UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FLOODS IN THE IOWA RIVER BASIN UPSTREAM FROM CORALVILLE LAKE, IOWA

By

Albert J. Heinitz, Hydrologist
United States Geological Survey

Prepared in cooperation with the

IOWA STATE HIGHWAY COMMISSION

Open-file Report

Iowa City, Iowa
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ABSTRACT

Flood information is reported for 207 miles of the main stem, 23 miles on the West Branch, and 23 miles on the East Branch, of the Iowa River. The information will be of use to those concerned with the design of bridges and other structures and the conduct of various operations on the flood plains of the streams. Included in the report are flood-peak records, gaging-station records, and water-surface profiles.

Outstanding floods treated in this report are the 1954 flood which is the greatest known in the upper reaches of the Iowa River, the 1969 flood which is the greatest flood in recent years in the central reach of the river, and the 1947 flood which is the greatest flood recorded, excepting the 1918 historic flood, in the lower reaches of the river. Selected data are also given for the 1918 flood, the greatest flood recorded on the Iowa River.

Flood profiles for the main stem include those for the 1947, 1954, 1969, the computed 25- and 50-year floods, and a partial profile for the June 1972 flood. On the West Branch Iowa River, profiles are shown for the 1944, 1969, the computed 25- and 50-year floods, and a partial profile for the June 1954 flood. On the East Branch Iowa River, profiles

are shown for the 1954, 1969, the computed 25- and 50-year floods, and a partial profile for the June 1944 flood. Low-water profiles are shown for all reaches.

INTRODUCTION

Purpose and Scope

The purpose of this report is to provide flood information for the Iowa River basin upstream from Coralville Lake. This information can be used for planning,designing, and operating structures and conducting other activities on or across the flood plain and for assessing the severity of floods. The report provides data on (1) basin characteristics - drainage area and slope, (2) flood history with brief descriptions of the meteorology of storms causing outstanding floods, (3) flood stages and discharges, (4) flood frequency, and (5) profiles of several major floods, the computed 25- and 50-year floods, and a low-water profile. This report covers that part of the Iowa River basin upstream from mile 118.7 (State Highway 149 near Homestead) to mile 348.6 on the East Branch Iowa River and to mile 349.0 on the West Branch Iowa River (fig. 1). The East and West Branch profiles terminate at State Highway 18 near Garner and Britt, respectively.

The stream-gaging station on the Iowa River at Iowa City is not within the area covered by this report. However, because of its long record and its location just downstream from the report area, it provides valuable data on the flood

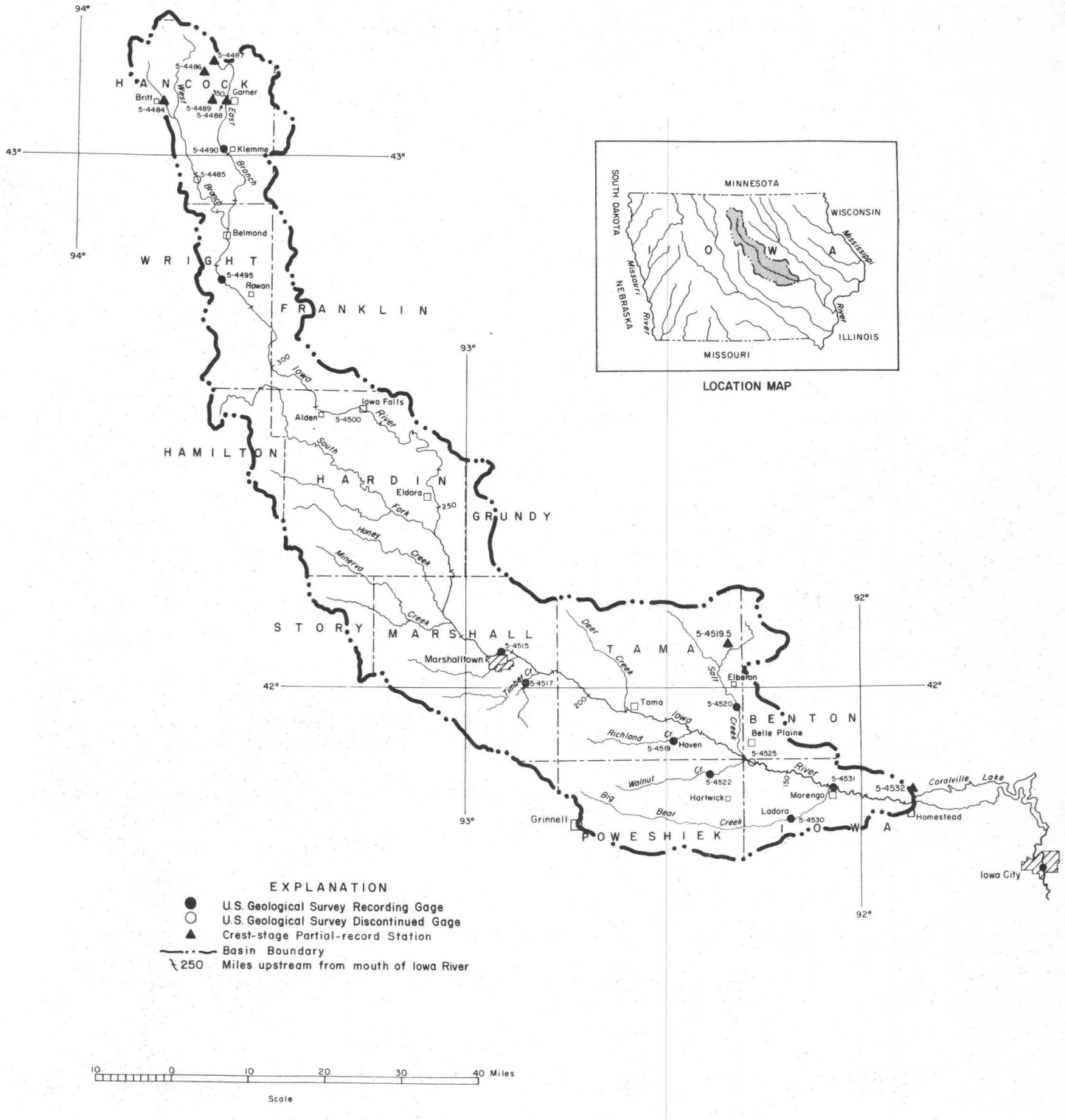

Figure 1. Map of Iowa River basin upstream from Coralville Lake, Iowa.

records of the Iowa River. This station is therefore used as a reference in the flood history of the basin.

A prior report (Yost, 1958) contains information on the floods of 1954 in the Iowa River basin as well as in other parts of Iowa. Profiles of the 1947 and 1954 floods on the Iowa River from the headwaters of the West Branch to Tama are included in the report.

Acknowledgments

This report is the sixth of a series prepared in a cooperative project with the Iowa State Highway Commission through the Iowa Highway Research Board. Profiles of floods prior to 1969 were prepared from flood-elevation data furnished by the Corps of Engineers. The 1969 flood-profile and subsequent data were collected by the U.S. Geological Survey. Records for stream-gaging stations were obtained as a part of the cooperative program with city, State, and Federal agencies. Acknowledgment of cooperation in operating gaging stations is contained in the annual streamflow reports of the U.S. Geological Survey (see references).

The author is grateful to the members of the U.S. Geological Survey staff in Iowa City for their assistance on this report with special acknowledgment to Donald Riddle, hydrologic technician, who compiled much of the data and prepared the illustrations for the report.

BASIN DESCRIPTION

The Iowa River basin above Coralville Lake is long and narrow, originating in north-central Iowa and extending in a southeasterly direction. The East and West Branches of the Iowa River join at Belmond to form the main stem of the Iowa River.

The upper part of the Iowa River basin in north-central Iowa is characterized by flat land with many depressions and low spots that collect water and prevent rapid runoff. From the vicinity of Alden and downstream, the topography becomes a hill and valley landscape as found throughout most of the State.

From Iowa Falls to Eldora, the Iowa River winds through a rocky, narrow, and steep river valley. There is very little contributing drainage area to the basin through this reach. Downstream from Eldora, the river valley widens and is subject to considerable inundation during high floods.

A number of cities and towns lie on or near the flood plain of the Iowa River. Some of these towns and cities are subject to severe flooding during major floods. Other towns, if not directly affected by flooding, are indirectly affected by the closing of roads, interruption of trade with flooded areas, and other effects which accompany major floods. The 1970 population of 15 cities and towns along the Iowa River is given in table 1.

Table 1. Population of selected cities and towns, on or near Iowa River upstream from State Highway 149, (Bureau of the Census, 1971).

Community	Population	Community	Population
Belmond	2,358	Union	484
Dows	777	Marshalltown	26,219
Popejoy	147	Montour	334
Alden	876	Tama	3,000
Iowa Falls	6,454	Chelsea	381
Steamboat Rock	394	Belle Plaine	2,810
Eldora	3,223	Marengo	2,235

The climate of the basin is temperate. Average yearly temperature ranges from about 47°F to about 50°F from north to south. Normal annual precipitation (1931-60) over the drainage area averages about 31.5 inches and ranges from 30 to 33 inches from north to south. Average seasonal snowfall ranges from 37 to 29 inches from north to south.

FLOOD HISTORY

Floods on the Iowa River at Iowa City have been well documented since the establishment of a gaging station in 1903. The length of record for this station is exceeded by only one other gaging station on streams within the State, that being the gage on the Cedar River at Cedar Rapids. The operation of Coralville Lake since 1958 has, however, terminated the Iowa City gage as an effective indicator of natural

flood peaks. The gage at Marshalltown is also one of the older gages in the State with almost complete record since October 1914.

The 1918 flood is the greatest ever recorded; however, flood-profile data for this flood are not well documented. Other major floods recorded occurred in 1947, 1954, and 1969. Flood discharges in June 1947 were generally the second or third greatest since 1903 from about Marshalltown to the Cedar River. Peak stages, however, were highest in 1969 from near Eldora to near Belle Plaine. The flood of major significance in the upper part of the basin occurred in 1954. A comparison of flood peak discharges for the gaging stations at Marshalltown and near Rowan is shown in figure 2.

Outstanding floods, exceeding the flood of 1918 at Iowa City, occurred in 1881 and 1851.

Major floods in the Iowa River basin generally result from widespread storms following a period of wet weather or from snowmelt with accompanying rain. Table 2 summarizes the data for major floods at gaging stations in the basin. Brief descriptions of some of the major floods follow.

Flood of 1851. The flood of 1851 is generally recognized as the maximum flood of record on some of the upper Mississippi River tributaries, including those in Iowa. It is the highest known flood on the Iowa River at Iowa City. A discharge of 70,000 cfs (cubic feet per second) was estimated for this flood. The flood evidently covered a large area; however, specific data are rather scarce.

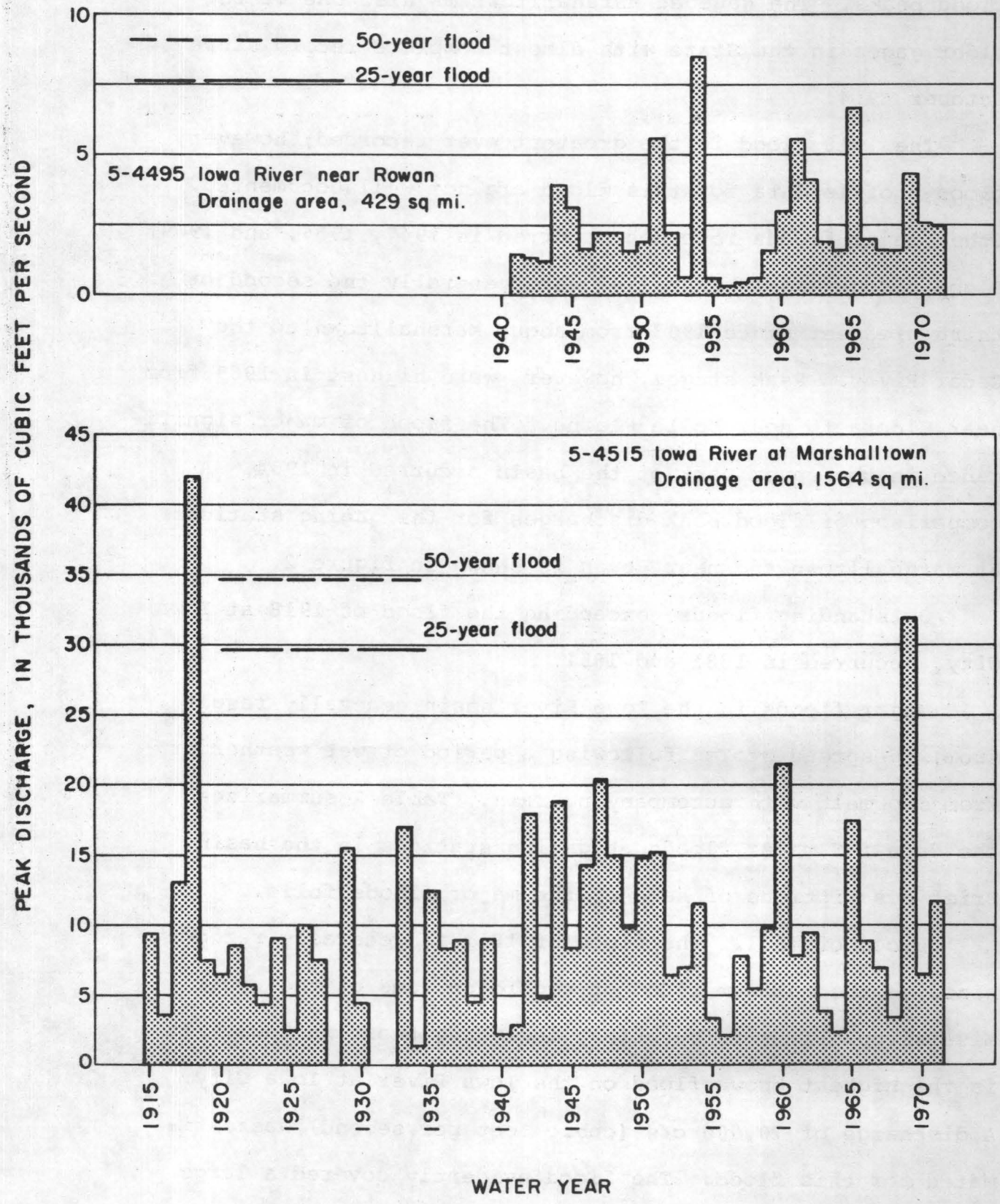

Figure 2. Annual peak discharges for period of record at Marshalltown and Rowan gages.

Table 2.--Summary of selected flood data at gaging stations in the Iowa River basin, upstream from Coralville Lake, Iowa.

Station Number	Mile	Gaging station	Period of flood record	Drainage area (sq. mi.)	Maximum flood of record			
					Date	Gage height (ft)	Discharge (cfs)	Recurrence Interval (yrs)
5-4485	339.2	W. Br. Iowa R nr Klemme	1948-58	112	6-21-54	14.97	1,920	6
5-4486		[a]E. Br. Iowa R. abv Hayfield	1953-	2.23	4-06-65	7.31	250	20
5-4487		[a]E. Br. Iowa R. nr Hayfield	1952-	7.94	6-18-54	13.01	457	12
5-4488	348.6	[a]E. Br. Iowa R. nr Garner	1952-	45.1	3-26-61	12.81	1,120	7
5-4489		[a]E. Br. Iowa R. trib. nr Garner	1952-	5.98	6-17-54	6.71	206	5
5-4490	341.0	E. Br. Iowa R. nr Klemme	1944, 1948-	133	6-19-54	11.2	5,960	[b]1.1
5-4495	316.4	Iowa R. nr Rowan	1941-	429	6-21-54	14.88	8,460	38
5-4515	222.6	Iowa R. at Marshalltown	1903, 1915-27, 1929-30, 1933-	1,564	6-04-18	17.74	42,000	[b]1.2
5-4517		Timber Cr. nr Marshalltown	1947, 1950-	118	5-14-70	16.66	5,940	10
5-4519		Richland Cr. nr Haven	1918, 1950-	56.1	3-30-60	12.39	3,650	8
5-4520		Salt Cr. nr Elberon	1944, 1946-	201	6-13-47	17.6	35,000	[b]2.2
5-4522		Walnut Cr. nr Hartwick	1947, 1950-	70.9	9-03-58	[c]15.67	4,930	12
5-4525	159.0	Iowa R. nr Belle Plaine	1918, 1940-59	2,455	6-05-18	17.85	43,000	80
5-4530		Big Bear Cr. at Ladora	1946-	189	3-30-60	14.60	10,500	25
5-4531	139.4	Iowa R. at Marengo	1957-	2,794	3-31-60	19.21	30,800	15

Station Number	1947			1954			1969		
	Date	Gage height (ft)	Discharge (cfs)	Date	Gage height (ft)	Discharge (cfs)	Date	Gage height (ft)	Discharge (cfs)
5-4485	--	--	--	6-21	14.97	1,920	--	--	--
5-4486	--	--	--	6-19	7.15	209	6-29	6.70	200
5-4487	--	--	--	6-18	13.01	457	6-29	11.67	350
5-4488	--	--	--	6-18	12.42	1,040	6-29	11.67	950
5-4489	--	--	--	6-17	6.71	206	6-29	5.33	58
5-4490	--	--	--	6-19	11.2	5,960	6-29	9.87	2,770
5-4495	7-7	10.6	2,240	6-21	14.88	8,460	7-1	12.36	4,250
5-4515	6-13	16.8	20,500	8-28	16.09	11,500	7-9	19.10	31,900
5-4517	June	16.8	5,700	6-10	13.47	2,450	6-30	13.94	2,800
5-4519	--	--	--	8-26	8.32	1,170	6-12	10.05	1,920
5-4520	6-13	17.6	35,000	8-26	15.21	5,410	7-18	17.78	12,500
5-4522	June	17.7	--	8-26	13.31	1,450	6-8	15.03	3,880
5-4525	6-14	17.07	34,000	6-28	14.50	10,700	--	--	--
5-4530	6-5	10.90	7,610	8-26	10.74	4,010	6-8	12.88	4,290
5-4531	--	--	--	--	--	--	7-12	19.79	28,300

a - Crest-gage partial-record station.
b - Ratio of maximum flood to that of 100-year computed flood.
c - Exceeded in 1947.

Flood of 1881. The year 1881 was the wettest year on record in Iowa with an average rainfall depth over the State of 44.2 inches. The city of Des Moines recorded 15.79 inches of rain for the month of June. The second highest known flood in Iowa City occurred in July 1881, with a discharge of 51,000 cfs.

Flood of 1918. Precipitation in May had thoroughly saturated the ground, and heavy rains falling on May 27 and 28 produced ordinary flood stages, only to be followed by still heavier rains June 3-5, which caused the greatest flood recorded on the Iowa River. The discharge at Iowa City for this flood was 42,500 cfs.

Flood of 1947. The outstanding features of the rains that produced the great floods of June 1947 were their wide areal extent, long duration, and large accumulated monthly and bimonthly (May and June) totals over the entire State. The rainfall over the State for the month of June 1947 was in general from two to two and a half times normal, though that occurrence alone was not entirely responsible for the serious floods experienced. Contributing materially were the antecedent conditions of a saturated soil and rivers already swollen by a series of rains.

Flood of 1954. Heavy rainfall during the last few days in May and the first half of June thoroughly saturated the soil throughout much of the northern half of Iowa and produced conditions favorable for the occurrence of flood runoff from the heavy rains that were to follow. Streams in

the upper Iowa River basin began rising to flood stages as a result of the heavy rainfall June 15-19. Additional heavy rains of June 20-22 throughout most of the same area added runoff to the already swollen streams and produced the greatest flood of record on the Iowa River above Eldora.

Flood of 1969. Very heavy rains of 8 inches or more were reported at most of the stations in the upper Iowa River basin for the month of June. This was followed by severe storms on July 6-9 with rainfalls of 7.33 and 8.61 inches at Iowa Falls and Eldora, respectively. Heavy flooding occurred on the streams south of Iowa Falls, particularly on the South Fork Iowa River. However, none of these streams are gaged.

BASIC DATA

Gaging-station Records

Nine recording stream-gaging stations and seven crest-stage stations are presently being operated in the Iowa River basin above Coralville Lake. A stream-gaging station at Belle Plaine was discontinued in 1959, and a station at Iowa Falls was operated from 1911 to 1914. The period of record for 15 of these stations is given in table 2. Three of the crest-stage stations established in 1966 furnish little information on floods because the stage-discharge relations have not been established. For this reason they are shown only on figure 1 and are not considered elsewhere in the report. These stations are Westmain Drainage Ditch 1 and 2

near Britt (5-4484), East Branch Salt Creek near Clutier (5-4519.5), and Price Creek at Amana (5-4532).

Flood-peak stage and discharge records through 1965 at the gages have been published (Schwob, 1966, Pt. 2). Daily records at the complete-record gaging stations and flood-peak records at crest-stage stations and miscellaneous sites are available in the annual streamflow publications of the U.S. Geological Survey (see references).

Tabulations of peak stages and discharges for 15 gages are in an appendix to this report. The station descriptions for these gages are also included in the appendix.

Mileage System

River mileages on the basin map and profiles are in miles upstream from the mouth of the Iowa River. They are based upon the mileage system of the Corps of Engineers modified slightly to account for changes in stream alignment. Bridges, creeks, and other easily identified points are indicated on the profiles. The mileages between these points can be adjusted proportionately if they do not agree with the users map mileage. An index number, such as 8109-35 SW, is shown at bridges and other points to aid in identifying the map location. The number 8109-35 SW indicates a location in Twp. 81 N., R.09 W., the southwest quarter of section 35.

FLOOD PROFILES

Profiles for the 1947 and the 1954 floods were based on data collected by the U.S. Army Corps of Engineers prior to completion of Coralville Lake. The remainder of the profiles are based on data of the U.S. Geological Survey. The profiles are shown in figures 4 through 16.

Peak discharges tabulated on the profile sheets were determined from stage-discharge relations (rating curves) at the gaging stations and supplemental discharge measurements. Elevations for the 25- and 50-year floods were generally determined from rating curves. At some locations, estimates for the 25- and 50-year flood elevations were based on extensions of rating curves.

The 25- and 50-year flood discharges were computed by methods developed by the U.S. Geological Survey. Information on the flood-frequency methods may be obtained from the U.S. Geological Survey in Iowa City, Iowa.

DISCUSSION

Most of the data and emphasis in this report are placed on the more recent floods of 1947, 1954 and 1969 even though the 1918 flood is by far the greatest recorded on the Iowa River. However, there are only scattered data available on the 1918 flood and conditions on the river may also have changed considerably since 1918. Certainly we know that considerable development has occurred on the flood plains since that flood. A measure of the changes that occur at

a section of the river is reflected in the stage-discharge relationship.

Flood-peak discharges plotted on rating curves will quite often show large shifts from one flood to the next. This can be illustrated with the flood-peak discharges and rating curves for the gaging station at Marshalltown (figure 3). During the period of record, the ratings have changed to reflect nearly 4 feet difference in elevation for a 50-year flood. The ratings have consistently shifted to the left except when the dikes broke during the 1969 flood. The curve labeled A in figure 3 was in use prior to the 1969 peak and shifted to curve B when the dikes gave way. The 25- and 50-year flood elevations were selected by extending the most recently defined rating curve.

The shifts in the stage-discharge relations are caused by construction of dikes, bridges, roads, residential and industrial developments, and other factors.

Shifts are also caused by vegetal growth on the flood plain and will vary seasonally depending upon the degree of obstruction caused.

The user of the report is urged to place greater emphasis on the more recent data in the report.

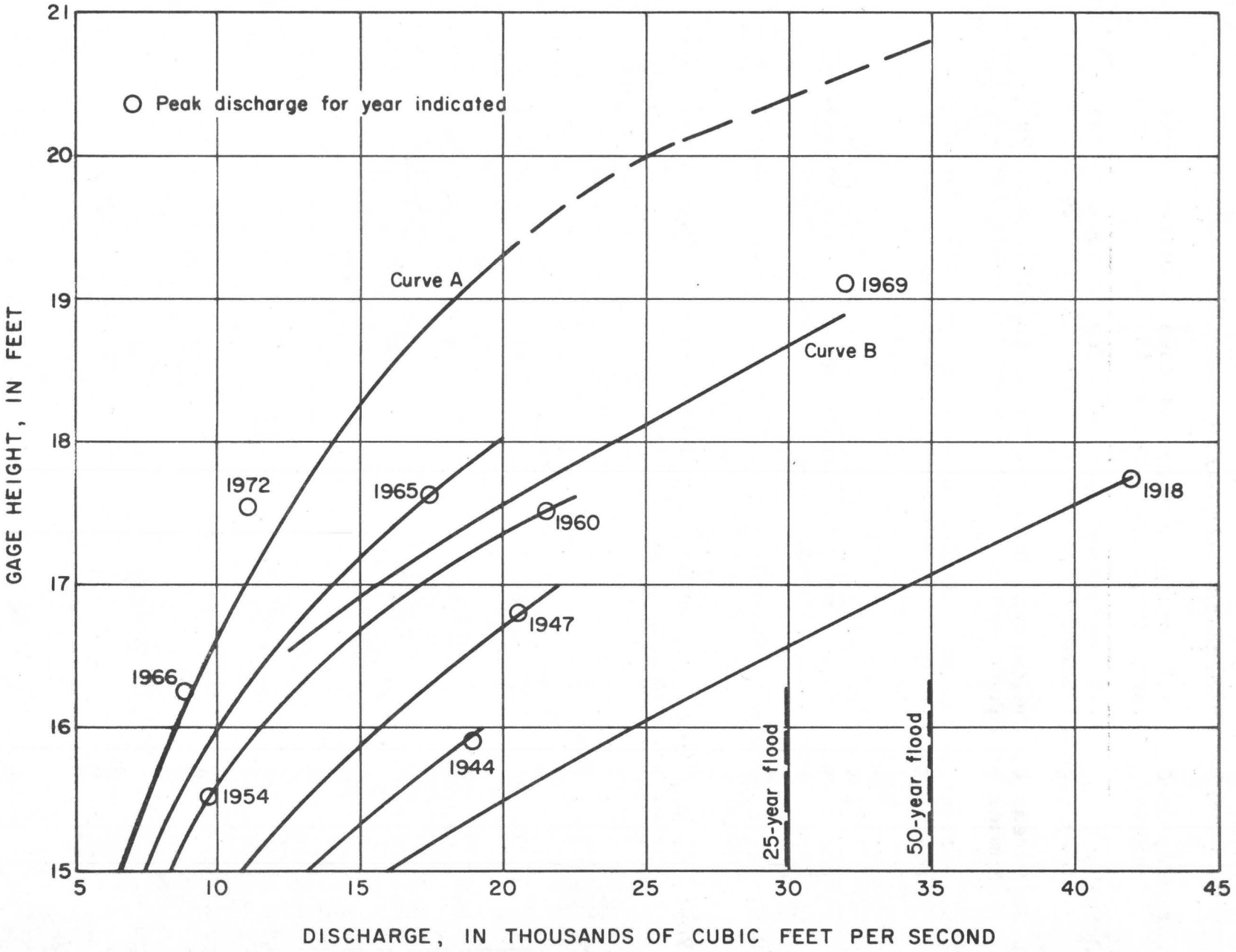

Figure 3. Selected rating curves and peaks for gaging station on Iowa River at Marshalltown showing change in stage-discharge relation.

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IOWA RIVER PROFILES

Mile	Drain area sq mi	Peak flood discharge, in cfs					10-15-70 discharge cfs
		June 1947	June 1954	July 1969	25-year	50-year	
128.2	2842	34,000	9500	28,100	39,800	46,000	2600

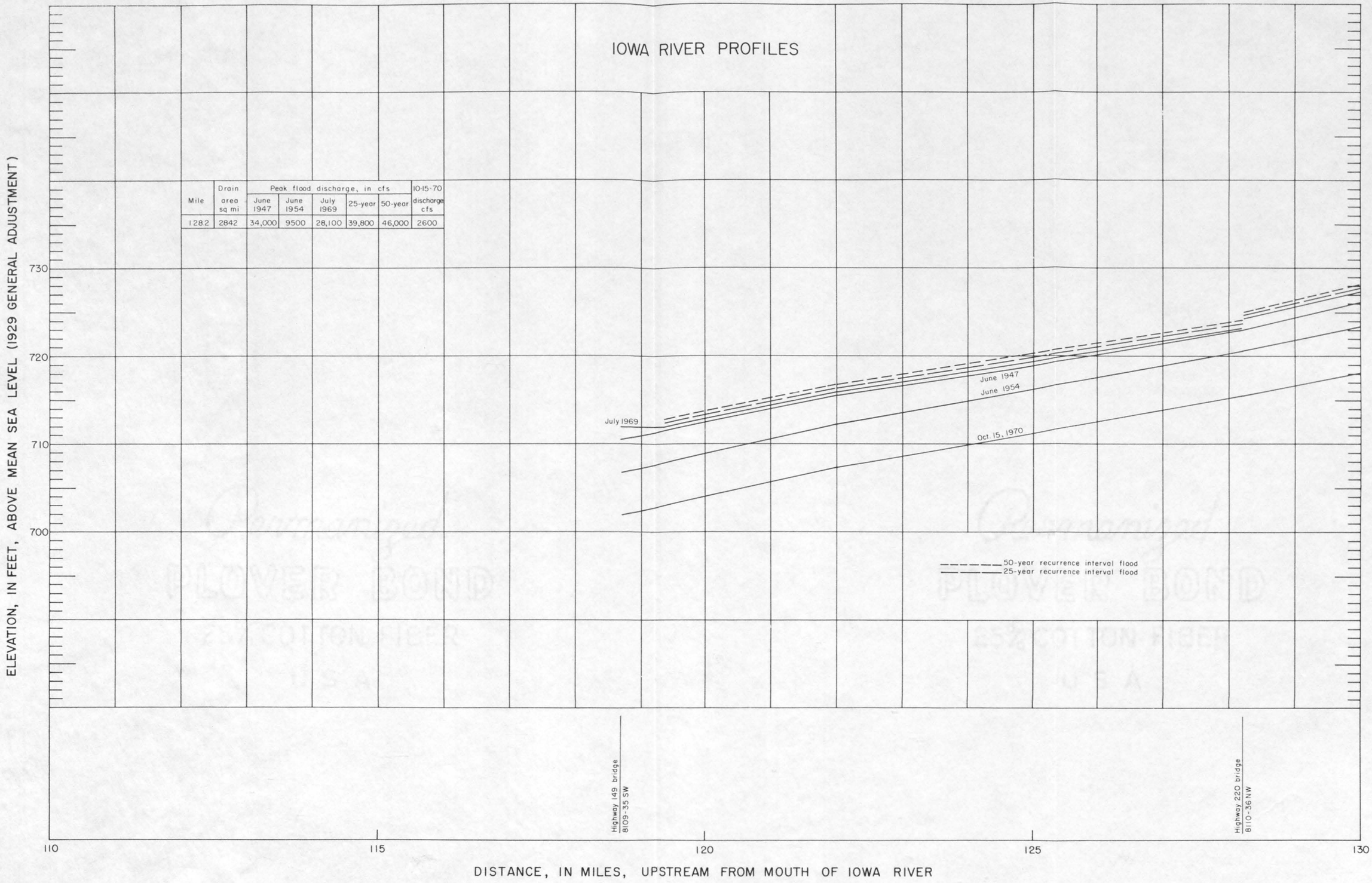


Figure 4. Iowa River profiles, mile 110 to mile 130.

IOWA RIVER PROFILES

Mile	Drain. area sq mi	Peak flood discharge, in cfs: June 1947	June 1954	July 1969	25-year	50-year	10-15-70 discharge cfs
139.4	2794	34,000	9700	28,300	39,400	45,700	2600
145.2	2545	34,000	9800	29,600	37,700	43,800	2300

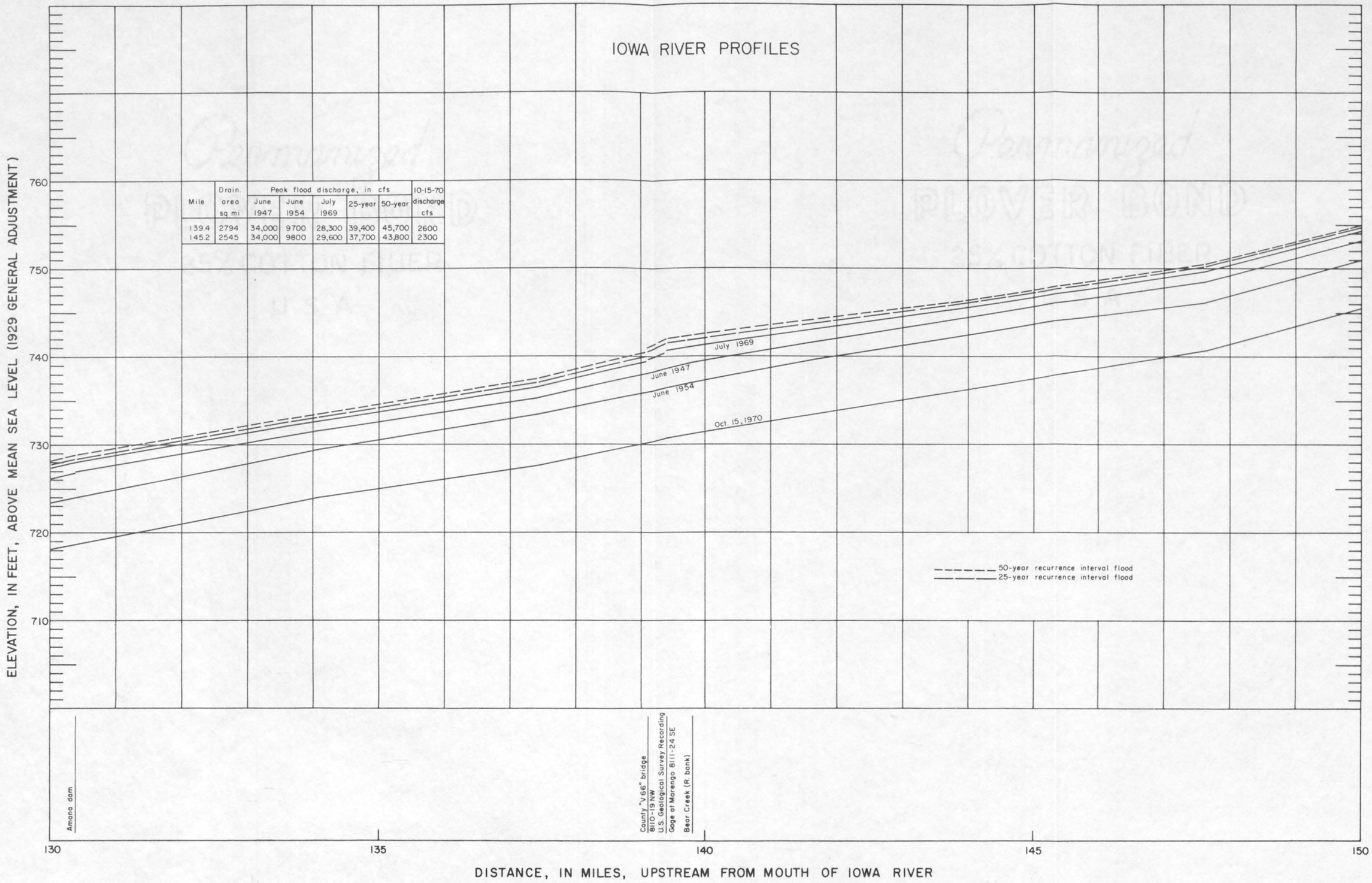


Figure 5. Iowa River profiles, mile 130 to mile 150.

IOWA RIVER PROFILES

Mile	Drain. area sq mi	Peak flood discharge, in cfs: June 1947	June 1954	July 1969	25-year	50-year	10-15-70 discharge cfs
158.95	2455	34,000	10,700	30,000	37,100	43,000	2200
160.2	2361	33,600	10,500	30,200	36,400	42,300	2200
168.6	2076	30,300	10,100	30,900	34,200	39,800	1900

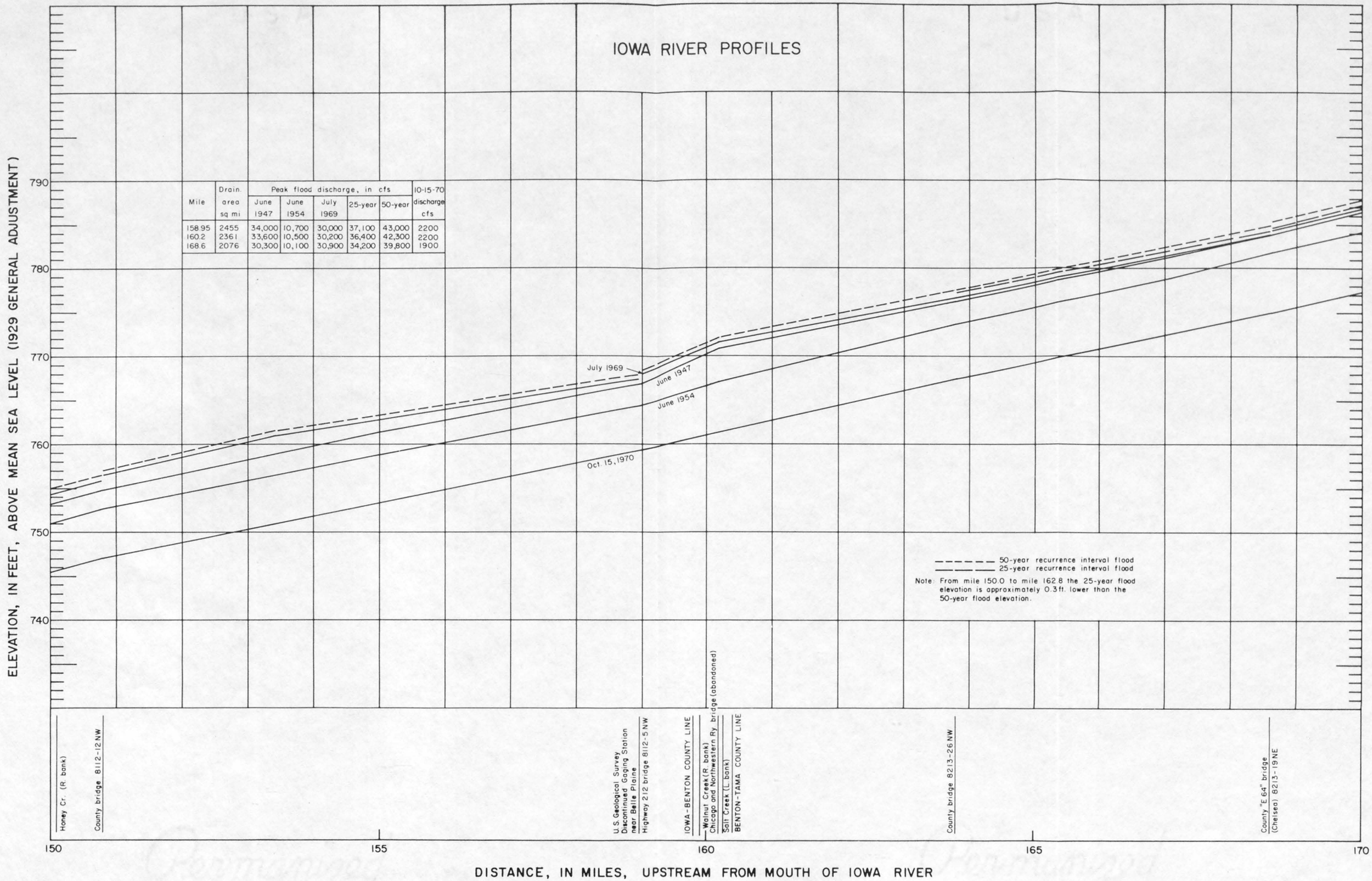


Figure 6. Iowa River profiles, mile 150 to mile 170.

IOWA RIVER PROFILES

Mile	Drain. area sq mi	Peak flood discharge, in cfs: June 1947	June 1954	July 1969	25-year	50-year	10-14-70 discharge cfs
178.9	2009	29,200	10,000	31,000	33,600	39,200	1800
188.5	1987	28,800	10,000	31,100	33,500	39,000	1800

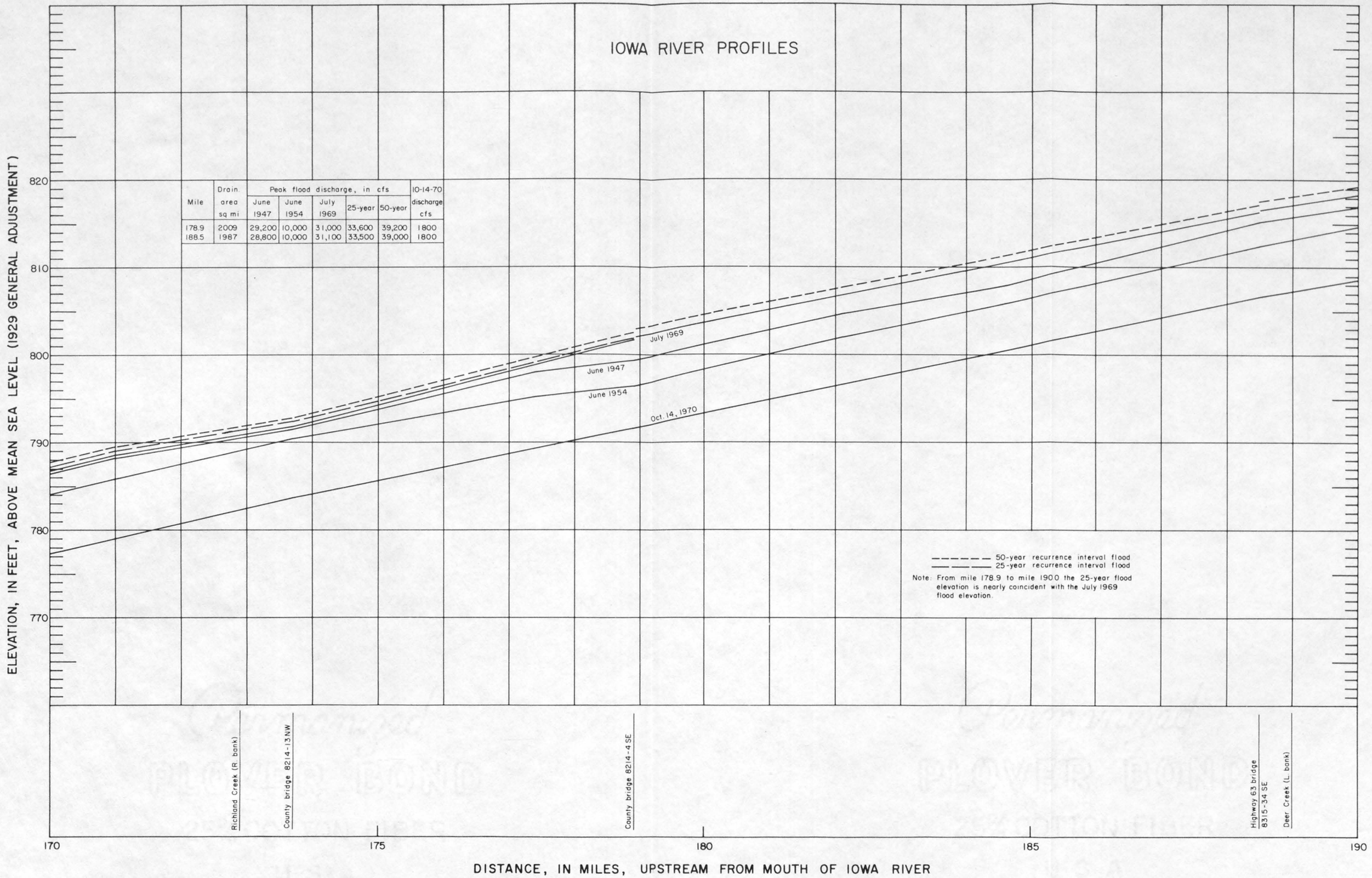


Figure 7. Iowa River profiles, mile 170 to mile 190.

IOWA RIVER PROFILES

Mile	Drain. area sq mi	Peak flood discharge, in cfs: June 1947	June 1954	July 1969	25-year	50-year	10-14-70 discharge cfs
194.2	1882	26,900	10,000	31,300	32,600	38,000	1600
199.7	1845	26,100	10,000	31,400	32,300	37,600	1500
203.9	1828	25,800	10,000	31,400	32,200	37,500	1400

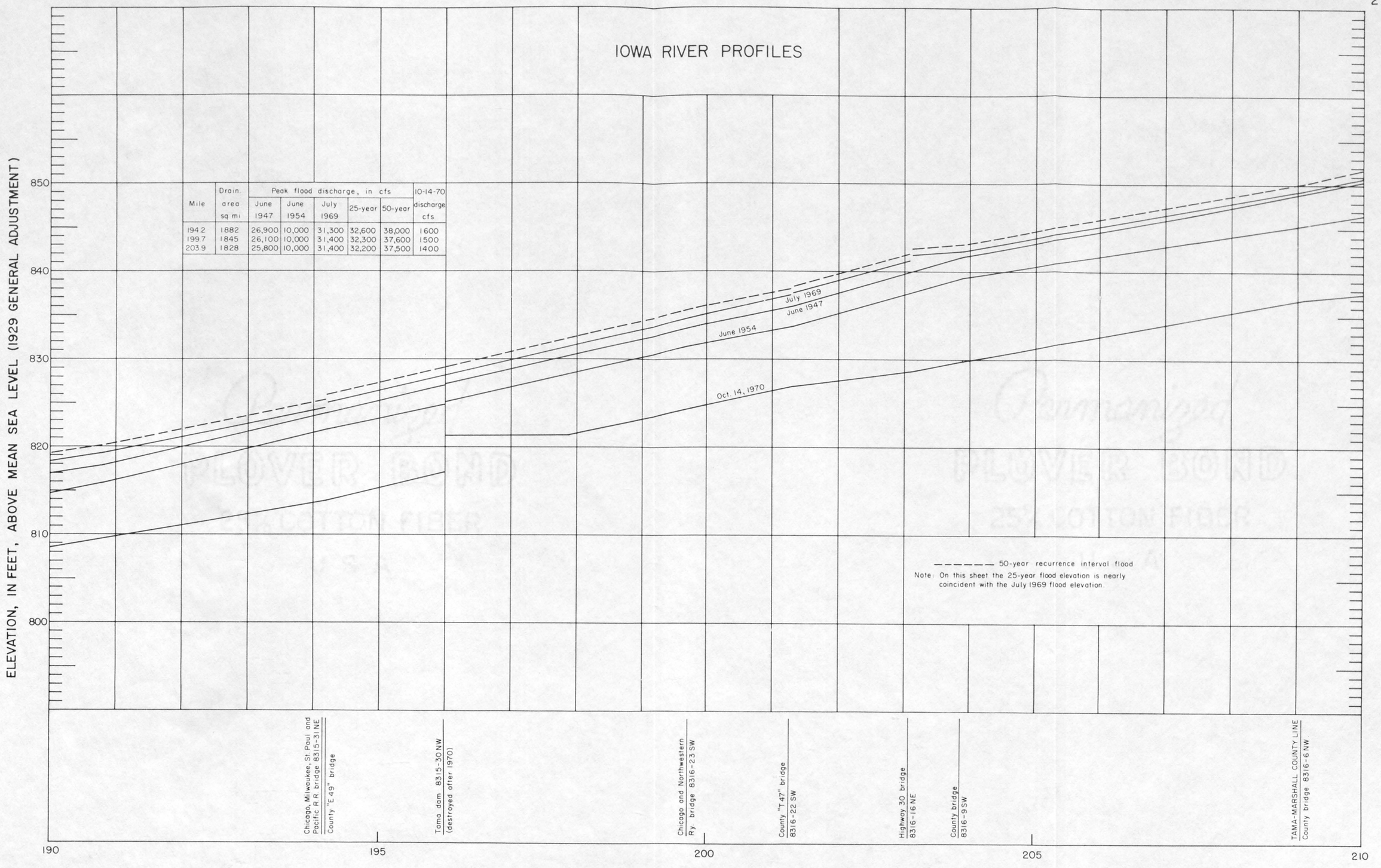


Figure 8. Iowa River profiles, mile 190 to mile 210.

IOWA RIVER PROFILES

Mile	Drain area sq mi	Peak flood discharge, in cfs: June 1947	June 1954	July 1969	25-year	50-year	10-14-70 discharge cfs
211.3	1782	25,100	9900	31,500	31,800	37,000	1300
222.6	1564	20,400	9700	31,900	29,900	34,900	970
228.4	1466	19,400	9600	31,900	27,800	32,400	870

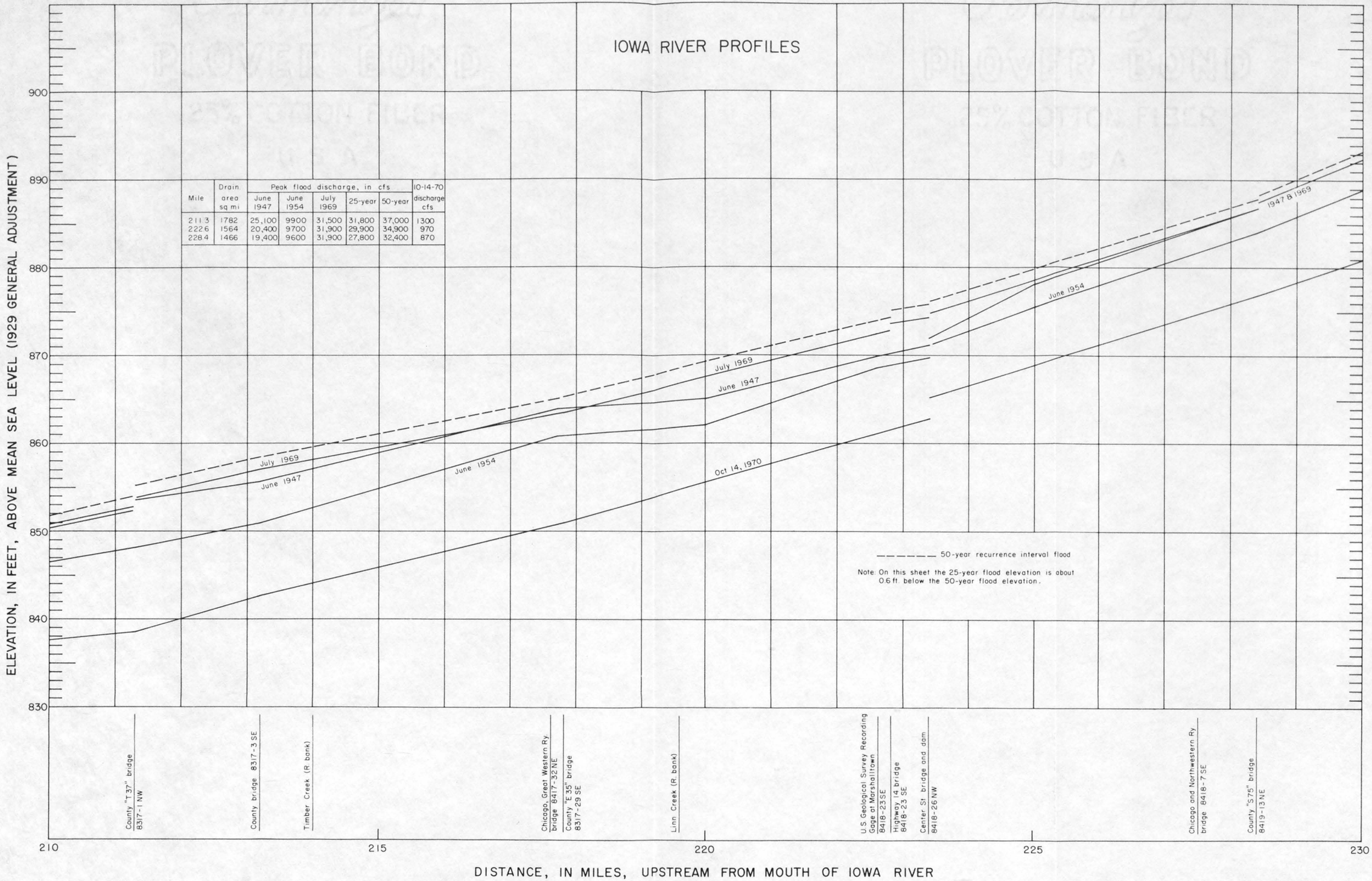


Figure 9. Iowa River profiles, mile 210 to mile 230.

IOWA RIVER PROFILES

Mile	Drain area sq mi	Peak flood discharge, in cfs: June 1947	June 1954	July 1969	June 1972	25-year	50-year	10-14-70 discharge cfs
232.8	1288	18,400	9450	30,700		23,900	28,000	690
236.2	1170	18,100	9300	28,200		21,400	25,100	580
242.9	1122	18,000	9200	27,000	6600	20,500	24,000	540
249.0	779	8,000	8900	12,000	5460	13,000	15,400	260

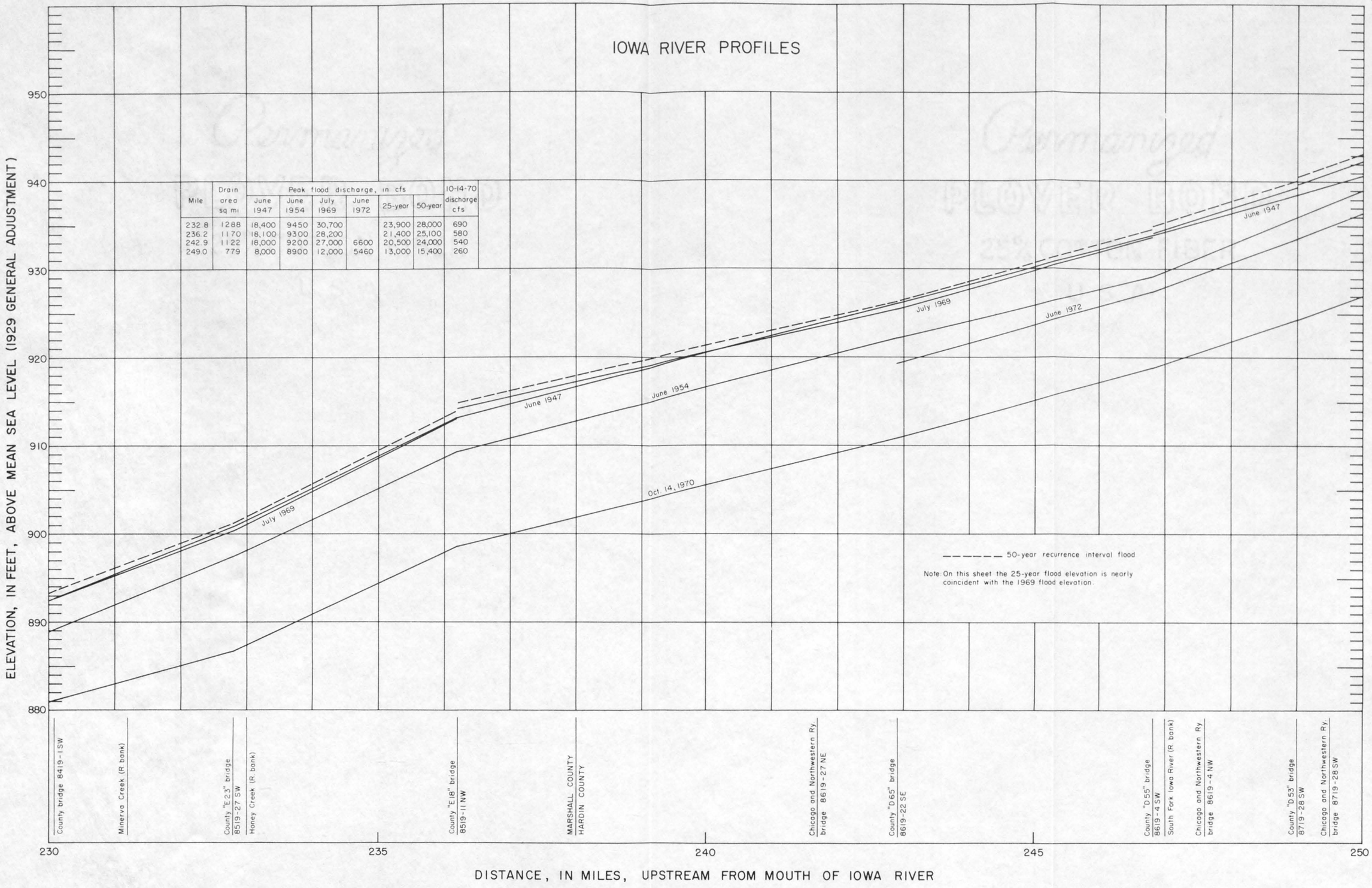


Figure 10. Iowa River profiles, mile 230 to mile 250.

IOWA RIVER PROFILES

Mile	Drain area sq mi	Peak flood discharge, in cfs						10-14-70 discharge cfs
		June 1947	June 1954	July 1969	June 1972	25-year	50-year	
255.5	746	6600	8900	11,700	5600	12,200	14,500	240
265.4	722	5800	8800	11,300		11,700	13,900	235

July 1969
June 1954
June 1947
Oct. 14, 1970
July 1969
June 1947
June 1954
June 1972
Oct 14, 1970

——— 50-year recurrence interval flood

Note: On this sheet the 25-year flood elevation is nearly coincident with the 1969 flood elevation.

County bridge 8719-8 SE
Dam, Eldora
Highway 175 bridge
8719-8 NE
County bridge 8719-5 NW
Chicago and Northwestern Ry. bridge 8819-28 NW
County "D35" bridge
Dam - Steamboat Rock
8819-28 NW
County "D25" bridge
8820-12 SE

ELEVATION, IN FEET, ABOVE MEAN SEA LEVEL (1929 GENERAL ADJUSTMENT)

1000
990
980
970
960
950
940
930
920

250
255
260
265
270

DISTANCE, IN MILES, UPSTREAM FROM MOUTH OF IOWA RIVER

Figure 11. Iowa River profiles, mile 250 to mile 270.

IOWA RIVER PROFILES

Mile	Drain. area sq mi	Peak flood discharge, in cfs: June 1947	June 1954	July 1969	25-year	50-year	10-14-70 discharge cfs
271.6	714	5500	8800	11,100	11,600	13,800	225
276.3	702	5100	8800	10,600	11,200	13,400	215
281.1	679		9110	9,000	10,800	12,900	195
289.0	639		9020	5,400	10,000	11,900	155

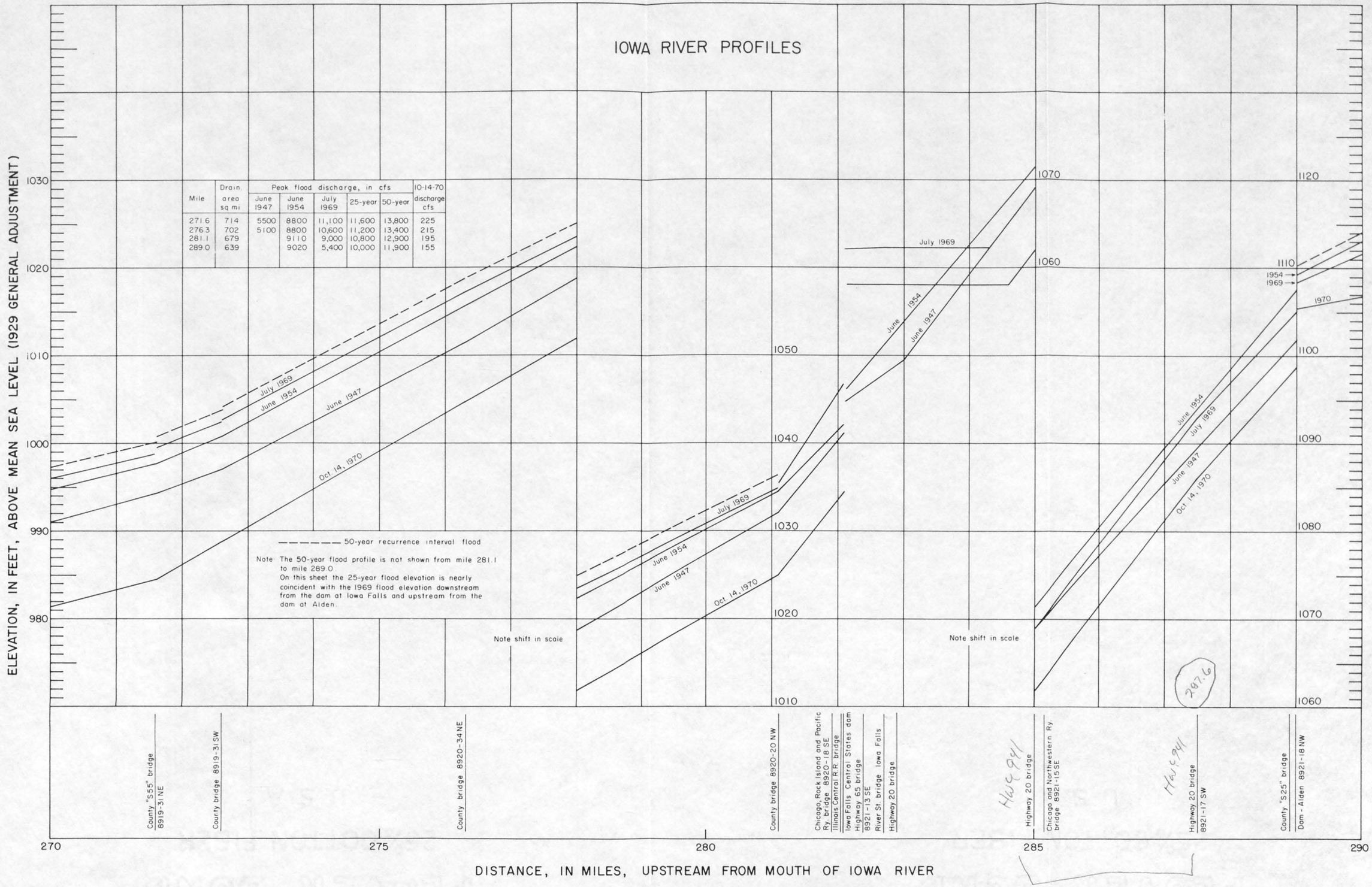


Figure 12. Iowa River profiles, mile 270 to mile 290.

IOWA RIVER PROFILES

Mile	Drain. area sq mi	Peak flood discharge, in cfs: June 1954	July 1969	25-year	50-year	10-13-70 discharge cfs
295.5	607	8680	4700	9300	11,200	130
304.2	547	8570	4500	8700	10,500	110

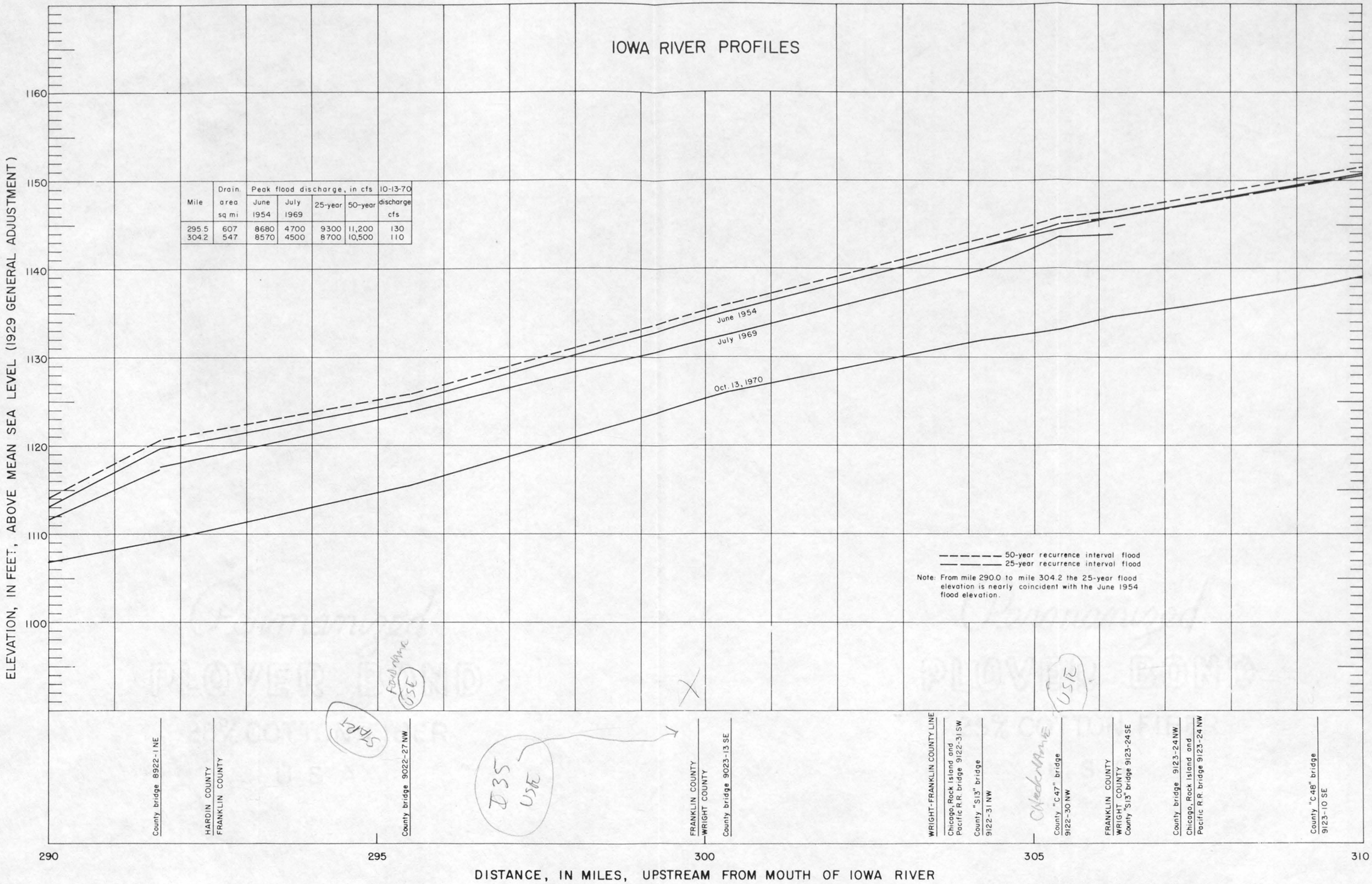


Figure 13. Iowa River profiles, mile 290 to mile 310.

IOWA RIVER PROFILES

Mile	Drain. area sq mi	Peak flood discharge, in cfs: June 1944	June 1954	July 1969	25-year	50-year	10-13-70 discharge cfs
316.4	429	3840	8460	4250	7530	9090	64
322.4	398		8330	4200	7200	8700	55
325.2	348		8090	4100	6610	7990	40

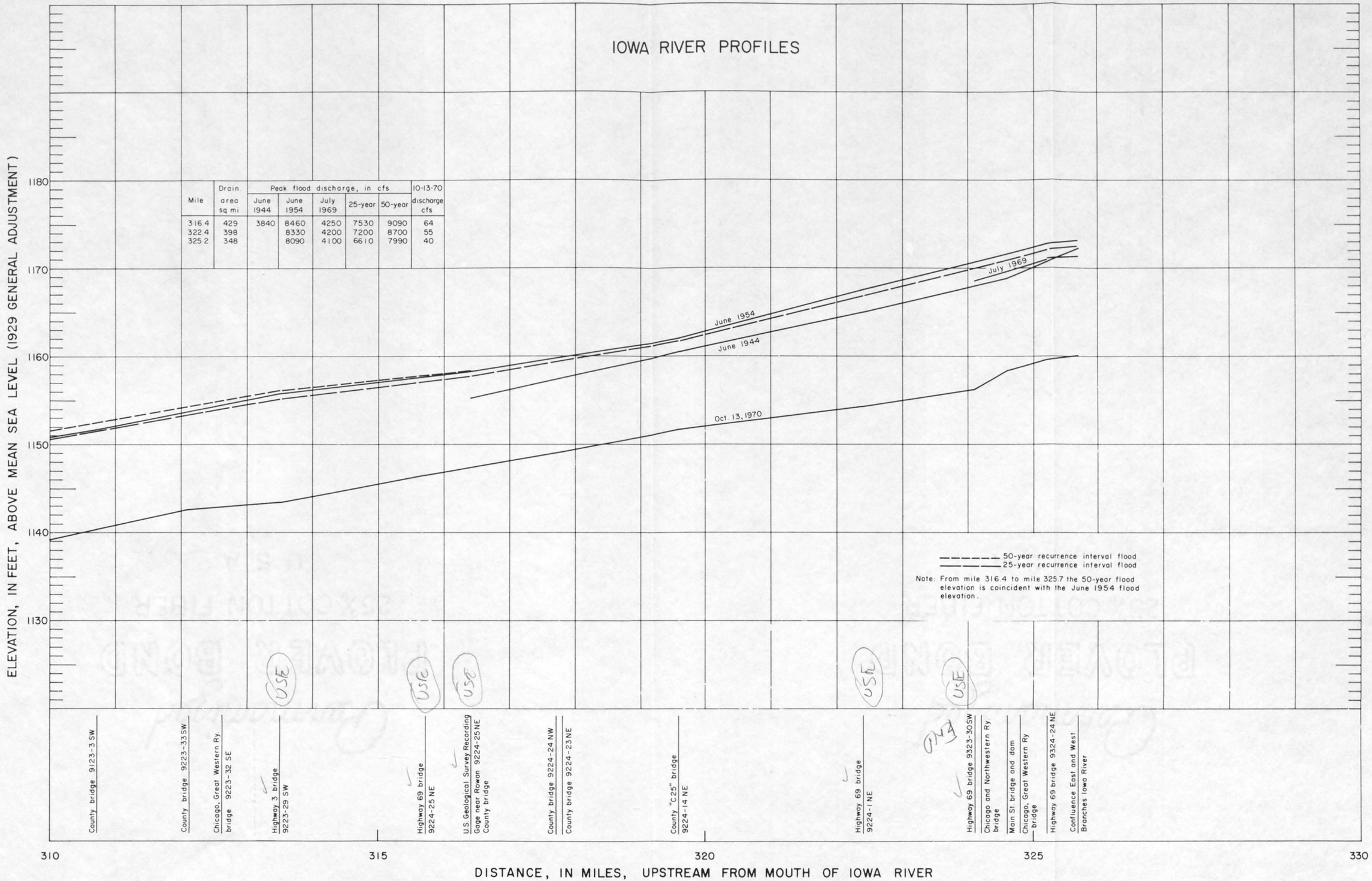
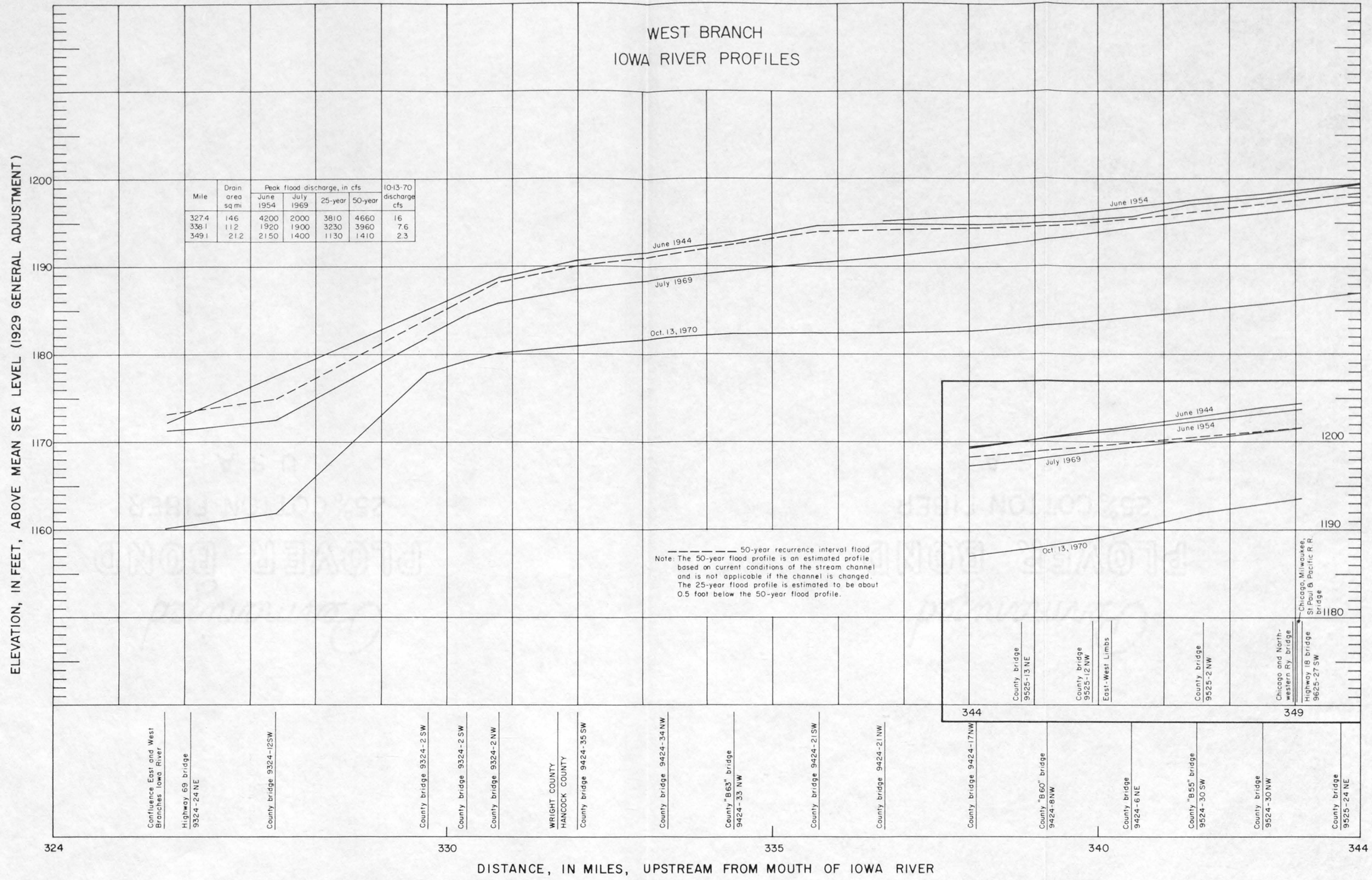


Figure 14. Iowa River profiles, mile 310 to mile 325.7.



Mile	Drain area sq mi	Peak flood discharge, in cfs				10-13-70 discharge cfs
		June 1954	July 1969	25-year	50-year	
327.4	146	4200	2000	3810	4660	16
338.1	112	1920	1900	3230	3960	7.6
349.1	21.2	2150	1400	1130	1410	2.3

Figure 15. West Branch Iowa River profiles, mile 325.7 to mile 349.1.

EAST BRANCH IOWA RIVER PROFILES

Mile	Drain. area sq mi	Peak flood discharge, in cfs				10-13-70 discharge cfs
		June 1954	July 1969	25-year	50-year	
327.0	194	6910	2600	4570	5550	22
341.0	133	5960	2770	3600	4440	13
348.6	45.1	1040	950	1820	2250	9.2

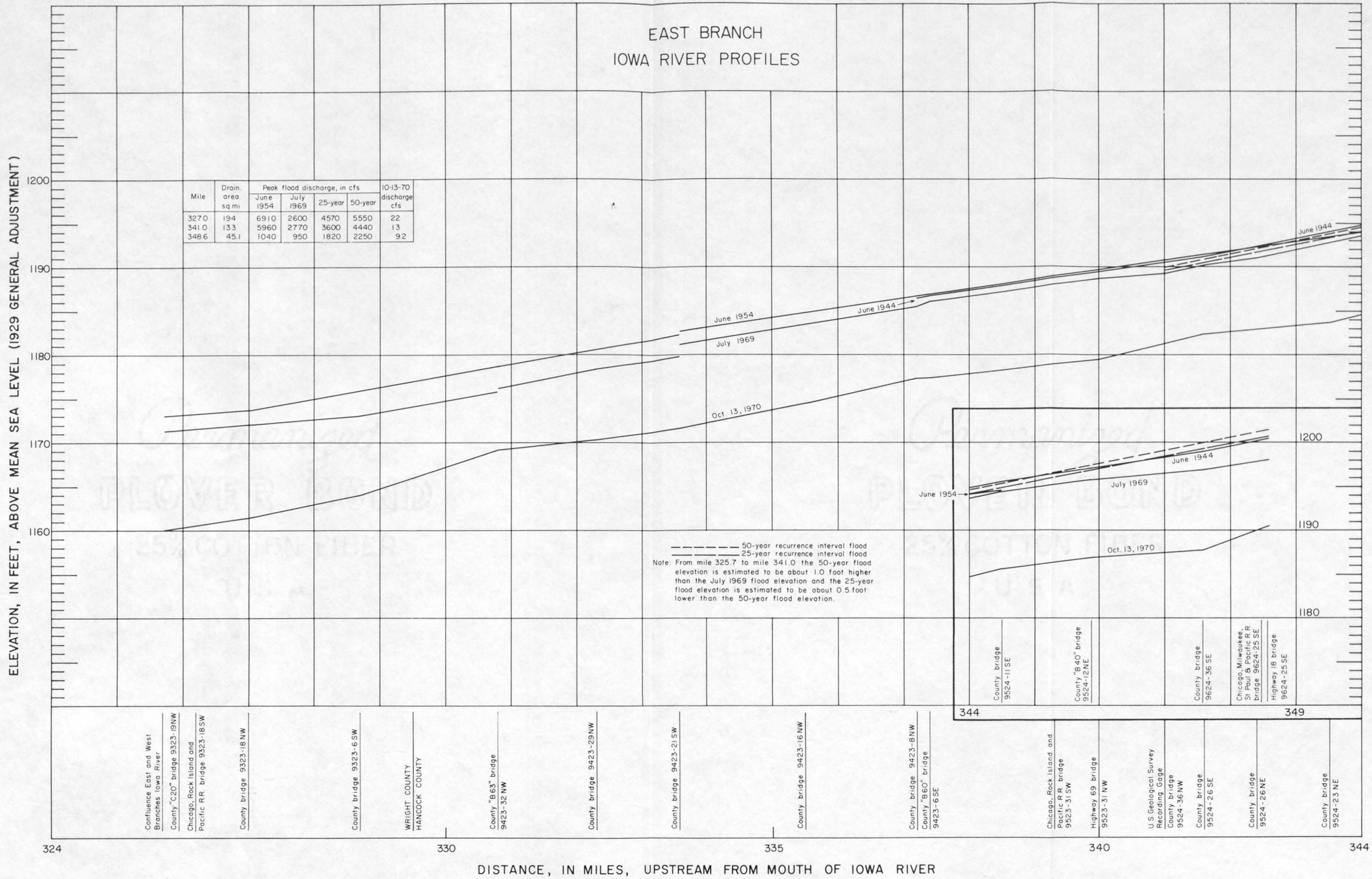


Figure 16. East Branch Iowa River profiles, mile 325.7 to mile 348.6.

APPENDIX

The data which follow pertain to the gaging stations that are or have been operated in the basin. Gaging-station records are in the downstream order used by and explained in the annual reports of the U.S. Geological Survey (see references). These reports contain much data that supplement the information herein, particularly data for antecedent and post flood periods.

Each gaging-station record has the assigned permanent station number preceding the station name. This number is used to identify the station on figure 1 and in the tables. The descriptive paragraphs following the station name contain material pertinent to the station's location, size of drainage areas, type of gage, definition of the rating curve, maximum flood of record, and, when applicable, the base for the partial-duration series.

Flood data are tabulated following the descriptive paragraphs. For regular gaging stations, the annual maximum discharge is listed, and any other peak discharges that exceed a selected base. At crest-stage stations only the annual peaks are listed. In the table, a line extending across the four columns indicates a break in the continuity of the record; sometimes involving a major change in gage location. Explanation of these events will be given in the descriptive paragraph for the gage. A line across the gage-height and discharge columns indicates a change in location which would be defined in the paragraph describing the gage.

The stations for which gage datum elevations are not listed are referenced to a local datum. Mean sea level elevations have not been run to these stations.

5-4485 West Branch Iowa River near Klemme, Iowa

(Gaging station, discontinued September 30, 1958)

Location.--Lat 42°57'50", long 93°42'20", in NE1/4NW1/4 sec. 17, T.94 N., R.24 W., on downstream side of highway bridge, 6 miles southwest of Klemme and 12.4 miles upstream from confluence with East Branch Iowa River.

Drainage area.--112 sq mi.

Gage-height record.--Wire-weight gage. Datum of gage is 1,180.83 ft above mean sea level.

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

Maximum of record.--June 1954: Discharge, 1,920 cfs June 21 (gage height, 14.97 ft).

Remarks.--Base for partial-duration series, 500 cfs. Tables of daily discharges and detailed hydrographs for flood of June 1954 are contained in U.S. Geological Survey Water-Supply Paper 1370-A.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1948	May 15, 1948	6.16	[c]110
1949	Mar. 27, 1949	7.08	538
1950	Mar. 27, 1950	7.09	522
1951	Feb. 26, 1951	[b]9.63	[a]550
	Mar. 28, 1951	[b]10.68	[a]740
	Apr. 7, 1951	11.84	1,420
	May 2, 1951	8.33	565
	June 26, 1951	12.38	1,340
	July 9, 1951	8.38	580
1952	Mar. 30, 1952	9.12	860
	June 14, 1952	7.36	568
	July 7, 1952	7.93	653
1953	June 8, 1953	6.16	391

West Branch Iowa River near Klemme, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1954	June 21, 1954	14.97	1,920
1955	July 6, 1955	5.9	349
1956	Mar. 27, 1956	[b] 4.40	[a] 130
1957	May 30, 1957	5.15	272
1958	June 4, 1958	5.35	256

a About
b Affected by ice
c Maximum for period April to September

5-4486 East Branch Iowa River above Hayfield, Iowa

(Crest-stage station)

Location.--Lat 43°09'XX", long 93°41'XX", near S1/4 corner sec. 4, T.96 N., R.24 W., at bridge, 1.5 miles southeast of Hayfield.

Drainage area.--2.23 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 141 cfs and extended to peak stage by logarithmic plotting.

Maximum of record.--April 1965: Discharge, 250 cfs April 6 (gage height, 7.31 ft).

Remarks.--Only annual peaks are shown.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1953	June 4, 1953	3.02	24.2
1954	June 18, 1954	7.15	209
1955	July 6, 1955	2.25	10.6
1956	July 2, 1956	2.05	8.0
1957		c	
1958	June 4, 1958	2.65	17.0
1959	May 21, 1959	6.77	186
1960	Mar. 29, 1960	4.67	75
1961	Mar. 26, 1961	7.03	196
1962	Aug. 31, 1962	3.34	31.1
1963	May 13, 1963	4.25	59

East Branch Iowa River above Hayfield, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1964	Sept. 7, 1964	4.25	58
1965	Apr. 6, 1965	7.31	250
1966	Feb. 9, 1966	[b]3.33	22
1967	June 10, 1967	3.81	40
1968	July 23, 1968	3.28	26
1969	June 29, 1969	6.70	200
1970		[c]	<7
1971	June 10, 1971	2.08	(+)

\+ Discharge not determined
b Affected by ice
c Peak stage did not reach bottom of gage

5-4487 East Branch Iowa River near Hayfield, Iowa

(Crest-stage station)

Location.--Lat 43°11'XX", long 93°39'XX", in NW1/4 sec. 35, T.97 N., R.24 W., at bridge, 2 miles east of Hayfield.

Drainage area.--7.94 sq mi.

Gage-height record.--Crest stages only.

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

Maximum of record.--June 1954: Discharge, 457 cfs June 18 (gage height, 13.01 ft).

Remarks.--Only annual peaks are shown.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1952	Mar. 29, 1952	6.45	122
1953	Aug. 4, 1953	7.26	172
1954	June 18, 1954	13.01	457
1955	July 6, 1955	6.50	51
1956	July 31, 1956	6.80	60
1957	June 23, 1957	7.11	69
1958	June 4, 1958	9.52	187
1959	May 21, 1959	11.89	357
1960	Mar. 29, 1960	6.33	34
1961	Mar. 26, 1961	12.16	260
1962	July 5, 1962	9.17	166

East Branch Iowa River near Hayfield, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage Height (feet)	Discharge (cfs)
1963	July 19, 1963	8.90	173
1964	Sept. 7, 1964	10.73	220
1965	Apr. 6, 1965	[b]13.67	370
1966	Feb. 9, 1966	[b]7.95	50
1967	June 10, 1967	6.67	56
1968	July 23, 1968	9.23	124
1969	June 29, 1969	11.67	350
1970		c	(+)
1971	Mar. 30, 1971	[b]11.27	200

\+ Discharge not determined
b Affected by ice
c Peak stage did not reach bottom of gage

5-4488 East Branch Iowa River near Garner, Iowa

(Crest-stage station)

Location.--Lat 43°06'XX", long 93°37'XX", near center sec. 25, T.96 N., R.24 W., at bridge on U.S. Highway 18, 1.2 miles west of Garner.

Drainage area.--45.1 sq mi.

Gage-height record.--Crest stages only. Datum of gage is 1,186.40 ft above mean sea level.

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

Maximum of record.--March 1961: Discharge, 1,120 cfs March 26 (gage height, 12.81 ft).

Remarks.--Only annual peaks are shown.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1952	Mar. 29, 1952	7.38	352
1953	Mar. 13, 1953	5.55	189
1954	June 18, 1954	12.42	1,040
1955	July 6, 1955	5.14	155
1956		c	
1957	May 30, 1957	7.06	322
1958		c	
1959	May 21, 1959	10.36	709
1960	Mar. 24, 1960	9.69	650
1961	Mar. 26, 1961	12.81	1,120
1962	Aug. 31, 1962	9.30	440
1963	July 19, 1963	9.04	507

East Branch Iowa River near Garner, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1964	Sept. 7, 1964	9.38	491
1965	Apr. 6, 1965	[b]12.89	[a]1,000
1966	Feb. 9, 1966	[b]9.46	300
1967		c	< 260
1968		c	< 260
1969	June 29, 1969	11.67	950
1970		c	(+)
1971	Mar. 31, 1971	[b]9.93	330

\+ Discharge not determined
a About
b Affected by ice
c Peak stage did not reach bottom of gage

5-4489 East Branch Iowa River tributary near Garner, Iowa

(Crest-stage station)

Location.--Lat 43°06'XX", long 93°40'XX", near center sec. 27, T.96 N., R.24 W., at culvert on U.S. Highway 18, 2.1 miles west of Garner.

Drainage area.--5.98 sq mi.

Gage-height record.--Crest stages only.

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

Maximum of record.--June 1954: Discharge 206 cfs June 17 (gage height, 6.71 ft).

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1952	Mar. 29, 1952	4.92	83
1953	Mar. 13, 1953	4.36	62
1954	June 17, 1954	6.71	206
1955		c	
1956		c	
1957		c	
1958		c	
1959	May 21, 1959	5.22	167
1960	Mar. 29, 1960	5.22	160
1961	Mar. 26, 1961	7.05	155
1962	Aug. 31, 1962	5.25	78
1963	June 9, 1963	4.51	39

East Branch Iowa River tributary near Garner, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1964	Sept. 7, 1964	5.88	104
1965	Apr. 6, 1965	[b]9.15	[a]170
1966	Feb. 9, 1966	[b]5.29	40
1967		c	(+)
1968		c	(+)
1969	June 29, 1969	5.33	58
1970		c	(+)
1971	Mar. 30, 1971	[b]6.66	100

\+ Discharge not determined
a About
b Affected by ice
c Peak stage did not reach bottom of gage

5-4490 East Branch Iowa River near Klemme, Iowa

Location.--Lat 43°00'31", long 93°37'42", in NE1/4 NW1/4 sec. 36, T.95 N., R.24 W., Hancock County, on left bank 15 ft downstream from bridge on county highway B55, 1.2 miles west of Chicago Rock Island and Pacific Railway crossing in Klemme, 1.5 miles upstream from Drainage ditch 9, 18.2 miles upstream from confluence with West Branch Iowa River, and at mile 341.0.

Drainage area.--133 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 1,179.33 ft above mean sea level. Apr. 1, 1948,to Sept. 30, 1955, nonrecording gage at site 0.6 mile upstream at datum 0.80 ft higher. Oct. 1, 1955,to Sept. 30, 1969,at present site at datum 0.31 ft lower.

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

Maximum of record.--June 1954: Discharge, 5,960 cfs June 19 (gage height, 11.2 ft, from floodmark, site and datum then in use).

Remarks.--Base for partial-duration series, 700 cfs. Tables of daily discharges and detailed hydrographs for flood of June 1954 are contained in U.S. Geological Survey Water-Supply Paper 1370-A.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1944	June 1944	9.96	2,550
1948	May 15, 1948	4.68	[c]238
1949	Mar. 27, 1949	[b]7.3	[a]685
1950	Mar. 26, 1950	[b]7.02	[a]500
1951	Mar. 29, 1951	[b]8.59	1,000
	Apr. 7, 1951	8.61	1,940
	June 26, 1951	10.80	3,440
1952	Mar. 30, 1952	7.60	900
1953	June 8, 1953	5.70	385

East Branch Iowa River near Klemme, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1954	June 19, 1954	[d]11.2	5,960
	June 21, 1954	10.74	4,820
1955	July 5, 1955	5.47	348
1956	Mar. 26, 1956	[b]4.91	[a]150
1957	June 23, 1957	4.75	176
1958	June 4, 1958	6.08	355
1959	May 21, 1959	8.25	1,100
	May 31, 1959	8.12	1,020
1960	Mar. 28, 1960	8.25	1,100
1961	Mar. 26, 1961	9.40	3,250
1962	Mar. 30, 1962	[b]9.05	[a]1,600
	July 5, 1962	8.53	1,420
	July 20, 1962	8.20	1,090
	Aug. 31, 1962	8.84	1,830
1963	July 6, 1963	8.48	950
	July 20, 1963	8.44	922
1964	Sept. 9, 1964	8.09	972
1965	Apr. 8, 1965	9.94	4,090
	June 6, 1965	7.63	728
	Sept.19, 1965	9.39	2,080
	Sept.29, 1965	8.48	1,090
1966	Feb. 9, 1966	8.11	[a]700
1967	June 11, 1967	7.25	582
1968	June 27, 1968	6.03	351

East Branch Iowa River near Klemme, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1969	Apr. 4, 1969	7.86	806
	June 27, 1969	8.29	765
	June 29, 1969	9.87	2,770
	July 9, 1969	8.92	1,170
1970	May 14, 1970	7.83	759
1971	Mar. 31, 1971	8.22	1,030
	June 8, 1971	7.93	790

a About
b Affected by ice
c Maximum for period April to September 1948
d Maximum stage known

5-4495 Iowa River near Rowan, Iowa

Location.--Lat 42°45'36", long 93°37'23", in NW1/4 NE1/4 sec. 25, T.92 N., R.24 W., Wright County, on left bank 10 ft downstream from bridge on county highway C38, 0.9 mile downstream from Drainage ditch 123, 3.8 miles northwest of Rowan, 10.7 miles downstream from confluence of East and West Branches, and at mile 316.4.

Drainage area.--429 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 1,143.35 ft above mean sea level. Prior to Oct. 14, 1948, nonrecording gage at same site and datum.

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

Maximum of record.--June 1954: Discharge, 8,460 cfs June 21 (gage height, 14.88 ft).

Remarks.--Base for partial-duration series, 1,200 cfs. Tables of daily discharges and detailed hydrographs for flood of June 1954 are contained in U.S. Geological Survey Water-Supply Paper 1370-A.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1941	June 5, 1941	9.4	1,450
	June 14, 1941	8.8	1,250
1942	Nov. 4, 1941	9.0	1,320
1943	Mar. 27, 1943	8.9	1,280
1944	May 22, 1944	10.3	2,160
	June 14, 1944	12.0	3,840
1945	Mar. 13, 1945	[b]11.8	[a]2,200
	Apr. 14, 1945	8.9	1,360
	Apr. 25, 1945	9.6	1,670
	June 3, 1945	9.5	1,620
	Aug. 15, 1945	11.5	3,120
1946	Jan. 6, 1946	[b]9.26	[a]1,360
	Mar. 14. 1946	9.0	1,400
	May 27, 1946	9.6	1,660

Iowa River near Rowan, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1947	Apr. 13, 1947	9.4	1,580
	June 14, 1947	8.5	1,200
	June 26, 1947	10.0	1,860
	July 2, 1947	10.5	2,170
	July 7, 1947	10.6	2,240
1948	Feb. 29, 1948	[b]10.9	[a]1,940
	Mar. 18, 1948	10.6	2,240
1949	Mar. 7, 1949	[b]12.02	[a]1,230
	Mar. 28, 1949	9.4	1,580
1950	Mar. 28, 1950	[b]11.06	[a]1,800
1951	Feb. 26, 1951	[b]11.09	[a]2,200
	Mar. 29, 1951	[b]12.78	[a]3,300
	Apr. 7, 1951	12.38	4,230
	May 3, 1951	10.10	1,860
	June 28, 1951	13.18	5,610
	July 10, 1951	9.85	1,700
	July 22, 1951	9.17	1,400
1952	Feb. 14, 1952	[b]9.17	[a]1,250
	Mar. 21, 1952	9.32	1,450
	Mar. 31, 1952	10.61	2,200
	June 16, 1952	8.75	1,220
	July 9, 1952	9.30	1,400
1953	May 2, 1953	6.87	645
1954	June 21, 1954	14.88	8,460
	Aug. 27, 1954	8.78	1,220
1955	July 7, 1955	6.54	551
1956	Mar. 28, 1956	[b]5.7	[a]300
1957	May 31, 1957	6.43	492
1958	May 27, 1958	6.77	530
1959	May 24, 1959	9.87	1,420
	June 2, 1959	10.07	1,540

Iowa River near Rowan, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1960	Mar. 30, 1960	[b]12.11	[a]2,900
1961	Mar. 28, 1961	12.81	5,580
1962	Mar. 29, 1962	[b]12.60	[a]4,050
	July 7, 1962	9.46	1,530
	July 22, 1962	9.35	1,530
	Sept. 2, 1962	11.21	3,090
1963	Mar. 20, 1963	9.29	1,260
	July 8, 1963	10.22	1,820
	July 22, 1963	9.55	1,390
1964	Sept.11, 1964	9.82	1,520
1965	Apr. 7, 1965	c	[a]6,700
	Sept.21, 1965	11.86	4,100
	Sept.30, 1965	10.98	2,750
1966	Feb. 11, 1966	10.21	1,910
	Apr. 2, 1966	9.19	1,320
	June 13, 1966	9.03	1,260
1967	June 10, 1967	10.13	1,640
1968	July 18, 1968	9.88	1,640
1969	Mar. 25, 1969	10.58	2,170
	Apr. 6, 1969	10.27	1,940
	July 1, 1969	12.36	4,250
	July 10, 1969	11.26	2,770
1970	May 14, 1970	10.98	2,560
1971	Mar. 16, 1971	---	[a]1,530
	Apr. 1, 1971	10.67	2,410
	June 9, 1971	9.50	1,510

a About
b Affected by ice
c Max. Gage height 14.62 ft., April 6, 1965

5-4515 Iowa River at Marshalltown, Iowa

Location.--Lat 42°04'00", long 92°54'18", in SE1/4 SE1/4 sec. 23, T.84 N., R.18 W., Marshall County, on right bank in city park in Marshalltown, 600 ft upstream from Burnett Creek, 900 ft downstream from bridge on State Highway 14, 2.0 miles upstream from Linn Creek, and at mile 222.6.

Drainage area.--1,564 sq mi., including that of Burnett Creek.

Gage-height record.--Water-stage recorder. Datum of gage is 853.10 ft above mean sea level. See Water-Supply Paper 1728 for history of changes prior to September 21, 1934.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Rating curve extended above 19,000 cfs on basis of velocity-area study for determination of June 1918 flood discharge.

Maximum of record.--June 1918: Discharge, 42,000 cfs June 14 (gage height, 17.74 ft, from floodmark).

Remarks.--Base for partial-duration series, 5,000 cfs. Table of daily discharges for flood of June 1954 contained in U.S. Geological Survey Water-Supply Paper 1370-A.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1903	May 29, 1903	6.80	7,760
1915	June 1, 1915	13.8	[c]9,440
1916	Mar. 29, 1916	9.5	3,620
1917	Mar. 27, 1917	14.6	13,000
	June 10, 1917	13.5	9,300
1918	May 25, 1918	12.9	7,750
	June 4, 1918	17.7	42,000
	June 22, 1918	11.2	5,060
1919	Mar. 17, 1919	13.0	7,480
	Apr. 14, 1919	12.2	6,300
1920	Oct. 6, 1919	12.4	6,520

Iowa River at Marshalltown, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1921	Sept.17, 1921	13.4	8,500
1922	Feb. 24, 1922	11.7	5,710
1923	Apr. 4, 1923	10.5	4,350
1924	June 29, 1924	13.6	9,060
	Aug. 23, 1924	11.4	5,200
1925	June 19, 1925	7.6	2,480
1926	Sept.19, 1926	13.9	10,000
1927	Feb. 12, 1927	12.2	6,300
	June 9, 1927	13.0	7,610
1929	Mar. 26, 1929	[b]18.0	[a]14,500
	Aug. 3, 1929	15.0	15,500
1930	Apr. 1, 1930	10.6	4,480
1933	Apr. 4, 1933	15.5	17,100
1934	Jan. 24, 1934	6.3	1,400
1935	Mar. 5, 1935	15.7	12,500
	June 26, 1935	13.0	6,960
1936	Mar. 9, 1936	13.6	8,450
1937	Mar. 6, 1937	13.8	9,130
	June 15, 1937	12.7	6,280
1938	May 6, 1938	11.3	4,540
1939	Mar. 13, 1939	13.8	9,080
1940	June 23, 1940	7.9	2,200
1941	Sept. 8, 1941	9.6	2,900

Iowa River at Marshalltown, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1942	June 3, 1942	15.8	18,100
	June 13, 1942	12.8	5,870
	Sept. 15, 1942	12.1	5,300
1943	Feb. 27, 1943	12.1	4,960
1944	May 3, 1944	12.9	6,090
	May 20, 1944	15.9	18,900
	June 13, 1944	13.5	6,340
	June 17, 1944	13.4	6,290
1945	Mar. 16, 1945	14.1	8,340
	Apr. 17, 1945	12.4	5,150
	June 2, 1945	13.9	7,880
1946	Jan. 6, 1946	[b]15.6	[a]14,300
	Mar. 13, 1946	13.6	7,050
1947	June 2, 1947	15.7	14,400
	June 5, 1947	15.0	11,000
	June 13, 1947	16.8	20,500
	June 18, 1947	14.8	10,100
	June 22, 1947	15.3	11,900
	July 1, 1947	14.4	8,760
1948	Feb. 28, 1948	15.8	15,000
	Mar. 17, 1948	15.0	10,600
	Mar. 19, 1948	15.2	11,400
	Mar. 28, 1948	13.8	7,240
1949	Mar. 5, 1949	14.8	10,000
1950	Mar. 7, 1950	15.8	14,800
	June 10, 1950	13.1	5,950
	June 19, 1950	15.1	11,200
	June 24, 1950	12.5	5,120

Iowa River at Marshalltown, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1951	Feb. 26, 1951	[b]16.05	[a]10,000
	Mar. 29, 1951	16.13	15,200
	Apr. 8, 1951	14.20	7,000
	May 3, 1951	13.60	5,760
	June 2, 1951	15.95	14,500
	July 4, 1951	13.93	6,300
	July 9, 1951	13.15	5,150
	Aug. 27, 1951	14.10	6,750
1952	Mar. 11, 1952	13.99	6,500
1953	Feb. 21, 1953	[b]16.70	[a]7,000
1954	June 2, 1954	14.21	6,520
	June 11, 1954	15.21	8,850
	June 16, 1954	16.02	11,200
	June 25, 1954	15.51	9,700
	Aug. 28, 1954	16.09	11,500
1955	Feb. 20, 1955	11.75	3,290
1956	May 13, 1956	9.89	2,160
1957	May 30, 1957	13.93	5,220
	June 16, 1957	15.24	7,800
	July 4, 1957	14.42	6,300
1958	June 13, 1958	14.11	5,550
1959	Mar. 20, 1959	15.48	9,700
	Mar. 27, 1959	15.57	10,000
1960	Mar. 31, 1960	17.51	21,500
	Apr. 18, 1960	14.12	6,340
	May 7, 1960	15.66	10,300
	May 26, 1960	13.77	5,070
1961	Feb. 18, 1961	[b]13.63	[a]5,100
	Feb. 23, 1961	13.95	6,170
	Mar. 7, 1961	13.32	5,070
	Mar. 15, 1961	13.31	5,070
	Mar. 31, 1961	14.81	7,850
	Sept. 30, 1961	13.47	5,370

Iowa River at Marshalltown, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1962	Mar. 29, 1962	15.90	9,400
	July 15, 1962	16.17	8,560
	July 20, 1962	14.10	5,420
1963	Mar. 16, 1963	12.64	3,890
1964	May 8, 1964	10.40	2,320
1965	Mar. 2, 1965	[b]16.53	[a]9,100
	Apr. 6, 1965	17.63	17,400
	July 9, 1965	13.72	5,490
	Sept.23, 1965	15.21	6,640
1966	Oct. 1, 1966	14.75	5,880
	May 24, 1966	14.43	5,680
	June 13, 1966	16.25	8,800
1967	June 13, 1967	15.49	6,900
1968	July 20, 1968	11.84	3,330
1969	Mar. 20, 1969	17.66	13,000
	Apr. 4, 1969	14.18	5,480
	July 9, 1969	19.10	31,900
	July 27, 1969	15.35	6,620
1970	May 14, 1970	14.99	6,580
1971	Feb. 20, 1971	---	[a]7,000
	Mar. 15, 1971	17.22	11,700
	Mar. 19, 1971	15.11	6,780

a About
b Affected by ice
c Maximum for period May to September, 1915.

5-4517 Timber Creek near Marshalltown, Iowa

Location.--Lat 42°00'25", long 92°51'15", in SE1/4 SW1/4 sec. 8, T.83 N., R.17 W., Marshall County, on left bank 20 ft downstream from bridge on U.S. Highway 30, 3.5 miles upstream from mouth, and 4.1 miles southeast of court house in Marshalltown.

Drainage area.--118 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 849.44 ft above mean sea level.

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

Maximum of record.--May 1970: Discharge, 5,940 cfs May 14 (gage height, 16.66 ft).

Remarks.--Base for partial-duration series, 1,000 cfs. Table of daily discharges for flood of June 1954 contained in U.S. Geological Survey Water-Supply Paper 1370-A.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1947	June 1947	16.8	5,700
1950	Feb. 9, 1950	11.92	1,520
	Feb. 10, 1950	12.30	1,690
	Mar. 5, 1950	15.10	4,030
	June 18, 1950	15.77	4,940
1951	Mar. 28, 1951	10.70	1,160
	June 1, 1951	11.52	1,390
1952	Mar. 10, 1952	13.87	2,770
1953	Feb. 20, 1953	15.09	4,030
1954	June 10, 1954	13.47	2,450
1955	Feb. 19, 1955	13.45	1,500
1956	May 13, 1956	4.35	150
1957	June 18, 1957	14.23	3,030
	July 3, 1957	15.38	4,420
1958	Feb. 24, 1958	[b]10.56	[a]800

Timber Creek near Marshalltown, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1959	Feb. 28, 1959	10.83	1,190
	Mar. 14, 1959	10.22	1,040
	Mar. 20, 1959	14.59	3,420
	Mar. 26, 1959	10.71	1,200
	May 19, 1959	14.32	3,120
1960	Jan. 13, 1960	14.0	2,850
	Mar. 30, 1960	14.57	3,420
	Apr. 17, 1960	10.47	1,120
	May 6, 1960	14.40	3,220
	May 26, 1960	12.36	1,740
1961	Feb. 18, 1961	15.67	4,810
	Feb. 23, 1961	13.37	2,370
	Mar. 6, 1961	12.86	2,020
	Mar. 13, 1961	12.3	1,690
1962	Mar. 20, 1962	10.99	1,240
	Mar. 22, 1962	11.43	1,360
	Mar. 24, 1962	10.94	1,220
	May 29, 1962	12.67	1,900
	July 14, 1962	13.53	2,450
	July 20, 1962	12.71	1,900
1963	Mar. 13, 1963	[b]13.24	[a]1,100
1964	June 23, 1964	12.86	2,020
1965	Feb. 7, 1965	[b]12.50	[a]1,400
	Feb. 10, 1965	[b]12.55	[a]1,500
	Mar. 1, 1965	[b]12.32	[a]1,250
	Mar. 17, 1965	[b]12.99	[a]1,550
	Apr. 1, 1965	[b]15.07	[a]2,100
	Apr. 5, 1965	14.57	2,530
	Apr. 24, 1965	14.31	3,130
	July 9, 1965	11.89	1,520
	Sept. 21, 1965	10.82	1,200

Timber Creek near Marshalltown, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage Height (feet)	Discharge (cfs)
1966	Feb. 8, 1966	10.22	1,040
	June 9, 1966	11.60	1,420
	June 12, 1966	16.31	5,200
1967	June 10, 1967	9.65	915
1968	Mar. 8, 1968	7.49	546
1969	Mar. 20, 1969	---	2,300
	June 7, 1969	10.93	1,220
	June 12, 1969	13.37	2,350
	June 30, 1969	13.94	2,800
	July 8, 1969	10.94	1,230
1970	Mar. 3, 1970	13.16	2,190
	May 14, 1970	16.66	5,940
	Aug. 5, 1970	14.51	3,360
1971	Oct. 9, 1970	12.33	[a]1,700
	Feb. 20, 1971	---	[a]2,200
	Feb. 27, 1971	---	[a]2,100
	Mar. 13, 1971	---	[a]1,300
	June 13, 1971	10.21	1,050

a About
b Affected by ice

5-4519 Richland Creek near Haven, Iowa

Location.--Lat 41°53'58", long 92°28'27", in SE1/4 NE1/4 sec. 21, T.82 N., R.14 W., Tama County, on right bank 5 ft upstream from bridge on county highway, 0.6 mile northeast of Haven, and 2.8 miles upstream from mouth.

Drainage Area.--56.1 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 798.69 ft above mean sea level.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,500 cfs.

Maximum of record.--March 1960: Discharge, 3,650 cfs March 30 (gage height, 12.39 ft).

Flood in June 1918 reached a stage of 14.3 ft (discharge unknown).

Remarks.--Base for partial-duration series, 1,000 cfs.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1918	June 1918	14.3	
1950	Mar. 5, 1950	10.24	2,100
	Mar. 6, 1950	10.10	2,090
	June 18, 1950	10.92	2,560
1951	July 8, 1951	7.68	935
1952	Mar. 10, 1952	7.50	870
1953	Feb. 20, 1953	10.22	2,100
1954	Aug. 26, 1954	8.32	1,170
1955	Feb. 19, 1955	8.56	1,290
1956	Aug. 1, 1956	4.88	364
1957	May 31, 1957	5.87	509

Richland Creek near Haven, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1958	July 14, 1958	9.10	1,530
	Sept. 3, 1958	9.18	1,580
	Nov. 18, 1958	8.50	1,250
1959	Mar. 20, 1959	8.98	1,480
	Mar. 26, 1959	7.93	1,010
	Apr. 28, 1959	9.54	1,730
1960	Jan. 12, 1960	10.37	2,220
	Mar. 30, 1960	12.39	3,650
1961	Feb. 18, 1961	9.60	1,960
	Mar. 6, 1961	10.33	2,240
	Mar. 8, 1961	7.5	1,220
	June 6, 1961	8.13	1,420
1962	Mar. 20, 1962	6.76	1,010
	July 14, 1962	9.19	1,810
1963	Mar. 12, 1963	5.86	785
1964	June 23, 1964	6.75	1,010
1965	Jan. 22, 1965	6.78	1,030
	Feb. 7, 1965	8.37	1,530
	Feb. 19, 1965	7.70	1,310
	Mar. 1, 1965	7.35	1,200
	Apr. 1, 1965	8.05	1,420
	Apr. 5, 1965	8.02	1,410
	Apr. 24, 1965	9.98	2,090
	June 5, 1965	7.98	1,390
	Sept.21, 1965	7.62	1,200
1966	Feb. 8, 1966	---	[a]1,300
	June 12, 1966	10.70	2,450
1967	June 10, 1967	7.54	1,090

Richland Creek near Haven, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1968	Apr. 3, 1968	4.87	535
1969	Mar. 18, 1969	9.64	1,760
	Mar. 19, 1969	8.54	1,330
	June 8, 1969	8.82	1,430
	June 12, 1969	10.05	1,920
	June 30, 1969	9.15	1,560
1970	Mar. 2, 1970	11.24	2,490
	May 14, 1970	7.77	1,100
	Aug. 5, 1970	8.23	1,130
1971	Oct. 9, 1970	7.71	1,080
	Feb. 20, 1971	---	[a]1,200
	Feb. 27, 1971	---	[a]1,400

a About

5-4520 Salt Creek near Elberon, Iowa

Location.--41°57'51", long 92°18'47", in NW1/4 NW1/4 sec. 36, T.83 N., R.13 W., Tama County, near center of span on downstream side of bridge on U.S. Highway 30, 2.0 miles upstream from Hog Run, 3.0 miles south of Elberon, and 9.0 miles upstream from mouth.

Drainage area.--201 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 781.58 ft above mean sea level (Iowa Highway Commission bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 16,300 cfs.

Maximum of record.--June 1947: Discharge, 35,000 cfs June 13 (gage height, 17.6 ft).

Remarks.--Base for partial-duration series, 1,700 cfs.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1944	June 16, 1944	19.9	[a]30,000
1946	Jan. 6, 1946	15.84	8,690
	Sept. 23, 1946	14.70	5,030
1947	Apr. 10, 1947	12.85	2,250
	June 1, 1947	16.10	16,700
	June 13, 1947	17.60	35,000
	June 22, 1947	13.60	4,000
1948	Feb. 28, 1948	[b]14.91	[a]2,400
	Mar. 17, 1948	14.00	4,670
	Mar. 19, 1948	14.40	5,820
1949	Mar. 5, 1949	[b]14.85	[a]3,500
1950	Mar. 7, 1950	15.50	10,500
	June 24, 1950	14.82	6,310

Salt Creek near Elberon, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1951	Feb. 25, 1951	14.12	3,860
	Mar. 29, 1951	13.40	3,680
	June 2, 1951	13.67	4,250
	June 16, 1951	12.34	2,340
	July 8, 1951	12.56	2,600
	Aug. 27, 1951	12.78	2,810
1952	Mar. 11, 1952	14.26	4,050
	Mar. 13, 1952	12.85	2,600
	May 23, 1952	11.50	1,750
1953	Feb. 20, 1953	[b]15.40	[a]7,000
	June 8, 1953	11.48	1,750
	June 12, 1953	13.70	4,250
1954	Aug. 26, 1954	15.21	5,410
1955	Oct. 10, 1954	11.83	1,360
1956	Aug. 1, 1956	13.82	3,610
1957	May 31, 1957	13.93	2,810
	June 17, 1957	12.77	1,790
	June 18, 1957	12.94	1,860
1958	July 15, 1958	16.12	6,600
	Aug. 16, 1958	13.75	2,020
	Sept. 6, 1958	13.44	1,770
1959	Mar. 20, 1959	15.60	6,580
	Mar. 27, 1959	14.75	4,470
1960	Jan. 13, 1960	[b]16.16	[a]6,400
	Mar. 30, 1960	[b]16.18	[a]5,700
	Apr. 17, 1960	14.00	[a]2,250
	May 7, 1960	15.60	5,200

Salt Creek near Elberon, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1961	Feb. 19, 1961	[b]16.23	[a]7,200
	Feb. 23, 1961	13.85	2,900
	Mar. 6, 1961	15.15	5,750
	Mar. 14, 1961	14.20	3,520
	Mar. 15, 1961	13.40	2,240
	June 7, 1961	16.18	9,400
1962	Oct. 1, 1961	13.04	1,800
	Mar. 26, 1962	14.16	2,740
	July 14, 1962	14.39	2,980
1963	Mar. 13, 1963	[b]14.42	[a]1,900
1964	June 23, 1964	11.78	1,190
1965	Feb. 7, 1965	[b]14.65	[a]2,000
	Feb. 10, 1965	[b]14.33	[a]1,800
	Mar. 2, 1965	[b]14.89	[a]2,500
	Apr. 1, 1965	15.75	4,680
	Apr. 5, 1965	15.15	3,900
	May 27, 1965	13.82	2,300
	May 31, 1965	13.82	2,300
	June 5, 1965	14.60	3,220
	July 9, 1965	13.36	1,840
	Sept. 21, 1965	13.84	2,320
1966	Feb. 9, 1966	14.04	2,550
	June 12, 1966	13.68	1,710
1967	Aug. 8, 1967	12.62	1,460
1968	Aug. 5, 1968	13.43	1,370

Salt Creek near Elberon, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1969	Mar. 18, 1969	15.23	4,000
	Apr. 4, 1969	15.29	4,080
	June 8, 1969	13.43	1,960
	June 13, 1969	14.47	3,060
	June 30, 1969	13.42	1,960
	July 9, 1969	16.05	5,650
	July 18, 1969	17.78	12,500
	July 27, 1969	16.24	6,240
1970	Mar. 2, 1970	17.21	9,940
	May 14, 1970	15.50	4,990
1971	Oct. 9, 1970	13.63	[a]1,940
	Feb. 20, 1971	---	[a]2,400
	Feb. 27, 1971	---	[a]2,250
	Mar. 14, 1971	---	[a]2,500

a About
b Affected by ice

5-4522 Walnut Creek near Hartwick, Iowa

Location.--Lat 41°50'06", long 92°23'10", in SE1/4 SW1/4 sec. 8, T.81 N., R.13 W., Poweshiek County, on left bank 5 ft upstream from bridge on county highway V21, 1.2 miles downstream from North Walnut Creek, 4.0 miles northwest of Hartwick, and 6.5 miles upstream from mouth.

Drainage area.--70.9 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 786.59 ft above mean sea level.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,640 cfs and by indirect measurement at 4,930 cfs.

Maximum of record.--September 1958: Discharge, 4,930 cfs Sept. 3 (gage height, 15.67 ft).

Remarks.--Base for partial-duration series, 1,000 cfs.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1947	June 1947	17.7	
1950	Mar. 5, 1950	[b]14.68	[a]1,700
	Mar. 6, 1950	[b]14.28	[a]2,000
	June 18, 1950	15.07	3,500
	June 24, 1950	15.12	3,600
1951	June 3, 1951	13.27	1,450
	July 9, 1951	13.27	1,450
1952	Mar. 10, 1952	13.90	1,820
	Mar. 13, 1952	12.08	1,060
1953	Feb. 20, 1953	[b]14.50	[a]2,000
1954	Aug. 26, 1954	13.31	1,450
	Aug. 27, 1954	13.31	1,450
	Sept. 29, 1954	11.94	1,020
1955	Apr. 23, 1955	11.57	952
1956	July 31, 1956	12.27	895

Walnut Creek near Hartwick, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1957	May 31, 1957	10.97	684
1958	July 14, 1958	13.45	1,290
	Sept. 3, 1958	15.67	4,930
	Sept. 6, 1958	13.41	1,270
1959	Mar. 20, 1959	14.88	3,230
	Mar. 26, 1959	12.27	1,120
	Apr. 1, 1959	11.91	1,020
	Apr. 27, 1959	14.07	1,950
	May 21, 1959	13.74	1,680
	June 30, 1959	14.24	2,180
1960	Nov. 4, 1959	13.21	1,410
	Jan. 12, 1960	15.04	3,500
	Jan. 14, 1960	13.01	1,450
	Mar. 29, 1960	[b]15.44	[a]3,000
	Mar. 31, 1960	12.73	1,360
	May 6, 1960	14.56	2,640
1961	Feb. 18, 1961	14.75	2,980
	Mar. 6, 1961	15.17	3,700
	Mar. 8, 1961	14.80	3,060
	Mar. 13, 1961	12.10	1,350
1962	Mar. 19, 1962	13.85	1,780
	Mar. 23, 1962	11.57	1,050
	July 14, 1962	14.30	2,250
	July 19, 1962	13.24	1,530
1963	Mar. 12, 1963	[b]11.57	[a]850
1964	June 23, 1964	14.19	2,120
1965	Jan. 22, 1965	[b]13.00	1,100
	Feb. 9, 1965	[b]13.68	1,100
	Mar. 17, 1965	12.62	1,340
	Mar. 30, 1965	14.59	2,700
	Apr. 5, 1965	13.75	1,760
	Apr. 24, 1965	14.17	2,080
	June 5, 1965	13.86	1,750
	July 2, 1965	12.63	1,340
	Sept.21, 1965	12.39	1,270

Walnut Creek near Hartwick, Iowa--(Continued)

Peak stages and discharge

Water year	Date	Gage height (feet)	Discharge (cfs)
1966	Feb. 8, 1966	---	[a]1,300
	May 17, 1966	12.09	1,150
	June 13, 1966	14.10	2,000
	July 26, 1966	12.50	1,270
1967	Jan. 24, 1967	12.55	1,280
	June 10, 1967	15.27	3,960
	June 12, 1967	12.97	1,440
1968	Apr. 3, 1968	10.36	761
1969	Mar. 17, 1969	---	1,730
	Mar. 18, 1969	---	1,900
	June 7, 1969	13.65	1,810
	June 8, 1969	15.03	3,880
	June 12, 1969	13.78	1,890
	June 26, 1969	13.20	1,620
	June 30, 1969	14.83	3,560
	July 26, 1969	13.35	1,570
1970	Mar. 2, 1970	15.22	3,850
	Aug. 5, 1970	14.85	2,080
	Sept.15, 1970	14.55	2,640
1971	Oct. 9, 1970	14.72	[a]2,860
	Feb. 19, 1971	---	[a]1,200
	Feb. 26, 1971	---	[a]1,000
	July 10, 1971	11.92	1,110

a About
b Affected by ice

5-4525 Iowa River near Belle Plaine, Iowa

Location.--Lat 41°51'30", long 92°16'50", in SW1/4 NW1/4 sec. 5, T.81 N., R.12 W., on right bank 5 ft downstream from bridge on State Highway 212, 1.0 mile downstream from Salt Creek, 1.1 miles downstream from Walnut Creek and 2.7 miles south of Belle Plaine.

Drainage area.--2,455 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 749.82 ft above mean sea level.

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

Maximum of record.--June 1918: Discharge, 43,000 cfs June 5 (gage height, 17.85 ft, from information by Corps of Engineers).

Maximum discharge since at least 1902 is that of June 1918.

Remarks.--Base for partial-duration series, 5,000 cfs. Table of daily discharges for flood of June 1954 contained in U.S. Geological Survey Water-Supply Paper 1370-A.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1918	June 5, 1918	17.85	43,000
1940	Mar. 19, 1940	[b]9.46	2,430
1941	Mar. 22, 1941	[b]12.40	4,280
1942	Nov. 2, 1941	13.0	5,620
	June 6, 1942	14.4	9,450
	June 11, 1942	13.2	6,200
	June 16, 1942	12.5	5,100
1943	Feb. 24, 1943	12.8	5,580
	Mar. 16, 1943	13.7	6,890
	May 16, 1943	12.8	5,680
	Aug. 4, 1943	12.7	5,540
1944	May 7, 1944	13.0	5,990
	May 21, 1944	16.9	31,800
	June 16, 1944	16.8	31,600

Iowa River near Belle Plaine, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1945	Mar. 19, 1945	14.1	8,770
	Mar. 28, 1945	12.7	5,390
	Apr. 19, 1945	13.3	6,380
	May 17, 1945	12.5	5,100
	June 6, 1945	13.4	6,560
	June 10, 1945	13.6	7,290
1946	Jan. 6, 1946	16.2	25,000
	Feb. 6, 1946	[b]13.6	5,100
	Mar. 17, 1946	13.7	7,390
	Sept. 23, 1946	13.6	7,190
1947	Apr. 11, 1947	13.8	7,590
	Apr. 20, 1947	13.2	6,200
	May 29, 1947	12.6	5,160
	June 2, 1947	16.5	27,600
	June 5, 1947	16.9	32,000
	June 14, 1947	17.1	34,000
	June 24, 1947	15.5	17,900
1948	Feb. 28, 1948	[b]15.1	12,000
	Mar. 17, 1948	14.4	10,400
	Mar. 19, 1948	15.5	18,100
	Mar. 30, 1948	13.1	5,890
1949	Mar. 8, 1949	c	14,000
1950	Mar. 7, 1950	[b]15.8	18,300
	June 22, 1950	14.1	8,730
	June 25, 1950	14.8	12,600
1951	Feb. 26, 1951	[b]14.33	[a]7,000
	Mar. 2, 1951	13.15	6,200
	Mar. 31, 1951	15.72	20,100
	Apr. 12, 1951	14.06	8,730
	Apr. 28, 1951	12.87	5,650
	May 6, 1951	13.25	6,200
	June 5, 1951	15.24	15,700
	June 22, 1951	12.46	5,060
	July 9, 1951	14.36	10,100

Iowa River near Belle Plaine, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1952	Mar. 14, 1952	14.58	11,300
	Apr. 5, 1952	12.65	5,650
1953	Feb. 21, 1953	[b]13.82	[a]6,500
1954	June 15, 1954	12.86	6,000
	June 20, 1954	13.90	8,010
	June 28, 1954	14.50	10,700
	Aug. 27, 1954	13.79	7,160
	Aug. 31, 1954	14.27	8,350
1955	Oct. 11, 1955	11.02	3,600
1956	May 14, 1956	10.37	2,590
1957	May 31, 1957	13.38	5,240
	June 20, 1957	14.21	6,950
	July 7, 1957	13.49	5,400
1958	July 16, 1958	14.45	7,200
	Sept. 4, 1958	13.94	6,080
	Sept. 6, 1958	13.54	5,370
1959	Mar. 3, 1959	13.15	5,210
	Mar. 14, 1959	13.16	5,210
	Mar. 23, 1959	15.37	14,100
	Mar. 27, 1959	15.02	11,300
	Apr. 28, 1959	13.28	5,370
	May 21, 1959	13.48	5,400
	July 1, 1959	12.72	5,370

a About
b Affected by ice
c Maximum gage height 15.58 ft. Mar. 7 (Backwater from ice)

5-4530 Big Bear Creek at Ladora, Iowa

Location.--Lat 41°44'58", long 92°10'55", in SW1/4 SW1/4 sec. 7, T.80 N., R.11 W., Iowa County, on left bank 10 ft downstream from bridge on county highway V52, 0.4 mile south of Ladora, 1.2 miles downstream from Coats Creek, 2.8 miles upstream from Little Bear Creek, and 8.1 miles upstream from mouth.

Drainage area.--189 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 754.94 ft above mean sea level.

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

Maximum of record.--March 1960: Discharge, 10,500 cfs March 30 (gage height, 14.60 ft).

Remarks.--Base for partial-duration series, 2,000 cfs.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1946	Jan. 5, 1946	13.1	9,050
	Mar. 6, 1946	9.4	3,830
	Mar. 26, 1946	7.8	2,260
	May 3, 1946	8.2	2,590
	June 19, 1946	7.9	2,340
	Sept. 22, 1946	7.73	2,200
1947	Apr. 5, 1947	7.42	2,260
	Apr. 10, 1947	7.68	2,570
	Apr. 20, 1947	7.36	2,200
	June 1, 1947	9.45	5,360
	June 5, 1947	10.90	7,610
	June 13, 1947	10.00	6,650
	June 21, 1947	8.67	3,830
	June 30, 1947	11.35	7,060
1948	Feb. 28, 1948	11.48	7,220
	Mar. 16, 1948	9.60	5,630
	Mar. 19, 1948	7.70	3,250
	July 21, 1948	7.72	3,270

Big Bear Creek at Ladora, Iowa--(Continued)

Peak Stages and Discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1949	Feb. 24, 1949	[b]9.86	[a]2,500
	Mar. 4, 1949	8.74	3,930
1950	Mar. 4, 1950	[b]12.14	[a]6,500
	June 18, 1950	11.64	7,320
	June 24, 1950	11.15	6,840
1951	Feb. 17, 1951	[b]9.12	[a]2,500
	May 26, 1951	8.44	2,860
	July 8, 1951	9.47	3,950
1952	Jan. 19, 1952	[b]10.74	[a]2,500
	Mar. 10, 1952	8.62	3,050
	May 23, 1952	7.56	2,180
1953	Feb. 20, 1953	[b]10.81	[a]4,800
	May 24, 1953	9.95	5,800
	June 8, 1953	8.71	4,170
	June 27, 1953	8.64	3,950
1954	Aug. 26, 1954	10.74	4,010
1955	Oct. 10, 1955	6.62	1,360
1956	July 7, 1956	9.60	2,950
1957	May 30, 1957	11.43	4,600
	July 28, 1957	8.93	2,440
1958	June 13, 1958	9.22	2,130
	Sept. 4, 1958	13.78	5,290
	Sept. 5, 1958	11.08	3,230
1959	Mar. 20, 1959	13.06	4,670
	Apr. 1, 1959	9.15	2,200
	Apr. 28, 1959	8.82	2,150
	May 21, 1959	11.39	3,480
	July 1, 1959	11.08	3,270

Big Bear Creek at Ladora, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1960	Jan. 12, 1960	13.50	4,950
	Mar. 30, 1960	14.60	10,500
	May 6, 1960	12.10	5,940
	May 26, 1960	7.95	2,160
1961	Feb. 18, 1961	11.55	3,800
	Mar. 6, 1961	12.69	4,400
	Mar. 8, 1961	11.33	3,560
	Mar. 13, 1961	11.65	3,740
1962	Mar. 20, 1962	12.11	4,040
	July 14, 1962	10.60	3,160
	July 19, 1962	10.02	2,830
1963	Mar. 4, 1963	[b]10.78	[a]1,900
1964	June 23, 1964	10.93	3,320
1965	Mar. 17, 1965	[b]10.39	2,200
	Mar. 30, 1965	[b]11.77	3,500
	Apr. 1, 1965	11.34	3,580
	Apr. 6, 1965	10.45	3,050
	Sept.21, 1965	11.12	3,240
1966	Feb. 8, 1966	10.90	3,260
	May 17, 1966	9.52	2,530
	May 23, 1966	8.76	2,150
	June 12, 1966	12.69	4,420
1967	Jan. 24, 1967	10.05	2,810
	June 10, 1967	11.97	4,170
1968	Apr. 4, 1968	4.59	668

Big Bear Creek at Ladora, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1969	Mar. 18, 1969	---	2,650
	June 7, 1969	12.09	3,810
	June 8, 1969	12.88	4,290
	June 12, 1969	12.72	4,190
	June 27, 1969	9.97	2,440
	June 30, 1969	12.88	3,930
	July 8, 1969	10.30	2,580
	July 9, 1969	10.38	2,620
	July 26, 1969	9.83	2,370
	Aug. 9, 1969	10.26	2,570
1970	Mar. 3, 1970	13.99	4,590
	Aug. 5, 1970	12.22	3,660
	Sept.15, 1970	9.12	2,460
1971	Oct. 9, 1970	11.71	3,920
	Feb. 20, 1971	---	[a]3,700
	Feb. 26, 1971	12.45	4,360
	July 10, 1971	8.35	2,090

a About
b Affected by ice

5-4531 Iowa River at Marengo, Iowa

Location.--Lat 41°48'41", long 92°03'42", in SW1/4 NE1/4 sec. 24, T.81 N., R.11 W., Iowa County, on right bank 10 ft downstream from abandoned highway bridge, 0.7 mile downstream from Big Bear Creek, 0.8 mile north of Marengo, 4.9 miles upstream from Hilton Creek, and at mile 139.4.

Drainage area.--2,794 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 720.52 ft above mean sea level.

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

Maximum of record.--March 1960: Discharge, 30,800 cfs Mar. 31 (gage height, 19.21 ft).

Remarks.--Base for partial-duration series, 6,000 cfs.

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1957	June 22, 1957	14.82	7,060
1958	July 17, 1958	14.77	7,060
	Sept. 4, 1958	16.34	11,000
1959	Mar. 21, 1959	16.62	14,000
	Mar. 24, 1959	16.92	15,400
	May 21, 1959	14.58	7,390
	July 1, 1959	14.18	6,490
1960	Jan. 14, 1960	16.89	14,000
	Mar. 31, 1960	19.21	30,800
	Apr. 21, 1960	14.44	6,960
	May 10, 1960	16.03	13,500
1961	Feb. 18, 1961	[b]16.80	[a]6,200
	Mar. 8, 1961	16.32	11,500
	Apr. 4, 1961	14.13	6,460
1962	Mar. 20, 1962	16.59	12,700
	Mar. 25, 1962	16.83	15,000
	July 15, 1962	15.58	9,900
	July 20, 1962	16.46	12,300

Iowa River at Marengo, Iowa--(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1963	Mar. 15, 1963	[b]15.10	[a]7,700
	Mar. 19, 1963	13.95	6,600
1964	June 23, 1964	14.08	6,040
1965	Mar. 18, 1965	[b]16.75	7,000
	Apr. 7, 1965	17.84	19,900
	Apr. 25, 1965	15.03	7,770
	Sept. 21, 1965	15.19	8,830
1966	Feb. 9, 1966	16.75	[a]8,600
	May 7, 1966	13.77	6,280
	June 13, 1966	16.20	10,800
	June 17, 1966	16.48	11,600
1967	June 10, 1967	14.62	7,720
1968	Aug. 5, 1968	11.41	3,730
1969	Mar. 23, 1969	17.12	14,100
	Apr. 6, 1969	15.08	7,610
	June 8, 1969	16.24	10,700
	June 12, 1969	16.20	10,600
	June 27, 1969	14.19	6,030
	June 30, 1969	16.24	10,700
	July 12, 1969	19.79	28,300
	July 19, 1969	17.91	16,600
	July 27, 1969	16.21	9,460
	Aug. 9, 1969	14.63	6,050
1970	Mar. 4, 1970	---	[a]10,000
	May 17, 1970	16.23	10,700
	Aug. 6, 1970	14.42	6,370
1971	Oct. 9, 1970	14.52	6,530
	Feb. 20, 1971	---	[a]14,000
	Feb. 27, 1971	---	[a]8,500
	Mar. 18, 1971	16.37	11,100
	July 10, 1971	14.47	6,440

a About
b Affected by ice

☆GPO 1973-761-386