Apr. 5, 1965	15.29	9,890
	May 27, 1965	14.94	9,300
	Sept. 30, 1965	12.38	5,610
1966	June 12, 1966	14.11	7,980
	June 28, 1966	11.47	4,620
1967	June 11, 1967	15.61	10,400
	June 19, 1967	15.61	10,400
	June 24, 1967	12.04	5,200
	June 28, 1967	11.75	4,900
1968	June 26, 1968	9.05	2,620
1969	Oct. 19, 1968	11.06	4,160
	Mar. 26, 1969	15.85	10,800
	Apr. 7, 1969	14.46	8,500
	Apr. 19, 1969	11.06	4,200
	June 30, 1969	12.88	6,110
	July 10, 1969	13.72	7,410
	July 30, 1969	12.16	5,220
1970	May 16, 1970	11.64[a]	4,690
1971	Feb. 21, 1971	15.75[b]	6,300[c]
	Mar. 15, 1971	13.70	7,160
1972	July 20, 1972	12.25	5,550
1973	Feb. 27, 1973	13.19[b]	5,460[c]
	Mar. 4, 1973	14.37[b]	7,370[c]
	Mar. 15, 1973	13.34	6,720
	Mar. 27, 1973	11.64	4,940
	Apr. 13, 1973	10.91	4,260
	Apr. 18, 1973	12.56	6,030
	May 4, 1973	11.29	4,720
	May 9, 1973	13.42	6,940
	May 31, 1973	12.78	6,170
	June 19, 1973	10.95	4,260
	July 4, 1973	15.11	9,060
	July 11, 1973	12.38	5,680
	Aug. 26, 1973	11.13	4,150
	Sept. 29, 1973	15.97	10,400

05482500 North Raccoon River near Jefferson, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1974	Oct. 14, 1973	14.06	7,240
	Nov. 23, 1973	12.04	5,340
	Feb. 20, 1974	15.11[b]	5,900[c]
	May 16, 1974	11.25	4,260
	May 18, 1974	13.35	6,400
1975	Apr. 28, 1975	12.84	6,060
	May 1, 1975	13.82	7,190
1976	May 24, 1976	10.31	3,330
1977	Feb. 23, 1977	5.71[b]	(k)
	Aug. 26, 1977	5.29	404
1978	July 10, 1978	12.21	5,160
	Sept. 17, 1978	14.67	8,200
	Sept. 21, 1978	10.98	4,010
1979	Mar. 20, 1979	16.56	12,300
	Mar. 25, 1979	17.84	15,300
	Mar. 31, 1979	17.5	14,500
	June 30, 1979	13.3	7,000
	Aug. 26, 1979	11.38	4,800
1980	Apr. 5, 1980	8.93	2,550
1981	June 29, 1981	7.35	1,620
1982	Mar. 21, 1982	12.00	5,440
	May 5, 1982	11.30	4,720
	May 6, 1982	10.96	4,400
	May 29, 1982	12.52	6,040
	June 15, 1982	10.53	4,110
	July 9, 1982	10.61	4,190
	July 13, 1982	10.96	4,490
	July 21, 1982	12.91	6,540
1983	Oct. 11, 1982	10.91	4,420
	Feb. 24, 1983	12.80	6,690

05482500 North Raccoon River near Jefferson, Iowa--Continued

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1983 cont.	Mar. 9, 1983	15.92	11,600
	Mar. 18, 1983	12.16	5,970
	Apr. 3, 1983	14.11	8,530
	Apr. 16, 1983	14.33	8,850
	May 5, 1983	13.16	7,210
	June 24, 1983	16.39	12,500
	July 2, 1983	17.38	14,500
1984	Feb. 19, 1984	12.05	5,790
	Apr. 6, 1984	11.00	4,840
	Apr. 11, 1984	12.38	6,320
	Apr. 25, 1984	12.58	6,570
	May 1, 1984	15.69	11,300
	May 31, 1984	13.05	7,170
	June 11, 1984	14.94	9,930
	June 17, 1984	15.85	11,500
	June 21, 1984	17.86	15,600
1985	Dec. 31, 1984	13.10[b]	2,800[c]
1986	Mar. 21, 1986	14.01	8,260
	Apr. 7, 1986	11.17	4,840
	May 1, 1986	11.31	4,990
	May 13, 1986	13.44	7,520
	June 30, 1986	13.95	8,230
	Sept. 22, 1986	10.86	4,390
	Sept. 28, 1986	10.47	4,010
1987	Oct. 15, 1986	14.03	8,840
	Apr. 17, 1987	11.54	5,420
	May 28, 1987	10.74	4,600
	July 15, 1987	11.46	5,320
	Sept. 18, 1987	10.56	4,250
1988	Feb. 20, 1988	7.08[b]	(k)
	May 10, 1988	6.78	1,470
1989	May 24, 1989	8.97	1,740
1990	May 21, 1990	12.22	6,160
	May 25, 1990	13.88	8,370
	June 19, 1990	18.61	18,400
	June 30, 1990	12.09	6,250
	Aug. 27, 1990	10.75	4,440

[a] From high-water mark.
[b] Affected by ice.
[c] Approximate.
[k] Discharge not determined.

05482600 Hardin Creek at Farnhamville, Iowa

Location.--Lat 42°16'01", long 94°25'10", near NE corner sec. 14, T.86 N., R. 31 W., Calhoun County at bridge on State Highway 175, near west city limits of Farnhamville.

Drainage area.--43.7 mi^2.

Gage.--Crest-stage gage.

Stage-discharge relation.--Defined by current-meter measurements.

Remarks.--Only annual peaks are shown.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1952	Mar. 29, 1952	8.09	318
1953	July 14, 1953	8.44	429
1954	Aug. 26, 1954	10.48	2,000
1955	Mar. 11, 1955	8.76	557
1956	Mar. 21, 1956	6.78	118
1957	June 16, 1957	7.90	270
1958	June 7, 1958	7.69	225
1959	June 1, 1959	9.06	700
1960	Mar. 29, 1960	9.75	840
1961	Sept. 30, 1961	7.91	272
1962	July 14, 1962	9.20	812
1963	May 13, 1963	9.55	995
1964	Apr. 13, 1964	8.54	466
1965	May 26, 1965	9.78	1,110
1966	May 23, 1966	7.93	277
1967	June 13, 1967	9.34	854
1968	June 25, 1968	8.79	570
1969	July 26, 1969	10.45	1,960
1970	--	(d)	<90
1971	Mar. 12, 1971	9.38[b]	480[c]
1972	Oct. 31, 1971	9.09	700
1973	Mar. 17, 1973	9.27	820
1974	June 22, 1974	8.82	570
1975	Apr. 26, 1975	9.56	1,000
1976	--	(d)	<90

05482600 Hardin Creek at Farnhamville, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1977	Aug. 21, 1977	7.85	250
1978	--	(d)	<90
1979	Mar. 19, 1979	10.29	1,850
1980	--	(d)	<90
1981	July 3, 1981	8.00	255
1982	May 4, 1982	8.95	580
1983	June 28, 1983	9.90	1,300
1984	June 21, 1984	9.97	900
1985	--	(d)	<88
1986	May 10, 1986	9.09	430
1987	Oct. 11, 1986	9.17	450
1988	--	(d)	<87
1989	--	(d)	<87
1990	June 16, 1990	10.39	1,980

[b] Affected by ice.
[c] Approximate.
[d] Peak stage did not reach bottom of gage.
< Less than.

05482800 Happy Run at Churdan, Iowa
(Discontinued September 1989)

Location.--Lat 42°10'16", long 94°29'39", in SW1/4 sec. 17, T.85 N., R.31 W., Greene County, at bridge on county highway, 1 mi northwest of Churdan.

Drainage area.--7.58 mi^2.

Gage.--Crest-stage gage.

Stage-discharge relation.--Defined by current-meter measurements and logarithmic extension above 100 ft^3/s.

Remarks.--Only annual peaks are shown.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1951	Mar. 29, 1951	7.72	110
1952	Mar. 19, 1952	6.25	54
1953	--	(d)	<19
1954	Aug. 26, 1954	7.87	116
1955	July 10, 1955	7.80	113
1956	--	(d)	<19
1957	June 17, 1957	7.81	71
1958	--	(d)	<19
1959	June 1, 1959	7.70	77
1960	May 6, 1960	6.50	48
1961	Sept. 30, 1961	6.42	46
1962	Mar. 25, 1962	8.57	150
1963	--	(d)	<19
1964	Apr. 13, 1964	7.27	61
1965	Sept. 27, 1965	7.77	80
1966	June 12, 1966	7.36	64
1967	June 13, 1967	9.37	(k)
1968	--	(d)	<19
1969	Mar. 26, 1969	6.29	(k)
1970	--	(d)	<19
1971	Mar. 12, 1971	6.74	(k)
1972	--	(d)	<19
1973	Apr. 28, 1973	4.87	(k)
1974	--	(d)	<19
1975	--	(d)	<19

05482800 Happy Run at Churdan, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1976	--	(d)	<19
1977	Aug. 21, 1977	4.49	(k)
1978	--	(d)	<19
1979	Mar. 19, 1979	9.36	(k)
1980	--	(d)	<19
1981	July 3, 1981	5.64	63.5
1982	May 4, 1982	6.41	100
1983	Feb. 20, 1983	5.01	50
1984	May 1, 1984	4.21	17
1985	--	(d)	(k)
1986	May 10, 1986	5.52	58
1987	--	(d)	(k)
1988	--	(d)	(k)
1989	--	(d)	(k)
Discontinued September 1989			

[d] Peak stage did not reach bottom of gage.
[k] Discharge not determined.
< Less than.

05482900 Hardin Creek near Farlin, Iowa

Location.--Lat 42°05'34", long 94°25'39", in NW1/4 sec. 14, T.84 N., R.31 W., Greene County, at bridge on county highway, 1.5 mi northeast of Farlin.

Drainage area.--101 mi^2.

Gage.--Crest-stage gage.

Stage-discharge relation.--Defined by current-meter and indirect measurements.

Remarks.--Only annual peaks are shown.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1951	Mar. 29, 1951	12.97	2,270
1952	Mar. 29, 1952	9.11	472
1953	July 14, 1953	7.96	300
1954	Aug. 27, 1954	12.57	1,810
1955	July 10, 1955	10.03	631
1956	--	(d)	<120
1957	June 17, 1957	10.59	743
1958	--	(d)	<120
1959	June 1, 1959	11.40	980
1960	Mar. 29, 1960	13.32	1,960
1961	Mar. 27, 1961	8.82	324
1962	Mar. 26, 1962	12.48	2,000
1963	May 13, 1963	10.87	930
1964	Apr. 13, 1964	9.39	615
1965	Sept.21, 1965	9.79	703
1966	June 12, 1966	9.13	474
1967	June 13, 1967	10.95	1,020
1968	--	(d)	<300
1969	July 26, 1969	12.17	1,950
1970	--	(d)	<300
1971	Mar. 12, 1971	12.37[b]	1,110
1972	May 6, 1972	9.04	570
1973	Mar. 18, 1973	11.32	960
1974	May 28, 1974	9.79	700
1975	--	(d)	<300
1976	--	(d)	<300
1977	--	(d)	<300
1978	Mar. 16, 1978	9.26	510
1979	Mar. 19, 1979	12.69	2,330

05482900 Hardin Creek near Farlin, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1980	--	(d)	<300
1981	--	(d)	<300
1982	May 4, 1982	9.84	768
1983	Feb. 19, 1983	10.15	835
1984	Apr. 30, 1984	9.55	708
1985	--	(d)	<479
1986	May 10, 1986	9.64	726
1987	Oct. 12, 1986	11.29	1,210
1988	--	(d)	<479
1989	--	(d)	<479
1990	June 16, 1990	12.89	2,470

[b] Affected by ice.
[d] Peak stage did not reach bottom of gage.
< Less than.

05482950 East Fork Hardin Creek near Paton, Iowa

(Discontinued September 1955)

Location.--Lat 42°08'15", long 91°23'00", near S1/4 corner, sec. 20, T.85 N., R.30 W., Greene County, at bridge on county road H, 6 mi west of Paton.

Drainage area.--7.57 mi^2.

Gage.--Crest-stage gage.

Stage-discharge relation.--Defined by current-meter measurements.

Remarks.--Only annual peaks are shown.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1952	July 7, 1952	4.72	39
1953	Mar. 24, 1953	7.77	68
1954	Aug. 26, 1954	7.00	60
1955	July 10, 1955	7.37	64
Discontinued September 1955			

05483000 East Fork Hardin Creek near Churdan, Iowa

Location.--Lat 42°06'27", long 94°22'12", in SE1/4 SW1/4 sec. 5, T.84 N., R.30 W., Greene County, hydrologic unit 07100006, on left bank 35 ft upstream from bridge on county highway E26, 1.6 mi upstream from small left-bank tributary, 4.4 mi upstream from mouth, and 6.5 mi southeast of Churdan.

Drainage area.--24.0 mi^2.

Gage.--Water-stage recorder. Datum is 1,050.90 ft above sea level.

Stage-discharge relation.--Defined by current-meter measurements below 180 ft^3/s and above by logarithmic plotting.

Bankfull stage.--High banks are not subject to overflow.

Remarks.--Peak base for partial-duration series, 150 ft^3/s. Base was 200 ft^3/s prior to 1962.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1952	July 14, 1952	4.33[m]	79
1953	June 10, 1953	5.17	105
1954	Aug. 26, 1954	7.73	329
1955	Oct. 13, 1954	6.15	250
	July 10, 1955	6.60	252
1956	May 13, 1956	4.42	112
1957	June 14, 1957	6.57	216
	June 16, 1957	8.82	371
1958	July 19, 1958	6.10	186
1959	May 31, 1959	7.36	288
1960	Mar. 29, 1960	7.63[b]	300[c]
	Apr. 24, 1960	8.04	350
	May 5, 1960	8.92	413
	May 25, 1960	6.30	231
1961	Feb. 22, 1961	5.41[b]	150[c]

05483000 East Fork Hardin Creek near Churdan, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1962	Mar. 25, 1962	6.06	231
	May 29, 1962	5.20	160
	July 14, 1962	7.46	315
	July 20, 1962	5.42	173
1963	Apr. 29, 1963	7.78	300[c]
1964	Apr. 13, 1964	5.36	172
	Apr. 27, 1964	5.18	159
1965	Mar. 31, 1965	8.28[b]	300[c]
	Apr. 5, 1965	6.13	214
	Sept. 27, 1965	5.45	170
1966	June 12, 1966	8.32	367
	June 27, 1966	6.27	180
1967	June 9, 1967	6.40	235
	June 13, 1967	6.83	265
	June 16, 1967	5.57	179
	June 19, 1967	5.21	157
	June 24, 1967	5.80	193
	June 27, 1967	6.70	256
1968	June 25, 1968	4.13	77
1969	Oct. 17, 1968	6.15	191
	Mar. 19, 1969	6.83	297
	Mar. 24, 1969	6.34	248
	May 5, 1969	5.97	215
	June 29, 1969	6.34	201
	July 9, 1969	7.46	306
	July 26, 1969	6.46	211
1970	May 14, 1970	3.89	70
1971	Feb. 19, 1971	7.86	200[c]
1972	Mar. 6, 1972	5.86[b]	160[c]
	Aug. 1, 1972	5.72	195

05483000 East Fork Hardin Creek near Churdan, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1973	Feb. 24, 1973	(b)	157[c]
	Mar. 1, 1973	(b)	152[c]
	Mar. 11, 1973	5.74	208
	Apr. 15, 1973	5.78	199
	May 7, 1973	5.95	205
	July 2, 1973	6.46	248
	Aug. 23, 1973	5.58	177
	Sept. 26, 1973	8.26	385
1974	Oct. 11, 1973	5.65	197
	Feb. 17, 1974	5.25	159
	May 13, 1974	5.58	206
	May 16, 1974	6.13	243
	May 18, 1974	7.71	385
1975	Mar. 18, 1975	6.83[b]	(k)
	Apr. 28, 1975	5.39	195
1976	May 23, 1976	5.11	148
1977	Sept. 30, 1977	6.02	197
1978	July 9, 1978	5.64	180
	Sept. 13, 1978	7.59	225
	Sept. 20, 1978	5.88	191
1979	Mar. 19, 1979	7.46	376
1980	June 4, 1980	5.62	179
1981	July 4, 1981	6.86	207
	Aug. 26, 1981	6.19	169
1982	Feb. 21, 1982	7.12	237
	May 4, 1982	7.16	282
	May 21, 1982	5.62	175
	May 26, 1982	5.28	155
	July 18, 1982	5.34	158
1983	Feb. 1983[n]	5.59[a]	173
	Mar. 6, 1983	5.94	194
	June 29, 1983	7.45	237

05483000 East Fork Hardin Creek near Churdan, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1984	Feb. 5, 1984	5.32	187
	Apr. 29, 1984	7.10	331
	June 13, 1984	4.93	158
	June 16, 1984	4.98	162
1985	June 2, 1985	4.20	110
1986	June 11, 1986	5.73	197
	June 30, 1986	10.78[a]	737
1987	Oct. 11, 1986	6.17	260
	July 12, 1987	5.83	152
	Aug. 26, 1987	5.05	171
1988	Dec. 9, 1987	2.64	37
	Jan. 27, 1988	3.29[b]	(k)
1989	June 27, 1989	3.81	82
1990	May 19, 1990	7.16	305
	May 25, 1990	6.53	241
	June 13, 1990	5.66	164
	June 17, 1990	10.20	754
	July 13, 1990	5.20	150
	July 26, 1990	7.82	406
	Aug. 25, 1990	6.28	249

[a] From high-water mark.
[b] Affected by ice.
[c] Approximate.
[k] Discharge not determined.
[m] Maximum for period July to September 1952.
[n] Sometime during the period Feb. 19-21.

05483318 Brushy Fork Creek near Templeton, Iowa

Location.--Lat 41°56'45", long 94°52'45", in NW1/4 sec. 1, T.82 N., R.35 W., Carroll County, at bridge on U.S. Highway 71, 4 mi northeast of Templeton.

Drainage area.--45.0 mi^2.

Gage.--Crest-stage gage.

Stage-discharge relation.--Not determined.

Remarks.--Only annual peaks are shown.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1966	June 12, 1966	88.62	(k)
1967	June 7, 1967	88.70	(k)
1968	--	(d)	(k)
1969	July 26, 1969	86.99	(k)
1970	May 13, 1970	83.91	(k)
1971	Mar. 13, 1971	87.78[b]	(k)
1972	Oct. 30, 1971	86.48	(k)
1973	Sept. 26, 1973	88.62	(k)
1974	June 23, 1974	90.96	5,330
1975	Apr. 27, 1975	85.72	(k)
1976	--	(d)	(k)
1977	--	(d)	(k)
1978	Sept. 12, 1978	87.56	1,850
1979	Mar. 19, 1979	86.58	(k)
1980	--	(d)	(k)
1981	--	(d)	(k)
1982	May 26, 1982	85.60	(k)
1983	--	(d)	(k)
1984	June 13, 1984	83.89	(k)
1985	--	(d)	(k)
1986	June 30, 1986	88.60	(k)
1987	--	(d)	(k)
1988	June 7, 1988	87.82	(k)
1989	July 8, 1989	78.43	(k)
1990	June 16, 1990	90.58	(k)

[b] Affected by ice.
[d] Peak stage did not reach bottom of gage.
[k] Discharge not determined.

05483349 Middle Raccoon River tributary at Carroll, Iowa

Location.--Lat 42°02'30", long 94°52'43", in NW1/4 sec. 36, T.84 N., R.35 W., Carroll County, at bridge on U.S. Highway 71, 1.5 mi south of Carroll.

Drainage area.--6.58 mi^2.

Gage.--Crest-stage gage.

Stage-discharge relation.--Defined by current-meter and indirect measurements.

Remarks.--Only annual peaks are shown.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1966	June 12, 1966	90.12	500
1967	June 27, 1967	90.45	550
1968	June 25, 1968	89.69	440
1969	July 26, 1969	90.37	540
1970	--	(d)	<80
1971	Mar. 13, 1971	89.64[b]	400[c]
1972	Sept.12, 1972	87.67	200
1973	July 1, 1973	90.58	580
1974	--	(d)	<80
1975	Apr. 27, 1975	90.34	530
1976	May 23, 1976	91.06	680
1977	--	(d)	<80
1978	--	(d)	<80
1979	--	(d)	<80
1980	Mar. 20, 1980	19.66	168
1981	June 29, 1981	22.83	694
1982	Mar. 19, 1982	23.07	810
1983	June 27, 1983	22.76	667
1984	June 13, 1984	22.91	726
1985	--	(d)	<36
1986	June 29, 1986	24.81	3,350
1987	Aug. 12, 1987	24.68	3,130
1988	June 8, 1988	22.07	439
1989	June 12, 1989	23.57	1,060
1990	June 13, 1990	23.97	1,580

[b] Affected by ice.
[c] Approximate.
[d] Peak stage did not reach bottom of gage.
< Less than.

05483450 Middle Raccoon River near Bayard, Iowa

Location.--Lat 41°46'43", long 94°29'33", in SW1/4 SW1/4 sec. 32, T.81 N., R.31 W., Guthrie County, hydrologic unit 07100007, on left bank 15 ft downstream from bridge on State Highway 25, 0.2 mi downstream from Battle Run Creek, 1.8 mi upstream from Springbrook Creek, 5.8 mi southeast of Bayard, 10.4 mi upstream from dam at Lake Panorama, and at mile 279.2 upstream from mouth of Des Moines River.

Drainage area.--375 mi^2.

Gage.--Water-stage recorder. Datum is 1,040.00 ft above sea level.

Stage-discharge relation.--Defined by current-meter measurements.

Remarks.--Base for partial-duration series, 1,200 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1979[m]	Mar. 23, 1979	17.68	3,460
	Mar. 30, 1979	14.74	2,520
	May 3, 1979	12.73	1,220
	June 28, 1979	17.65	3,410
	July 23, 1979	16.63	2,770
	July 24, 1979	13.36	1,440
	July 30, 1979	12.79	1,240
1980	Mar. 16, 1980	11.51	859
1981	May 23, 1981	13.73	1,580
	June 30, 1981	15.74	2,370
	July 4, 1981	13.23	1,400
	Aug. 2, 1981	15.34	2,200
1982	Feb. 22, 1982	18.71[b]	3,480[c]
	Mar. 12, 1982	13.21	1,390
	Mar. 20, 1982	17.53	3,340
	May 20, 1982	15.16	2,130
	May 22, 1982	13.20	1,390
	May 27, 1982	17.00	2,970
	June 16, 1982	16.14	2,540
1983	Feb. 20, 1983	17.30	3,180
	Mar. 7, 1983	15.79	2,390
	Apr. 1, 1983	15.62	2,320
	Apr. 13, 1983	14.25	1,770
	May 3, 1983	15.44	2,140
	June 30, 1983	18.03	3,310
	July 2, 1983	19.79	5,190

05483450 Middle Raccoon River near Bayard, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1984	Feb. 16, 1984	14.76	1,700
	Apr. 9, 1984	14.24	1,440
	Apr. 22, 1984	16.12	2,150
	Apr. 27, 1984	15.72	2,000
	Apr. 30, 1984	19.99	4,960
	May 25, 1984	14.02	1,420
	May 29, 1984	15.65	2,060
	June 13, 1984	15.14	1,920
	June 15, 1984	16.33	2,400
	June 17, 1984	18.50	3,700
	June 20, 1984	14.85	1,810
1985	Feb. 22, 1985	14.10[b]	1,170[c]
1986	Feb. 27, 1986	(b)	1,500[c]
	Mar. 16, 1986	13.08	1,210
	Mar. 19, 1986	18.49	3,630
	May 11, 1986	19.25	4,400
	May 17, 1986	14.88	1,600
	June 14, 1986	15.64	1,800
	June 30, 1986	24.70	12,300
	July 6, 1986	16.43	2,060
	July 12, 1986	14.20	1,290
	Aug. 5, 1986	16.22	2,010
	Aug. 14, 1986	20.24	5,200
1987	Oct. 12, 1986	18.24	3,350
	July 12, 1987	16.12	1,970
	Aug. 13, 1987	14.11	1,310
	Aug. 26, 1987	16.54	2,180
	Sept. 17, 1987	14.35	1,330
1988	June 8, 1988	16.63	2,230
	July 18, 1988	14.52	1,390
1989	Mar. 10, 1989	18.35[b]	1,450[c]
	May 24, 1989	17.35	2,620
	May 29, 1989	14.68	1,440
	Sept. 8, 1989	18.11	3,090

05483450 Middle Raccoon River near Bayard, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1990	May 20, 1990	20.20	5,180
	May 25, 1990	18.35	3,290
	June 14, 1990	19.19	4,080
	June 17, 1990	23.23	9,570
	June 23, 1990	17.02	2,370
	June 28, 1990	17.65	2,750
	July 11, 1990	16.21	1,910
	July 26, 1990	15.95	1,800
	Aug. 25, 1990	16.41	2,070

[b] Affected by ice.
[c] Approximate.
[m] Peaks for 1979 are from March 23 to September 30.

05483600 Middle Raccoon River at Panora, Iowa

Location.--Lat 41°41'14", long 94°22'15", in NE1/4 NW1/4 sec. 5, T.79 N., R.30 W., Guthrie County, hydrologic unit 07100007, on left bank 15 ft downstream from bridge on county highway, 0.2 mi southwest of Panora, 1.5 mi upstream from Andy's Branch, 1.6 mi downstream from Lake Panorama, 18.2 mi upstream from mouth, and at mile 267.2 upstream from mouth of Des Moines River.

Drainage area.--440 mi^2.

Gage.--Water-stage recorder and concrete control. Datum is 991.20 ft above sea level.

Stage-discharge relation.--Defined by current-meter measurements below 4,500 ft^3/s, and above by logarithmic plotting.

Remarks.--Base for partial-duration series, 2,500 ft^3/s. City of Panora diverts approximately 100 acre-ft/yr upstream of station. Flow regulated by dam on Lake Panorama since August 1970.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1953	June 10, 1953	14.3[a]	14,000[c]

1958	July 2, 1958	11.87	9,150[c]
	July 3, 1958	8.95	4,200
	July 19, 1958	8.07	3,020
1959	June 1, 1959	7.50	2,480
1960	Mar. 31, 1960	9.68	5,320
	May 7, 1960	8.33	3,740
1961	June 16, 1961	7.82	2,730
1962	Mar. 26, 1962	9.29	4,620
	June 10, 1962	8.85	3,940
1963	Aug. 7, 1963	9.05	4,200
1964	June 22, 1964	10.47	6,300
1965	Mar. 2, 1965	11.54[b]	4,600[c]
	Mar. 17, 1965	10.87	6,890
	Apr. 2, 1965	8.49	3,540
	Apr. 5, 1965	9.35	4,690
	May 27, 1965	7.90	2,840
1966	June 12, 1966	8.54	3,480
	June 29, 1966	8.79	3,800

05483600 Middle Raccoon River at Panora, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1967	June 7, 1967	8.45	3,550
	June 10, 1967	9.95[a]	5,600
	June 12, 1967	8.37	3,450
	June 25, 1967	9.53[a]	5,010
1968	June 26, 1968	6.18	1,150
1969	Mar. 20, 1969	9.84[a]	5,380
	Mar. 24, 1969	10.25	5,950
	July 10, 1969	7.93	2,870
1970	May 15, 1970	7.83	2,780
1971	Feb. 19, 1971	12.98[a,b]	8,900[c]
1972	Mar. 1, 1972	7.63	2,670
	May 7, 1972	7.51	2,550
	June 17, 1972	8.17	3,300
	Aug. 2, 1972	9.64	5,110
1973	Mar. 2, 1973	7.87	2,970
	Apr. 16, 1973	8.35	3,370
	Apr. 26, 1973	8.39	3,380
	May 9, 1973	8.87	4,180
	June 4, 1973	8.04	3,190
	July 3, 1973	13.56[a]	12,000
	July 30, 1973	9.39	4,570
	Sept. 28, 1973	8.99	4,090
1974	May 17, 1974	7.85	2,810
	May 19, 1974	14.80	14,000
	May 21, 1974	9.00	4,240
	May 27, 1974	9.13	4,410
	June 14, 1974	8.13	3,150
1975	Apr. 29, 1975	8.36	3,420
	June 18, 1975	7.88	2,850
	Aug. 27, 1975	7.90	2,870
1976	May 23, 1976	11.05	7,300
1977	Aug. 26, 1977	7.75	2,690
1978	Mar. 20, 1978	8.97	4,180
	Sept. 13, 1978	9.18	4,470

05483600 Middle Raccoon River at Panora, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1979	Mar. 19, 1979	12.95	10,700
	Mar. 24, 1979	7.78	2,730
	Mar. 30, 1979	7.58	2,500
	June 28, 1979	8.53	3,630
	July 23, 1979	7.66	2,590
1980	June 4, 1980	8.30	3,350
1981	Aug. 14, 1981	7.46	2,380
1982	Feb. 23, 1982	9.13	4,330
	Mar. 19, 1982	8.21	3,210
	May 27, 1982	8.42	3,580
	June 16, 1982	8.26	3,350
1983	Feb. 16, 1983	7.69	2,620
	Feb. 20, 1983	7.94	2,920
	Mar. 7, 1983	7.82	2,770
	Apr. 1, 1983	8.29	3,340
	June 28, 1983	8.61	3,730
	July 2, 1983	9.81	5,360
1984	Feb. 16, 1984	7.78	2,730
	Apr. 4, 1984	7.73	2,680
	Apr. 23, 1984	7.85	2,810
	Apr. 30, 1984	11.18	7,530
	June 16, 1984	8.19	3,210
	June 17, 1984	8.89	4,090
1985	Dec. 29, 1984	7.43	2,350
1986	Feb. 28, 1986	8.18	3,200
	Mar. 19, 1986	8.09	3,090
	May 11, 1986	9.08	4,330
	May 25, 1986	8.13	3,140
	June 30, 1986	15.50	15,300
	Aug. 5, 1986	8.55	3,450
	Aug. 14, 1986	9.88	4,970
1987	Oct. 12, 1986	8.42	3,320
	Aug. 26, 1987	8.07	2,960
1988	June 8, 1988	7.40	2,300
1989	Sept. 8, 1989	8.40	3,300

05483600 Middle Raccoon River at Panora, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1990	May 20, 1990	9.27	4,520
	May 25, 1990	8.29	3,530
	June 13, 1990	8.66	3,900
	June 18, 1990	12.77	9,000
	June 23, 1990	8.00	3,190
	June 28, 1990	7.72	2,880
	July 11, 1990	7.38	2,520
	Aug. 26, 1990	8.46	3,690

[a] From high-water mark.
[b] Affected by ice.
[c] Approximate.

05484000 South Raccoon River at Redfield, Iowa

Location.--Lat 41°35'22", long 94°09'04", in SW1/4 NE1/4 sec. 2, T.78 N., R.28 W., Dallas County, hydrologic unit 07100007, on right bank 20 ft upstream from bridge on county highway at Redfield, 3.2 mi downstream from bridge on U.S. Highway 6, 3.4 mi downstream from Middle Raccoon River, 14.0 mi upstream from mouth, and at mile 245.6 upstream from mouth of Des Moines River.

Drainage area.--994 mi^2.

Gage.--Water-stage recorder. Datum is 888.88 ft above sea level. Prior to June 12, 1946, nonrecording gage; June 12, 1946, to Sept. 30, 1966, water-stage recorder at site 20 ft upstream; and Sept. 30, 1966, to Sept. 30, 1986, water-stage recorder at site 2.4 mi upstream; all at datum 7.55 ft higher.

Stage-discharge relation.--Defined by current-meter measurements.

Flood stage.--14 ft.

Remarks.--Base for partial-duration series, 5,000 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1940	July 31, 1940	13.3	6,100
1941	June 28, 1941	10.5	3,550
1942	May 11, 1942	13.0	5,740
	Aug. 28, 1942	13.4	6,380
1943	Aug. 25, 1943	14.1	6,610
1944	May 3, 1944	13.2	5,930
	May 20, 1944	23.8	20,000
	May 23, 1944	16.9	9,750
	June 11, 1944	13.7	6,430
1945	May 14, 1945	15.0	7,730
	May 22, 1945	17.2	10,100
	May 30, 1945	15.0	7,730
	June 6, 1945	13.1	5,830
1946	Aug. 24, 1946	18.9	12,000
	Sept. 8, 1946	21.4	15,200

05484000 South Raccoon River at Redfield, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1947	June 2, 1947	19.9	15,000
	June 5, 1947	22.7	20,500
	June 12, 1947	24.3	23,800
	June 24, 1947	16.7	10,500
1948	Mar. 19, 1948	21.3	17,600
1949	Mar. 6, 1949	14.2	7,530
1950	May 5, 1950	14.7	7,990
	June 19, 1950	17.9	11,600
	June 23, 1950	13.8	7,080
1951	Mar. 29, 1951	20.10	15,400
	May 2, 1951	17.70	11,700
	June 2, 1951	18.14	12,200
	June 7, 1951	12.19	5,680
	July 3, 1951	16.26	10,100
1952	Mar. 13, 1952	11.53	5,160
	Mar. 31, 1952	14.39	7,840
	June 21, 1952	12.12	5,680
	June 27, 1952	16.06	9,740
1953	May 24, 1953	12.23	5,680
	June 10, 1953	23.08	21,300
1954	Aug. 22, 1954	13.84	7,200
1955	Apr. 24, 1955	12.86	6,310
1956	Sept. 4, 1956	9.80	3,840
1957	June 17, 1957	17.80	12,700
1958	July 2, 1958	29.04[a]	35,000
	July 4, 1958	19.28	14,200
	July 19, 1958	15.80	9,580
	Sept. 6, 1958	25.12	25,500
1959	May 30, 1959	10.95	5,420
1960	Mar. 30, 1960	15.29	9,340
	May 7, 1960	15.31	9,340

05484000 South Raccoon River at Redfield, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1961	Feb. 23, 1961	11.23	5,590
	Mar. 27, 1961	10.67	5,160
	June 14, 1961	10.78	5,250
	Sept. 30, 1961	11.00	5,420
1962	Mar. 19, 1962	17.50[a,b]	(k)
	Mar. 24, 1962	14.42	8,350
	May 29, 1962	15.46	9,340
	June 9, 1962	13.01	7,090
1963	Mar. 3, 1963	13.43[b]	6,300[c]
	Apr. 29, 1963	15.25	9,240
	Aug. 7, 1963	10.85	5,080
1964	Apr. 13, 1964	13.57	7,720
	June 23, 1964	19.69	14,900
1965	Feb. 21, 1965	11.82[b]	5,600[c]
	Mar. 2, 1965	17.70	12,800
	Mar. 17, 1965	19.60	15,800
	Apr. 1, 1965	15.14	9,350
	Apr. 5, 1965	16.99	11,800
1966	June 12, 1966	15.17	9,460
1967	June 8, 1967	14.06	8,080
	June 10, 1967	17.12	12,000
	June 12, 1967	15.21	9,430
1968	Sept. 4, 1968	6.27	1,710
1969	Mar. 19, 1969	16.69	11,700
	Mar. 24, 1969	16.08	10,900
	June 29, 1969	11.75	5,990
	July 9, 1969	13.55	7,780
1970	May 14, 1970	14.50	9,050
1971	Feb. 19, 1971	20.82	17,800
	Mar. 14, 1971	14.61	9,200
	June 6, 1971	17.25	12,500
1972	Aug. 2, 1972	12.82	7,220
	Sept.11, 1972	13.95	8,410

05484000 South Raccoon River at Redfield, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1973	Mar. 14, 1973	10.33	5,010
	Apr. 1, 1973	10.95	5,650
	Apr. 16, 1973	14.77	9,650
	May 8, 1973	17.63	13,000
	June 5, 1973	10.74	5,260
	July 4, 1973	19.97	16,500
	July 30, 1973	10.96	5,450
	Sept. 26, 1973	14.74	9,310
1974	Oct. 11, 1973	11.96	6,380
	Apr. 21, 1974	15.58	10,300
	Apr. 28, 1974	12.93	7,380
	May 16, 1974	10.64	5,210
	May 19, 1974	21.85	20,000
	May 21, 1974	13.42	8,300
	May 26, 1974	11.52	6,150
1975	Apr. 28, 1975	15.45	10,200
	June 18, 1975	14.28	8,680
	June 25, 1975	12.40	6,720
1976	Mar. 12, 1976	10.41	5,130
	May 23, 1976	12.71	7,490
1977	Aug. 26, 1977	15.90	11,300
	Aug. 28, 1977	13.76	8,740
	Sept. 3, 1977	12.97	7,870
1978	Mar. 21, 1978	(b)	8,640
	Mar. 22, 1978	14.02	8,990
	Apr. 17, 1978	17.13	12,700
	Sept. 13, 1978	13.79	8,770
	Sept. 14, 1978	14.63	9,760
1979	Mar. 13, 1979	10.75	5,550
	Mar. 19, 1979	22.81	20,400
	Aug. 10, 1979	12.10	6,910
1980	June 15, 1980	7.47	2,700
1981	May 23, 1981	7.08	2,430
1982	Feb. 21, 1982	14.22[b]	6,150[c]
	Feb. 23, 1982	12.46	5,650
	Mar. 19, 1982	12.85	7,740
	May 28, 1982	11.31	6,110
	June 15, 1982	12.82	7,700

05484000 South Raccoon River at Redfield, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1983	Dec. 28, 1982	11.34	6,130
	Feb. 20, 1983	12.92	7,800
	Mar. 31, 1983	10.96	5,740
	May 19, 1983	12.44	7,280
	June 29, 1983	13.02	7,910
	July 3, 1983	11.24	6,020
1984	Apr. 30, 1984	18.58	14,500
	May 25, 1984	10.22	5,020
	June 15, 1984	10.84	5,630
	June 16, 1984	12.02	6,840
	June 17, 1984	12.03	6,850
1985	Feb. 21, 1985	16.37[b]	6,200
1986	Feb. 26, 1986	(b)	5,800
	Mar. 18, 1986	9.67	5,030
	Apr. 30, 1986	10.17	5,640
	May 11, 1986	15.29	11,400
	May 16, 1986	11.99	7,080
	July 1, 1986	25.15	26,300
	July 10, 1986	10.47	5,100
	July 14, 1986	10.51	5,140
	Aug. 6, 1986	10.46	5,070
	Aug. 14, 1986	17.54	13,000
	.....	.....	.....
1987	July 12, 1987	11.44	7,290
	Aug. 26, 1987	14.30	10,900
	Sept. 16, 1987	11.10	6,340
1988	Jan. 30, 1988	14.31[b]	8,400
1989	Sept. 8, 1989	13.33	9,380
1990	May 19, 1990	10.92	6,890
	May 25, 1990	10.73	6,660
	June 14, 1990	10.32	6,190
	June 16, 1990	19.05	19,100
	June 23, 1990	9.69	5,240

[a] From high-water mark.
[b] Affected by ice.
[c] Approximate.
[k] Discharge not determined.

5484500 Raccoon River at Van Meter, Iowa

Location.--Lat 41°32'02", long 93°56'59", in SW1/4 SW1/4 sec. 22, T.78 N., R.27 W., Dallas County, hydrologic unit 07100006, on right bank 10 ft downstream from bridge on county highway R16, 0.3 mi northeast of Van Meter, 0.7 mi upstream from small left bank tributary, 1.1 mi downstream from confluence of North and South Raccoon Rivers, 29.0 mi upstream from mouth, and at mile 230.5 upstream from mouth of Des Moines River.

Drainage area.--3,441 mi^2.

Gage.--Water-stage recorder at present site after Aug. 9,1934. Datum is 841.16 ft above sea level. Prior to Oct. 1, 1915, chain gage at same site and at datum 2 ft higher. Oct. 1, 1915, to May 30, 1923, chain gage; May 31, 1923, to Sept. 30, 1927, water-stage recorder; and Oct. 1, 1927, to Aug. 8, 1934, chain gage; all at same site and datum.

Stage-discharge relation.--Defined by current-meter measurements.

Flood stage.--13 ft.

Remarks.--Base for partial-duration series, 8,500 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1915	May 29, 1915	15.19	21,600
1916	Mar. 16, 1916	8.4	5,840
1917	June 7, 1917	18.4	35,200
	June 10, 1917	17.0	26,000
1918	June 6, 1918	13.7	14,800
1919	Apr. 24, 1919	12.6	12,400
	May 4, 1919	12.4	12,000
	June 4, 1919	11.7	10,700
	June 11, 1919	11.8	11,000
1920	Mar. 14, 1920	12.2[b]	10,000[c]
1921	Sept. 20, 1921	11.1	9,670
1922	Apr. 11, 1922	12.1	11,400
1923	Mar. 27, 1923	11.6	10,300
1924	Oct. 3, 1923	11.2	10,000
	June 8, 1924	12.3	12,400
	June 25, 1924	15.2	20,100

05484500 Raccoon River at Van Meter, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1925	Aug. 7, 1925	10.1	8,060
1926	Sept. 20, 1926	19.0	32,000
1927	Feb. 8, 1927	9.7	6,880
1928	Aug. 27, 1928	10.8	8,480
1929	Mar. 14, 1929	16.2	19,400
1930	May 13, 1930	8.8	5,870
1931	June 21, 1931	8.3	5,270
1932	Nov. 24, 1931	14.6	15,200
	Jan. 1, 1932	12.5	11,400
	Mar. 4, 1932	14.2	14,200
1933	Apr. 5, 1933	10.1	7,550
1934	Apr. 7, 1934	5.0	2,020
1935	Mar. 5, 1935	13.1	11,000
1936	Mar. 5, 1936	13.9	12,200
1937	Mar. 4, 1937	13.9	12,200
1938	June 2, 1938	11.6	8,590
1939	Mar. 12, 1939	17.85[b]	14,000[c]
	Mar. 16, 1939	13.0	10,600
1940	July 31, 1940	9.2	5,770
1941	June 2, 1941	10.0	6,920
1942	May 11, 1942	11.7	8,800
1943	June 16, 1943	12.9	10,000
	Aug. 16, 1943	14.7	12,500
1944	May 21, 1944	18.3	23,400
	June 11, 1944	15.1	13,100
	June 16, 1944	17.2	17,900

05484500 Raccoon River at Van Meter, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1945	Mar. 15, 1945	13.7	11,600
	Apr. 28, 1945	12.7	10,200
	May 15, 1945	13.4	11,200
	May 23, 1945	15.7	14,300
	May 31, 1945	15.0	12,900
	June 6, 1945	16.1	15,100
	June 13, 1945	13.0	10,900
1946	Aug. 25, 1946	13.2	10,300
	Sept. 9, 1946	16.1	15,100
1947	June 3, 1947	17.4	19,800
	June 5, 1947	19.3	25,600
	June 13, 1947	21.37[a]	41,200
	June 23, 1947	16.4	17,300
	June 25, 1947	21.1	38,000
1948	Mar. 19, 1948	19.0	26,700
1949	Mar. 6, 1949	15.7	15,900
1950	Mar. 7, 1950	12.4	11,300
	June 20, 1950	16.1	17,600
	June 24, 1950	14.0	13,700
1951	Mar. 31, 1951	19.15	27,700
	May 2, 1951	17.00	19,900
	June 3, 1951	17.13	20,200
	June 8, 1951	14.47	14,400
	July 4, 1951	15.18	15,800
	July 6, 1951	11.55	10,100
1952	Apr. 1, 1952	14.81	15,100
	June 27, 1952	14.67	14,900
1953	June 11, 1953	19.42	26,000
1954	June 16, 1954	12.46	11,000
	June 25, 1954	17.40	20,800
	Aug. 22, 1954	12.07	10,200
	Aug. 31, 1954	14.14	13,800
1955	Apr. 24, 1955	11.43	8,620
1956	Sept. 4, 1956	7.43	4,150

05484500 Raccoon River at Van Meter, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1957	June 18, 1957	17.27	20,000
1958	July 3, 1958	21.77	35,200
	July 20, 1958	13.73	13,300
	Sept. 6, 1958	17.76	20,900
1959	June 4, 1959	13.22	13,500
1960	Apr. 2, 1960	21.18	32,300
	May 7, 1960	14.62	14,800
	May 26, 1960	11.76	10,400
1961	Mar. 27, 1961	12.35	11,300
1962	Mar. 31, 1962	17.23	19,700
	May 29, 1962	14.33	14,900
	June 11, 1962	12.42	11,900
	Sept. 7, 1962	11.45	10,400
1963	Mar. 4, 1963	14.38[b]	10,000[c]
	Mar. 11, 1963	13.85	12,200
	Apr. 29, 1963	12.62	12,200
1964	June 23, 1964	15.92	17,400
1965	Mar. 2, 1965	14.73[b]	13,000[c]
	Mar. 17, 1965	18.20[b]	20,100[c]
	Apr. 1, 1965	13.93	14,300
	Apr. 6, 1965	18.35	22,300
	May 30, 1965	11.20	10,400
1966	June 13, 1966	15.15	16,200
1967	June 8, 1967	13.09	12,300
	June 10, 1967	17.04	18,700
	June 12, 1967	18.07	20,600
	June 26, 1967	12.11	10,900
1968	June 27, 1968	7.05	4,360
1969	Mar. 25, 1969	17.60	22,800
	Apr. 9, 1969	12.07	10,900
	June 29, 1969	12.95	12,400
	July 10, 1969	14.18	14,700
	July 18, 1969	11.74	10,400

05484500 Raccoon River at Van Meter, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1970	May 14, 1970	14.23	14,800
1971	Feb. 20, 1971	18.85[b]	23,000[c]
	Mar. 14, 1971	14.55	15,400
	June 6, 1971	13.44	13,300
1972	June 18, 1972	10.74	8,840
	Aug. 2, 1972	10.96	9,140
	Aug. 6, 1972	10.71	8,790
	Sept.11, 1972	11.33	9,730
1973	Feb. 2, 1973	15.15[b]	14,300[c]
	Feb. 25, 1973	11.00	9,200
	Mar. 7, 1973	13.43	13,300
	Mar. 14, 1973	14.80	16,000
	Apr. 1, 1973	13.48	13,400
	Apr. 16, 1973	17.59	22,700
	May 8, 1973	17.55	21,600
	June 1, 1973	10.68	8,750
	June 5, 1973	11.77	10,400
	July 1, 1973	20.74	32,400
	July 4, 1973	21.74	35,600
	Sept. 29, 1973	13.16	12,800
1974	Oct. 1, 1973	15.33	17,100
	Oct. 11, 1973	14.01	14,300
	Oct. 15, 1973	11.87	10,600
	Apr. 21, 1974	13.47	13,400
	Apr. 29, 1974	14.33	15,000
	May 19, 1974	20.13	30,400
	May 27, 1974	11.95	11,000
	May 29, 1974	10.71	9,380
	June 9, 1974	11.87	11,100
1975	Mar. 21, 1975	12.34	11,300
	Apr. 28, 1975	13.90	14,100
	June 18, 1975	14.01	14,300
	June 25, 1975	11.92	10,700
	June 27, 1975	10.59	8,630
1976	Apr. 24, 1976	10.69	8,710
	May 24, 1976	12.84	12,200
1977	Aug. 26, 1977	12.50	11,600
	Aug. 28, 1977	12.79	11,900

05484500 Raccoon River at Van Meter, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1978	Mar. 22, 1978	17.62[b]	20,800[c]
	Aug. 18, 1978	14.48	15,300
	Sept.14, 1978	13.14	12,800
	Sept.20, 1978	12.63	11,800
1979	Mar. 19, 1979	20.39	29,900
	Apr. 2, 1979	15.80	17,000
	June 29, 1979	11.09	9,340
	Aug. 10, 1979	12.25	11,200
1980	June 15, 1980	7.76	4,870
1981	July 4, 1981	7.12	4,130
1982	Feb. 21, 1982	14.34[b]	11,600[c]
	Feb. 23, 1982	12.25	11,500
	Mar. 20, 1982	12.14	11,300
	May 20, 1982	12.86	12,700
	May 26, 1982	12.41	11,800
	June 15, 1982	14.21	15,100
	June 16, 1982	10.92	9,390
1983	Dec. 28, 1982	12.78	12,200
	Feb. 20, 1983	13.66	13,700
	Mar. 11, 1983	14.28	14,900
	Mar. 16, 1983	10.53	8,520
	Apr. 2, 1983	14.00	14,400
	Apr. 10, 1983	12.73	12,000
	Apr. 17, 1983	14.08	14,500
	May 7, 1983	13.64	13,700
	May 19, 1983	11.61	10,200
	June 26, 1983	12.70	12,100
	June 30, 1983	16.25	19,400
	July 3, 1983	18.59	25,500
1984	Feb. 12, 1984	13.61	13,900
	Feb. 19, 1984	11.61	10,800
	Apr. 12, 1984	11.64	10,200
	Apr. 16, 1984	11.21	9,550
	Apr. 30, 1984	19.51	28,500
	May 25, 1984	11.94	10,700
	May 29, 1984	11.39	9,830
	June 8, 1984	10.73	8,790
	June 9, 1984	13.45	13,300
	June 13, 1984	13.31	13,100
	June 17, 1984	18.09	24,000
	June 23, 1984	17.50	22,400

05484500 Raccoon River at Van Meter, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1985	Feb. 22, 1985	12.70[b]	9,900[c]
1986	May 11, 1986	13.92	14,300
	May 17, 1986	15.20	17,000
	July 1, 1986	22.69	40,200
	July 10, 1986	11.28	9,880
	July 11, 1986	11.07	9,520
	July 14, 1986	11.39	9,990
	Aug. 14, 1986	14.14	14,400
1987	Oct. 12, 1986	12.42	11,500
	July 12, 1987	10.64	8,730
	Aug. 26, 1987	13.97	14,700
1988	Feb. 21, 1988	11.66[b]	(k)
	June 9, 1988	7.16	3,920
1989	Mar. 10, 1989	11.00[b]	(k)
	Sept. 9, 1989	9.98[a]	7,640
1990	May 21, 1990	12.27	11,300
	May 28, 1990	13.60	13,600
	June 16, 1990	21.39	34,600

[a] From high-water mark.
[b] Affected by ice.
[c] Approximate.
[k] Discharge not determined.

05484800 Walnut Creek at Des Moines, Iowa

Location.--Lat 41°35'14", long 93°42'11", in SW1/4 SE1/4 sec. 2, T.78 N., R. 25 W., Polk County, hydrologic unit 07100006, on left bank, 25 ft downstream from bridge on 63rd Street in Des Moines, and 2.2 mi upstream from Raccoon River.

Drainage area.--78.4 mi^2.

Gage.--Water-stage recorder. Datum is 801.04 ft above sea level (levels by Iowa Natural Resources Council).

Stage-discharge relation.--Defined by current-meter measurements.

Flood stage.--13 ft.

Remarks.--Base for partial-duration series, 600 ft^3/s.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1972	June 20, 1972	9.53	680
	Sept. 10, 1972	8.86	644
1973	Dec. 30, 1972	10.39[b]	700[c]
	Feb. 1, 1973	14.00	2,350
	Apr. 16, 1973	11.85	1,610
	May 1, 1973	9.70	942
	May 8, 1973	9.99	878
	July 1, 1973	17.72	9,000
	July 4, 1973	12.56	1,670
1974	Oct. 11, 1973	12.74	1,770
	Apr. 28, 1974	12.73	1,740
	May 19, 1974	12.78	1,760
	June 9, 1974	17.44	8,160
1975	Apr. 27, 1975	9.08	736
	June 15, 1975	8.82	670
	June 18, 1975	11.53	1,440
	Aug. 27, 1975	17.00	5,800
	Aug. 29, 1975	10.19	948
1976	Apr. 18, 1976	14.24	2,470
	Apr. 24, 1976	12.20	1,530
	June 10, 1976	10.13	928
	June 12, 1976	9.82	875
	June 13, 1976	9.05	686
	June 28, 1976	13.41	2,060

05484800 Walnut Creek at Des Moines, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1977	Aug. 26, 1977	11.84	1,400
	Aug. 28, 1977	14.48	2,590
	Aug. 31, 1977	9.43	746
	Sept. 17, 1977	8.70	602
1978	Mar. 20, 1978	8.80	620
	Apr. 17, 1978	9.99	933
	Apr. 17, 1978	10.75	1,180
	Aug. 27, 1978	10.32	965
	Sept. 20, 1978	8.62	616
1979	June 13, 1979	10.30	1,010
	Aug. 10, 1979	9.59	855
	Aug. 19, 1979	8.72	662
	Aug. 21, 1979	8.77	672
1980	June 1, 1980	9.60	674
	June 4, 1980	9.28	827
	Aug. 16, 1980	9.80	954
1981	May 23, 1981	11.93	1,560
	June 24, 1981	11.49	1,420
	July 3, 1981	13.47	2,190
	July 17, 1981	11.44	1,440
	Aug. 14, 1981	12.25	1,700
	Aug. 28, 1981	8.45	643
1982	Feb. 23, 1982	(b)	821[c]
	Mar. 19, 1982	8.58	702
	Apr. 16, 1982	8.79	766
	June 15, 1982	9.65	989
	July 6, 1982	9.39	920
	July 18, 1982	11.41	1,440
	July 21, 1982	8.56	668
	Aug. 5, 1982	12.08	1,650
1983	Dec. 27, 1982	8.84	757
	Apr. 12, 1983	8.67	728
	May 7, 1983	9.21	899
	May 19, 1983	8.56	740
	June 9, 1983	8.01	618
	June 29, 1983	11.60	1,490
	July 2, 1983	9.00	771
	July 3, 1983	12.64	1,840
	Aug. 30, 1983	8.30	609

05484800 Walnut Creek at Des Moines, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1984	Nov. 3, 1983	8.41	700
	Nov. 19, 1983	8.14	638
	Apr. 29, 1984	9.85	989
	May 25, 1984	10.38	1,130
	May 28, 1984	9.01	774
	June 8, 1984	12.58	1,820
	June 9, 1984	14.63	2,820
	June 11, 1984	10.75	1,240
	June 14, 1984	10.56	1,180
	July 14, 1984	12.07	1,640
	July 26, 1984	10.77	1,240
1985	Nov. 1, 1984	9.69	946
	Sept. 22, 1985	9.02	776
1986	Apr. 30, 1986	14.37	3,160
	May 8, 1986	8.21	669
	May 10, 1986	18.32	12,500
	May 13, 1986	7.88	687
	May 17, 1986	10.43	1,450
	May 25, 1986	11.46	1,820
	June 4, 1986	10.12	1,340
	June 30, 1986	14.88	3,450
	July 10, 1986	9.75	1,220
	July 29, 1986	7.63	625
	Aug. 13, 1986	12.18	2,090
1987	Apr. 14, 1987	8.09	740
	June 18, 1987	8.09	735
	June 25, 1987	7.75	645
	July 8, 1987	8.92	964
	July 12, 1987	11.87	1,970
	Aug. 8, 1987	8.02	732
	Aug. 25, 1987	9.50	1,150
	Aug. 26, 1987	10.42	1,440
1988	June 8, 1988	7.58	613
	Aug. 22, 1988	7.95	704
1989	Nov. 15, 1988	8.69	899
	May 24, 1989	8.41	824
	July 18, 1989	8.76	924
	Aug. 29, 1989	7.66	642
	Sept. 9, 1989	8.36	822

05484800 Walnut Creek at Des Moines, Iowa--Continued

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft^3/s)
1990	Mar. 13, 1990	11.61	2,070
	May 25, 1990	8.19	766
	June 16, 1990	18.00	7,780
	June 19, 1990	9.68	1,200
	June 22, 1990	7.89	689
	June 28, 1990	8.71	907
	July 5, 1990	7.64	628
	July 19, 1990	10.76	1,560
	July 26, 1990	7.74	652
	July 27, 1990	10.97	1,640

[b] Affected by ice.
[c] Approximate.

Appendix 2

FLOOD PROFILES

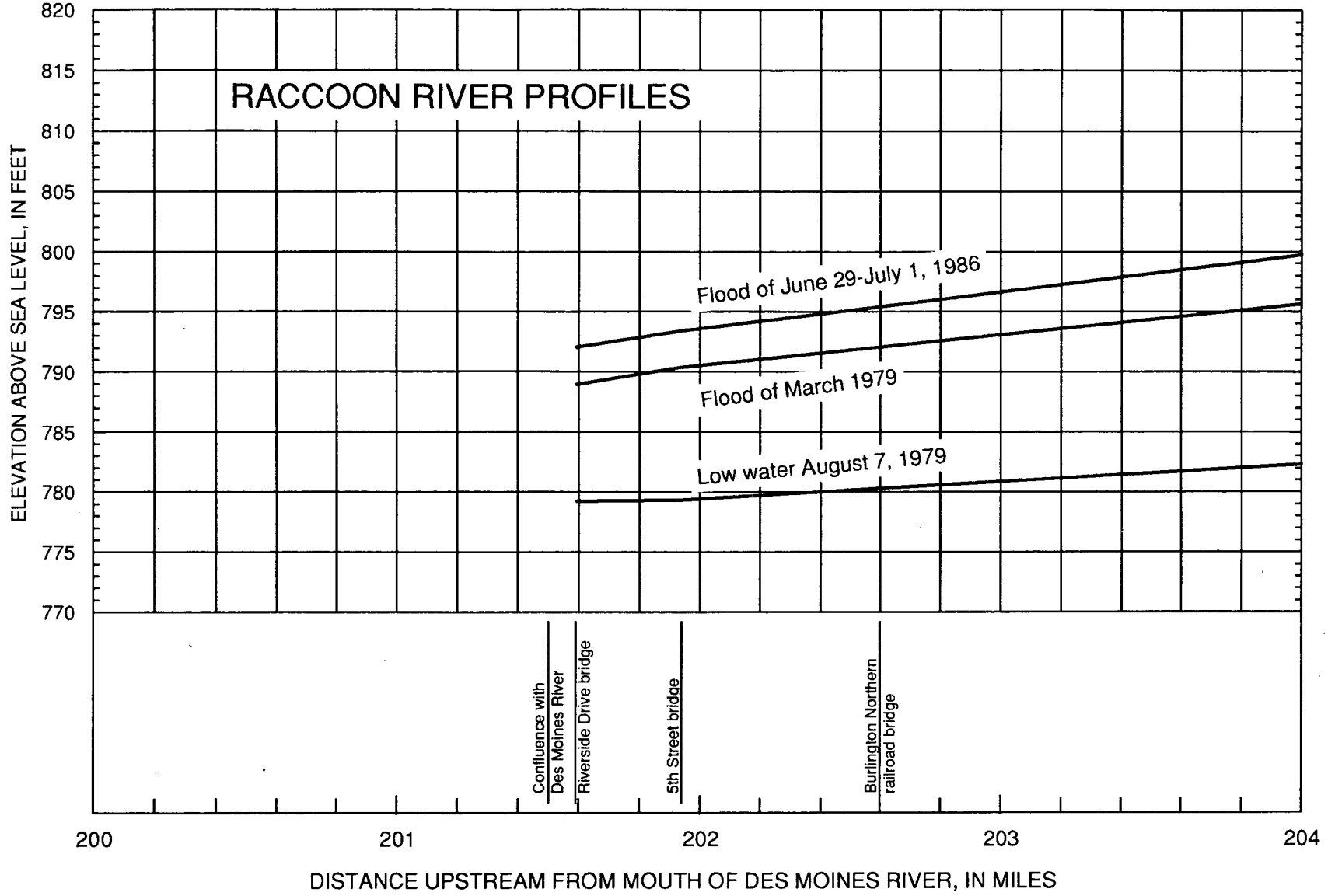

Figure 19. Water-surface-elevation profiles for Raccoon River, river miles 201.50 to 204.

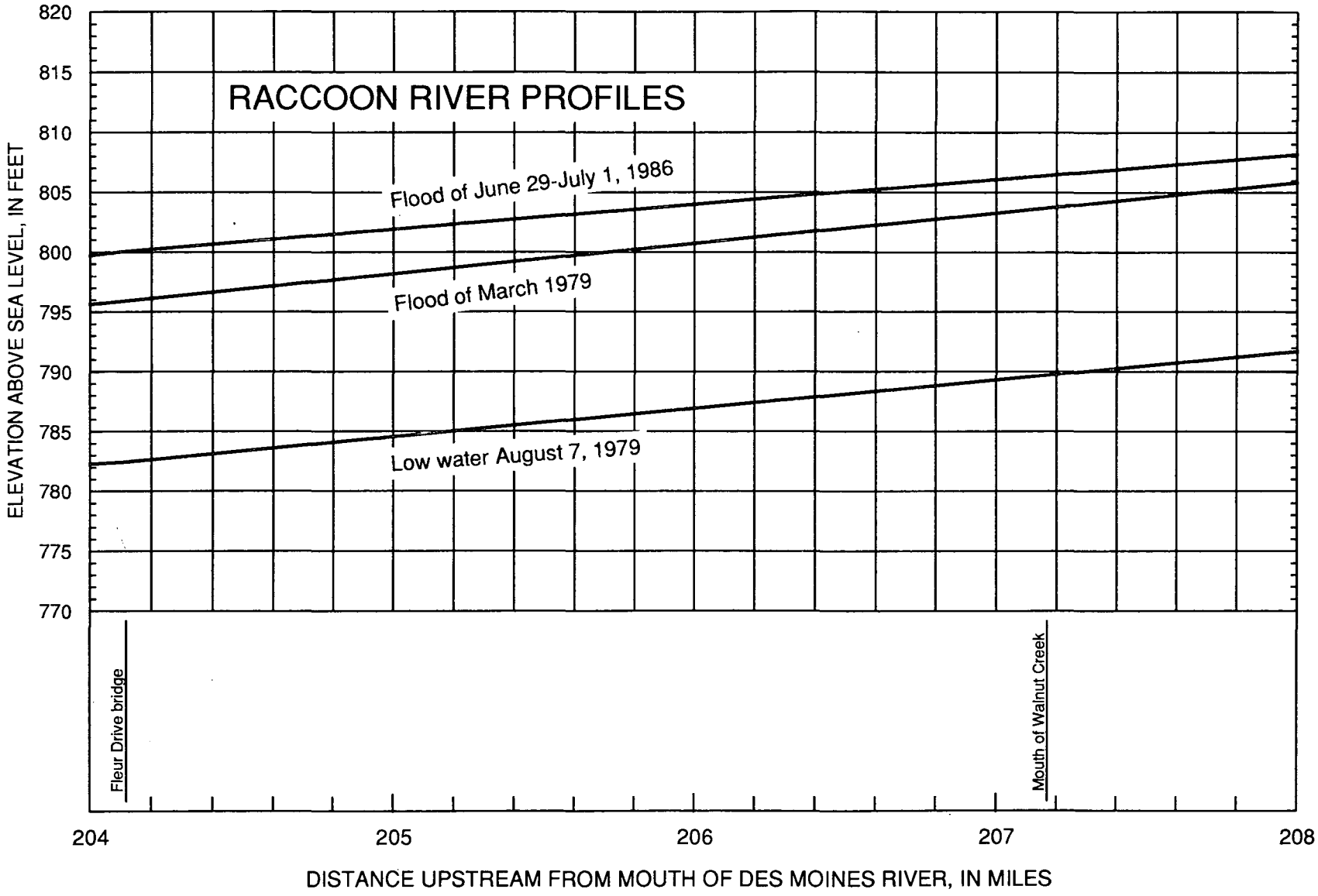

Figure 20. Water-surface-elevation profiles for Raccoon River, river miles 204 to 208.

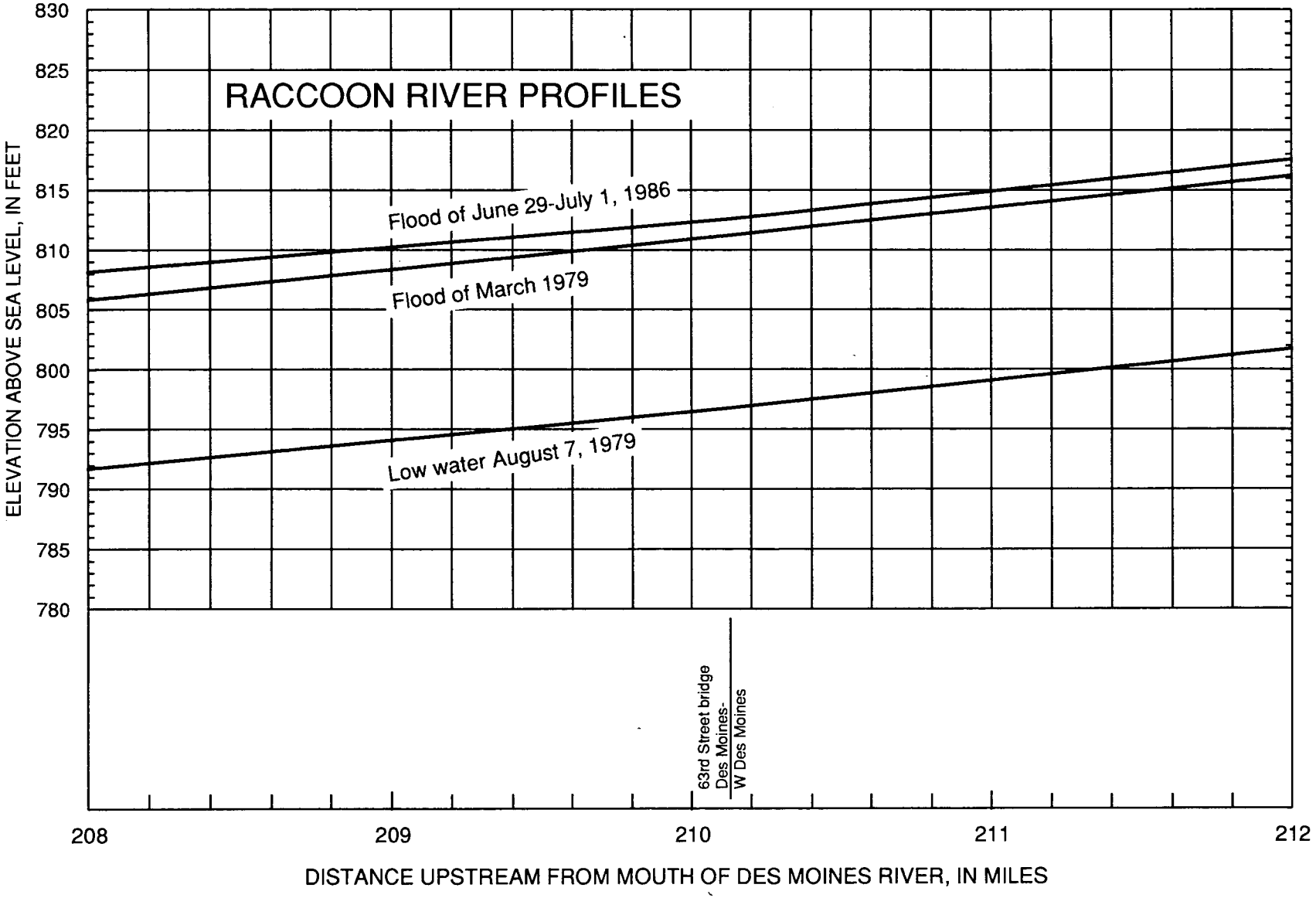

Figure 21. Water-surface-elevation profiles for Raccoon River, river miles 208 to 212.

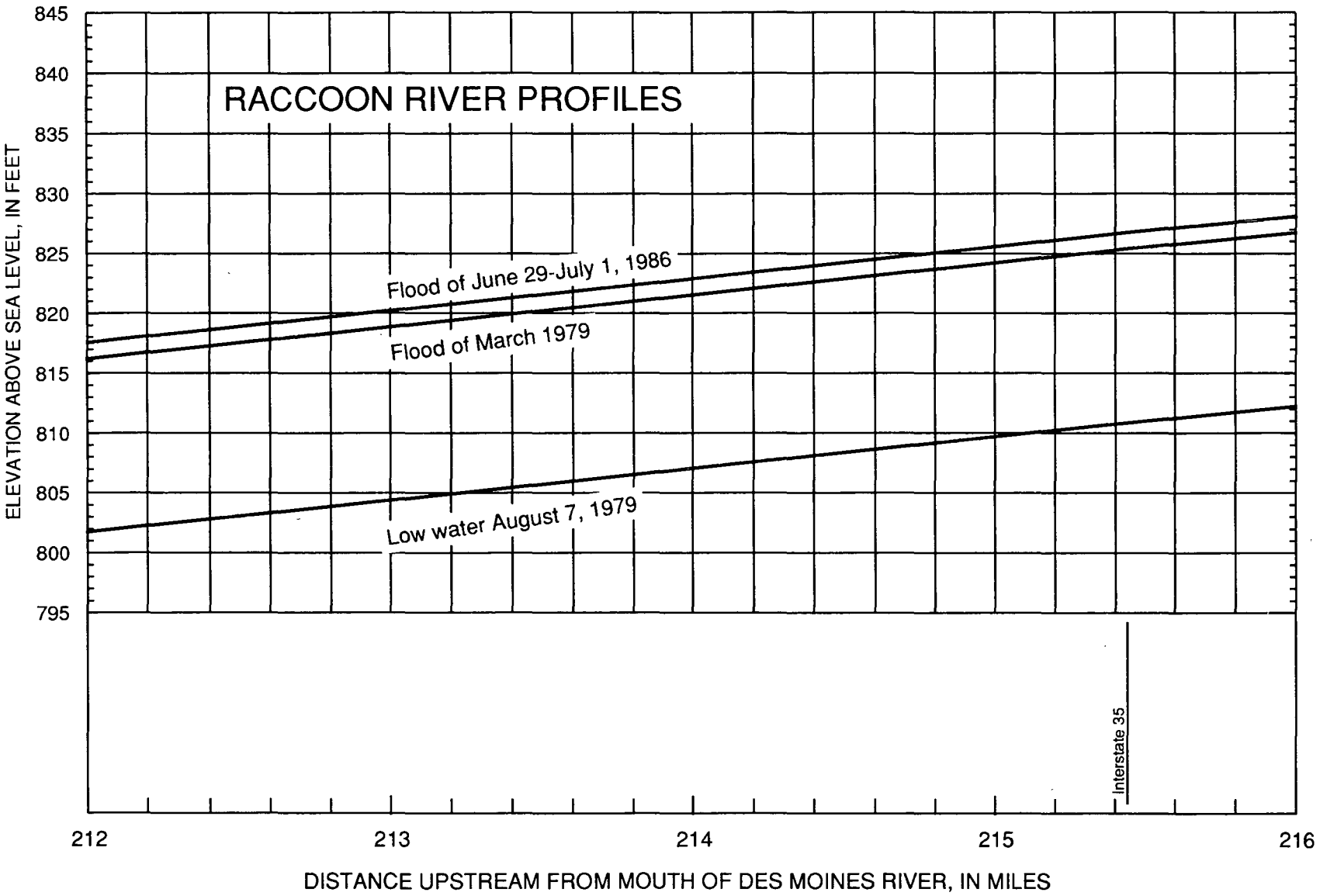

Figure 22. Water-surface-elevation profiles for Raccoon River, river miles 212 to 216.

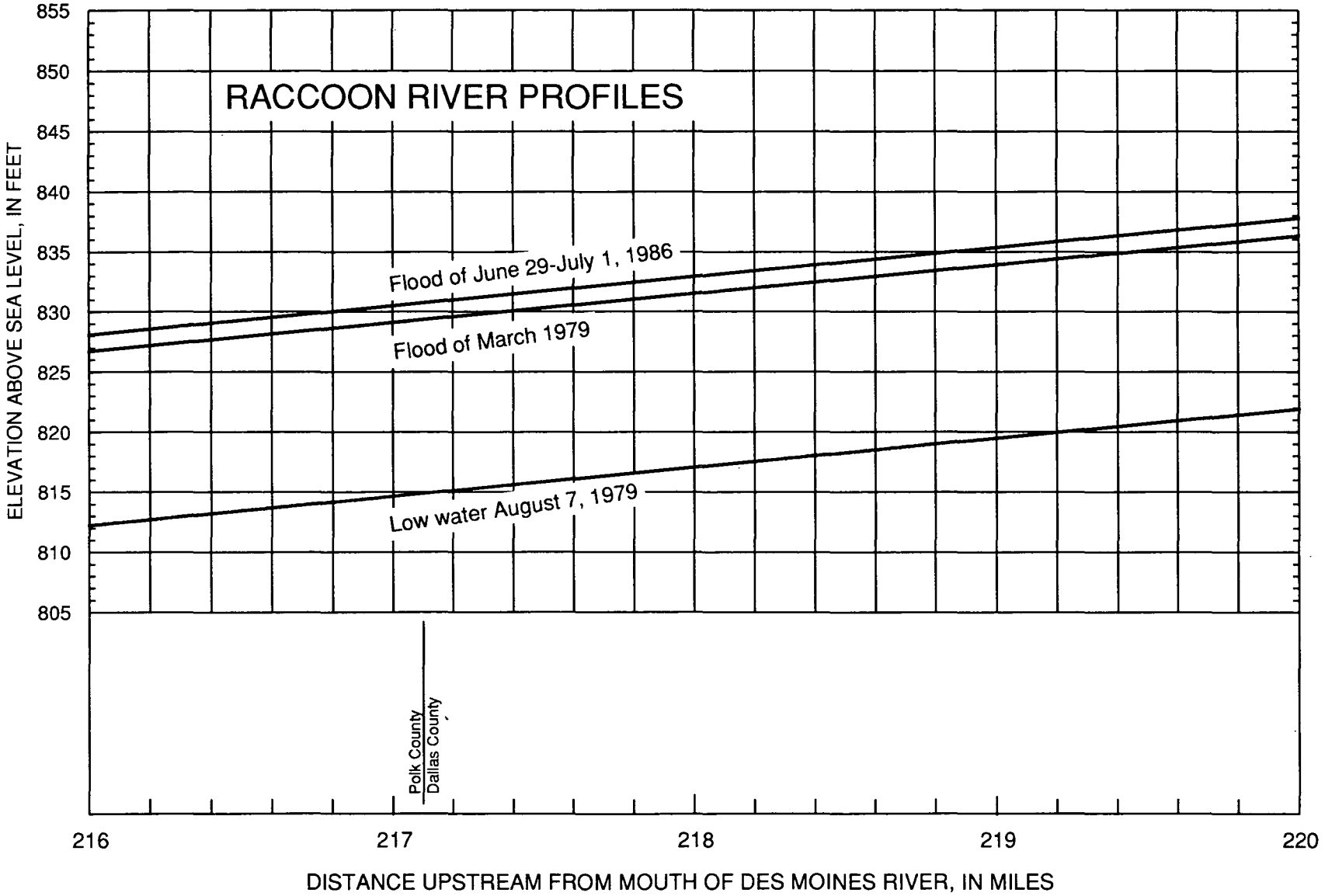

Figure 23. Water-surface-elevation profiles for Raccoon River, river miles 216 to 220.

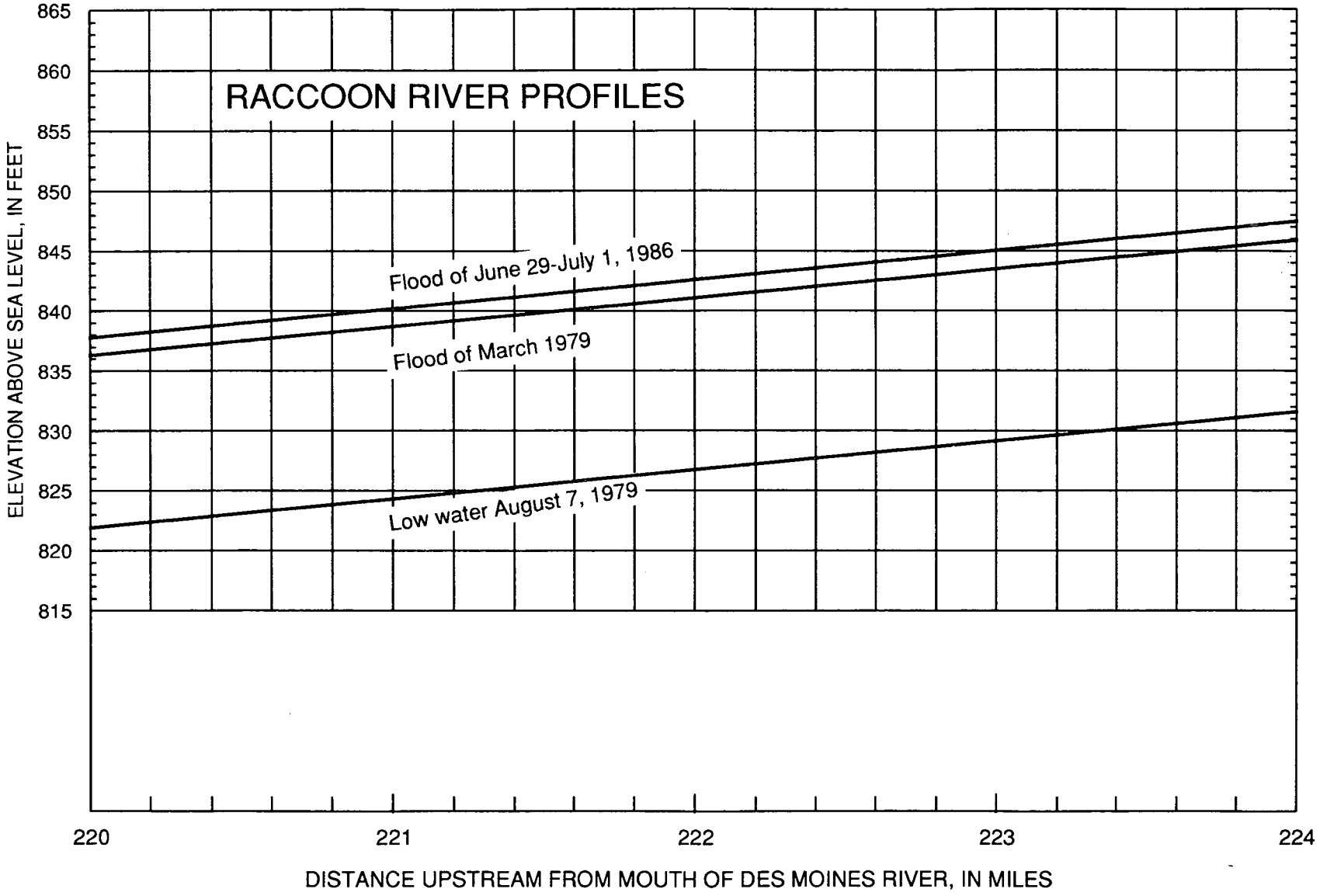

Figure 24. Water-surface-elevation profiles for Raccoon River, river miles 220 to 224.

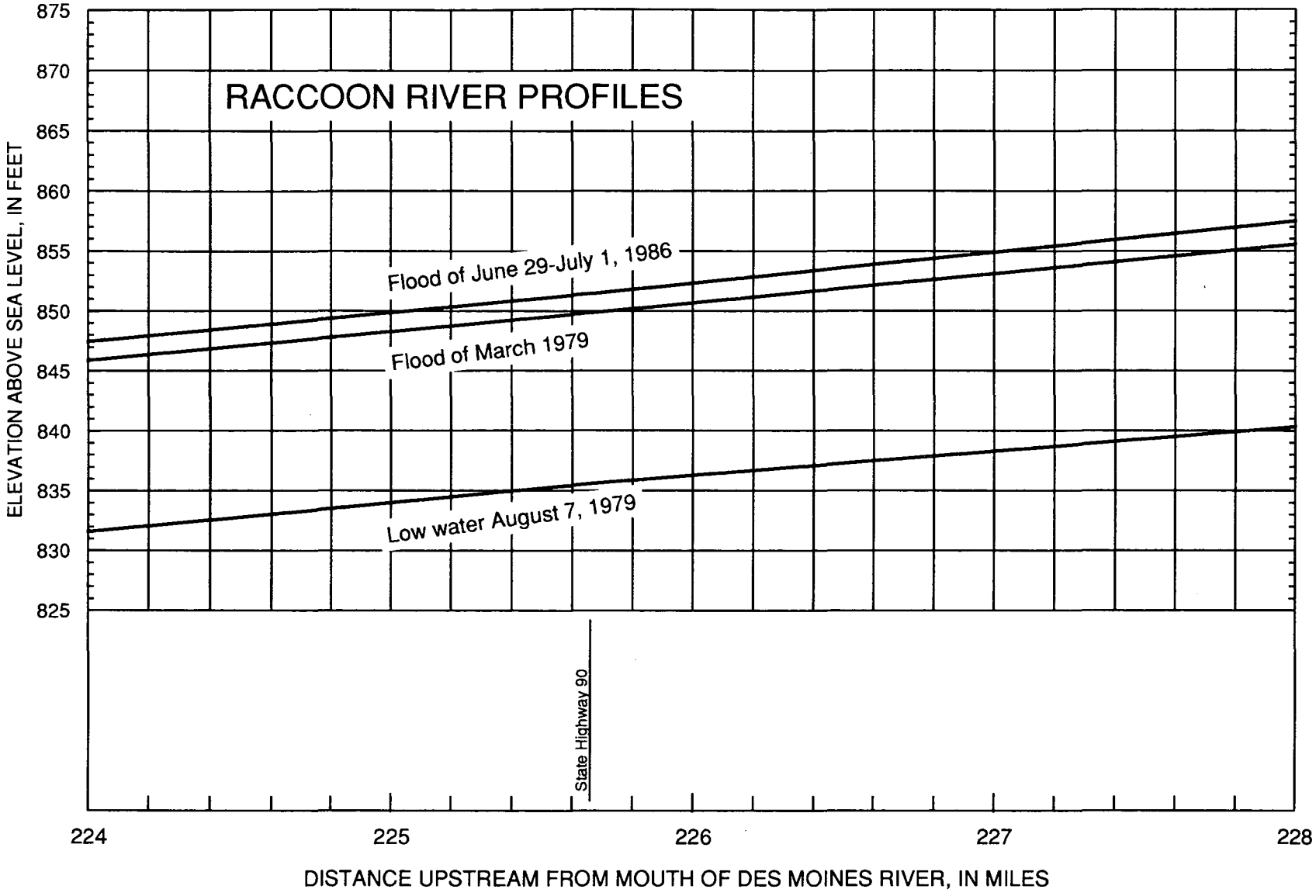

Figure 25. Water-surface-elevation profiles for Raccoon River, river miles 224 to 228.

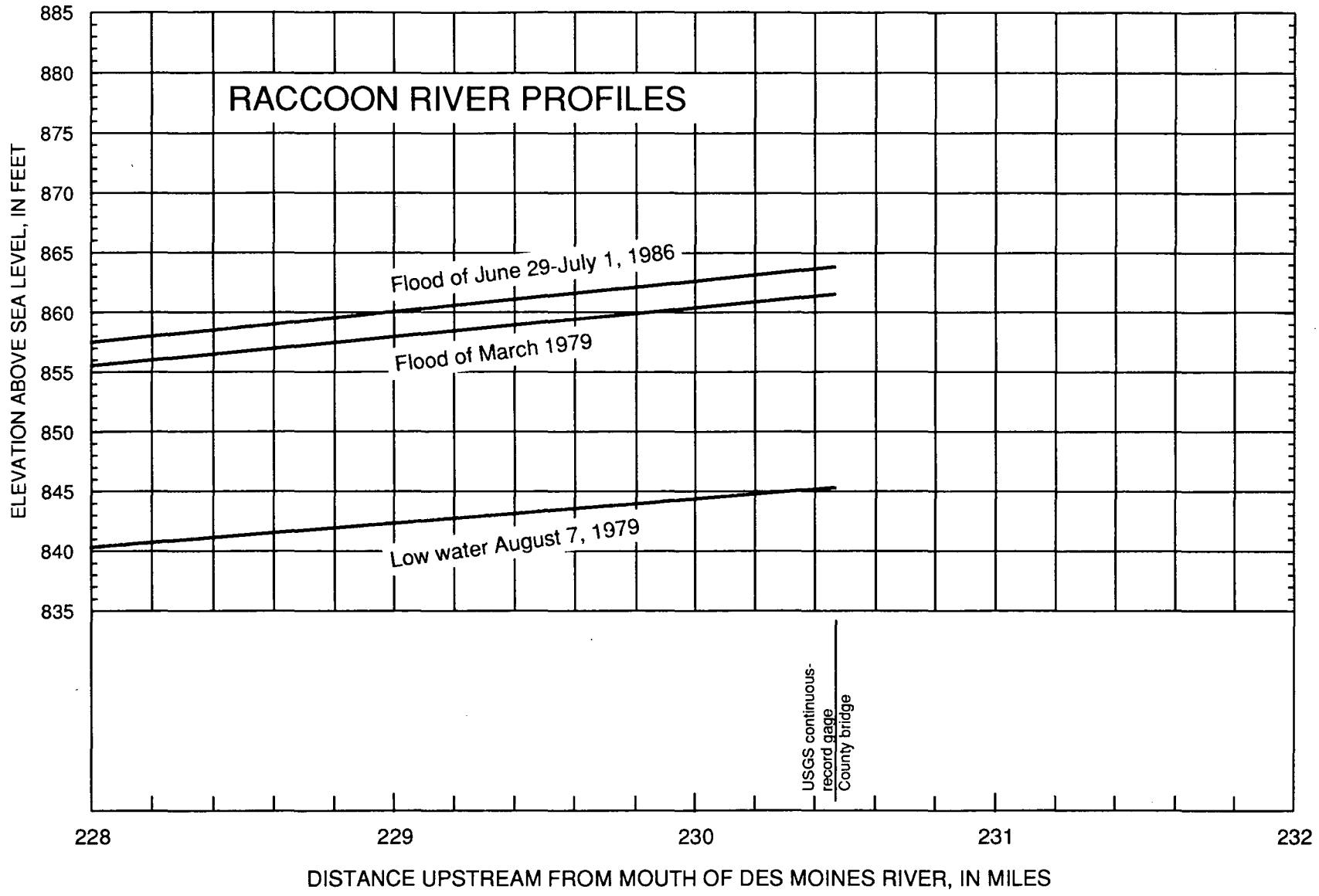

Figure 26. Water-surface-elevation profiles for Raccoon River, river miles 228 to 230.47.

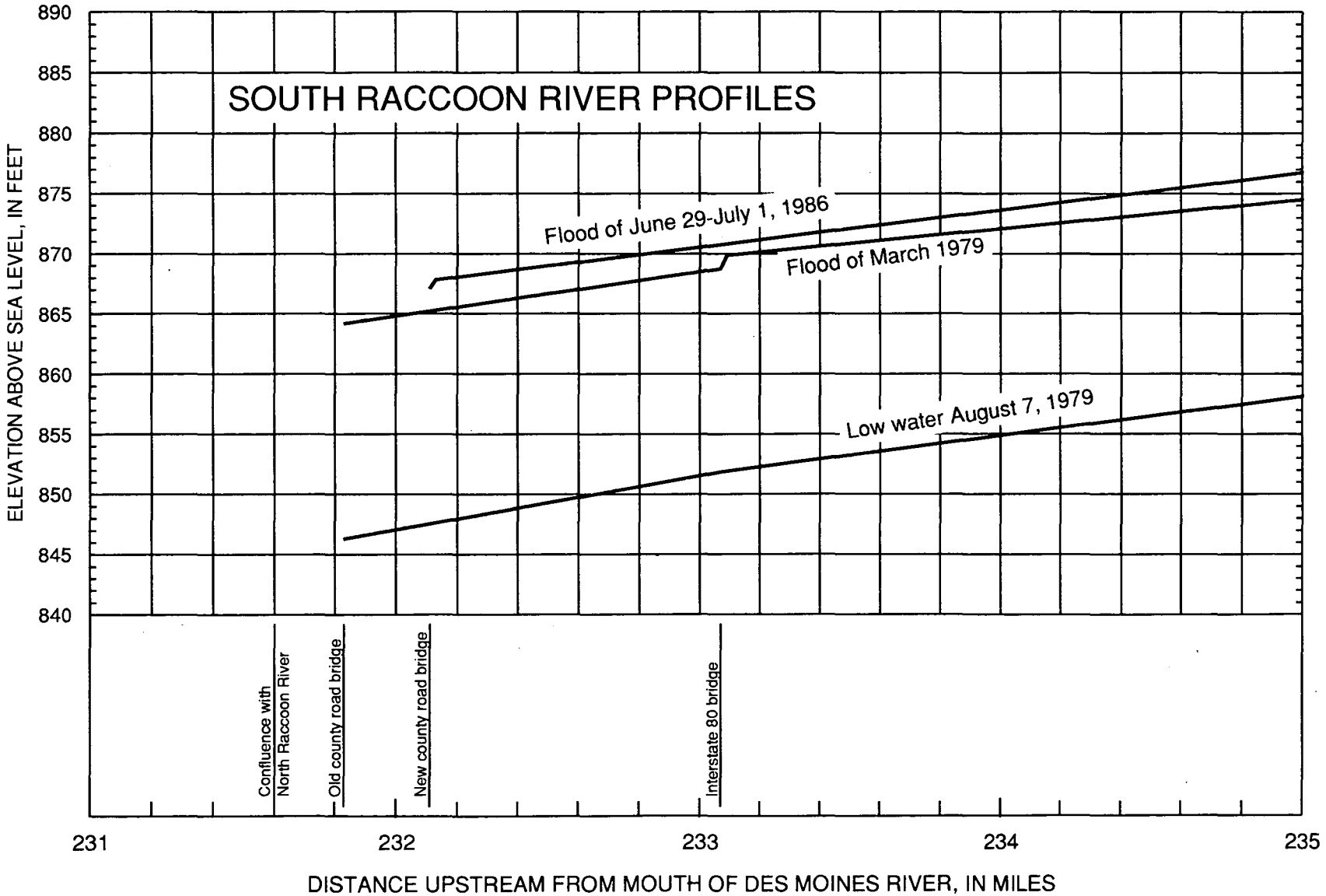

Figure 27. Water-surface-elevation profiles for South Raccoon River, river miles 231.83 to 235.

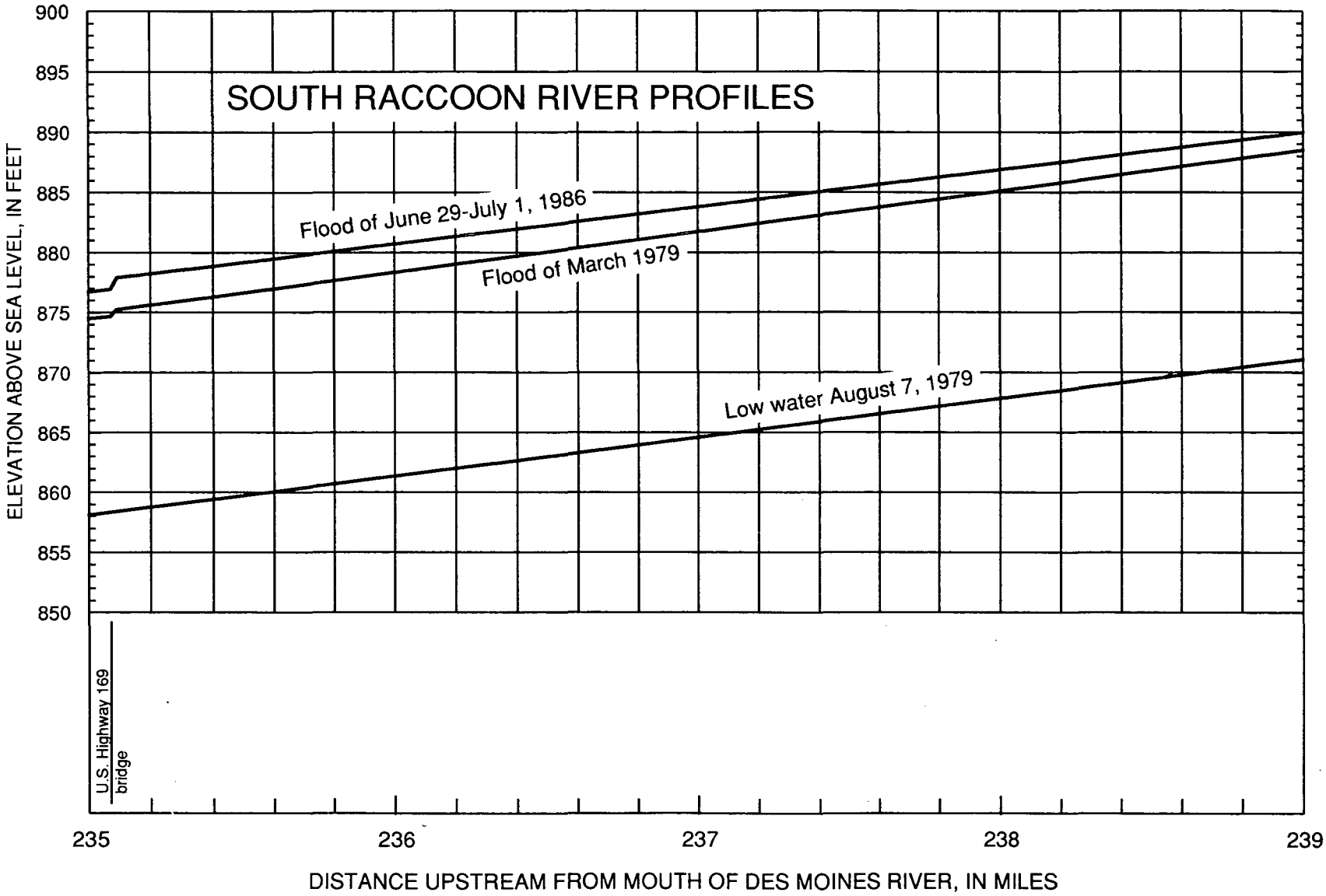

Figure 28. Water-surface-elevation profiles for South Raccoon River, river miles 235 to 239.

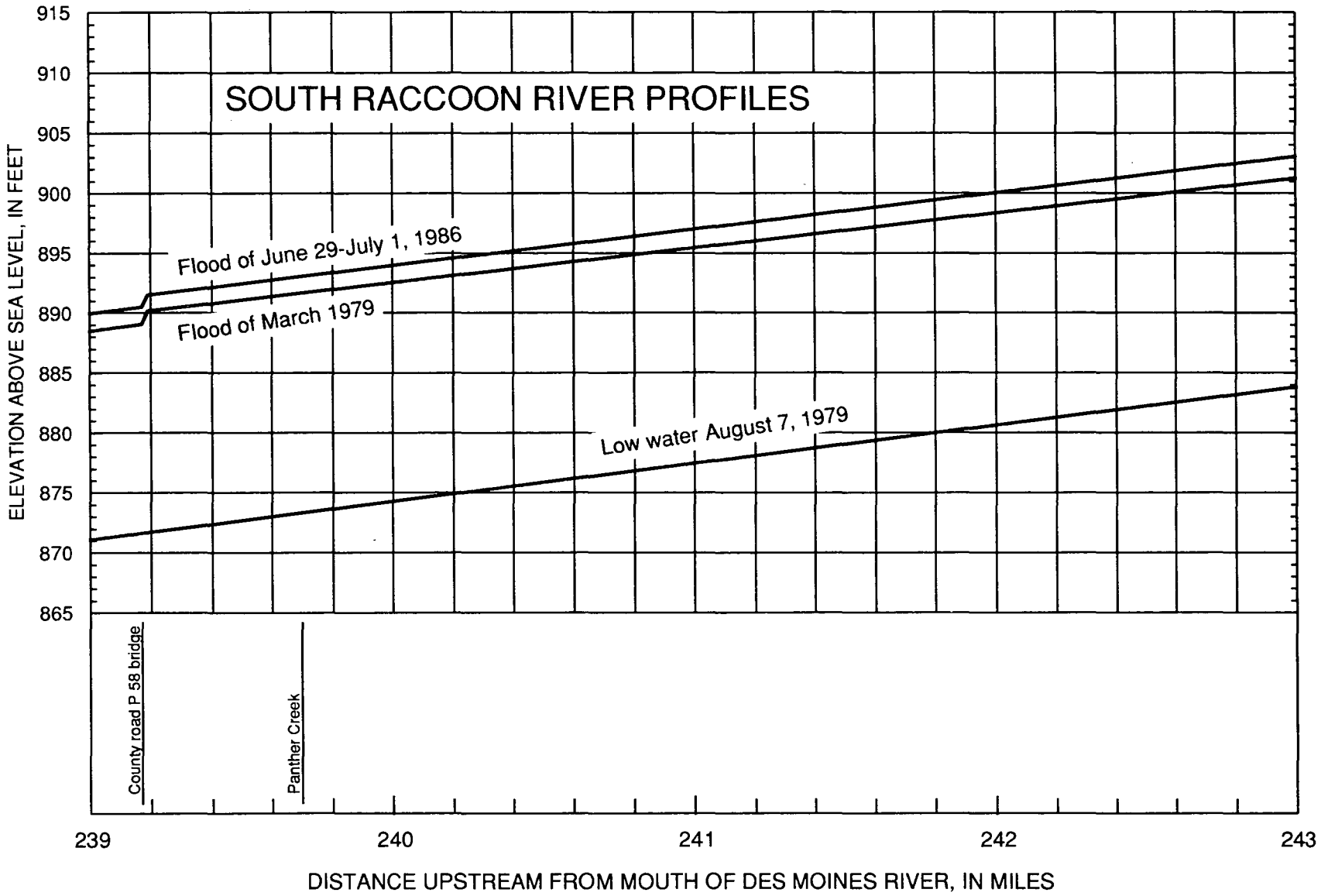

Figure 29. Water-surface-elevation profiles for South Raccoon River, river miles 239 to 243.

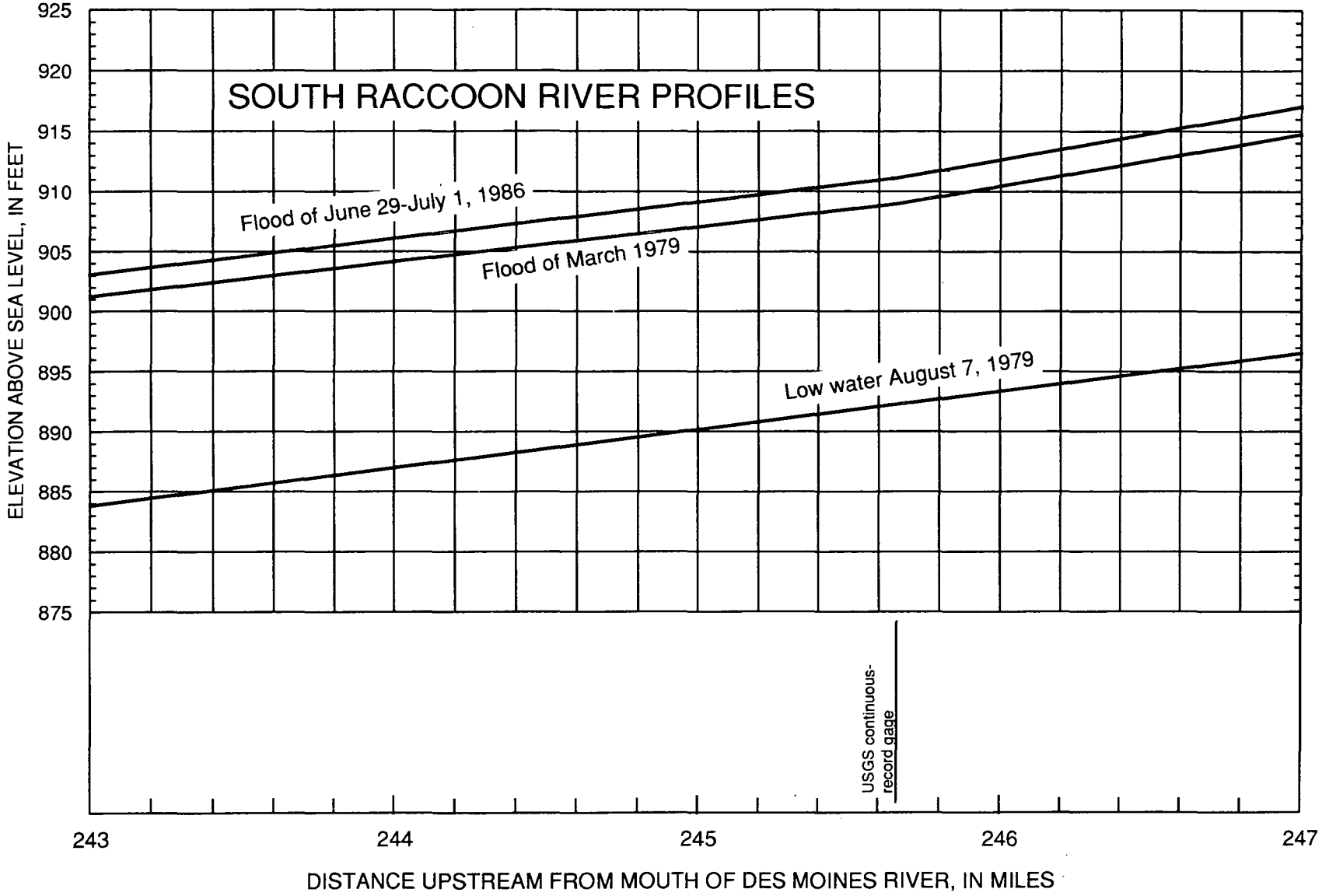

Figure 30. Water-surface-elevation profiles for South Raccoon River, river miles 243 to 247.

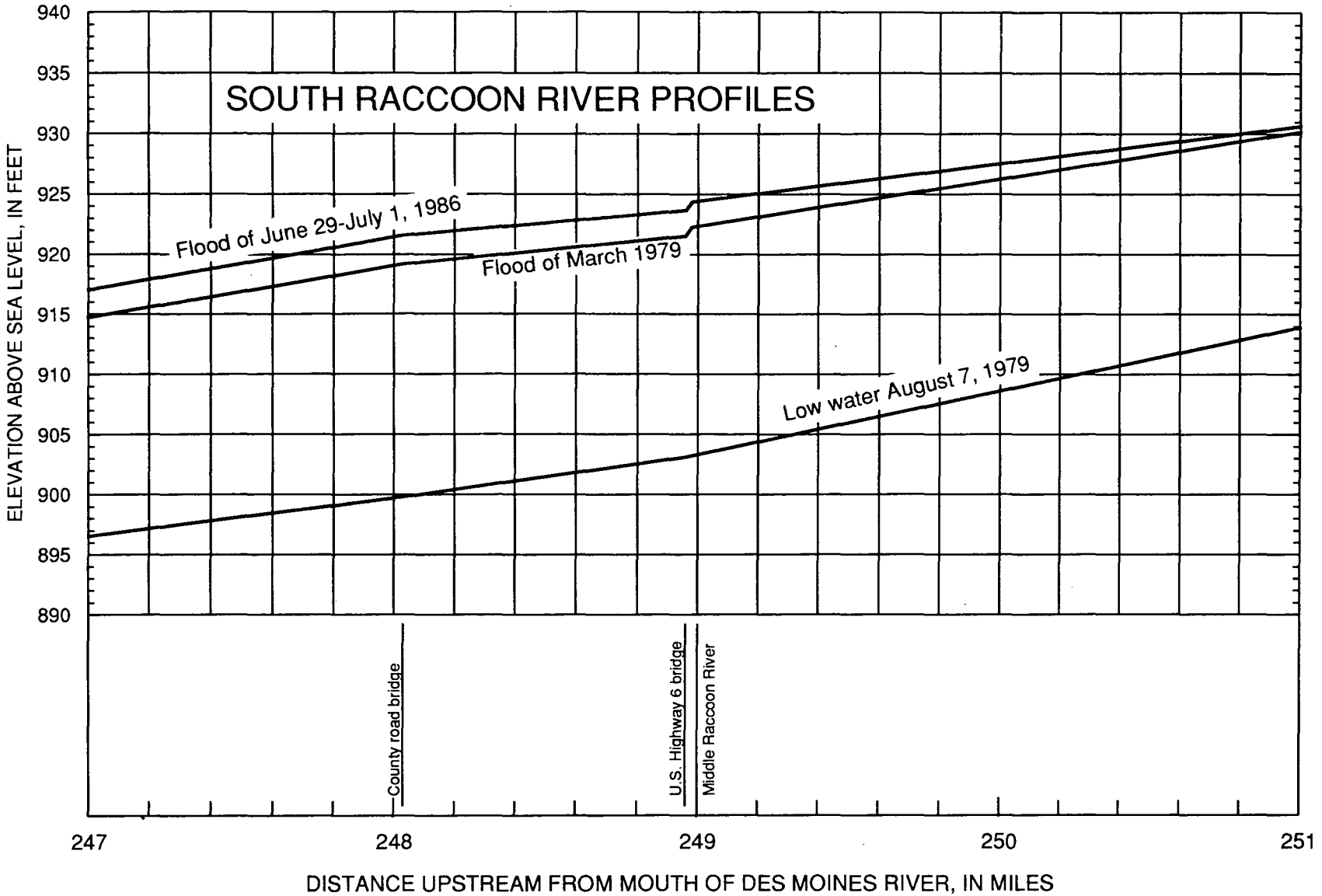

Figure 31. Water-surface-elevation profiles for South Raccoon River, river miles 247 to 251.

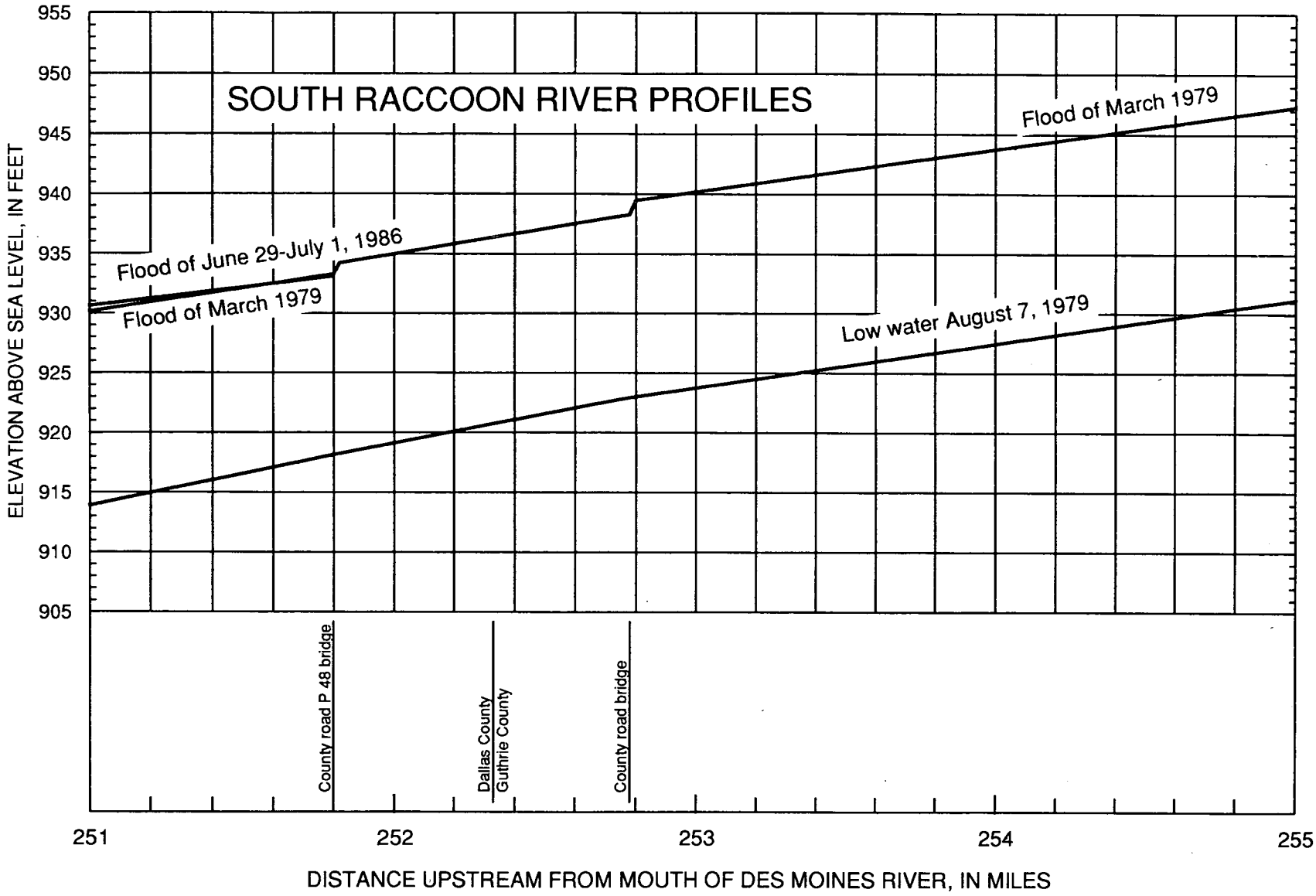

Figure 32. Water-surface-elevation profiles for South Raccoon River, river miles 251 to 255.

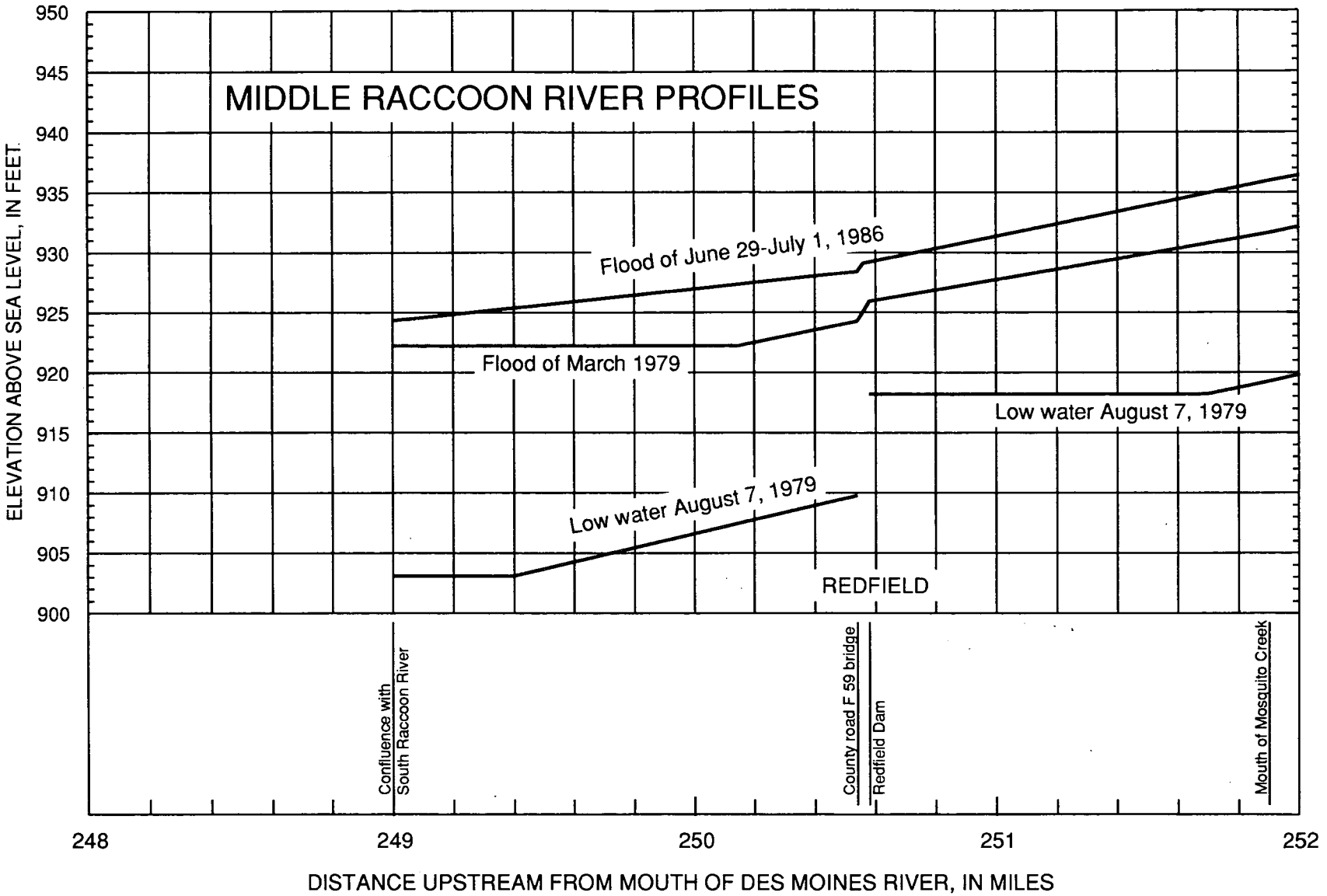

Figure 33. Water-surface-elevation profiles for Middle Raccoon River, river miles 249 to 252.

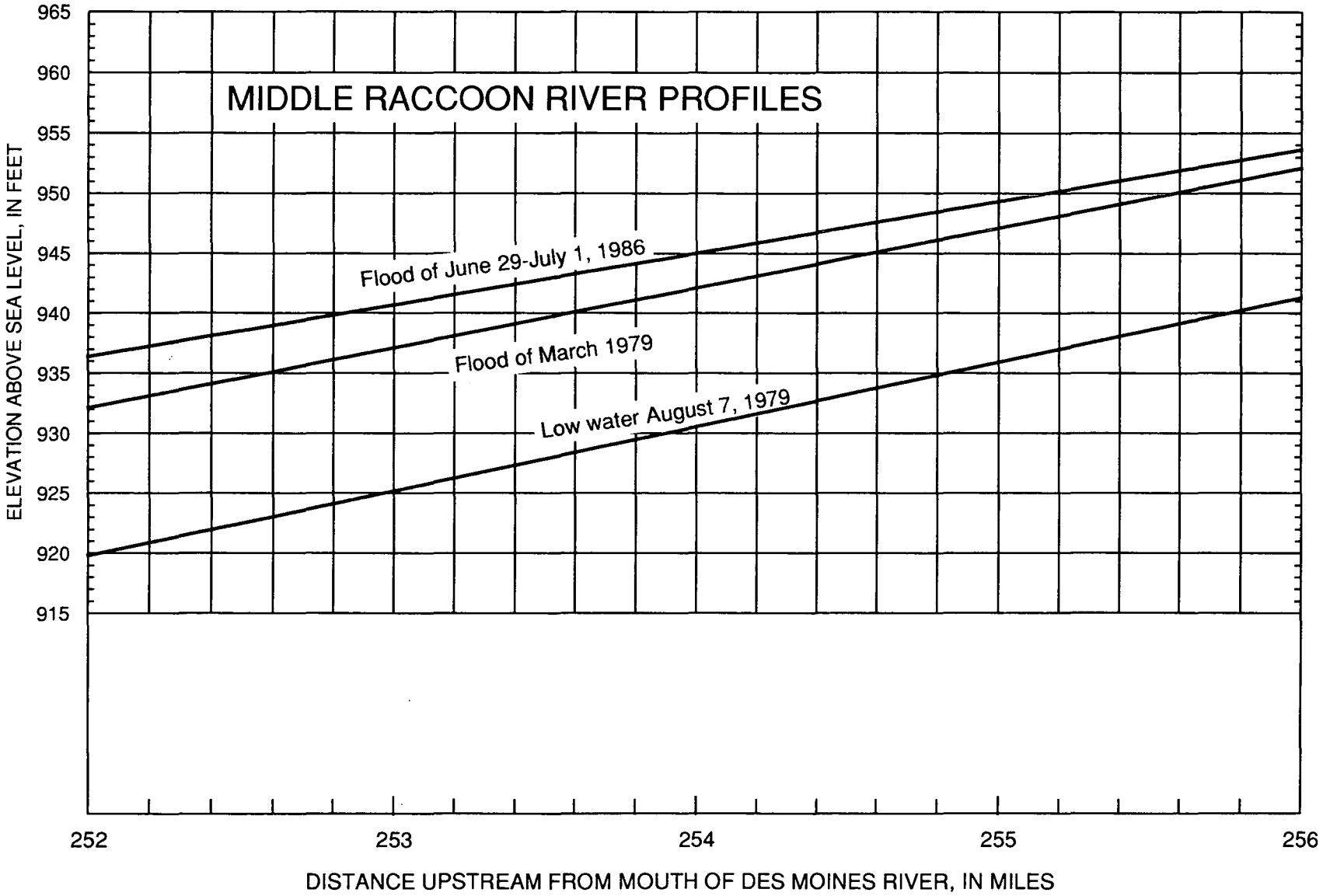

Figure 34. Water-surface-elevation profiles for Middle Raccoon River, river miles 252 to 256.

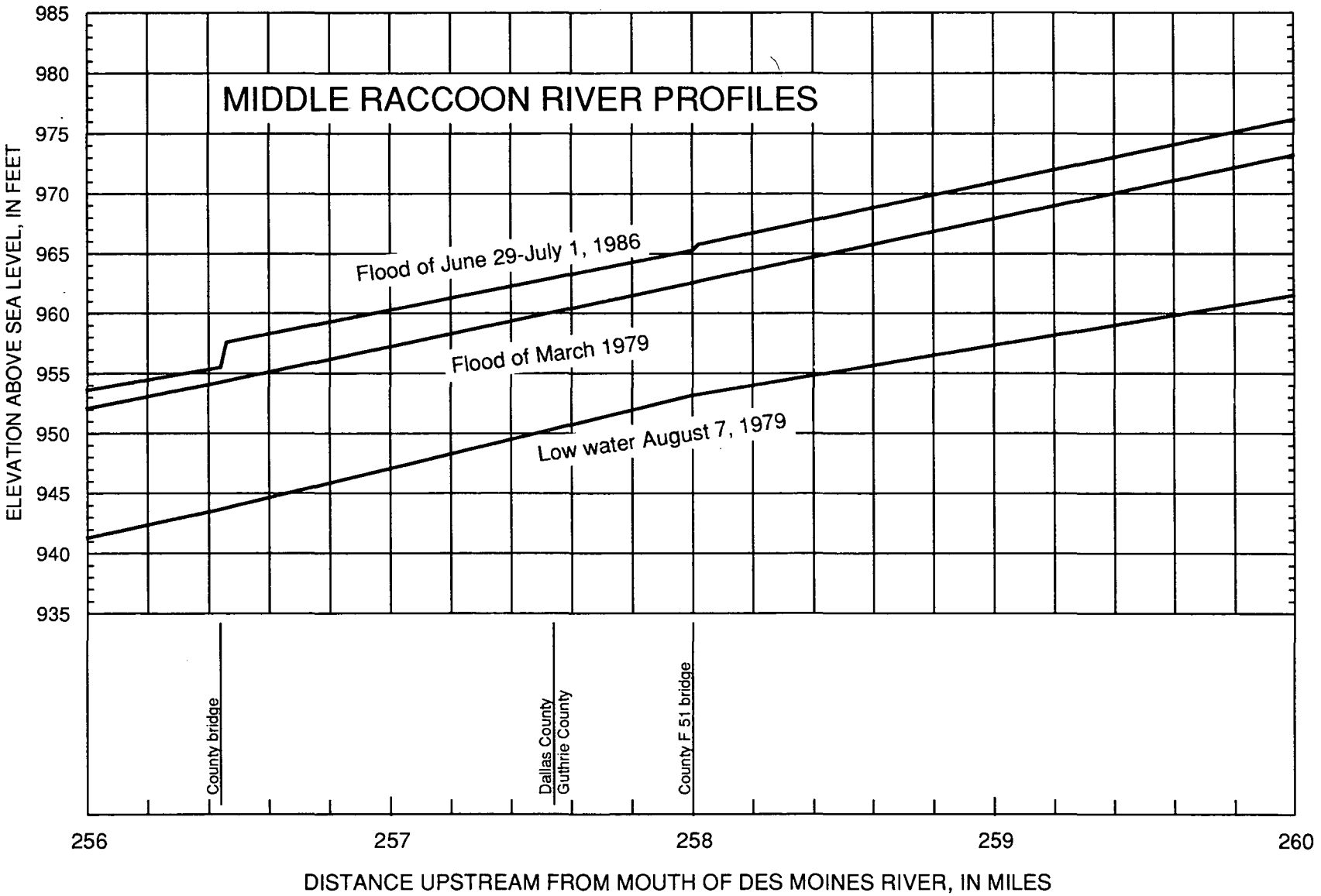

Figure 35. Water-surface-elevation profiles for Middle Raccoon River, river miles 256 to 260.

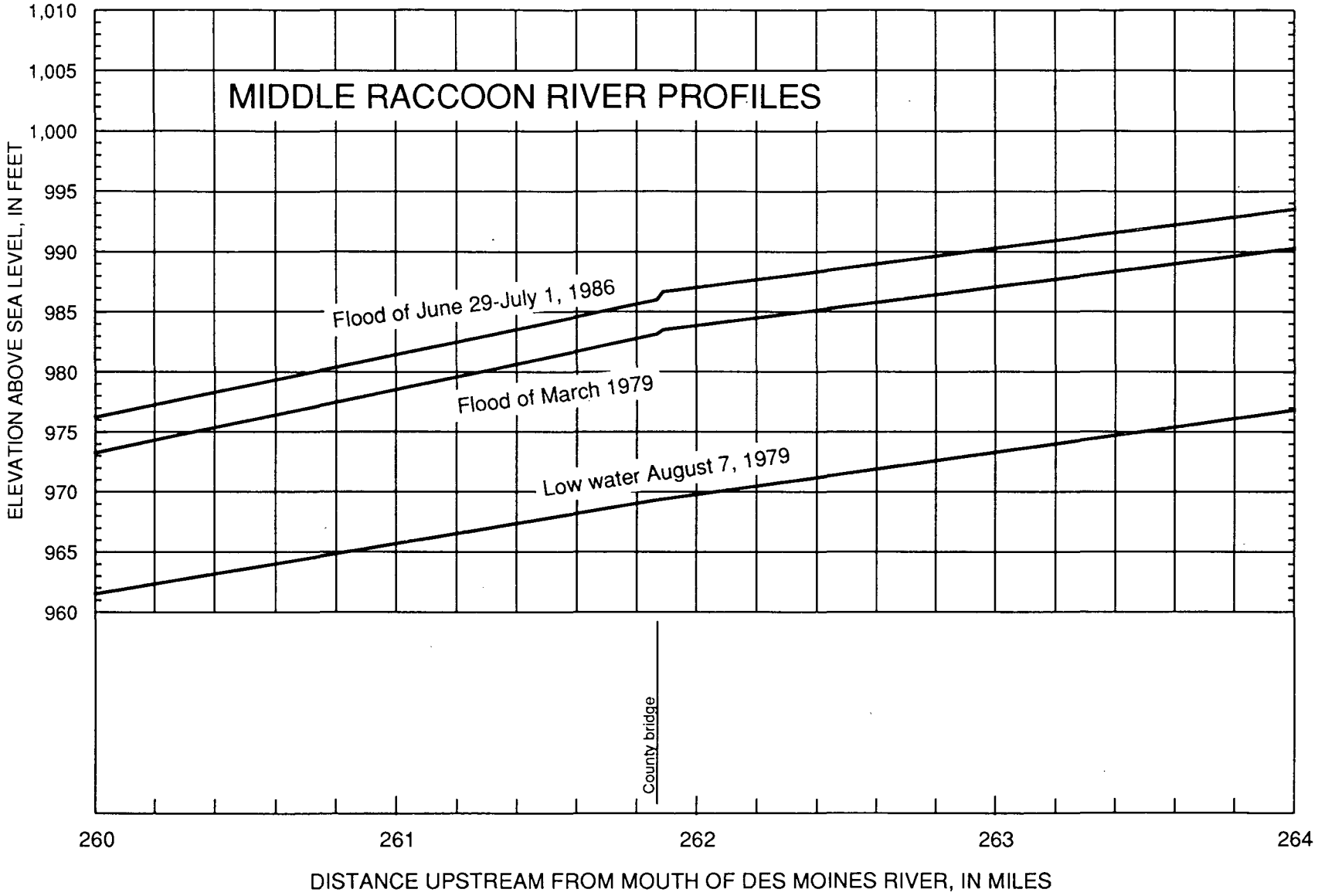

Figure 36. Water-surface-elevation profiles for Middle Raccoon River, river miles 260 to 264.

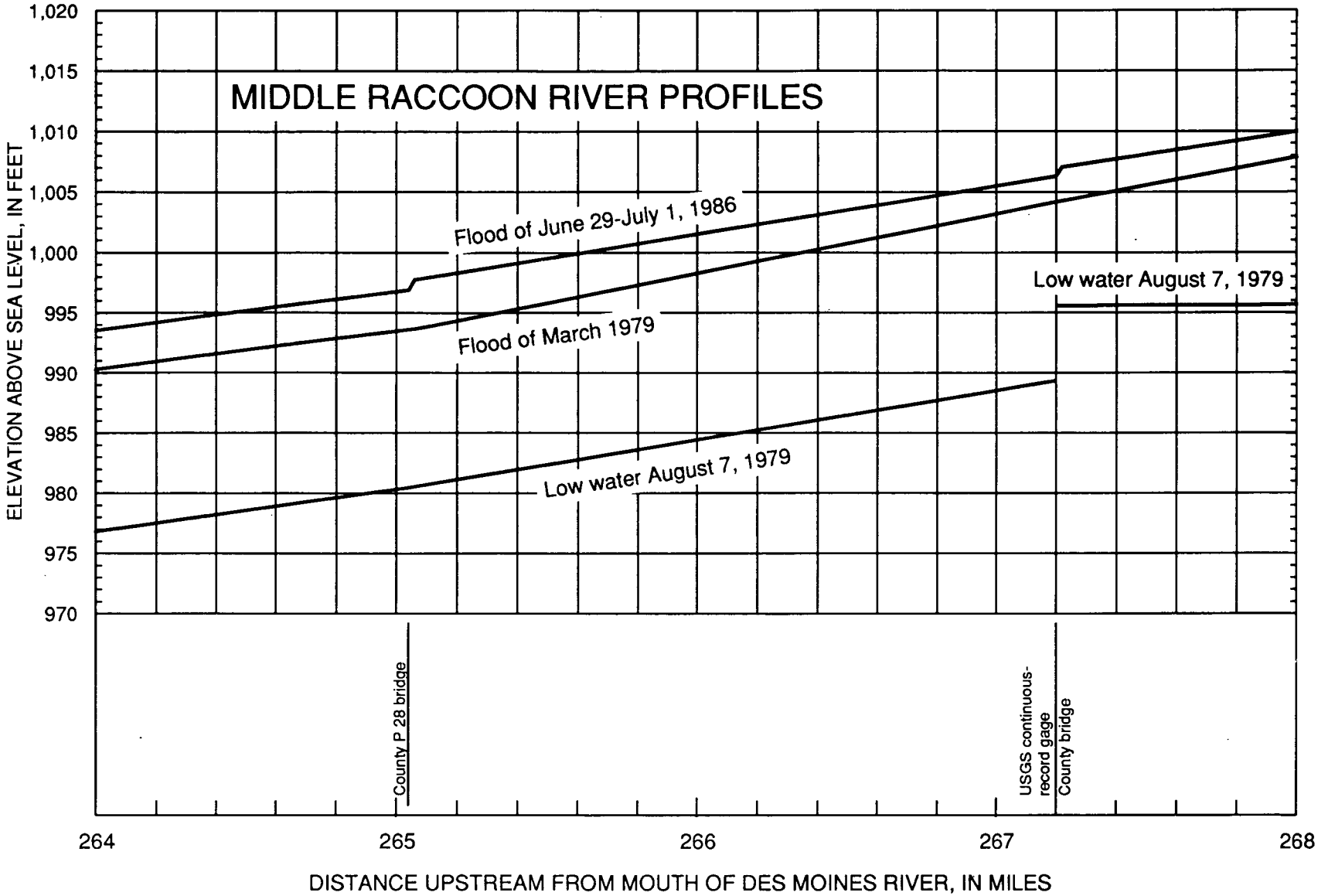

Figure 37. Water-surface-elevation profiles for Middle Raccoon River, river miles 264 to 268.

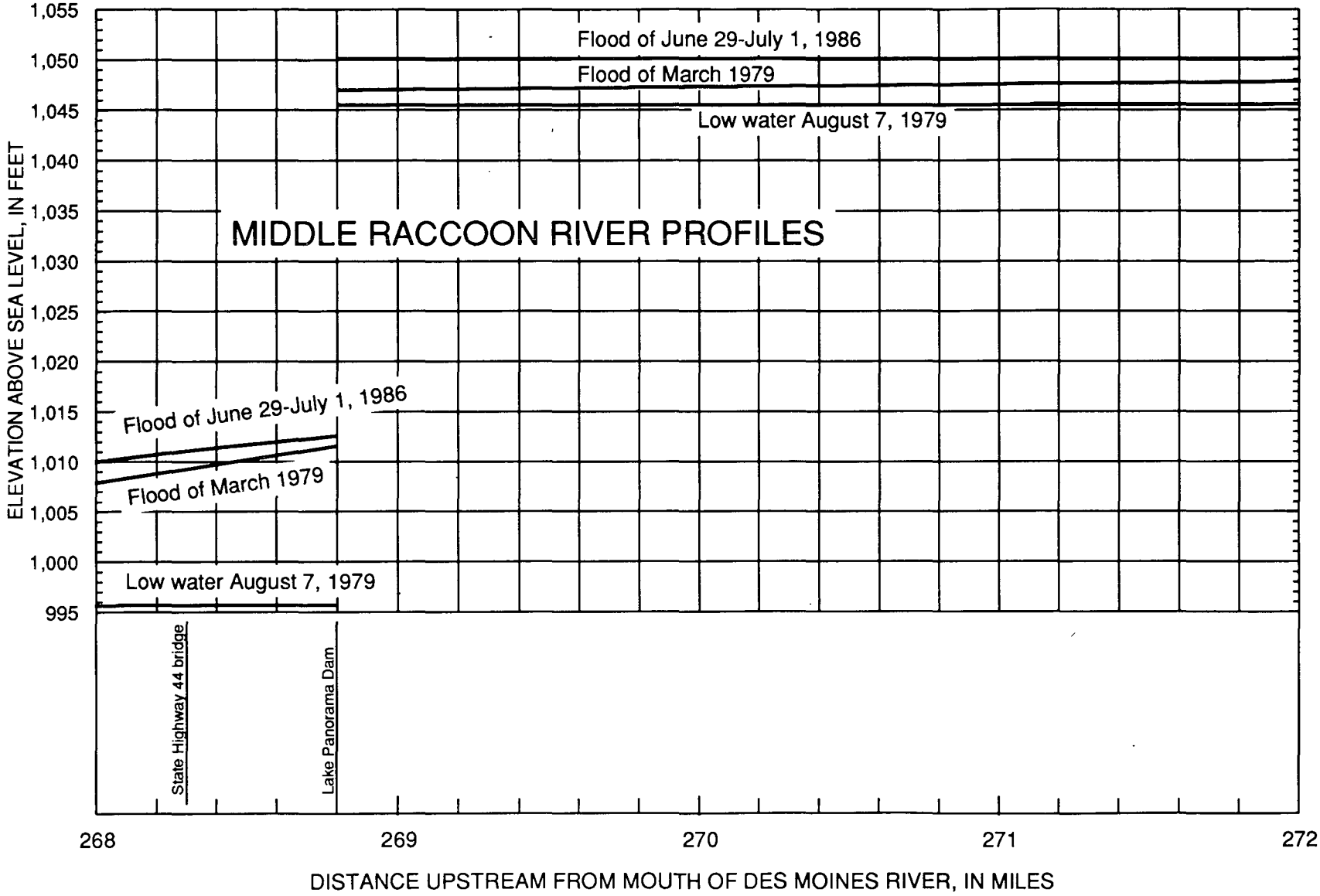

Figure 38. Water-surface-elevation profiles for Middle Raccoon River, river miles 268 to 272.

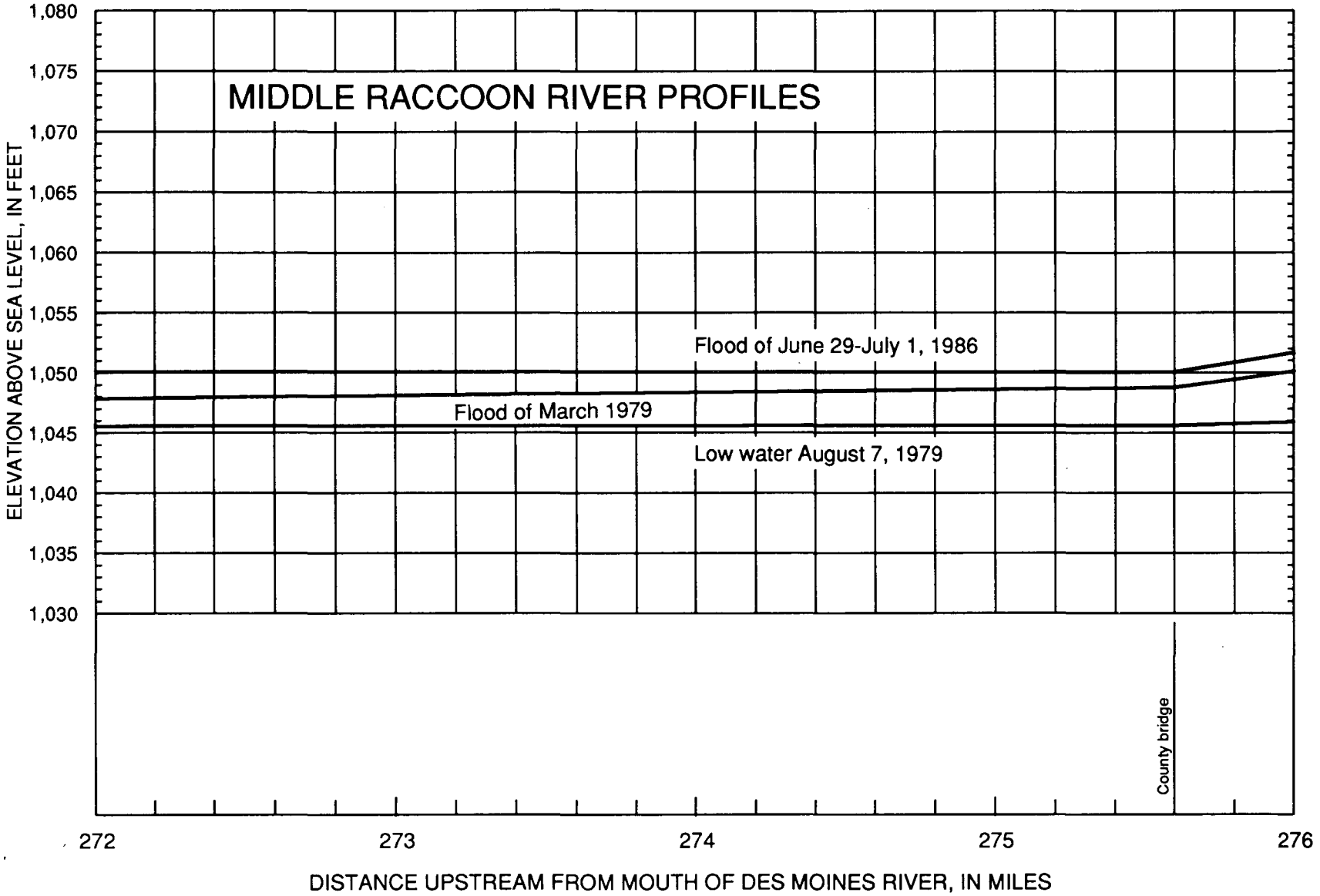

Figure 39. Water-surface-elevation profiles for Middle Raccoon River, river miles 272 to 276.

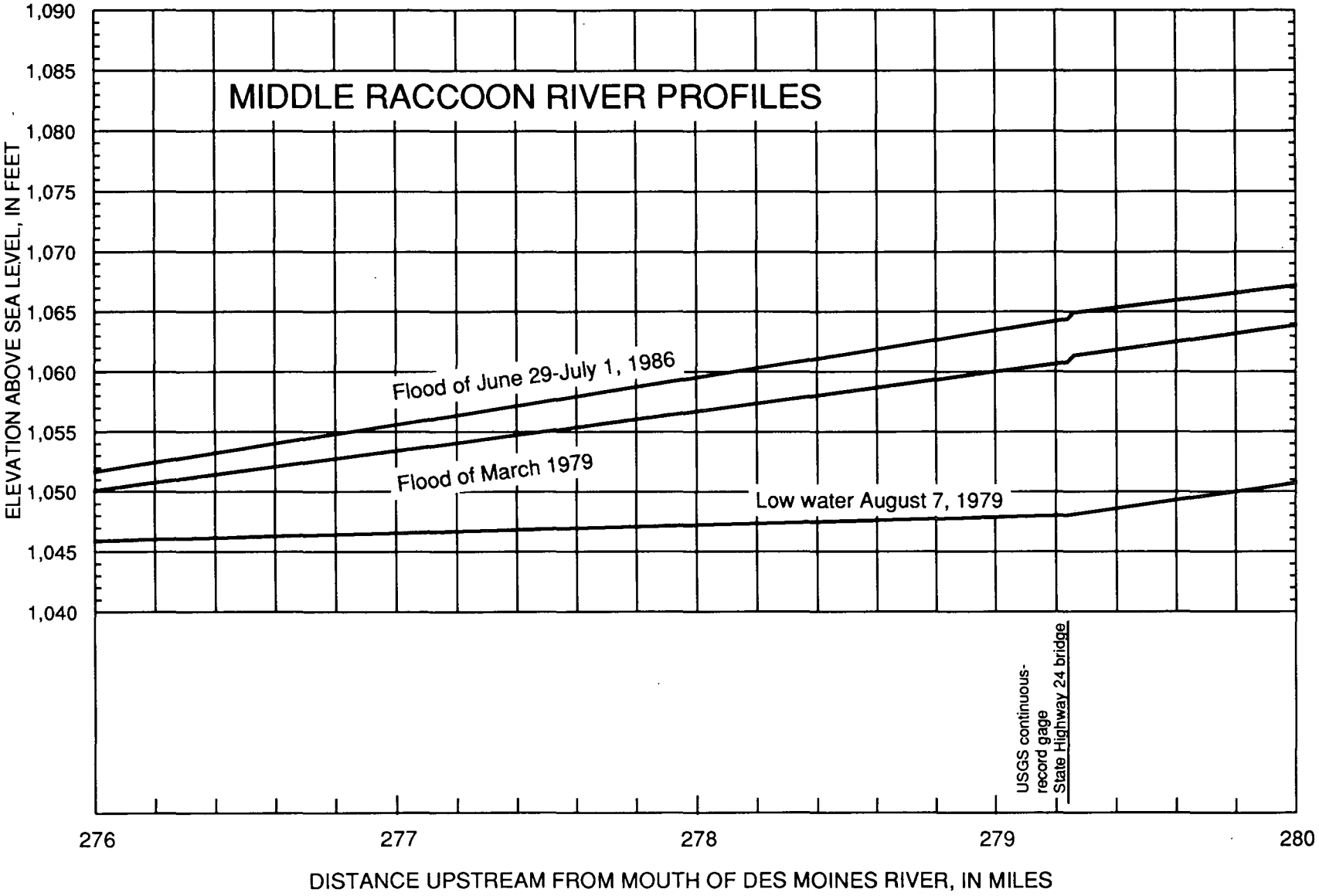

Figure 40. Water-surface-elevation profiles for Middle Raccoon River, river miles 276 to 280.

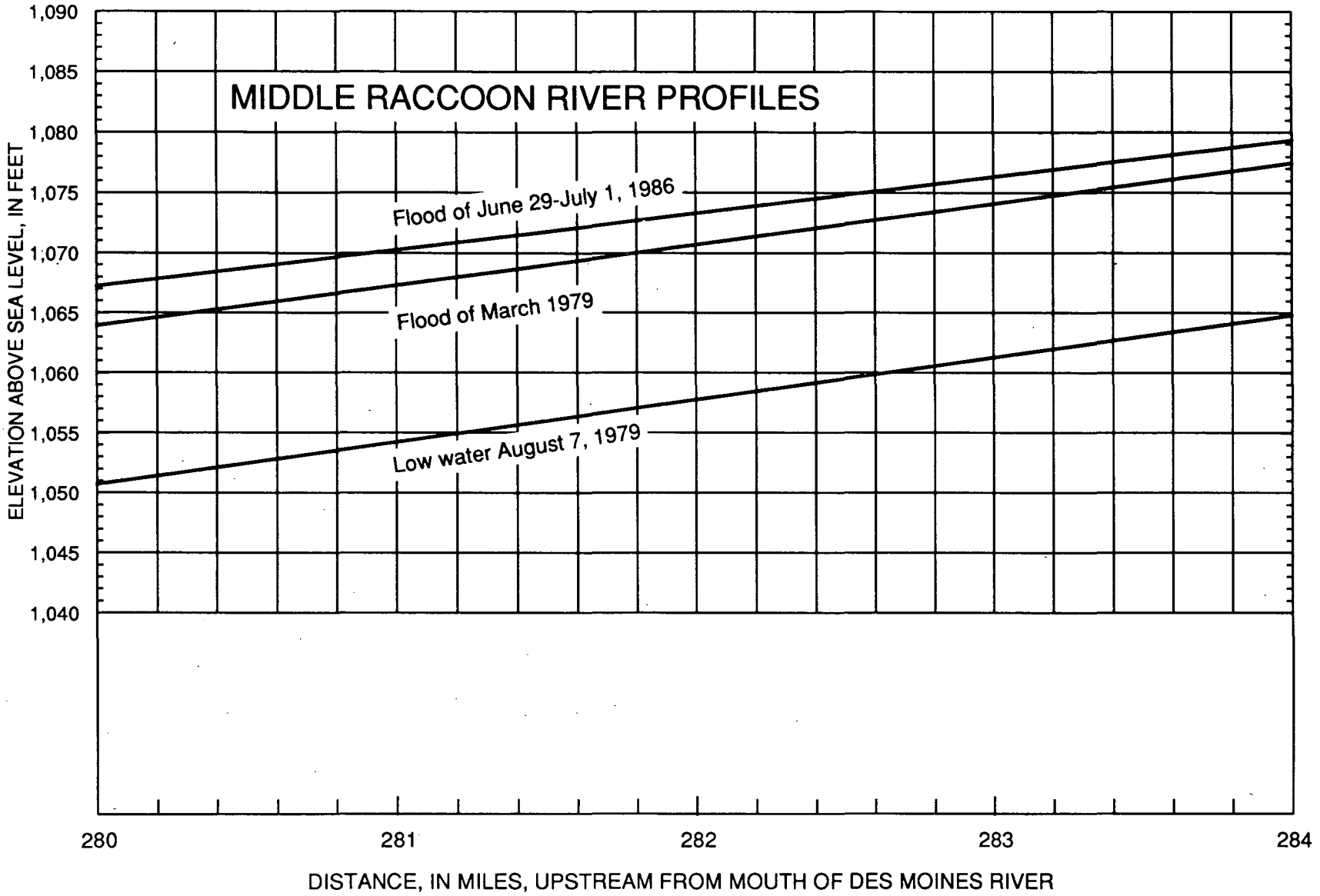

Figure 41. Water-surface-elevation profiles for Middle Raccoon River, river miles 280 to 284.

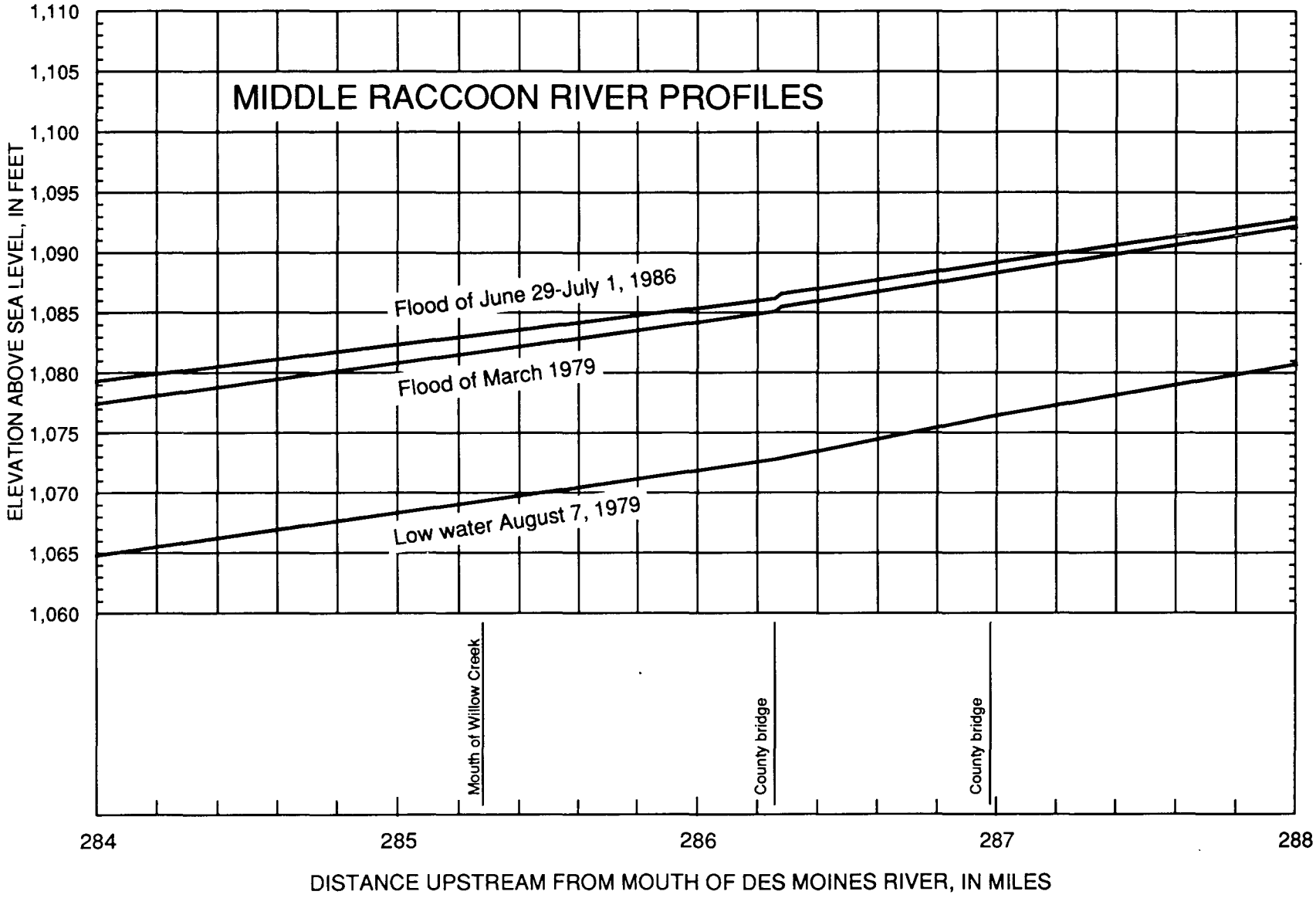

Figure 42. Water-surface-elevation profiles for Middle Raccoon River, river miles 284 to 288.

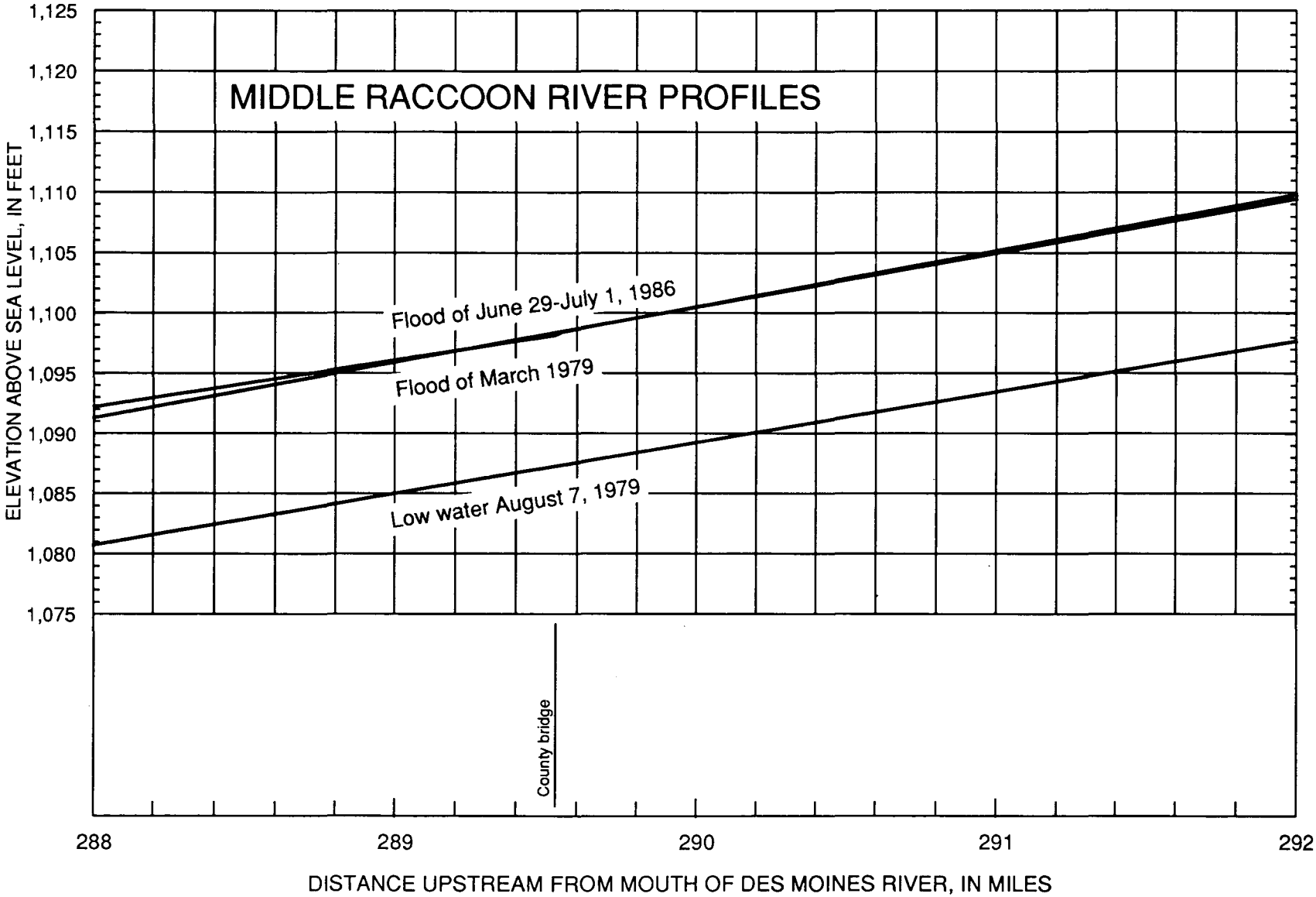

Figure 43. Water-surface-elevation profiles for Middle Raccoon River, river miles 288 to 292.

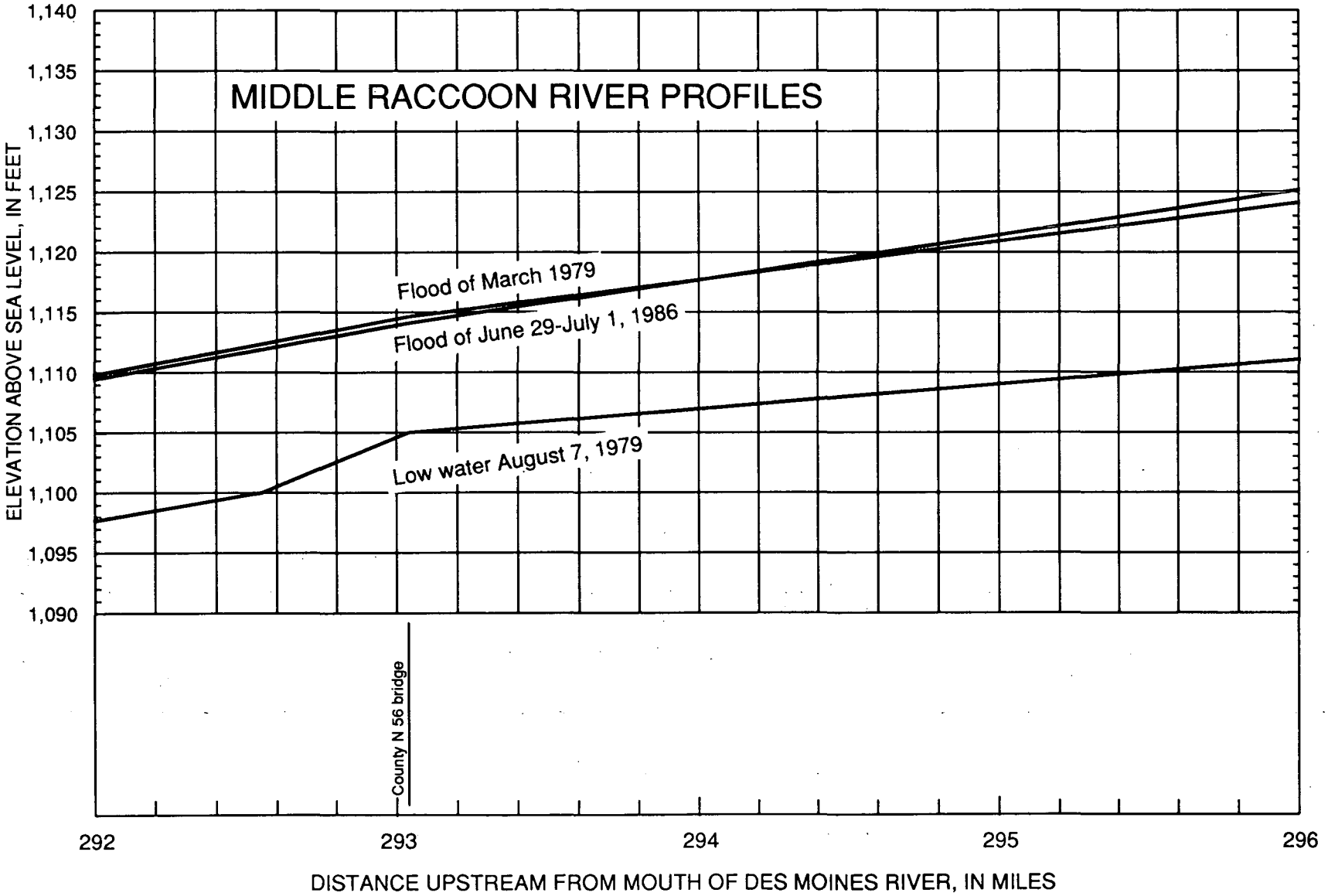

Figure 44. Water-surface-elevation profiles for Middle Raccoon River, river miles 292 to 296.

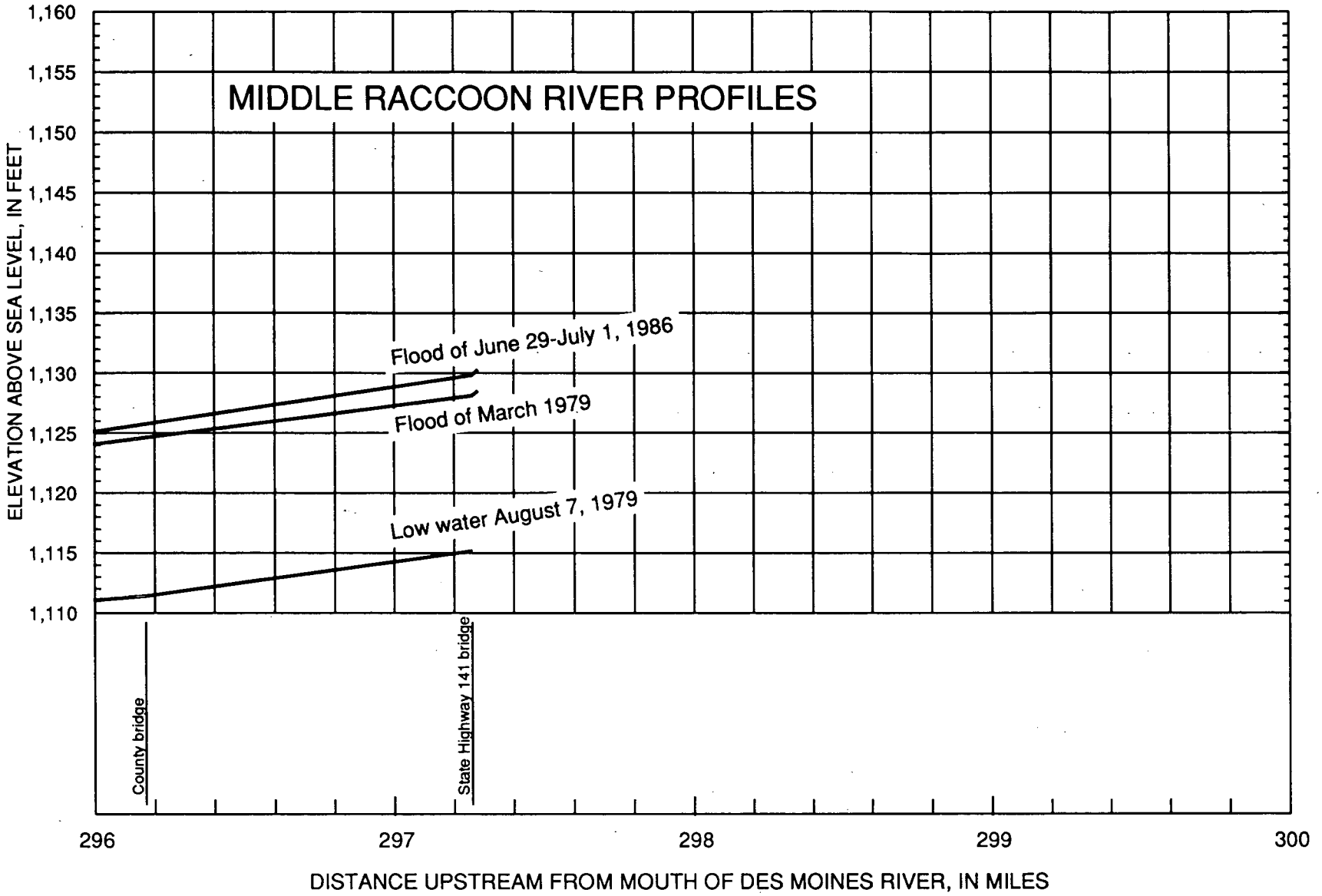

Figure 45. Water-surface-elevation profiles for Middle Raccoon River, river miles 292 to 296.

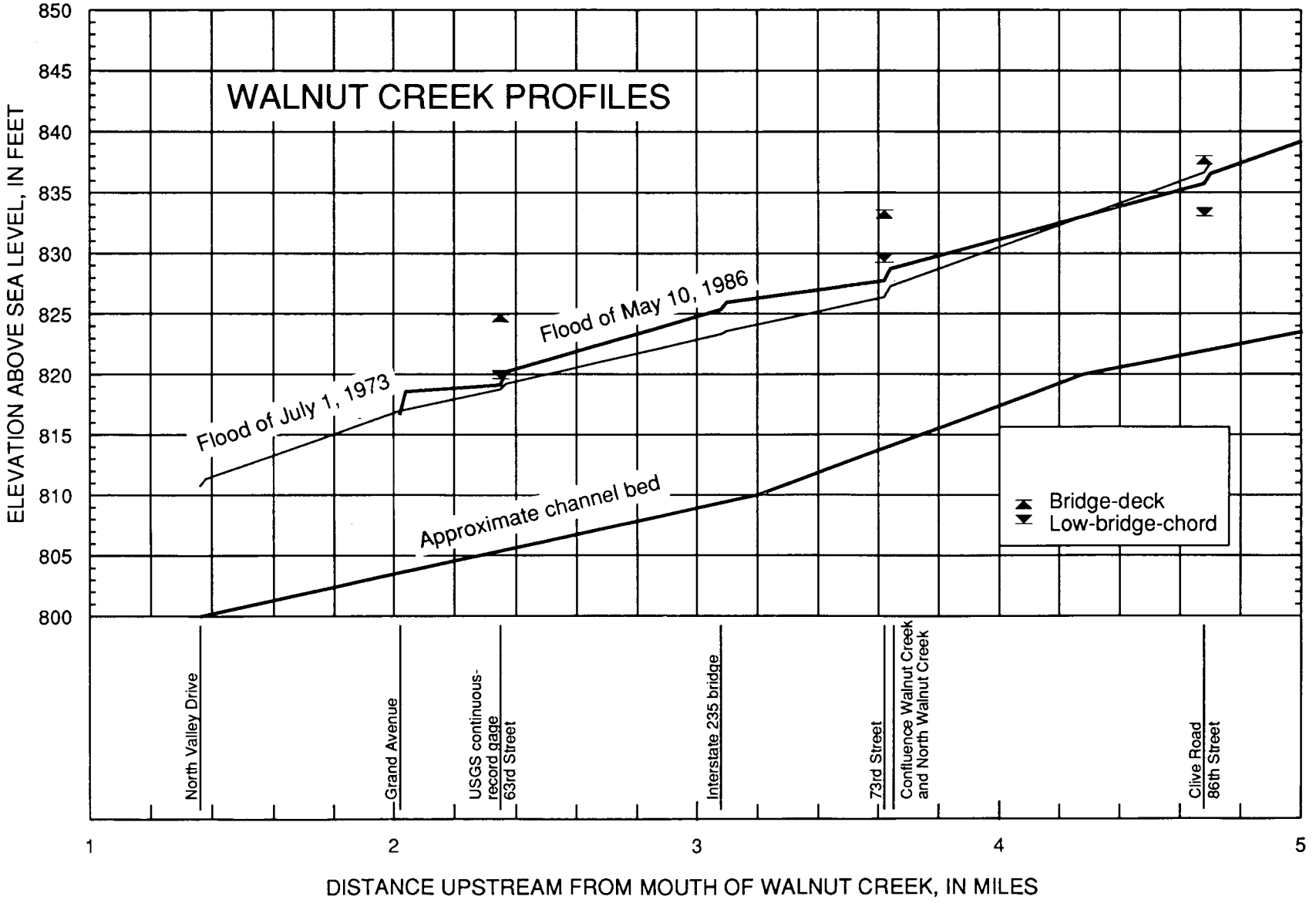

Figure 46. Water-surface-elevation profiles for Walnut Creek, river miles 1.36 to 5.

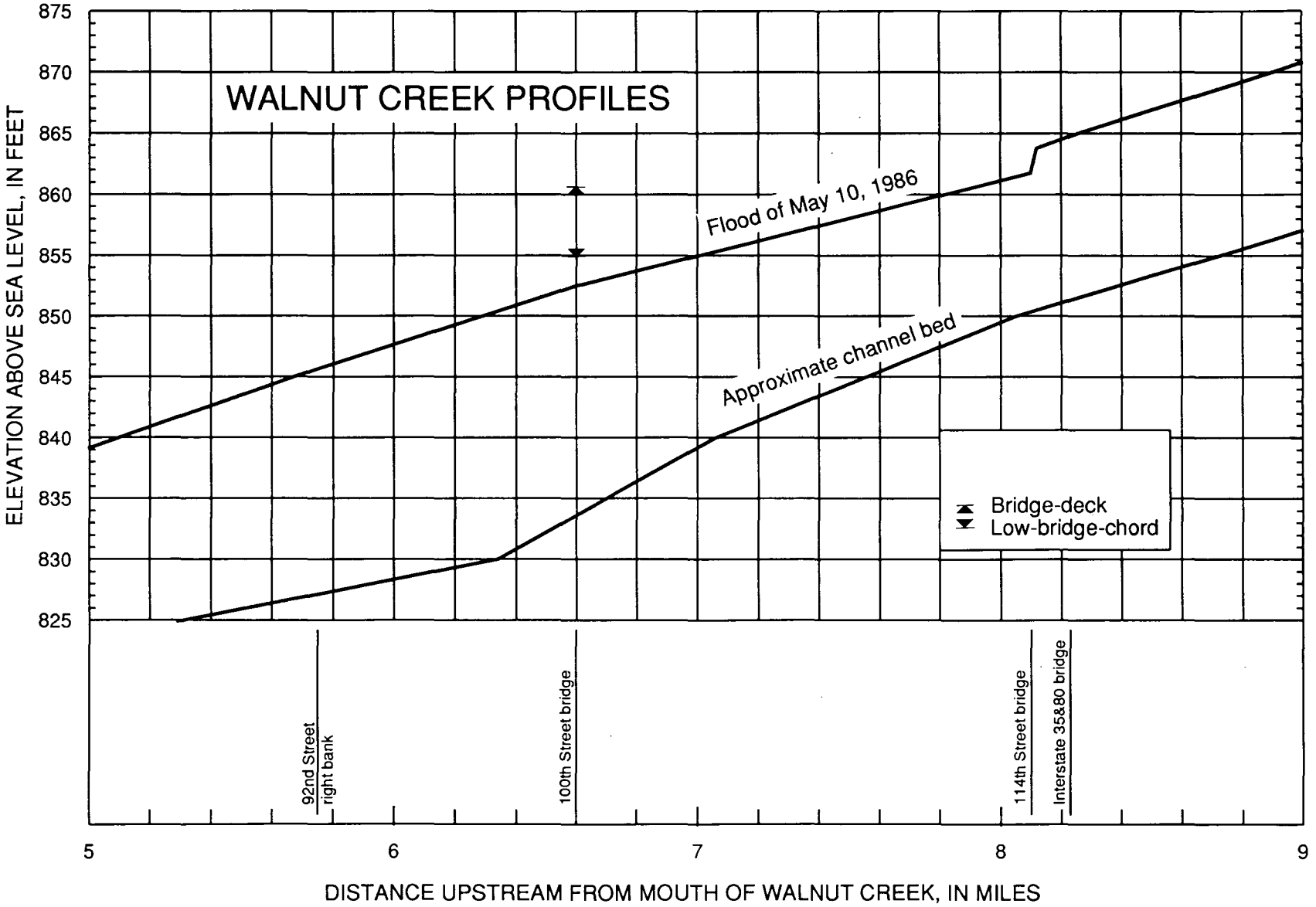

Figure 47. Water-surface-elevation profiles for Walnut Creek, river miles 5 to 9.

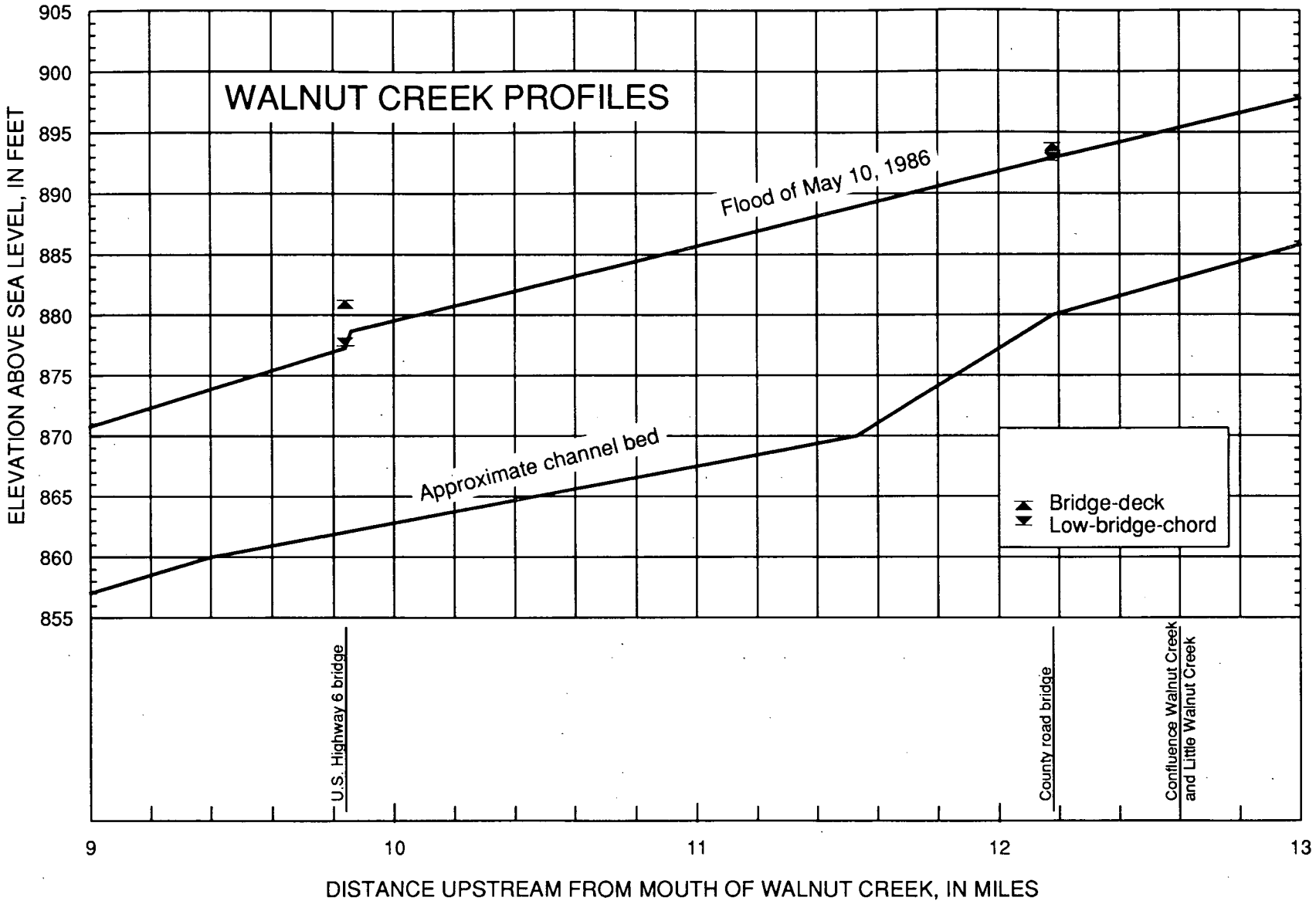

Figure 48. Water-surface-elevation profiles for Walnut Creek, river miles 9 to 13.

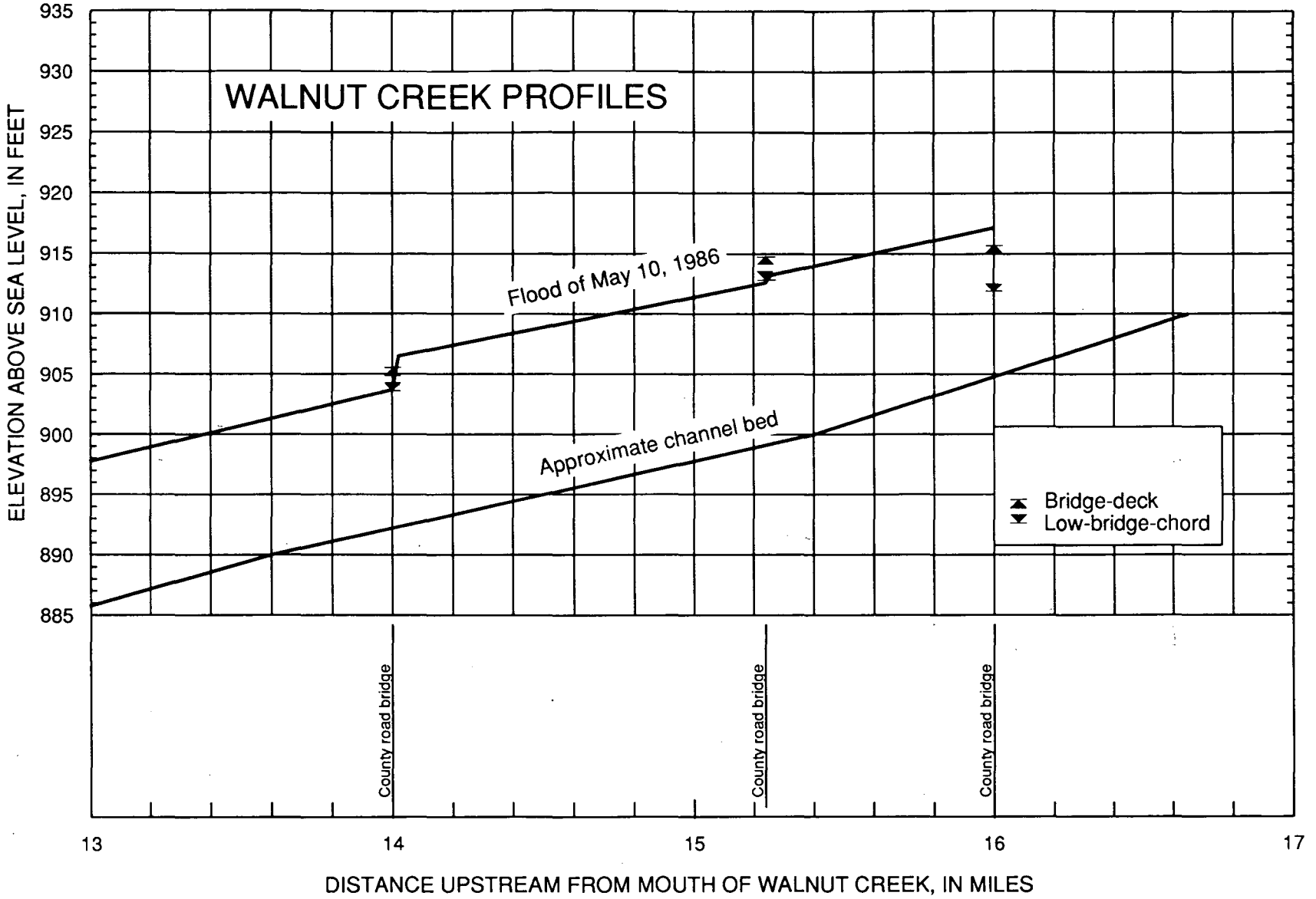

Figure 49. Water-surface-elevation profiles for Walnut Creek, river miles 13 to 16.65.

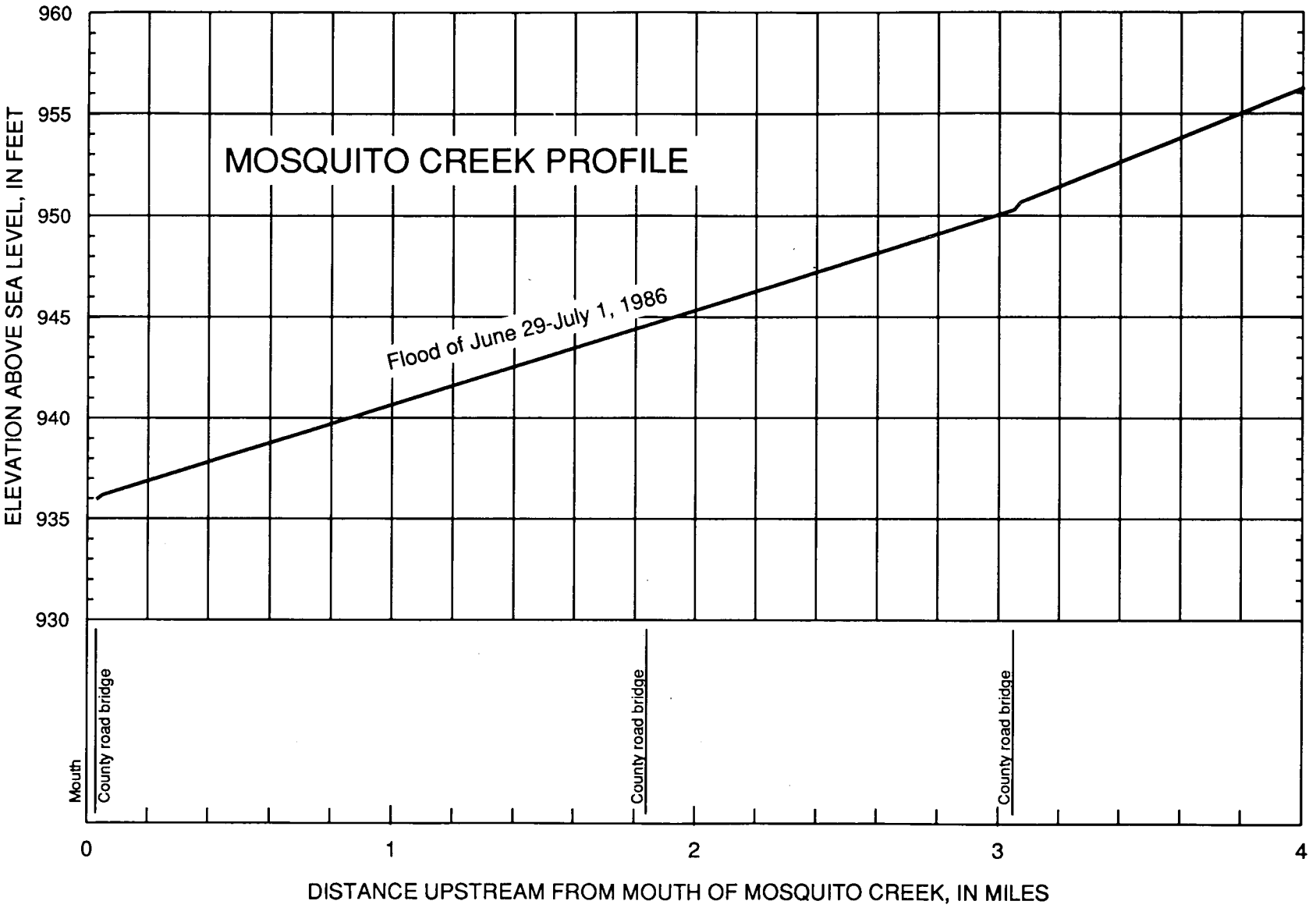

Figure 50. Water-surface-elevation profiles for Mosquito Creek, river miles 0.03 to 4.

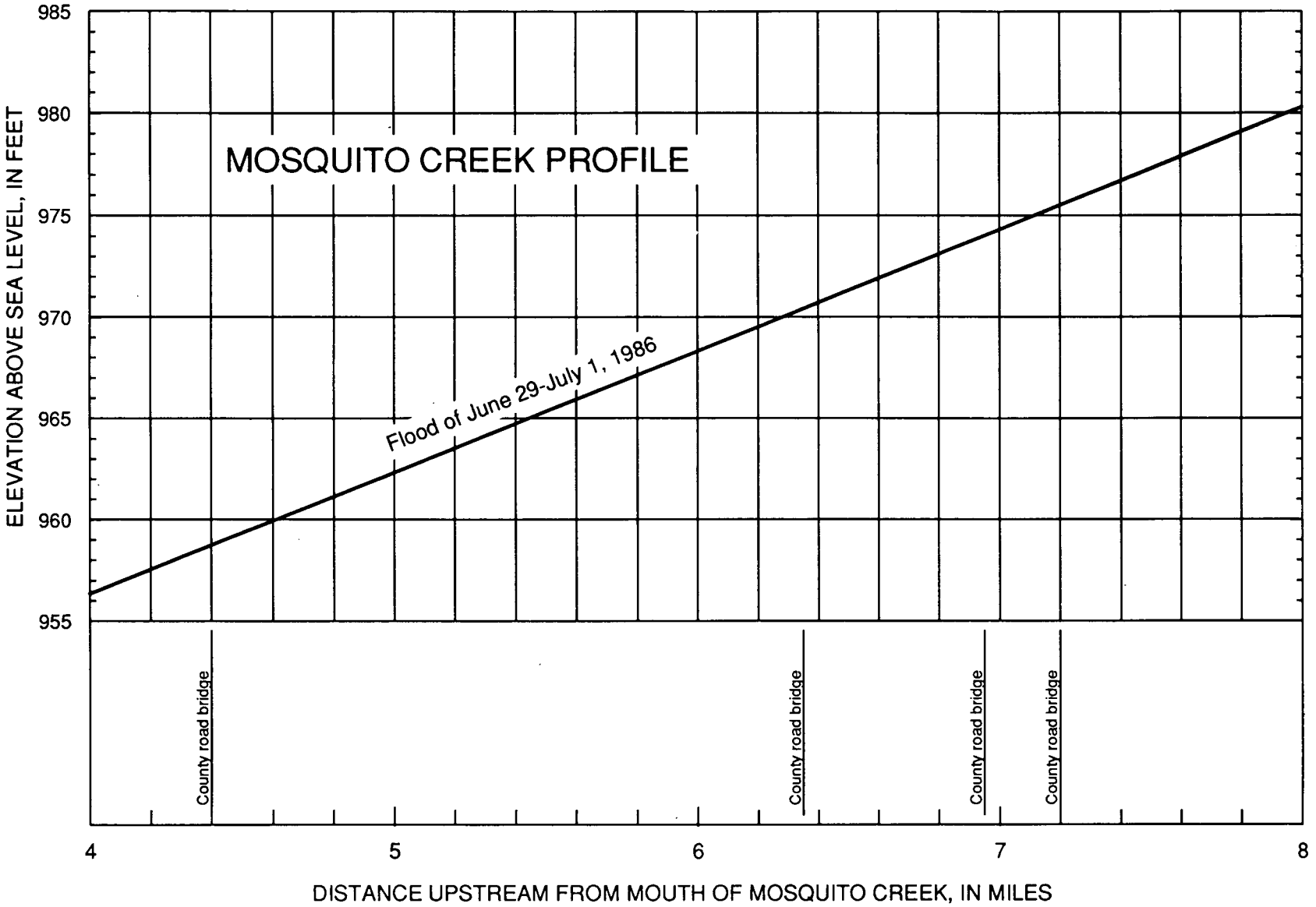

Figure 51. Water-surface-elevation profiles for Mosquito Creek, river miles 4 to 8.

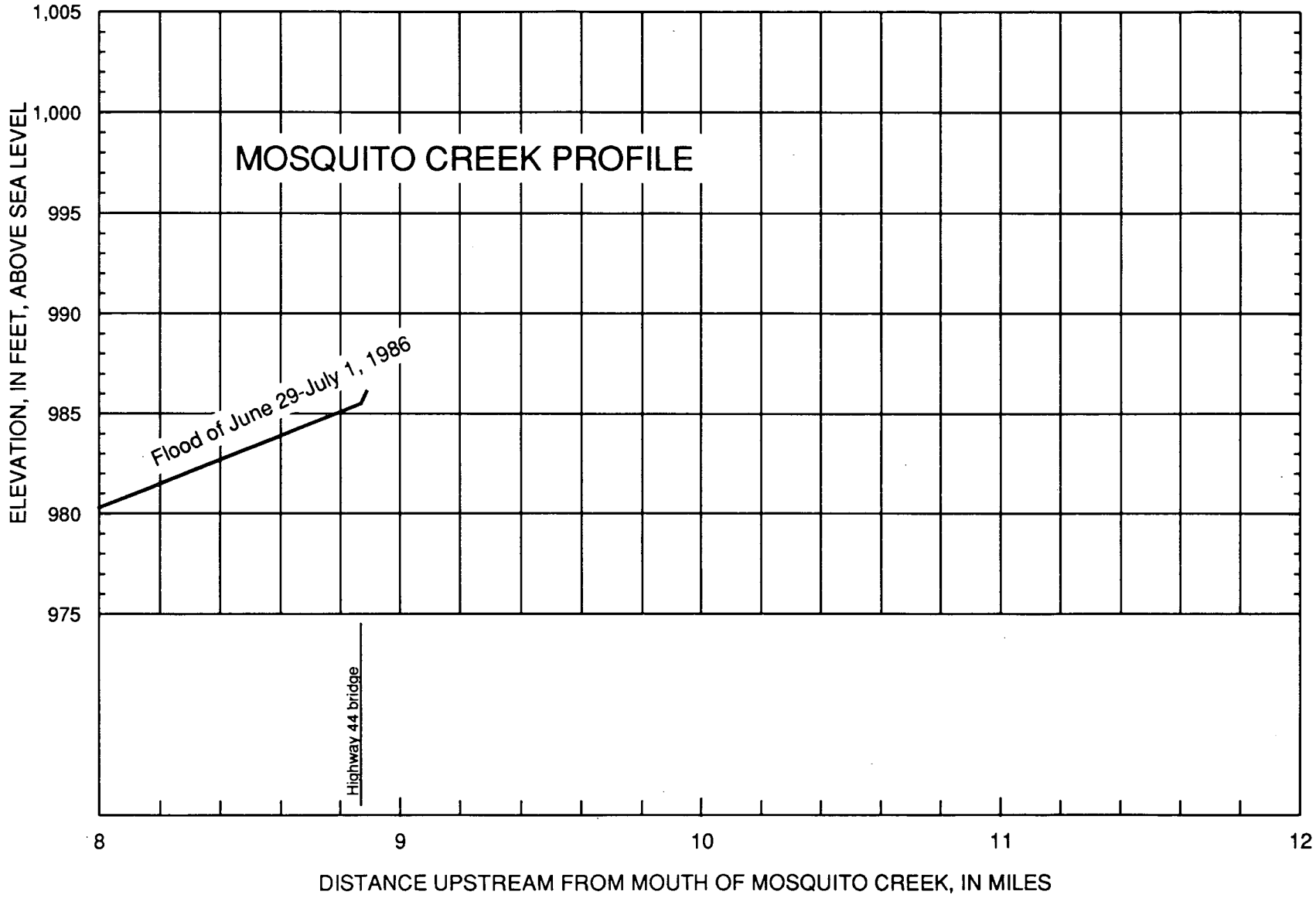

Figure 52. Water-surface-elevation profiles for Mosquito Creek, river miles 8 to 8.87.

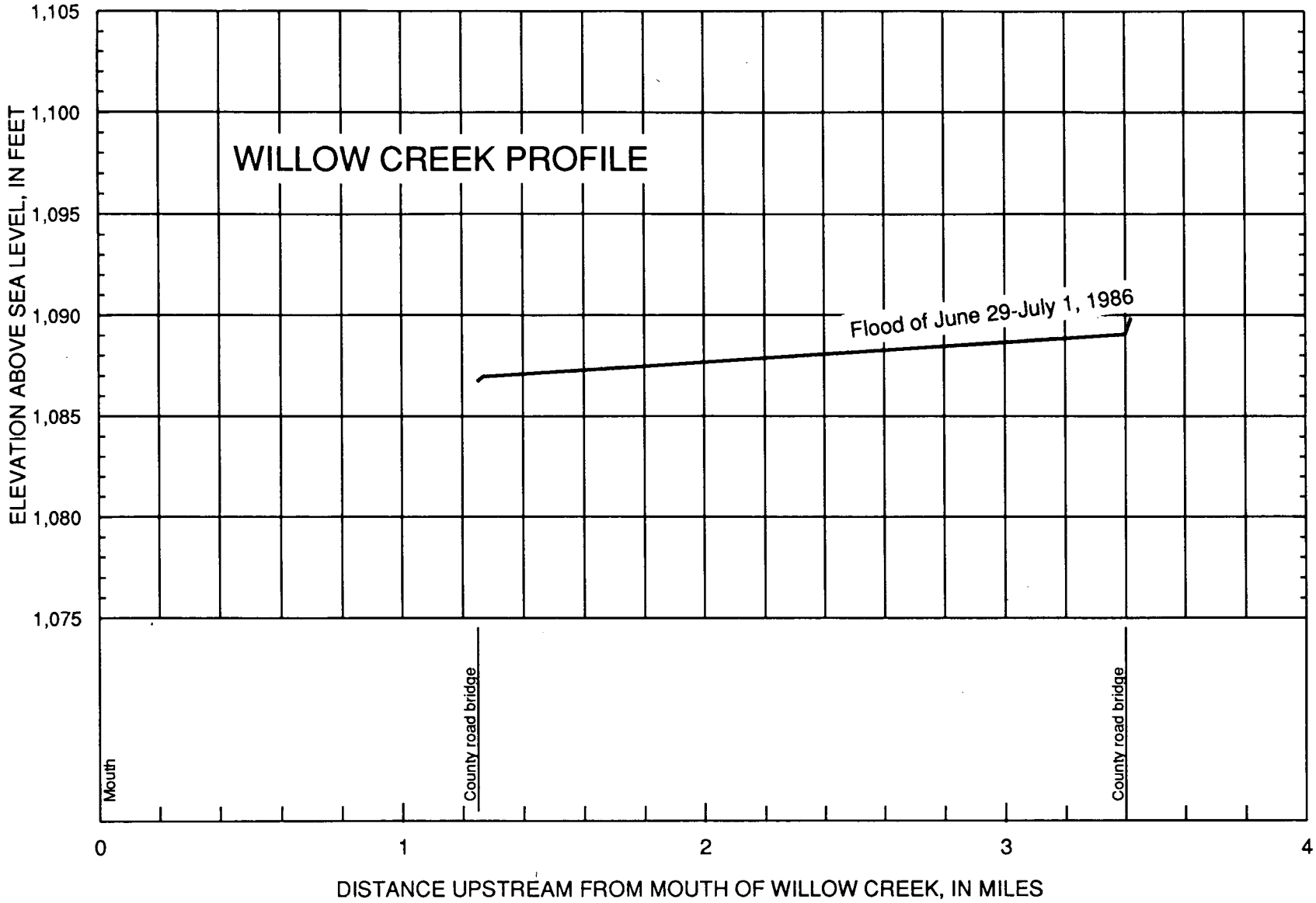

Figure 53. Water-surface-elevation profiles for Willow Creek, river miles 1.25 to 3.40.

Appendix 3

TEMPORARY BENCH MARKS AND REFERENCE POINTS IN THE RACCOON RIVER BASIN, WEST-CENTRAL IOWA

The temporary bench marks listed in this tabulation have been established by the U.S. Geological Survey (USGS). Elevations for the bench marks also were established by the USGS except those for which credit is given in the description of the bench mark. The work was done as a part of a stream profile jointly funded by the Highway Research Advisory Board, Highway Division, Iowa Department of Transporation and the USGS.

The streams included in the level work were the Raccoon River, North Raccoon River, South Raccoon River, Middle Raccoon River, Willow Creek, Mosquito Creek, and Walnut Creek. Bench marks were set at all bridges and at intermediate points to preserve the level lines.

Level lines to establish the third-order accuracy bench marks shown herein were run from first- or second-order bench marks established and adjusted by the National Geodetic Survey (NGS) or from third-order bench marks established and adjusted by the Topographic Division of the USGS. Errors of closure in the USGS level work were adjusted along the level line to the elevations published by the NGS and the Topographic Division. These bench marks are repeated in this listing. All elevations are referenced to sea level.

The bench marks have been identified by an index number, which is composed of the township, range, and section number as mandated by Congress and the quarter section in which they are located. The township and range numbers have been combined into a four-digit number, such as 8030 for Township 80 North and Range 30 West. This is followed by a dash and the section number in which the mark is located. Within the section, the quarter in which the mark is located is designated by NE, SE, NW, and SW. A number in parentheses following this letter designation indicates the number of the mark in that particular quarter section. The index number serves to describe the landline location of the mark without further reference in the body of the description.

Standard marks, such as chiseled squares and crosses, were used on concrete or steel. On trees or poles, a 20-penny pole spike driven horizontally through a short piece of 1/8-in. galvanized pipe or a railroad spike was used. Existing marks were used wherever available, and the agency responsible for the mark, when known, is indicated in the description. Some temporary bench marks were given names, such as N8 or 48 PJH A, to be used as cross references. Marks indicated as (REFERENCE POINT) following the name of the stream were established to permit water-surface elevations to be determined by use of a tape and weight. The terms "right" and "left" in the descriptions are determined as viewed while facing in the direction of the flow of the stream.

The user of this information is cautioned that bench marks can be disturbed, destroyed, and can move over time. Many of the marks that are listed herein are located on bridges that may have been repaired, replaced, or destroyed since the original level lines were run. Some of the marks may be disturbed or gone. It is the responsibility of the user to determine the condition and the suitability of the bench mark.

Additional information can be obtained by writing to the following address: U.S. Geological Survey, Water Resources Division, Rm. 269, Federal Building, 400 South Clinton Street, Iowa City, IA 52244.

TEMPORARY BENCH MARKS AND REFERENCE POINTS

7824-08 NE (1) - At Des Moines on Fleur Drive bridge over Raccoon River, at end of right downstream abutment guardrail post at sidewalk level; chiseled square.

Elevation 809.23 ft.

7824-08 NE (2) - At Des Moines on Fleur Drive bridge over Raccoon River, on right downstream curb; chiseled triangle.

Elevation 810.52 ft.

7824-08 NE (3) - (REFERENCE POINT) At Des Moines at Fleur Drive bridge over Raccoon River between 1st and 2nd handrail posts right of 4th pier from right bank on downstream side of bridge; chiseled arrow.

Elevation 829.05 ft.

7824-08 NE (5) - At Des Moines at Fleur Drive bridge over Raccoon River and Chicago, Rock Island and Pacific Railroad, on 4th concrete pier from left downstream end of bridge, 40 ft south of south rail set in top of pier footing; a standard disk stamped "A 164 1950" (NGS).

Elevation 797.357 ft.

7824-09 NE (1) - At Des Moines on 5th Street bridge over Raccoon River, on left downstream wingwall on landward corner; chiseled triangle. (Found 7/86)

Elevation 801.99 ft.

7824-09 NE (2) - (REFERENCE POINT) At Des Moines on 5th Street bridge over Raccoon River, on top of 8th walkway post from left downstream; chiseled arrow.

Elevation 807.74 ft.

7824-09 SE (2) - At Des Moines on 7th Street bridge over Raccoon River, on left downstream abutment base at corner with wingwall, at track level; white-paint pencil square.

Elevation 797.10 ft.

7824-09 SW (1) - At Des Moines on Burlington Northern railroad bridge over Raccoon River, on 1st pier from right bank on downstream landward bolt of girder seat; chiseled cross.

Elevation 798.27 ft.

7824-09 SW (2) - (REFERENCE POINT) At Des Moines on Burlington Northern railroad bridge over Raccoon River, on downstream landward side of 8th steel floor beam from 2nd pier from right bank; chiseled arrow.

Elevation 800.66 ft.

7824-10 NW (1) - In Des Moines at Riverside Drive bridge over Raccoon River, on left upstream wingwall; chiseled square. (Found 7/86)

Elevation 803.54 ft.

7824-10 NW (2) - (REFERENCE POINT) In Des Moines at Riverside Drive bridge over Raccoon River, on center of downstream handrail section at center light post; chiseled arrow.

Elevation 809.76 ft.

7825-02 SE (1) - At Des Moines at USGS gaging station on 63rd Street bridge over Walnut Creek, first guardrail post from left downstream abutment, on top of a bolt; chiseled X. (Gage RM 1) (Found 6/91)

Elevation 826.07 ft.

7825-02 SE (2) - At Des Moines at USGS gaging station on 63rd Street bridge over Walnut Creek, on top of left downstream wingwall; chiseled square. (Gage RM 2) (Found 6/91)

Elevation 829.00 ft.

7825-02 SE (3) - At Des Moines at USGS gaging station on 63rd Street bridge over Walnut Creek, on the upstream, streamward corner of the gage-house foundation; chiseled square. (Gage RM 3) (Found 6/91)

Elevation 825.42 ft.

7825-02 NE (1) - At Des Moines at Interstate 235 bridge over Walnut Creek, on top of the left downstream retaining wall; Iowa Department of Transportation Plug. (Found 6/91).

Elevation not available.

7825-03 NE (1) - At Des Moines at 73rd Street bridge over Walnut Creek, on top of the left downstream wingpost; chiseled cross. (Found 6/91)

Elevation 836.96 ft.

7825-13 NE (1) - About 1.25 mi east of 63rd street between Chicago and North Western, and Chicago, Rock Island and Pacific Railroad on west abutment of bridge number 3611 over Walnut Creek; standard disk stamped "H4 1930." (NGS)

Elevation 808.637 ft.

7825-14 NE (1) - At West Des Moines at the 63rd Street bridge over Raccoon River on left downstream wingwall curb; chiseled square. (Not found 7/86)

Elevation 823.85 ft.

7825-14 NE (2) - (REFERENCE POINT) At West Des Moines at 63rd Street bridge over Raccoon River, on 15th guardrail post from left downstream end of bridge; chiseled arrow. (Found 7/86)

Elevation 831.75 ft.

7825-14 NE (3) - At Des Moines-West Des Moines boundary on 63rd Street crossing of Chicago, Rock Island and Pacific Railroad, 45 ft north and 43 ft east of crossing in south side of 2 ft by 1 ft power pole; railroad spike.

Elevation 814.06 ft.

7825-14 NW (1) - In West Des Moines about 2,000 ft west of 63rd Street in "Y" formed by Chicago and Northwestern Railway and Chicago, Rock Island and Pacific Railroad, 35 ft west of west property line of 6th Street extended, in southeast corner of 4 ft by 8 ft concrete slab on top of 2-in. bolt; chiseled cross.

Elevation 813.40 ft.

7825-15 NE (1) - About 0.5 mi southwest of West Des Moines Post Office at a road crossing along Chicago, Rock Island and Pacific Railroad 0.1 mi east of Penn-Dixie Cement Plant, 33 ft northwest of northwest rail of most northwestern side track, 45 ft south of centerline of gravel road leading west to cement plant and at southwest edge of road crossing tracks, in top of concrete post 0.2 ft above ground; standard disk stamped "MISS 1950" (NGS).

Elevation 815.12 ft.

7825-15 SW (1) - About 1.2 mi southwest of Post Office in West Des Moines at bridge 3639 on Chicago, Rock Island and Pacific Railroad, on upstream end of right abutment 1 ft below level of track; standard disk stamped "N 155 1950" (NGS).

Elevation 818.693 ft.

7825-21 NE (1) - About 1.3 mi northeast of Commerce along the Chicago, Rock Island and Pacific Railroad at a private road crossing leading southeast across tracks, 18 ft southwest of centerline of crossing, 41.5 ft northwest of northwest rail, 56 ft southeast of centerline of State Highway 90, 2.3 ft east of witness post set in top of a concrete post 0.3 ft above ground; a standard disk stamped "P 155 1950" (NGS).

Elevation 820.061 ft.

7825-29 NE (1) - At Commerce 125 ft northwest of north end of former bridge location across Raccoon River, 38.5 ft north of north rail, 72 ft west of centerline of old road leading to former bridge, 25 ft south of centerline of east-west road and 2.2 ft east of witness post, set in top of concrete post 0.2 ft above ground; standard disk stamped "Q 155 1950" (NGS).

Elevation 838.906 ft.

7825-30 NE (1) - About 0.9 mi west of Commerce along Chicago, Rock Island and Pacific Railroad, about 1,400 ft west of Interstate 35 overpass at a private road crossing, 16 ft west of crossing, 47.5 ft north of north rail, 1.7 ft south of fence, 2.2 ft west of witness post, set in top of concrete post 0.4 ft above ground; standard disk stamped "R 155 1950" (NGS).

Elevation 828.634 ft.

7825-30 NW (1) - About 1.3 mi west of Commerce along Chicago, Rock Island and Pacific Railroad at State Highway 90 overpass, set vertically in south face of most southeasterly of four concrete piers on north side of track and 2.1 ft above ground; a standard disk stamped "S 155 1950" (NGS).

Elevation 833.614 ft.

7825-30 SE (1) - At West Des Moines at Interstate 35 bridge over Raccoon River, on left downstream wingwall curb of downstream bridge; chiseled cross. (Found 7/86)

Elevation 835.70 ft.

7825-30 SE (2) - (REFERENCE POINT) At West Des Moines at Interstate 35 bridge over Raccoon River, on 35th guardrail post from left downstream end of downstream bridge; filed arrow.

Elevation 839.03 ft.

7825-35 SW (1) - At Des Moines at 86th Street bridge over Walnut Creek, on top of the left downstream wingpost; chiseled square. (Found 6/91)

Elevation 840.24 ft.

7826-25 NW (1) - About 2.4 mi west of Commerce at Chicago, Rock Island and Pacific Railroad culvert, on right end of upstream headwall; a USGS standard disk stamped "Elev 834.903 ft."

Elevation 834.933 ft.

7826-26 NW (1) - About 3.4 mi west of Commerce along Chicago, Rock Island and Pacific Railroad at bridge number 369.7, on top of downstream end of right abutment 1 ft below level of track; a standard disk stamped "T 155 1950" (NGS).

Elevation 841.967 ft.

7826-28 NE (1) - About 1.9 mi east of Booneville along Chicago, Rock Island and Pacific Railroad at bridge number 370.9, in downstream end of right abutment; USGS standard disk stamped "Elev. 845.208 ft."

Elevation 845.261 ft.

7826-28 SW (1) - About 0.9 mi east of Booneville railroad station along State Highway 90, 118 ft south of centerline, 16 ft east of center of gate, 1.1 ft north of fence, and 2.2 ft east of witness post, in top of concrete post 0.4 ft above ground; a standard disk stamped "U 155 1950" (NGS).

Elevation 854.234 ft.

7826-30 SW (1) - About 0.6 mi west of Booneville on Chicago, Rock Island and Pacific Railroad overflow bridge number 3735 west of main bridge over Raccoon River, in downstream end of right abutment 0.5 ft below level of track; standard disk stamped "V 155 1950" (NGS). (Found 7/86)

Elevation 856.813 ft.

7826-30 SW (2) - About 0.3 mi west of Booneville at State Highway 90 bridge over Raccoon River, on right downstream curb; Iowa Department of Transportation plug. (Found 7/86)

Elevation 863.18 ft.

7826-30 SW (3) - (REFERENCE POINT) About 3.0 mi west of Booneville at State Highway 90 bridge over Raccoon River, on top of guardrail beside 45th post from right downstream bridge; chiseled arrow. (Found 7/86)

Elevation 863.65 ft.

7827-07 SW (1) - About 4.0 mi south of Adel on U.S. Highway 169 at T-road west, 190 ft north and 50 ft west of intersection, on high bank 5 ft west of fence line, in concrete post; standard tablet stamped "2 AH 1948."

Elevation 992.709 ft.

7827-18 NW (1) - About 4.0 mi south of Adel at U.S Highway 169 bridge over South Raccoon River, and on left upstream wingwall; chiseled square. (Found 7/86)

Elevation 885.43 ft.

7827-18 NW (2) - (REFERENCE POINT) About 4.0 mi south of Adel at U.S. Highway 169 bridge over South Raccoon River, on top of guardrail beside 16th post from left downstream end of bridge; filed arrow. (Found 7/86)

Elevation 888.52 ft.

7827-20 NE (1) - About 2.0 mi northwest of Van Meter at Interstate 80 bridge over South Raccoon River, on left upstream wingwall curb of upstream bridge; Iowa Department of Transportation plug.

Elevation 879.05 ft.

7827-20 NE (2) - (REFERENCE POINT) About 2.0 mi northwest of Van Meter at Interstate 80 bridge over South Raccoon River, on top of 30th guardrail post from left downstream end of downstream bridge; filed arrow.

Elevation 881.17 ft.

7827-20 SE (1) - About 1.9 mi west of Van Meter along Chicago, Rock Island and Pacific Railroad at a railroad bridge over Bulgers Creek, on top of right upstream abutment; a standard disk stamped "T 161 1950" (NGS). (Found 8/90)

Elevation 878.023 ft.

7827-21 NW (1) - About 1.5 mi northeast of Van Meter at Interstate 80 bridge over North Raccoon River, on downstream bridge on right downstream wingwall; Iowa Department of Transportation plug.

Elevation 875.64 ft.

7827-21 NW (2) - (REFERENCE POINT) About 1.5 mi northeast of Van Meter at Interstate 80 bridge over North Raccoon River, on top of 35th guardrail post from right downstream end of downstream bridge; chiseled arrow.

Elevation 877.40 ft.

7827-21 SW (5) - About 1.0 mi northwest of Van Meter at county road bridge over South Raccoon River, on left downstream wingwall curb; chiseled square. (Found 8/90)

Elevation 878.09 ft.

7827-21 SW (6) - About 1.0 mi northwest of Van Meter at county road bridge over South Raccoon River, on 33rd guardrail post from left downstream end; chiseled arrow. (Found 8/90)

Elevation 879.90 ft.

7827-22 SW (1) - At Van Meter at USGS gage on Raccoon River at county highway N 16 bridge on right downstream wingwall; reference mark #11, chiseled square.

Elevation 867.22 ft.

7827-22 SW (2) - At Van Meter at USGS gage on Raccoon River at county highway R 16 bridge, on right downstream bridge seat of new bridge; chiseled square. (RM 15)

Elevation 866.11 ft.

7827-22 SW (3) - At Van Meter at USGS gage and county highway R 16 bridge over Raccoon River, on right downstream wingwall; chiseled square.

Elevation 870.34 ft.

7828-02 NE (2) - At Redfield at USGS gage on right bank 20 ft upstream from county highway bridge over South Raccoon River in left upstream curb; railroad spike. (RM 2)

Elevation 911.11 ft.

7828-16 NE (1) - About 6.5 mi southeast of Redfield at county road P 58 bridge over South Raccoon River on right downstream wingwall; chiseled square. (Not found 7/86)

Elevation 898.96 ft.

7828-16 NE (2) - (REFERENCE POINT) About 6.5 mi southeast of Redfield at county road P 58 bridge over South Raccoon River, on top of guardrail beside 33rd post from right downstream end of bridge; filed arrow. (Found 7/86)

Elevation 901.16 ft.

7828-17 SE (1) - About 5.5 mi southeast of Redfield and about 0.8 mi west along dirt road in Earlham access from entrance at county road P 58, 45 ft east from corrugated pipe culvert, in trunk of large basswood tree on right bank of South Raccoon River, pole spike and collar.

Elevation 891.18 ft.

7828-17 NW (1) - About 5.0 mi southeast of Redfield at a telephone cable crossing over South Raccoon River, on left bank in base of north pole of cable support; railroad spike.

Elevation 891.66 ft.

7829-02 NE (1) - About 2.25 mi east of Redfield at USGS continuous-record gage at county road bridge over South Raccoon River, on top of left upstream abutment; chiseled square. (Gage RM 1) (Found 9/89)

Elevation 924.67 ft.

7829-02 NE (2) - (REFERENCE POINT) About 2.25 mi east of Redfield at USGS continuous-record gage at county road bridge over South Raccoon River, on 20th vertical guardrail post from left downstream end of bridge; chiseled arrow. (Gage RP 1) (Found 9/89)

Elevation 925.96 ft.

7829-02 NE (3) - About 2.25 mi east of Redfield at USGS continuous-record gage at county road bridge over South Raccoon River, left upstream curb; railroad spike. (Gage RM 2) (Found 9/86)

Elevation 923.56 ft.

7829-02 NE (4) - About 2.25 mi east of Redfield at USGS continuous-record gage at county road bridge over South Raccoon River, on left downstream abutment; chiseled square. (Gage RM 3) (Found 9/86)

Elevation 924.63 ft.

7829-02 NE (5) - About 2.25 mi east of Redfield at USGS continuous-record gage at county road bridge over South Raccoon River, USGS tablet set in concrete 6 in. above ground and 2 ft north of gage house; USGS tablet. (Gage RM 4) (Found 9/86)

Elevation 914.94 ft.

7829-03 SE (1) - About 1.5 mi east of Redfield along north-south section of generally east-west road, at a tile outlet collection pit and culvert between sec. 2 and 3, on west headwall; chiseled square.

Elevation 918.44 ft.

7829-03 SW (1) - About 1 mi southeast of Redfield at bridge over South Raccoon River, 70 ft downstream from gage in upstream face of 48 in. Elm tree stump; 1/2-in. galvanized bolt.

Elevation 915.73 ft.

7829-03 SW (2) - About 1 mi southeast of Redfield at bridge over South Raccoon River, on left downstream pier; chiseled cross on rivet.

Elevation 918.33 ft.

7829-04 NW (1) - At Redfield at county road F 59 bridge over Middle Raccoon River, on left upstream wingwall; chiseled cross. (Found 8/90)

Elevation 933.48 ft.

7829-04 NW (2) - (REFERENCE POINT) At Redfield at county road F 59 bridge over Middle Raccoon River, on top of guardrail at 14th post from left downstream end of bridge; chiseled arrow.

Elevation 936.96 ft.

7829-04 SE (1) - About 0.5 mi south of Redfield at junction of U.S. Highway 6 and "T" road east, 54 ft south and 29 ft east of intersection in power pole; railroad spike.

Elevation 960.46 ft.

7829-07 NW (1) - About 4 mi north of Dexter at first house west of county road P 48 south of "T" road west, on southwest corner of concrete porch step; no mark.

Elevation 1,027.15 ft.

7829-07 SE (1) - About 3 mi north of Dexter at county road P48 bridge over South Raccoon River, on left downstream wingwall; chiseled square. (Found 7/86)

Elevation 946.04 ft.

7829-07 SE (2) - (REFERENCE POINT) About 3 mi north of Dexter at county road P 48 bridge over South Raccoon River on top of 22nd guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 948.33 ft.

7829-07 SW (1) - About 3 mi north of Dexter at junction of county road P 48 and "T" road west, 77 ft west and 27 ft south of intersection in power pole; railroad spike.

Elevation 939.66 ft.

7829-09 NE (1) - About 1.0 mi south of Redfield at U.S Highway 6 bridge over South Raccoon River, on top of left upstream guardrail; Iowa Department of Transportation plug. (Found 7/86)

Elevation 938.02 ft.

7829-09 NE (2) - (REFERENCE POINT) About 1.0 mi south of Redfield at U.S. Highway 6 bridge over South Raccoon River, on top of and at center of 10th concrete guardrail section from left downstream end of bridge; chiseled arrow. (Found 7/86)

Elevation 939.28 ft.

7829-13 NE (1) - About 4 mi southeast of Redfield, south of "L" in county road to east and on tangent line with east ditch line, 40 ft northwest of center of road and on high bank 12 ft north of power pole, in concrete post; standard tablet stamped "4 RH 1948."

Elevation 1,055.920 ft.

7829-18 NE (1) - About 4.5 mi southeast of Redfield at entrance to Central Iowa Bible Camp, which intersects with an east-west county road, 60 ft east and 39 ft south of intersection in base of a power pole; pole spike and collar.

Elevation 1,046.04 ft.

7830-04 SE (1) - About 4.5 mi southwest of Linden at a county road bridge over South Raccoon River, on right downstream curb; chiseled square.

Elevation 979.86 ft.

7830-04 SE (2) - (REFERENCE POINT) About 4.5 mi southwest of Linden at a county road bridge over South Raccoon River, on top of 14th guardrail post from right downstream end of bridge; chiseled arrow.

Elevation 981.81 ft.

7830-05 NE (1) - About 4 mi southwest of Linden at junction of county road P 28 and "T" road west, 48 ft south and 23 ft east of intersection in power pole; railroad spike.

Elevation 1,145.79 ft.

7830-05 SE (1) - About 5.5 mi southwest of Linden at county road P 28 bridge over South Raccoon River, on left downstream wingwall; chiseled square.

Elevation 987.61 ft.

7830-05 SE (2) - (REFERENCE POINT) About 5.5 mi southwest of Linden at county road P 28 bridge over South Raccoon River, on top of 22nd guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 990.29 ft.

7830-05 SE (3) - About 4.5 mi southwest of Linden on west side of county road P 28 at a field entrance, 50 ft west and 14 ft north on top of 2-ft diameter corrugated metal culvert; punched hole.

Elevation 1,050.90 ft.

7830-06 NE (1) - About 5 mi southwest of Linden at county road bridge over South Raccoon River, on left downstream wingwall; chiseled square.

Elevation 999.82 ft.

7830-06 NE (2) - (REFERENCE POINT) About 5 mi southwest of Linden at county road bridge over South Raccoon River, on top of 20th guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 1,002.13 ft.

7830-10 SE (1) - About 4.5 mi northwest of Dexter at county road bridge over South Raccoon River, on right downstream bridge seat; chiseled cross on bolt.

Elevation 958.23 ft.

7830-10 SE (2) - (REFERENCE POINT) About 4.5 mi northwest of Dexter at county road bridge over South Raccoon River, on 2nd vertical I-beam from right downstream end of bridge; chiseled arrow.

Elevation 964.16 ft.

7830-12 SE (1) - About 3.25 mi northwest of Dexter at east-west county road bridge over South Raccoon River, on left upstream end of curb; chiseled square.

Elevation 947.53 ft.

7830-12 SE (2) - (REFERENCE POINT) About 3.25 mi northwest of Dexter at east-west county road bridge over South Raccoon River, on top of 20th guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 948.98 ft.

7830-12 SW (1) - About 3.5 mi northwest of Dexter at a county road bridge over a tributary to South Raccoon River, on left downstream end of truss on rivet; chiseled cross.

Elevation 950.49 ft.

7830-14 NW (1) - About 4 mi northwest of Dexter at intersection of county roads, 45 ft south and 32 ft west of intersection in power pole; railroad spike.

Elevation 1,025.72 ft.

7925-31 NE (1) - About 1 mi west of Interstate 35 and 80 and U.S. Highway 6 interchange, at bridge on U.S. Highway over Walnut Creek, on the left downstream curb; chiseled square. (Found 6/91)

Elevation 881.29 ft.

7926-13 NW (1) - About 3.5 mi southwest of Grimes at county road bridge over Walnut Creek, in left upstream wingwall; railroad spike. (Found 6/91)

Elevation 915.50 ft.

7926-14 NE (1) - About 3.5 mi southwest of Grimes at county road bridge over Walnut Creek, at right upstream end of bridge, the most right upstream bolt head on the bridge flange, 1.4 ft below the bridge deck; bolt head. (Found 6/91)

Elevation 914.34 ft.

7926-24 NW (1) - About 3 mi southwest of Grimes at county road bridge over Walnut Creek, on right upstream retaining wall; brass tablet. (Levels by Dallas County) (Found 6/91)

Elevation 907.68 ft.

7926-25 NE (1) - At Des Moines at 200th Street bridge over Walnut Creek, on right upstream wingwall; bolt head. (Found 6/91)

Elevation 894.38 ft.

7926-25 SW (1) - About 0.3 mi north of and 2.7 mi east of Waukee, 106 ft north of, 34 ft east of and 2.1 ft higher than crossroads, 1.5 ft north of power pole, in top of concrete post; standard tablet stamped "10 WMC 1964 1031." (Found 6/91)

Elevation 1,031.382 ft.

7927-05 NW (1) - About 4.3 mi north of Adel at the intersection of State Highway 169 and 44, 50 ft west of Highway 169 and 37 ft south of a power pole, in concrete post; standard tablet stamped "TT 2MT 1948."

Elevation 1,016.792 ft.

7927-06 NE (1) - About 5 mi north of Adel at State Highway 44 bridge over North Raccoon River, on left downstream wingwall curb; Iowa Department of Transportation plug.

Elevation 952.84 ft.

7927-06 NE (2) - (REFERENCE POINT) About 5 mi north of Adel at State Highway 44 bridge over North Raccoon River, on top of guardrail beside 50th post from left downstream end of bridge; chiseled arrow.

Elevation 935.52 ft.

7927-20 SW (1) - About 0.8 mi north of Adel and 0.25 mi south of bridge over North Raccoon River on U.S. Highway 169 at "T" road west, about 500 ft west of intersection in west headwall of small concrete culvert under old Highway 169 south of "T" road; Iowa Department of Transportation plug.

Elevation 894.93 ft.

7927-20 SW (2) - About 1.3 mi north of Adel at U.S. Highway 169 bridge over north channel of North Raccoon River, on right downstream wingpost; Iowa Department of Transportation plug.

Elevation 901.82 ft.

7927-20 SW (3) - (REFERENCE POINT) About 1.3 mi north of Adel at U.S. Highway 169 bridge over North Channel of North Raccoon River, on top of guardrail beside 35th post from right downstream end of bridge; chiseled arrow.

Elevation 901.25 ft.

7927-29 NW (1) - About 0.4 mi north of Adel at U.S Highway 169 bridge over South Channel (Mill Slough) of North Raccoon River, on left downstream wingwall curb; chiseled square.

Elevation 891.30 ft.

7927-29 NW (2) - (REFERENCE POINT) About 0.4 mi north of Adel at U.S. Highway 169 bridge over South Channel (Mill Slough) of North Raccoon River, on top of guardrail beside 9th post from left downstream end of bridge; chiseled arrow.

Elevation 894.15 ft.

7927-29 SE (1) - At northeast edge of Adel and about 0.3 mi south of U.S. Highway 169 bridge over South Channel (Mill Slough) of North Raccoon River, on right wingwall of dam; chiseled square.

Elevation 885.93 ft.

7927-29 SE (2) - At Adel 720 ft south of courthouse along U.S. Highway 169, at Chicago, Milwaukee, Saint Paul and Pacific Railroad crossing, 18 ft north of center of track on concrete steps on west side of street, on bottom step; reference mark, chiseled square.

Elevation 892.23 ft.

7927-29 SE (3) - At Adel at Chicago, Milwaukee, Saint Paul and Pacific Railroad bridge over North Raccoon River, on rivet at right downstream end of truss; filed cross.

Elevation 888.50 ft.

7927-29 SE (4) - (REFERENCE POINT) At Adel at Chicago, Milwaukee, Saint Paul and Pacific Railroad bridge over North Raccoon River, on downstream center vertical member of west truss; filed arrow.

Elevation 890.58 ft.

7927-29 SE (5) - At Adel at Prairie St. bridge over North Raccoon River, on right upstream abutment; chiseled square.

Elevation 887.55 ft.

7927-29 SE (6) - (REFERENCE POINT) At Adel at Prairie St. bridge over North Raccoon River (Mill Slough branch), 3rd vertical member from right downstream end of bridge; chiseled arrow.

Elevation 892.41 ft.

7927-29 SE (7) - (REFERENCE POINT) At Adel at Prairie St. bridge over North Raccoon River, on 6th vertical member from left downstream end of bridge; chiseled arrow.

Elevation 892.89 ft.

7927-29 SE (8) - At Adel at U.S. Highway 6 bridge over North Raccoon River, on right upstream wingpost; Iowa Department of Transportation plug.

Elevation 895.36 ft.

7927-29 SE (9) - (REFERENCE POINT) At Adel at U.S. Highway 6 bridge over North Raccoon River, near base of lamp post on downstream guardrail; chiseled arrow.

Elevation 895.92 ft.

7929-06 NE (1) - About 4.5 mi east of Panora at State Highway 44 bridge over Mosquito Creek, on right downstream wingpost; Iowa Department of Transportation plug. (Found 7/86)

Elevation 994.57 ft.

7929-15 SE (1) - About 3.5 mi east of Linden at county road F 51 bridge over Mosquito Creek, on left downstream curb; chiseled square. (Found 8/90)

Elevation 959.96 ft.

7929-22 SE (1) - About 3.0 mi north of Redfield near southeast corner of section 22, about 0.1 mi west of county gravel road bridge over Mosquito Creek, 39 ft north of center of road and 4 ft east of center of driveway to house on south side of road, 36 ft west of telephone pole and 1.5 ft north of fence in concrete post; standard tablet stamped "TT 13 MT 1948." (Found 8/90)

Elevation 979.148 ft.

7929-30 NW (1) - About 2 mi south of Linden north of a bend in a north-south county road, 33 ft east of road, 3 ft east of north-south fence line, 4 ft south of fence line east in concrete post; standard tablet stamped "TT 18JO 1951." (Found 8/90)

Elevation 1,130.885 ft.

7929-30 SE (1) - About 2 mi south of Linden on north-south county road bridge over Middle Raccoon River, on left downstream wingwall curb; chiseled square. (Found 7/86)

Elevation 963.28 ft.

7929-30 SE (2) - (REFERENCE POINT) About 2 mi south of Linden on north-south county road bridge over Middle Raccoon River, on top of guardrail beside 20th post from left downstream end of bridge; filed arrow.

Elevation 966.00 ft.

7929-34 SE (3) - About 1.5 mi northwest of Redfield at county road bridge over Mosquito Creek, on top of left upstream wingwall; Iowa Department of Transportation plug. (Found 8/90)

Elevation 942.34 ft.

7930-05 NW (1) - Near southwest edge of Panora at USGS streamflow-gaging station at county bridge, on left upstream wingwall; chiseled square. (gage RM 6) (Found 7/86)

Elevation 1,015.78 ft.

7930-05 NW (2) - Near southwest edge of Panora at USGS streamflow-gaging station at county bridge, on left downstream wingwall; chiseled square. (gage RM 5)

Elevation 1,015.81 ft.

7930-05 SE (1) - About 1.0 mi south of Panora at intersection of county road P 28 and T-road east, west of intersection on top of west end of a 36-in. concrete culvert; chiseled square.

Elevation 1,115.81 ft.

7930-06 NE (1) - About 1.0 mi west of Panora at State Highway 44 bridge over Middle Raccoon River on right downstream wingwall curb; Iowa Department of Transportation plug. (Found 7/86)

Elevation 1,036.19 ft.

7930-06 NE (2) - (REFERENCE POINT) About 1.0 mi west of Panora at State Highway 44 bridge over Middle Raccoon River, on top of 20th guardrail post from right downstream end of bridge; filed arrow.

Elevation 1,034.41 ft.

7930-08 NE (1) - About 1.5 mi south of Panora at county road P 28 bridge over Middle Raccoon River, on left upstream wingwall curb; bolt embedded in curb. (Found in 7/86)

Elevation 1,001.76 ft.

7930-09 NW (1) - (REFERENCE POINT) About 1.5 mi south of Panora at county road P 28 bridge over Middle Raccoon River, on top of guardrail beside 14th post from left downstream end of bridge; filed arrow.

Elevation 1,001.39 ft.

7930-13 SW (1) - About 1.5 mi west of Linden at intersection of county roads, in northeast corner of intersection in base of a power pole; pole spike and collar.

Elevation 1,146.78 ft.

7930-14 SW (1) - About 2.5 mi west of Linden at intersection of county road and T-road north, south of intersection in base of power pole; pole spike and collar.

Elevation 1,062.21 ft.

7930-15 SE (1) - About 3.0 mi west of Linden at county road bridge over Middle Raccoon River on left downstream wingwall curb; chiseled square. (Found 7/86)

Elevation 990.57 ft.

7930-15 SE (2) - (REFERENCE POINT) About 3.0 mi west of Linden at county road bridge over Middle Raccoon River, on top of 17th guardrail post from left downstream end of bridge; filed arrow.

Elevation 992.58 ft.

7930-23 SE (1) - About 1.5 mi southwest of Linden at abandoned county road bridge over Middle Raccoon River, on top of a steel beam on right downstream pier; filed square.

Elevation 970.39 ft.

7930-23 SE (2) - (REFERENCE POINT) About 1.5 mi southwest of Linden at abandoned county road bridge over Middle Raccoon River, on top of guardrail beside 3rd vertical member from right downstream end of bridge; filed arrow.

Elevation 975.07 ft.

7930-24 SW (1) - About 2.0 mi southwest of Linden at a bend in county road, 20 ft northwest of centerline of road, 15 ft northeast of centerline of a field entrance in base of a power pole; pole spike and collar.

Elevation 1,123.01 ft.

7930-25 SE (2) - About 2.0 mi southwest of Linden at county road F 51 bridge over Middle Raccoon River, on left downstream wingwall curb; chiseled square. (Found 7/86)

Elevation 973.72 ft.

7930-25 SE (3) - (REFERENCE POINT) About 2.0 mi southwest of Linden at county road F 51 bridge over Middle Raccoon River, on top of 20th guardrail post from left downstream end of bridge: filed arrow.

Elevation 975.90 ft.

7930-26 SE (1) - About 2.5 mi southwest of Linden at intersection of county road F 51 and T-road north, south of intersection, in base of power pole; pole spike and collar.

Elevation 1,143.72 ft.

7930-27 SE (1) - About 3.0 mi southwest of Linden at intersection of county road P 28 and T-road F51 east, in southeast corner of intersection, 26 ft north and 42 ft east of northeast corner of a church, in a concrete post; standard tablet stamped "TT 17 JO 1951 RESET 1956."

Elevation 1,153.396 ft.

7930-30 SE (1) - About 2.0 mi south of Linden at a county road bridge over Middle Raccoon River, on left downstream wingwall curb; chiseled square.

Elevation 963.28 ft.

7930-30 SE (2) - (REFERENCE POINT) About 2.0 mi south of Linden at county road bridge over Middle Raccoon River on top of guardrail beside 20th post from left downstream end of bridge; filed arrow.

Elevation 966.00 ft.

7930-32 NW (1) - About 3 mi southeast of Montieth at county road bridge over South Raccoon River, on left downstream wingwall; chiseled cross. (Iowa Natural Resources Council)

Elevation 1,012.33 ft.

7930-32 NW (2) - About 3 mi southeast of Montieth at county road bridge over South Raccoon River, on left downstream wingwall; chiseled square.

Elevation 1,012.80 ft.

7930-32 NW (3) - (REFERENCE POINT) About 3 mi southeast of Montieth at county road bridge over South Raccoon River, on top of 22nd guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 1,014.84 ft.

7930-35 SW (1) - About 3.5 mi southwest of Linden in northeast corner of Junction of county roads P 28 and F 59, in base of power pole; pole spike and collar.

Elevation 1,151.34 ft.

7931-06 NW (1) - Near northwest corner of Guthrie Center at old bridge over South Raccoon River, on left downstream end of bridge on channel iron of abutment cap; chiseled cross. (Iowa Natural Resources Council)

Elevation 1,077.82 ft.

7931-06 NW (2) - (REFERENCE POINT) Near northwest corner of Guthrie Center at old bridge over South Raccoon River, on 1st vertical member from left downstream end of bridge; filed arrow.

Elevation 1,083.56 ft.

7931-06 SW (1) - At west edge of Guthrie Center at State Highway 44 bridge over South Raccoon River, on right upstream end of concrete guardrail; Iowa Department of Transportation plug.
Elevation 1,080.05 ft.

7931-06 SW (2) - (REFERENCE POINT) At west edge of Guthrie Center at State Highway 44 bridge over South Raccoon River, on top of 5th concrete guardrail section from right upstream end of bridge; chiseled arrow. (Found 7/86)
Elevation 1,080.62 ft.

7931-07 SE (1) - About 1.0 mi south of Guthrie Center at State Highway 25 bridge over Mason Creek, on right downstream wingwall; chiseled square. (USGS UE 39-45 B)
Elevation 1,074.99 ft.

7931-07 NW (1) - Near south edge of Guthrie Center at State Highway 25 bridge over South Raccoon River, on northeast corner of left downstream wingwall; no visible mark.
Elevation 1,074.84 ft.

7931-07 NW (2) - Near south edge of Guthrie Center at State Highway 25 bridge over South Raccoon River, on right downstream curb; chiseled square.
Elevation 1,075.16 ft.

7931-07 NW (3) - (REFERENCE POINT) Near south edge of Guthrie Center at State Highway 25 bridge over South Raccoon River, on 3rd vertical I-beam member from left downstream end of bridge; filed arrow.
Elevation 1,078.00 ft.

7931-07 NW (4) - Near south edge of Guthrie Center at State Highway 25 bridge over South Raccoon River, on left downstream curb; bolt.
Elevation 1,075.16 ft.

7931-17 SE (1) - About 2 mi southeast of Guthrie Center at county road bridge over South Raccoon River, on top of left upstream concrete pier cap; chiseled cross. (Iowa Natural Resources Council)
Elevation 1,049.95 ft.

7931-17 SE (2) - (REFERENCE POINT) About 2 mi southeast of Guthrie Center at county road bridge over South Raccoon River, on 3rd vertical I-beam member from right downstream end of bridge; filed arrow.
Elevation 1,057.90 ft.

7931-21 NE (1) - About 1.5 mi northwest of Montieth along a northwest-southeast dead-end road at a 5-ft concrete box culvert, on top of downstream headwall 3.5 ft higher than road; a standard disk stamped "U 102 1935" (NGS).
Elevation 1,042.747 ft.

7931-22 NE (1) - About 0.6 mi northwest of Montieth at junction of county road and "T" road west, 96 ft north and 41 ft west of intersection; chiseled square.
Elevation 1,040.50 ft.

7931-22 NW (1) - About 1.6 mi northwest of Montieth at a county road bridge over South Raccoon River, on right downstream curb; chiseled cross. (Iowa Natural Resources Council)
Elevation 1,049.44 ft.

7931-22 NW (2) - (REFERENCE POINT) About 1.6 mi northwest of Montieth at a county road bridge over South Raccoon River, on top of 18th guardrail post from right downstream end of bridge; chiseled arrow.

Elevation 1,051.81 ft.

7931-23 NW (1) - About 0.8 mi northwest of Montieth at a county road bridge over South Raccoon River, on right downstream end of truss on bolt; filed cross.

Elevation 1,034.59 ft.

7931-23 NW (2) - (REFERENCE POINT) About 0.8 mi northwest of Montieth at a county road bridge over South Raccoon River, on top of 3rd vertical I-beam member from right downstream end of bridge; filed arrow.

Elevation 1,038.57 ft.

7931-23 SE (1) - About 0.5 mi east of Montieth at county road F 51 bridge over South Raccoon River, on right upstream wingwall; chiseled cross.

Elevation 1,028.60 ft.

7931-23 SW (1) - At Montieth at junction of county road F 51 and "T" road south, in southwest corner of intersection in base of east transformer power pole; railroad spike.

Elevation 1,040.94 ft.

7931-26 NE (1) - (REFERENCE POINT) About 0.5 mi east of Montieth at county road F 51 bridge over South Raccoon River, on top of 15th guardrail post from right end of bridge; filed arrow.

Elevation 1,030.53 ft.

8028-11 NE (1) - About 1.9 mi west of Minburn along gravel road, thence about 1.1 mi northwest along North Raccoon River, about 400 ft east of barn on the Ross farm, 185 ft southeast of a fence corner in a northwest-southeast fence line, in a concrete post; standard table stamped "2 0C 1948."

Elevation 947.131 ft.

8028-13 NE (1) - About 2 mi southwest of Minburn, at county road F31 bridge over North Raccoon River, on left downstream curb; Iowa Department of Transportation plug.

Elevation 921.80 ft.

8028-13 NE (2) - (REFERENCE POINT) About 2 mi southwest of Minburn at county road F 31 bridge over North Raccoon River, on top of guardrail beside 30th post from left downstream end of bridge; filed arrow.

Elevation 925.12 ft.

8030-31 NW (1) - About 1.0 mi west of Panora at Lake Panorama dam on Middle Raccoon River, on right abutment of dam about 1.5 ft north of manhole cover; chiseled square.

Elevation 1,067.44 ft.

8030-32 SE (1) - At Panora on State Highway 44, 100 ft west of the crossing of Chicago, Milwaukee, Saint Paul and Pacific Railroad at the southwest corner of intersection of the Steward road, 6.5 ft northwest of a power pole, 1.5 ft southwest of curb, and about 3 in. lower than top of curb; a State survey standard disk stamped "39-65" and set in top of concrete post.

Elevation 1,051.697 ft.

8031-09 SE (1) - About 5.0 mi northeast of Guthrie Center at county road bridge over Middle Raccoon River, on right downstream wingwall curb; chiseled square.

Elevation 1,053.38 ft.

8031-09 SE (2) - (REFERENCE POINT) About 5.0 mi northeast of Guthrie Center at a county road bridge over Middle Raccoon River, on top of 30th guardrail post from right downstream end of bridge; filed arrow.

Elevation 1,055.29 ft.

8031-09 SW (1) - About 5.0 mi north of Guthrie Center at intersection of county road and T-road north, 244 ft east and 30.6 ft south of T-road north, 3 ft higher than center of road in concrete post; standard tablet stamped "TT 3 JO 1951."

Elevation 1,073.421 ft.

8128-08 NE (1) - About 1.20 mi west of Perry along Chicago, Milwaukee, Saint Paul and Pacific Railroad, north of Oscar Meyer stockyards along a gravel road north of and parallel to railroad tracks, 500 ft northeast of northwest corner of stockyard fence, in base of power pole; railroad spike.

Elevation 945.32 ft.

8128-08 NW (1) - About 2.0 mi west of Post Office in Perry at Chicago, Milwaukee, Saint Paul and Pacific Railroad bridge over North Raccoon River, on left downstream corner of left downstream pier; chiseled square.

Elevation 933.58 ft.

8128-08 NW (2) - (REFERENCE POINT) About 2.0 mi west of Post Office in Perry at Chicago, Milwaukee, Saint Paul and Pacific Railroad bridge over North Raccoon River, on a metal plate between vertical and diagonal members on right downstream bridge truss; chiseled arrow.

Elevation 941.79 ft.

8128-08 NW (3) - About 2 mi west of Perry at county road bridge over North Raccoon River, on bolt in left downstream bridge seat plate; chiseled cross.

Elevation 935.41 ft.

8128-08 NW (4) - (REFERENCE POINT) About 2 mi west of Perry at county road bridge over North Raccoon River, on first vertical member from left downstream end of bridge; filed arrow.

Elevation 942.11 ft.

8128-08 SW (1) - About 1.5 mi west of Perry at State Highway 141 bridge over North Raccoon River, on left downstream wingwall curb; Iowa Department of Transportation plug.

Elevation 944.53 ft.

8128-08 SW (2) - (REFERENCE POINT) About 1.5 mi west of Perry at State Highway 141 bridge over North Raccoon River, on top of 18th guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 946.94 ft.

8128-10 SW (1) - At Perry at the Walford Street side of Post Office, in the water table under the grilled window, 10 ft from northwest corner of building, and about 2.5 ft above ground; a standard disk stamped "969.129 U3 1930" (NGS).

Elevation 969.129 ft.

8128-16 NW (1) - About 1.0 mi west of Perry at intersection of State Highway 141 and road leading to Oscar Meyer, in southeast corner of intersection in base of middle power pole of three poles; railroad spike.

Elevation 936.50 ft.

8128-25 SW (1) - About 2.75 mi southeast along Chicago and Northwestern Railroad from Perry, 0.3 mi northwest of mile post 280, 10 ft east of the east fence line of a north-south road and 37 ft southwest of centerline of track; a standard disk stamped "1026.307 W3 1930" and set in the top of a concrete post. (NGS)

Elevation 1,026.307 ft.

8128-26 SW (1) - About 3.0 mi northwest of Minburn at intersection of east-west county road and T-road north, in northeast corner of intersection in base of power pole; railroad spike.

Elevation 1,002.42 ft.

8128-34 NW (1) - About 3.0 mi south of Perry at county road P 58 bridge over North Raccoon River, on right upstream wingwall curb; bolt set flush with curb.

Elevation 940.29 ft.

8129-03 SW (1) - About 0.5 mi north of Dawson at county road P 46 bridge over North Raccoon River, on right downstream curb; chiseled square.

Elevation 952.74 ft.

8129-03 SW (2) - (REFERENCE POINT) About 0.5 mi north of Dawson at county road P 46 bridge over North Raccoon River, on top of guardrail beside 8th post from right downstream end of bridge; filed arrow.

Elevation 955.44 ft.

8129-04 SW (1) - About 1.0 mi northwest of Dawson at concrete bridge over small creek west of T-road south, on left upstream wingpost; chiseled square.

Elevation 950.81 ft.

8129-09 NW (1) - About 1.0 mi west of Dawson at intersection of county road and Chicago, Milwaukee, Saint Paul and Pacific Railroad 595 ft north of crossing, 23 ft east of gravel road, 1 ft west of cemetery fence line in a concrete post; standard tablet stamped "15 OC 1948."

Elevation 1,033.063 ft.

8131-01 SE (1) - About 1.0 mi northeast of Bagley at a county road bridge over Mosquito Creek, on top of the right end of the downstream guardrail; chiseled cross. (Found 8/90)

Elevation 1,092.07 ft.

8131-01 SE (2) - (REFERENCE POINT) About 1.0 mi northeast of Bagley at a county road bridge over Mosquito Creek, on top of the downstream guardrail between the ninth and tenth vertical support beams from the left side; chiseled arrow. (Found 8/90)

Elevation 1,092.13 ft.

8131-03 E (1) - About 0.5 mi north of Bagley at a county road bridge over Mosquito Creek, on top of the right end of the downstream guardrail; no visible mark. (Found 8/90)

Elevation 1,097.98 ft.

8131-03 E (2) - About 0.5 mi north of Bagley at a county road bridge over Mosquito Creek, on top of the downstream guardrail at the tenth vertical support beam; chiseled arrow. (Found 8/90)

Elevation 1,097.73 ft.

8131-04 SE (1) - About 1.0 mi west of Bagley at State Highway 141 bridge over tributary to Mosquito Creek, on left upstream wingwall; chiseled cross. (Found 8/90)

Elevation 1,102.05 ft.

8131-17 NW (1) - About 3.2 mi southwest of Bagley at State Highway 25 bridge over tributary to Mosquito Creek, on top of guardrail post at right downstream end of bridge; Iowa Department of Transportation plug. (Found 8/90)

Elevation 1,136.30 ft.

8131-18 SE (1) - About 2.0 mi south of, and 3.0 mi west of Bagley, 250 ft north and 52 ft west of crossroads, on west ROW fence line in concrete post; standard tablet stamped "TT 7T 1953" (NGS). (Found 8/90)

Elevation 1,150.413 ft.

8131-32 SW (9) - About 5.8 mi southeast of Bayard at USGS gaging station on left bank, on top of left downstream concrete barrier of bridge, chiseled square. (RM9) (Found 7/86)

Elevation 1,074.83 ft.

8132-06 NW (1) - About 3.0 mi southeast of Coon Rapids, at Chicago, Milwaukee, Saint Paul and Pacific Railroad overpass over county road, on east end of the north headwall; reference mark for "59 PJH 1969"; chiseled square.

Elevation 1,135.18 ft.

8132-10 NE (1) - About 0.5 mi south of Bayard at county road N 70 bridge over Willow Creek, on top of curb at left, downstream end of bridge; chiseled cross. (Found 8/90)

Elevation 1,091.89 ft.

8132-10 NE (2) - About 0.5 mi south of Bayard at county road N 70 bridge over Willow Creek, on top of curb at right, downstream end of bridge; chiseled cross. (Found 8/90)

Elevation 1,091.53 ft.

8132-23 NW (1) - About 2.0 mi south of Bayard and 1.0 mi upstream from mouth at a county road bridge over Willow Creek, on top of guardrail post at left upstream end of bridge; two filed lines. (Found 8/90)

Elevation 1,090.75 ft.

8132-27 NW (1) - About 3.5 mi south of Bayard at county road N70 bridge over Middle Raccoon River, on right upstream wingwall curb; chiseled square.

Elevation 1,091.65 ft.

8132-27 NE (1) - (REFERENCE POINT) About 3.5 mi south of Bayard at county road N 70 bridge over Middle Raccoon River, on top of guardrail beside 13th post from left downstream end of bridge; filed arrow.

Elevation 1,094.05 ft.

8132-27 SW (1) - (REFERENCE POINT) About 4 mi south of Bayard at bridge over Middle Raccoon River, on first vertical member from left downstream end of bridge; filed arrow.

Elevation 1,093.82 ft.

8132-28 SE (1) - About 4 mi south of Bayard at county road bridge over Middle Raccoon River, on right upstream end of truss on top of rivet in bridge seat plate; filed cross.

Elevation 1,088.42 ft.

8132-29 NW (1) - About 4 mi southwest of Bayard at a county road bridge over Middle Raccoon River, on right downstream end of truss; filed cross on bolt. (Not found 7/86)

Elevation 1,104.33 ft.

8132-29 NW (2) - (REFERENCE POINT) About 4 mi southwest of Bayard at a county road bridge over Middle Raccoon River, on top of guardrail beside 2nd vertical member from left downstream end of bridge; filed arrow. (Found 7/86)

Elevation 1,107.63 ft.

8132-29 NW (3) - About 4 mi southeast of Bayard at a county road bridge over Middle Raccoon River, on top of the most upstream, landward rivet on the right, upstream end of the bridge truss; filed cross. (Found 7/86)

Elevation 1,103.92 ft.

8132-32 NW (1) - About 5 mi southwest of Bayard at intersection of county road F 24 and north-south county road, in southeast corner of intersection in base of fence corner post; railroad spike. (UE K7)

Elevation 1,284.32 ft.

8132-33 NE (1) - About 4.5 mi south of Bayard at intersection of county roads, in southwest corner of intersection on top of corrugated pipe culvert; punch marks.

Elevation 1,124.68 ft.

8133-02 NW (1) - About 1.0 mi southeast of Coon Rapids at State Highway 141 bridge over Middle Raccoon River, on right upstream wingwall curb; Iowa Department of Transportation plug. (Found 7/86)

Elevation 1,133.71 ft.

8133-02 NW (2) - (REFERENCE POINT) About 1.0 mi southeast of Coon Rapids at State Highway 141 bridge over Middle Raccoon River, on the 16th guardrail post from right downstream end of bridge; filed arrow.

Elevation 1,136.10 ft.

8133-11 NW (1) - About 2.0 mi southeast of Coon Rapids near a county road bridge over Middle Raccoon River, 20 ft southwest of the right downstream abutment, in base of a power pole; railroad spike.

Elevation 1,124.34 ft.

8133-11 NW (2) - (REFERENCE POINT) About 2.0 mi southeast of Coon Rapids at a county road bridge over Middle Raccoon River, on top of guardrail beside 2nd vertical member from left downstream end of bridge; filed arrow.

Elevation 1,128.50 ft.

8133-23 NE (1) - About 4.0 mi southeast of Coon Rapids at county road N 56 bridge over Middle Raccoon River, 11 ft west and 2.9 ft higher than road, on top and in center of left upstream wingwall; chiseled square. (Found 7/86)

Elevation 1,129.07 ft.

8133-23 NE (2) - (REFERENCE POINT) About 4.0 mi southeast of Coon Rapids at county road N 56 bridge over Middle Raccoon River, on top of guardrail beside 12th post from left downstream end of bridge; filed arrow.

Elevation 1,129.16 ft.

8229-18 SW (1) - About 4.0 mi east of Cooper at county road E 57 bridge over North Raccoon River, in right downstream wingpost; a bolt sunk in concrete.

Elevation 969.03 ft.

8229-18 SW (2) - (REFERENCE POINT) About 4.0 mi east of Cooper at county road E 57 bridge over North Raccoon River, on top of 21st guardrail post from right downstream end of bridge; chiseled arrow.

Elevation 970.68 ft.

8230-01 NW (1) - About 3.0 mi northeast of Cooper at intersection of county road P 30 and T-road east, in northeast corner of intersection in base of a power pole; railroad spike.

Elevation 974.50 ft.

8230-01 NW (2) - About 3.0 mi northeast of Cooper at a county road bridge over North Raccoon River, in right upstream wingwall; horizontal bolt protruding out of wingwall.

Elevation 972.36 ft.

8230-01 NW (3) - (REFERENCE POINT) About 3.0 mi northeast of Cooper at a county road bridge over North Raccoon River, on top of 9th guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 980.24 ft.

8230-12 NW (1) - About 2.5 mi northeast of Cooper at intersection of county road P 30 and T-road west, on east side of intersection in base of a power pole; railroad spike.

Elevation 1,036.40 ft.

8230-13 NW (1) - About 2.5 mi east of Cooper at intersection of county roads E 57 and P 30, in northeast corner of intersection in base of power pole; railroad spike.

Elevation 1,060.51 ft.

8230-14 NW (1) - About 1.5 mi east of Cooper at intersection of county road E 57 and T-road north in northeast corner of road junction in base of power pole; railroad spike.

Elevation 1,062.06 ft.

8230-16 NE (1) - At Cooper on the Chicago, Milwaukee, Saint Paul and Pacific Railroad of the southernmost street crossing in town, 18 ft east of centerline of track, 40 ft south of street, and about 2 ft lower than track; a standard disk stamped "G 102 1935" and set in the top of a concrete post. (NGS)

Elevation 1,079.069 ft.

8233-17 SW (1) - About 3.0 mi northwest of Coon Rapids at a county road bridge over Middle Raccoon River, on right downstream wingpost; chiseled square.

Elevation 1,160.89 ft.

8233-17 SW (2) - (REFERENCE POINT) About 3.0 mi northwest of Coon Rapids at a county road bridge over Middle Raccoon River, on top of guardrail beside 15th post from right downstream end of bridge; filed arrow.

Elevation 1,161.58 ft.

8233-20 NW (1) - About 2.5 mi northwest of Coon Rapids and about 0.25 mi southeast of a small cemetery, on west headwall of a concrete culvert; chiseled square.

Elevation 1,169.35 ft.

8233-20 SW (1) - About 2.0 mi northwest of Coon Rapids at intersection of county road and T-road north in northwest corner of intersection top of north end of a 1.5 ft corrugated pipe culvert; punch mark. (N8)

Elevation 1,261.52 ft.

8233-27 NW (1) - About 1.0 mi north of Coon Rapids at county road N44 bridge over Middle Raccoon River, 17 ft west and 0.8 ft higher than road, end of left upstream wingwall; chiseled square. (N5)

Elevation 1,147.86 ft.

8233-27 NW (2) - (REFERENCE POINT) About 1.0 mi north of Coon Rapids at county road N 44 bridge over Middle Raccoon River, on 12th guardrail post from left downstream end of bridge; filed arrow.

Elevation 1,149.60 ft.

8233-34 NE (1) - At Coon Rapids at Bridge Street bridge over Middle Raccoon River, beside right upstream wingwall curb on sidewalk; chiseled square.

Elevation 1,167.59 ft.

8233-34 NE (2) - (REFERENCE POINT) At Coon Rapids at Bridge Street bridge over Middle Raccoon River, on 9th guardrail post from right downstream end of bridge; chiseled square.

Elevation 1,172.42 ft.

8233-34 SE (1) - At Coon Rapids at Chicago, Milwaukee, Saint Paul and Pacific Railroad bridge over Middle Raccoon River, on left downstream abutment; chiseled square.

Elevation 1,161.61 ft.

8233-34 SE (2) - (REFERENCE POINT) At Coon Rapids at Chicago, Milwaukee, Saint Paul and Pacific Railroad bridge over Middle Raccoon River, in center of downstream concrete curb; chiseled arrow.

Elevation 1,161.86 ft.

8233-34 SE (3) - At Coon Rapids at Main St. bridge over Middle Raccoon River, on top of right downstream wingpost; chiseled square.

Elevation 1,140.85 ft.

8233-34 SE (4) - (REFERENCE POINT) At Coon Rapids at Main St. bridge over Middle Raccoon River, on guardrail beside 10th post from right downstream end of bridge; filed arrow.

Elevation 1,140.94 ft.

8234-01 NE (1) - About 8.0 mi south of Glidden near southeast edge of Carrollton, about 0.2 mi south of right angle curve in road, 13 ft west and 0.2 ft higher than road in top of west headwall of a concrete box culvert; chiseled square. (48 PJH A)

Elevation 1,205.80 ft.

8234-01 SW (1) - About 4.0 mi northeast of Dedham at a county road bridge over Middle Raccoon River, on left upstream end of truss; filed cross on bolt.

Elevation 1,170.88 ft.

8234-01 SW (2) - (REFERENCE POINT) About 4.0 mi northeast of Dedham at county road bridge over Middle Raccoon River, on top of guardrail beside 3rd vertical member from left downstream end of bridge; filed arrow.

Elevation 1,176.59 ft.

8234-02 NE (1) - About 4.0 mi northeast of Dedham at county road E 57 bridge over Middle Raccoon River, on left downstream end of truss; filed cross on bolt.

Elevation 1,174.40 ft.

8234-02 NE (2) - (REFERENCE POINT) About 4.0 mi northeast of Dedham at county road E 57 bridge over Middle Raccoon River, on top of guardrail beside 2nd vertical member from left downstream end of bridge; filed arrow.

Elevation 1,178.35 ft.

8234-12 SW (1) - About 3.5 mi northeast of Dedham at county road bridge over Middle Raccoon River, at right upstream corner of bridge; 8.0 ft north and 0.6 ft higher than road, 1.5 ft east of west end of wooden curb; top of iron bolt. (48 PJH D)

Elevation 1,169.10 ft.

8234-12 SW (2) - (REFERENCE POINT) About 3.5 mi northeast of Dedham at county road bridge over Middle Raccoon River, on top of guardrail beside 4th vertical member from left downstream end of bridge; filed arrow.

Elevation 1,172.00 ft.

8330-07 NE (1) - At Jefferson at intersection of Grinnel Road and Lincolnway, 21 ft east of Grinnel Road and 95 ft north of Lincolnway, in base of a power pole; pole spike and collar.

Elevation 1,071.57 ft.

8330-08 NW (1) - At Jefferson, Greene County, on the Chicago and North Western Railway, 80 ft west of west end of station, at street crossing, 45 ft south of centerline of south track, 36 ft east of centerline of street, and 3 ft northeast of a pole. A standard disk, stamped "1055.303 F89 1935" and set in top of a concrete post. (NGS)

Elevation 1,055.355 ft.

8330-18 NW (1) - At southwest edge of Jefferson on bridge over North Raccoon River, on curb at left downstream end of bridge; chiseled square.

Elevation 994.56 ft.

8330-18 NW (2) - (REFERENCE POINT) At southwest edge of Jefferson on bridge over North Raccoon River, on top of guardrail at 27th post from left downstream end of bridge; chiseled arrow.

Elevation 997.18 ft.

8330-20 NW (1) - About 2 mi south of Jefferson at State Highway 4 bridge over North Raccoon River, on right downstream pier on downstream face 2 ft above rip-rap; top of bolt head. (gage RM number 1)

Elevation 977.92 ft.

8330-21 NW (1) - About 1.7 mi south and 1.2 mi east of Jefferson at a railroad, 30 ft south and 72 ft east of railroad crossing, 4 ft north of a fence corner, set in concrete post; standard tablet stamped "16 JDF 1953."

Elevation 1,011.510 ft.

8330-21 SW (1) - About 2.5 mi southeast of Jefferson at the Chicago, Milwaukee, Saint Paul and Pacific Railroad bridge over North Raccoon River, on upstream end of bridge pier on left bank; chiseled square.

Elevation 985.91 ft.

8330-21 SW (2) - (REFERENCE POINT) About 2.5 mi southeast of Jefferson at the Chicago, Milwaukee, Saint Paul and Pacific Railroad bridge over North Raccoon River, on a cross brace perpendicular with 3rd vertical member from left downstream end of bridge; filed arrow.

Elevation 991.89 ft.

8330-22 SE (1) - About 3.5 mi southeast of Jefferson at county road bridge over Hardin Creek, on right downstream corner of bridge in piling; copper nail and washer.

Elevation 979.20 ft.

8330-36 SW (1) - About 3.5 mi northeast of Cooper at county road P30 bridge over North Raccoon River, on right downstream wingwall curb; chiseled square.

Elevation 979.59 ft.

8330-36 SW (2) - (REFERENCE POINT) About 3.0 mi northeast of Cooper at county road P 30 bridge over North Raccoon River, on top of 15th guardrail post from right downstream end of bridge; chiseled arrow.

Elevation 981.69 ft.

8331-03 NW (1) - About 4.0 mi west of Jefferson at north-south county road P 14 bridge over North Raccoon River, on left downstream wingwall curb; chiseled square.

Elevation 1,012.12 ft.

8331-03 NW (2) - (REFERENCE POINT) About 4.0 mi west of Jefferson at north-south county road P 14 bridge over North Raccoon River on top of 15th guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 1,014.72 ft.

8331-05 NE (1) - About 5.0 mi west of Jefferson at U.S. Highway 30 bridge over North Raccoon River, on curb near left downstream corner of bridge; Iowa Department of Transportation plug. (Not found 7/86)

Elevation 1,020.24 ft.

8331-05 NE (2) - (REFERENCE POINT) About 5.0 mi west of Jefferson at U.S. Highway 30 bridge over North Raccoon River, on top of guardrail beside 25th post from right downstream end of bridge; filed arrow. (Found 7/86)

Elevation 1,020.71 ft.

8331-11 NW (1) - About 2.5 mi west of Jefferson at intersection of Chicago and Northwestern Railway and a north-south county road, in the southeast corner of the intersection, on top of base from railroad crossing signal; chiseled square.

Elevation 1,061.25 ft.

8331-11 SW (1) - About 2.5 mi west of Jefferson at county road E 53 bridge over North Raccoon River, on left downstream wingwall curb; chiseled square.

Elevation 1,001.52 ft.

8331-11 SW (2) - (REFERENCE POINT) About 2.5 mi west of Jefferson at county road E 53 bridge over North Raccoon River, on top of guardrail 5 ft left of 4th concrete post from left downstream end of bridge; chiseled arrow.

Elevation 1,004.67 ft.

8331-12 NW (1) - 1.7 mi west along Chicago and North Western Railway from the station at Jefferson, Greene County at a county road crossing 45 ft south of the centerline of the south track, 30 ft west of centerline of the road, 11 ft west and 2 ft north of a fence corner, and 3 ft lower than track. A standard disk stamped "G89 1935" and set in the top of a concrete post. (NGS)

Elevation 1,066.297 ft.

8333-08 NW (1) - About 3.0 mi south of Glidden at intersection of county road N 44 and T-road west, 250 ft north, 14 ft east and 2.8 ft lower than T-road, on top near center of east headwall of a concrete culvert; reference mark, chiseled square.

Elevation 1,215.83 ft.

8334-02 NE (1) - About 3.0 mi southwest of Glidden at T-road intersection on top of the west end of a concrete culvert; chiseled square.

Elevation 1,190.98 ft.

8334-12 NW (1) - About 3.0 mi south of Glidden at "L" in county road, 280 ft west of bend in road, 15 ft south of centerline of private drive in fence line, in base of power pole with red ring; pole spike and collar.

Elevation 1,225.05 ft.

8334-13 NW (1) - About 4.0 mi southwest of Glidden at county road E 45 bridge over Middle Raccoon River, on left downstream wingwall curb; chiseled square.

Elevation 1,190.90 ft.

8334-13 NW (2) - (REFERENCE POINT) About 4.0 mi southwest of Glidden at county road E 45 bridge over Middle Raccoon River, on 10th guardrail post from left downstream end of bridge; filed arrow.

Elevation 1,192.68 ft.

8334-14 SE (1) - About 5.0 mi southwest of Glidden at a county road bridge over Middle Raccoon River, on left upstream end of truss; filed cross on bolt.

Elevation 1,184.43 ft.

8334-22 SE (1) - About 6 mi southwest of Glidden at county road E 53 bridge over Middle Raccoon River, on left upstream end of truss; filed cross on bolt.

Elevation 1,185.39 ft.

8334-23 NE (1) - (REFERENCE POINT) About 5.0 mi southwest of Glidden at a county road bridge over Middle Raccoon River, on top of guardrail beside 5th vertical member from left downstream end of bridge; filed arrow.

Elevation 1,189.09 ft.

8334-27 NE (1) - (REFERENCE POINT) About 6 mi southwest of Glidden at county road E 53 bridge over Middle Raccoon River, on top of guardrail between 2nd and 3rd vertical members from left downstream end of bridge; filed arrow.

Elevation 1,188.89 ft.

8334-35 NW (1) - About 4.5 mi northeast of Dedham at a county road bridge over Middle Raccoon River, on truss at left downstream end of bridge; filed cross on bolt.

Elevation 1,179.32 ft.

8334-35 NW (2) - (REFERENCE POINT) About 4.5 mi northwest of Dedham at a county road bridge over Middle Raccoon River, on guardrail between 2nd and 3rd vertical members from left downstream end of bridge; filed arrow.

Elevation 1,182.67 ft.

8431-18 SW (1) - About 4.5 mi northeast of Scranton at intersection of county road E 33 and north-south county road, in northeast corner of intersection, on top of north end of a concrete culvert; chiseled square.

Elevation 1,116.60 ft.

8431-19 NE (1) - About 5.0 mi northeast of Scranton at intersection of county road E 33 with a north-south road, in southwest corner of intersection, in base of power pole, 36 ft south and 23 ft west of intersection; railroad spike.

Elevation 1,118.74 ft.

8431-31 NE (1) - About 3.5 mi northeast of Scranton at county road bridge over North Raccoon River, on top of curb at right downstream abutment; chiseled square.

Elevation 1,024.11 ft.

8431-31 NE (2) - (REFERENCE POINT) About 3.0 mi northeast of Scranton at county road bridge over North Raccoon River, on top of guardrail beside 12th post from right downstream end of bridge; chiseled arrow.

Elevation 1,026.74 ft.

8431-31 SE (1) - About 1.5 mi north and 6.0 mi west of Jefferson at intersection of U.S Highway 30 and county T-road south, 59 ft north and 350 ft west of intersection, 21 ft east of a power pole, 3 ft south of a north right-of-way fence, in a concrete post; standard tablet stamped "14 T 1960 1126."

Elevation 1,126.082 ft.

8432-07 SE (1) - About 3.5 mi north of Ralston at east-west county road bridge over a small creek, in a post at intersection of abutment and wingwall at right downstream corner of bridge; pole spike and collar.

Elevation 1,059.38 ft.

8432-08 NW (1) - About 4.0 mi north of Ralston at east-west county road bridge over North Raccoon River, on left downstream wingwall; chiseled square.

Elevation 1,043.26 ft.

8432-08 NW (2) - (REFERENCE POINT) About 4.0 mi north of Ralston at east-west county road bridge over North Raccoon River, on top of 6th concrete guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 1,045.92 ft.

8432-09 NW (1) - About 4.0 mi northeast of Ralston at T-road west, 42 ft north and 35 ft east of intersection, in base of power pole; pole spike and collar.

Elevation 1,115.22 ft.

8432-10 SW (1) - About 4.5 mi northeast of Ralston; on county road N 65 bridge over North Raccoon River, on right downstream wingwall; chiseled square.

Elevation 1,041.46 ft.

8432-10 SW (2) - (REFERENCE POINT) About 4.5 mi northeast of Ralston on county road N 65 bridge over North Raccoon River, on guardrail by 16th post from right downstream end of bridge; filed arrow.

Elevation 1,044.19 ft.

8432-14 SE (1) - About 4.0 mi north of Scranton at intersection of county road E 33 and county T-road north, in northeast corner of intersection, in base of power pole; pole spike and collar.

Elevation 1,119.53 ft.

8432-18 NW (1) - About 3 mi north of Ralston at county road N 58 bridge over North Raccoon River, on right downstream wingwall; chiseled square.

Elevation 1,056.56 ft.

8432-18 NW (2) - (REFERENCE POINT) About 3 mi north of Ralston at county road N 58 bridge over North Raccoon River, on 12th guardrail post from right downstream end of bridge; filed arrow.

Elevation 1,059.15 ft.

8432-23 SE (1) - About 3.0 mi north of Scranton at county road E 33 bridge over North Raccoon River, on left downstream wingwall curb; chiseled square.

Elevation 1,025.56 ft.

8432-23 SE (2) - (REFERENCE POINT) About 3.0 mi north of Scranton at county road E 33 bridge over North Raccoon River, on guardrail beside 11th post from left downstream end of bridge; filed arrow.

Elevation 1,027.85 ft.

8433-03 NE (1) - About 4.5 mi southeast of Lanesboro at county road N 50 bridge over North Raccoon River, on right downstream wingpost; chiseled square.

Elevation 1,064.54 ft.

8433-03 NE (2) - (REFERENCE POINT) About 4.5 mi southeast of Lanesboro at county road N 50 bridge over North Raccoon River, on concrete guardrail, above 1st gutter from right downstream end of bridge; chiseled arrow.

Elevation 1,065.02 ft.

8433-24 NE (1) - About 2 mi north of Ralston at intersection of county road N 58 and an east-west county road, in the southeast corner of intersection on south end of concrete culvert; chiseled square.

Elevation 1,090.70 ft.

8433-25 NW (1) - About 1 mi northwest of Ralston at intersection of U.S. Highway 30 and a county road, in the southeast corner of intersection, on the east end of a concrete culvert; chiseled square.

Elevation 1,110.82 ft.

8433-35 NE (1) - About 1 mi west of Ralston at intersection of Chicago and Northwestern Railway and county road, 48 ft north of centerline of track, 40 ft west of the centerline of road, 6 ft northwest of inside fence corner, 2 ft north of the fence; a standard disk stamped "R89 1935" (NGS).

Elevation 1,134.781 ft.

8434-35 SE (1) - About 2.5 mi southwest of Glidden at county road bridge over Middle Raccoon River, on left downstream abutment; chiseled square.

Elevation 1,194.55 ft.

8434-35 SE (2) - (REFERENCE POINT) About 2.5 mi southwest of Glidden at county road bridge over Middle Raccoon River, on 10th guardrail post from left downstream end of bridge; filed arrow.

Elevation 1,198.61 ft.

8533-06 SW (1) - About 3 mi northwest of Lanesboro near corner of sec. 1, 6, 7, and 12, 15 ft east of a field entrance north of county road near base of a power pole; pole spike and collar.

Elevation 1,094.99 ft.

8533-07 NE (1) - About 2.5 mi northwest of Lanesboro at county road bridge over North Raccoon River, on right downstream wingpost; end of large horizontal bolt.

Elevation 1,093.37 ft.

8533-07 NE (2) - (REFERENCE POINT) About 2.5 mi northwest of Lanesboro at county road bridge over North Raccoon River, on 13th guardrail post from right downstream end of bridge; filed arrow.

Elevation 1,094.40 ft.

8533-17 SW (1) - About 2 mi southwest of Lanesboro at State Highway 286 bridge over North Raccoon River, on right downstream wingwall; chiseled square.

Elevation 1,082.38 ft.

8533-17 SW (2) - (REFERENCE POINT) About 2 mi southwest of Lanesboro at State Highway 286 bridge over North Raccoon River, on guardrail, beside 10th post from left downstream end of bridge; filed arrow.

Elevation 1,088.79 ft.

8533-20 NE (1) - About 1.5 mi southwest of Lanesboro at railroad bridge over North Raccoon River, on upstream side of southernmost concrete pier on left bank of river, on angle iron bolted onto pier; top of 18th bolt from top of pier.

Elevation 1,070.71 ft.

8533-21 SE (1) - About 2 mi south of Lanesboro at county road bridge over North Raccoon River, on right upstream wingwall; chiseled square.

Elevation 1,073.13 ft.

8533-21 SE (2) - (REFERENCE POINT) About 2 mi south of Lanesboro at county road bridge over North Raccoon River, on downstream guardrail bracket beside 3rd vertical member from left of center section; filed arrow.

Elevation 1,077.97 ft.

8533-27 SW (1) - About 3 mi south of Lanesboro at curve in county road from east to south, near base of power pole; pole spike and collar.

Elevation 1,072.57 ft.

8533-34 SW (1) - About 3 mi south of Lanesboro at entrance to "Merritt Access," near base of pole; pole spike and collar.

Elevation 1,059.93 ft.

8534-12 NE (1) - About 3.5 mi northwest of Lanesboro at a county road bridge over a small creek, in the center of the downstream curb; a standard tablet stamped "3 FWK 1975."

Elevation 1,099.043 ft.

8534-13 SE (2) - About 3.5 mi southwest of Lanesboro at intersection of north-south county road and county road E 17 in the northeast corner of intersection on the south side of a power pole; railroad spike.

Elevation 1,150.27 ft.

8534-24 SE (1) - About 4 mi southwest of Lanesboro at T-road west 34 ft east, and 15 ft north of intersection, 4.5 ft northwest of power pole in a 6-in. tile; a standard tablet stamped "2 FWK 1965."

Elevation 1,164.453 ft.

8634-06 SW (1) - About 2 mi northeast of Auburn at county road N28 bridge over North Raccoon River, on right downstream wingwall; chiseled square.

Elevation 1,135.97 ft.

8634-06 SW (2) - (REFERENCE POINT) About 2 mi northeast of Auburn at county road N 28 bridge over North Raccoon River, on curb beside 19th guardrail post from right downstream end of bridge; chiseled arrow.

Elevation 1,141.15 ft.

8634-14 SW (1) - About 2 mi southwest of Lake City at corner of a right angle county road, at quarter corner between sections 14 and 23, 40 ft northwest from centerline of road, near base of power pole; pole spike and collar.

Elevation 1,159.34 ft.

8634-17 SE (2) - About 4.5 mi west of Lake City at State Highway 175 bridge over North Raccoon River, on left downstream wingwall; Iowa Department of Transportation plug.

Elevation 1,118.57 ft.

8634-17 SE (2) - (REFERENCE POINT) About 4.5 mi west of Lake City at State Highway 175 bridge over North Raccoon River, on top of 13th guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 1,119.36 ft.

8634-22 NW (1) - About 3 mi southwest of Lake City at county road bridge over North Raccoon River, on left downstream wingwall; chiseled square.

Elevation 1,112.63 ft.

8634-22 NW (2) - (REFERENCE POINT) About 3 mi southwest of Lake City on county road bridge over North Raccoon River, on downstream guardrail beside 4th vertical member from left end of bridge; filed arrow.

Elevation 1,116.54 ft.

8634-23 NE (1) - About 1.5 mi southwest of Lake City near corner of sec. 13, 14, 23, and 24, at a field entrance west of north-south county road, 27 ft west of road, 16 ft south of field entrance on south end of culvert chiseled square.

Elevation 1,188.82 ft.

8634-23 NW (1) - About 2.5 mi southwest of Lake City at remains of old railroad bridge crossing over small creek, on highest remaining limestone block of left bridge abutment; chiseled square.

Elevation 1,123.96 ft.

8634-25 SW (1) - About 2.5 mi southwest of Lake City at county road N37 bridge over North Raccoon River, on upstream concrete curb between center and left spans of three-span concrete bridge; a standard table stamped "4 FWK 1975."

Elevation 1,100.824 ft.

8634-25 SW (2) - (REFERENCE POINT) About 2.5 mi southwest of Lake City at county road N 37 bridge over North Raccoon River between center and left spans of three-span bridge on downstream concrete railing; chiseled arrow.

Elevation 1,104.29 ft.

8635-02 NW (1) - About 3 mi northwest of Auburn along county road at Illinois Central Gulf Railroad overpass on the south end of the bottom tier of blocks of the west abutment; chiseled square.

Elevation 1,178.58 ft.

8635-03 NW (1) - About 7 mi east of Lake View at county road bridge over North Raccoon River, on left downstream curb; chiseled square.

Elevation 1,160.98 ft.

8635-03 NW (2) - (REFERENCE POINT) About 7 mi east of Lake View at county road bridge over North Raccoon River, on downstream guardrail beside the 20th guardrail post from the left end of bridge; filed arrow.

Elevation 1,162.89 ft.

8635-11 NE (1) - About 2 mi north of Auburn along a north-south county road, on the 2nd pole south of section line of fence, near base of power pole; pole spike and collar.

Elevation 1,201.11 ft.

8635-11 NW (1) - About 2 mi northwest of Auburn on a county road bridge over North Raccoon River, on left downstream end of truss; bolt marked with a filed cross.

Elevation 1,142.60 ft.

8635-11 NW (2) - (REFERENCE POINT) About 2 mi northwest of Auburn on a county road bridge over North Raccoon River, on top of guardrail between 3rd and 4th vertical members from right downstream end of bridge; filed arrow.

Elevation 1,146.53 ft.

8635-11 NW (3) - About 1.5 mi northwest of Auburn along a north-south county road leading north out of Grant City, about 0.1 mi south of a farmhouse on a large culvert on east side of road; chiseled square.

Elevation 1,156.05 ft.

8635-14 NE (1) - About 1 mi northwest of Auburn on a county road bridge over North Raccoon River, at left downstream end of truss; bolt marked with a filed cross.

Elevation 1,138.91 ft.

8635-14 NE (2) - (REFERENCE POINT) About 1 mi northwest of Auburn at a county road bridge over North Raccoon River, on top of guardrail beside 4th post from right downstream end of bridge; filed arrow.

Elevation 1,142.78 ft.

8735-29 NW (1) - About 4.5 mi northwest of Lake View at State Highway 196 bridge over North Raccoon River, on left downstream curb; chiseled square.

Elevation 1,169.81 ft.

8735-29 NW (2) - (REFERENCE POINT) About 4.5 mi northeast of Lake View at State Highway 196 bridge over North Raccoon River, on curb beside 8th guardrail post from left downstream end of bridge; chiseled arrow.

Elevation 1,169.86 ft.

8735-32 NE (1) - About 6 mi east of Lake View at county road bridge over North Raccoon River, on left downstream curb; chiseled square.

Elevation 1,170.10 ft.

8735-32 NE (2) - (REFERENCE POINT) About 6 mi east of Lake View at county road bridge over North Raccoon River, on downstream guardrail post beside 3rd gutter from left end of bridge; filed arrow.

Elevation 1,171.83 ft.

8735-33 NW (1) - About 6 mi east of Lake View at county road bridge over North Raccoon River, on left downstream end of truss; on top of bolt marked with a filed cross.

Elevation 1,157.52 ft.

8735-33 NW (2) - (REFERENCE POINT) About 6 mi east of Lake View at county road bridge over North Raccoon River, on top of guardrail beside 2nd vertical member from left downstream end of bridge; filed arrow.

Elevation 1,160.65 ft.

8735-34 NE (1) - About 8 mi east of Lake View on east-west county road bridge over a small creek, on left upstream wingwall; chiseled cross.

Elevation 1,147.08 ft.

8735-34 NW (1) - About 7 mi east of Lake View at the intersection of county roads, in the southwest corner of intersection near the base of a power pole; pole spike and collar.

Elevation 1,170.70 ft.

8735-35 SW (1) - About 8 mi east of Lake View at county road bridge over North Raccoon River, on left downstream end of truss; bolt marked with a filed cross.

Elevation 1,147.69 ft.

8735-35 SW (2) - (REFERENCE POINT) About 8 mi east of Lake View at county road bridge over North Raccoon River, on downstream guardrail between 7th and 8th vertical members from right end of bridge; filed arrow.

Elevation 1,151.82 ft.

8736-01 NW (1) - About 2.5 mi south of Sac City at county road bridge over North Raccoon River, on left downstream curb; chiseled square.

Elevation 1,179.53 ft.

8736-01 NW (2) - (REFERENCE POINT) About 2.5 mi south of Sac City at county road bridge over North Raccoon River, on top of guardrail by 20th post from left downstream end of bridge; filed arrow.

Elevation 1,182.42 ft.

8736-02 NE (1) - About 3 mi south of Sac City, near the center of the north half of sec. 2, 85 ft south, 29 ft east, and 5.1 ft lower than the centerline of the road at curve, 37 ft east of the northeast corner of a small wooden shed, 22 ft east of east gate post, 1 ft north of the south right-of-way fence; a standard tablet set inside of an 8-in. concrete drain tile stamped "7DDB 1975."

Elevation 1,268.650 ft.

8736-13 NW (1) - About 4.5 mi south of Sac City at county road bridge over North Raccoon River, on right downstream curb; chiseled square.

Elevation 1,176.03 ft.

8736-13 NW (2) - (REFERENCE POINT) About 4.5 mi south of Sac City at county road bridge over North Raccoon River, on top of 16th guardrail post from right downstream end of bridge; filed arrow.

Elevation 1,177.97 ft.

8736-13 SE (1) - About 5.5 mi south of Sac City at T-road south at field entrance in line with T-road, on the west end of a concrete culvert; chiseled square.

Elevation 1,166.85 ft.

8736-13 SW (1) - About 5.5 mi south of Sac City at county road D 46 bridge over North Raccoon River, in end piling of left upstream wingwall; top bolt head. (Gage RM 3)

Elevation 1,162.69 ft.

8736-14 NE (1) - About 4.5 mi south of Sac City near the corner of sec. 11, 12, 13, and 14, 419 ft south, 10 ft west, and 4.5 ft lower than the centerline of crossroads, on top and at the north end of the west concrete railing of a small iron and concrete bridge; a standard tablet stamped "6DDB 1975."

Elevation 1,169.167 ft.

8736-24 SE (1) - About 4 mi northeast of Lake View at county road bridge over North Raccoon River, on end of truss at left downstream end of bridge; on top of bolt marked with a filed cross.

Elevation 1,160.72 ft.

8736-24 SE (2) - (REFERENCE POINT) About 4 mi northeast of Lake View at county road bridge over North Raccoon River, on top of guardrail beside the center vertical member; filed arrow.

Elevation 1,164.59 ft.

8836-01 NW (2) - (REFERENCE POINT) About 2.5 mi south of Sac City at county road bridge over North Raccoon River, on top of the 16th guardrail post from the left downstream end of bridge; filed arrow.

Elevation 1,182.42 ft.

8836-10 NE (1) - About 2 mi north of Sac City at a railroad bridge over county road, on pier on south side of road, in the north post of pier; pole spike and collar.

Elevation 1,231.10 ft.

8836-11 NW (1) - About 2 mi north of Sac City at county road bridge over North Raccoon River, on left downstream end of truss; bolt marked with a chiseled cross.

Elevation 1,209.31 ft.

8836-11 NW (2) - (REFERENCE POINT) About 2 mi north of Sac City at county road bridge over North Raccoon River, on top of guardrail beside 2nd vertical member from left downstream end of bridge; filed arrow.

Elevation 1,213.78 ft.

8836-14 NW (1) - About 1.5 mi north of Sac City at county bridge over North Raccoon River, on right downstream wingwall; chiseled square.

Elevation 1,207.10 ft.

8836-14 NW (2) - (REFERENCE POINT) About 1.5 mi north of Sac City at county road bridge over North Raccoon River, on top of guardrail beside 16th post from right downstream end of bridge; filed arrow.

Elevation 1,209.50 ft.

8836-24 NW (1) - In Sac City at county road M 54 bridge over North Raccoon River, on curb at right downstream end of bridge; chiseled square.

Elevation 1,200.30 ft.

8836-24 NW (2) - (REFERENCE POINT) In Sac City at county road M 54 bridge over North Raccoon River, on curb beside 13th guardrail post from right downstream end of bridge; chiseled arrow.

Elevation 1,200.54 ft.

8836-24 NW (3) - In Sac City at county road M 54 bridge over North Raccoon River, on wingwall at right upstream end of bridge; chiseled cross.

Elevation 1,199.73 ft.

8836-24 SE (1) - In Sac City at U.S. Highway 20 bridge over North Raccoon River, on right downstream abutment; chiseled square.

Elevation 1,190.25 ft.

8836-24 SE (2) - (REFERENCE POINT) In Sac City at U.S. Highway 20 bridge over North Raccoon River, on top of guardrail beside 10th post from right downstream end of bridge; filed arrow.

Elevation 1,197.66 ft.

8836-24 SW (1) - At Sac City, near the intersection of Main Street and West State Street, in a park 180 ft south of county courthouse,129 ft east of east curb of West State Street, 8.7 ft south of curb of Main Street, at the Union Soldier's Memorial Monument 40.5 ft northeast of the northwest corner of base; a standard disk stamped "1211.261 SAC CITY 1933" set in the top of a 4-in. iron pipe projecting 16-in. above ground.

Elevation 1,211.261 ft.

8836-36 NW (1) - About 2 mi south of Sac City at county road bridge over North Raccoon River, on end of truss at left downstream end of bridge; bolt marked with a filed cross.

Elevation 1,173.01 ft.

8836-36 NW (2) - (REFERENCE POINT) About 2 mi south of Sac City on county road bridge over North Raccoon River, on guardrail beside 5th vertical member from left downstream end of bridge; painted cross.

Elevation 1,179.19 ft.

8935-04 NW (1) - About 3.2 mi south of Newell near corner of sec. 4, 5, 32, and 33, 43.5 ft south, 53 ft east, and 2.3 ft lower than county M 54 road, at road west; at northwest corner of grove of trees and 1 ft north of metal witness post; a standard tablet stamped "11 KED 1974" and approximately 1-in. below ground surface.

Elevation 1,266.475 ft.

8935-06 NW (1) - About 4 mi northeast of Nemaha at county T-road south, east of dirt T-road on headwall of a concrete culvert at intersection; a chiseled square.

Elevation 1,238.82 ft.

8935-31 SE (1) - About 4 mi north of Sac City at county bridge over North Raccoon River, on downstream end of left abutment; chiseled square.

Elevation 1,217.44 ft.

8935-31 SE (2) - (REFERENCE POINT) About 4 mi north of Sac City at county road bridge over North Raccoon River, on top of 11th guardrail post from left downstream end of bridge; filed arrow.

Elevation 1,220.17 ft.

8936-01 NE (1) - About 4 mi northeast of Nemaha at county road bridge over North Raccoon River, on left downstream end of truss; bolt marked with chiseled cross.

Elevation 1,241.64 ft.

8936-01 NE (2) - (REFERENCE POINT) About 4 mi northeast of Nemaha at county road bridge over North Raccoon River, on top of guardrail between 2nd and 3rd vertical member from left downstream end of bridge; filed arrow.

Elevation 1,245.57 ft.

8936-01 SE (1) - About 3.5 mi northeast of Nemaha at intersection of county road, at northwest corner of intersection near base of power pole; pole spike and collar.

Elevation 1,260.00 ft.

8936-12 NE (1) - About 3.5 mi northeast of Nemaha at county road bridge over North Raccoon River, on left downstream end of truss; bolt marked with a filed cross.

Elevation 1,239.38 ft.

8936-12 NE (2) - (REFERENCE POINT) About 3.5 mi northeast of Nemaha at county road bridge over North Raccoon River, on top of guardrail, beside 2nd vertical member from left downstream end of bridge; filed arrow.

Elevation 1,243.40 ft.

8936-12 SE (1) - About 3 mi northeast of Nemaha at intersection of county roads, at northwest corner of intersection, near base of power pole; pole spike and collar.

Elevation 1,280.61 ft.

8936-13 NW (1) - About 2 mi northeast of Nemaha at county road bridge over North Raccoon River, on left downstream pier on a metal plate; chiseled square.

Elevation 1,237.14 ft.

8936-13 NW (2) - (REFERENCE POINT) About 2 mi northeast of Nemaha on county road bridge over North Raccoon River, on guardrail beside 2nd vertical member from left downstream end of bridge; filed arrow.

Elevation 1,241.43 ft.

8936-24 NE (1) - About 2.5 mi east of Nemaha at county highway D 15 bridge over North Raccoon River, on downstream end of left abutment; chiseled square.

Elevation 1,246.73 ft.

8936-24 NE (2) - (REFERENCE POINT) About 2.5 mi east of Nemaha at county highway D 15 bridge over North Raccoon River, on top of 6th guardrail post from left downstream end of bridge; filed arrow.

Elevation 1,248.21 ft.

8936-25 SE (1) - About 3 mi southeast of Nemaha at county road bridge over North Raccoon River, on left downstream end of truss; bolt marked with filed cross.

Elevation 1,228.21 ft.

8936-25 SE (2) - (REFERENCE POINT) About 3 mi southeast of Nemaha at county road bridge over North Raccoon River, on top of guardrail beside 4th vertical member from left downstream end of bridge; filed arrow.

Elevation 1,232.32 ft.

9035-32 SW (1) - About 5 mi northeast of Nemaha at intersection of county road; at northeast corner of intersection near base of power pole; pole spike and collar.

Elevation 1,280.59 ft.

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