

# FLOODS IN THE ENGLISH RIVER BASIN, IOWA

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U.S. GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS

OPEN-FILE REPORT 81-67

Prepared in cooperation with

Highway Research Board  
Highway Division  
Iowa Department of Transportation



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

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By A.J. Heinitz and D.E. Riddle

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Iowa City, Iowa  
January 1981



05-4551.40 North English River near Montezuma, Iowa

Location.--Lat 41°38'45", long 92°34'20", in SW1/4 sec.14, T.79 N., R.15 W., Poweshiek County, at bridge 5.0 miles northwest of Montezuma.

Drainage area.--31.0 mi<sup>2</sup>.

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 <sup>3</sup> /s)
1973	May 26, 1973	22.51	940
1974	May 28, 1974	26.97	4,000
1975	Mar. 18, 1975	22.45	920
1976	Apr. 24, 1976	21.66	740
1977	Aug. 16, 1977	26.70	3,700
1978	July 20, 1978	28.18	6,800
1979	Mar. 18, 1979	23.75	1,350



Y909 7/2/2011

1. The first part of the report is a description of the project and its objectives. This is followed by a brief overview of the methodology used in the study.

2. The second part of the report is a detailed description of the results of the study. This includes a discussion of the data collected and the analysis of the results.

3. The third part of the report is a conclusion and a discussion of the implications of the findings. This is followed by a list of references and a list of figures and tables.

05-4551.50 North English River near Montezuma, Iowa  
(Prior to 1970 published as "North Fork English River")  
(Discontinued 1973)

Location.--Lat 41°39', long 92°33', in SW1/4 sec.13, T.79 N., R.15 W., Poweshiek County, at bridge on U.S. Highway 63, 5 miles northwest of Montezuma.

Drainage area.--34.0 mi<sup>2</sup>.

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 <sup>3</sup> /s)
1953	Mar. 24, 1953	13.25	4,240
1954	Aug. 26, 1954	7.47	1,270
1955	--	a	<450
1956	June 20, 1956	7.08	1,120
1957	July 28, 1957	12.22	3,700
1958	May 31, 1958	9.13	1,940
1959	Mar. 20, 1959	13.18	4,190
1960	Mar. 30, 1960	11.60	2,000
1961	Mar. 13, 1961	12.95	3,400
1962	--	a	b
1963	Apr. 28, 1963	8.03	990
1964	--	a	b

a Peak stage did not reach bottom of gage.

b Discharge not determined.

05-4551.50 North English River near Montezuma, Iowa-- (Continued)

## Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1965	July 9, 1965	12.23	2,370
1966	June 12, 1966	12.81	3,650
1967	June 9, 1967	8.79	1,130
1968	Aug. 20, 1968	6.18	640
1969	July 8, 1969	10.27	1,650
1970	Mar. 2, 1970	11.12	2,100
1971	Mar. -- 1971	11.09 c	700 d
1972	Apr. 16, 1972	11.90	2,700
1973	May 26, 1973	9.10	1,200

Discontinued 1973

c Affected by ice.  
d About.

05-4552.00 North English River near Guernsey, Iowa  
(Prior to 1970 published as "North Fork English River")

Location.--Lat 41°38', long 92°24', near SW corner sec.17, T.79 N., R.13 W., Poweshiek County, at bridge, 2.2 miles west of Guernsey.

Drainage area.--68.7 mi<sup>2</sup>.

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 <sup>3</sup> /s)
1953	May 24, 1953	11.70	7,000
1954	Aug. 26, 1954	11.35	6,300
1955	Feb. 20, 1955	9.86	4,280
1956	June 20, 1956	5.72	700
1957	July 3, 1957	11.39	2,200
1958	Sept. 10, 1958	11.21	2,130
1959	Mar. 20, 1959	12.65	b
1960	Mar. 30, 1960	13.63	b
1961	Mar. 6, 1961	11.98	b
1962	May 29, 1962	7.11	1,650
1963	Apr. 28, 1963	8.48	b
1964	June 22, 1964	6.64	b
1965	Sept. 21, 1965	8.65	b
1966	June 12, 1966	13.47	4,450
1967	June 9, 1967	8.17	1,780
1968	Aug. 20, 1968	5.88	970
1969	--	a	b

a Peak stage did not reach bottom of gage.  
b Discharge not determined.

05-4552.00 North English River near Guernsey, Iowa-- (Continued)

## Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1970	Aug. 5, 1970	13.18	4,500
1971	Feb. 19, 1971	11.60 c	1,200 d
1972	Aug. 6, 1972	8.53	1,930
1973	Mar. 10, 1973	11.46	3,400
1974	May 28, 1974	13.72	4,400
1975	Aug. 18, 1975	9.15	2,200
1976	Apr. 24, 1976	9.68	2,500
1977	Sept. 18, 1977	14.49	5,200
1978	July 20, 1978	14.25	4,000
1979	Mar. 18, 1979	12.60	2,800

c Affected by ice.

d About.

05-4552.10 North English River at Guernsey, Iowa  
(Prior to 1970 published as "North Fork English River")

Location.--Lat 41°38', long 92°21', in NW1/4 sec.22, T.79 N., R.13 W., Poweshiek County, at bridge on State Highway 21, 1 mile southwest of Guernsey.

Drainage area.--81.5 mi<sup>2</sup>.

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 <sup>3</sup> /s)
1960	Jan. 12, 1960	85.25	3,970
1966	June 12, 1966	85.73	5,300
1967	Apr. 13, 1967	85.21	4,400
1968	--	a	<1,860
1969	July 8, 1969	84.35	3,500
1970	Mar. 2, 1970	86.15	6,600
1971	Feb. 19, 1971	83.86 c	1,400 d
1972	Aug. 6, 1972	85.25	4,400
1973	Mar. 1, 1973	85.05	4,200
1974	May 28, 1974	85.66	5,000
1975	Mar. 18, 1975	83.39	2,800
1976	Apr. 24, 1976	85.03	4,200
1977	Sept. 18, 1977	87.36	7,000
1978	July 20, 1978	86.62	5,500
1979	Mar. 18, 1979	85.44	3,600

a Peak stage did not reach bottom of gage.

c Affected by ice.

d About.

## 05-4552.30 Deep River at Deep River, Iowa

Location.--Lat 41°35', long 92°21', in SW1/4 sec.3, T.78 N., R.13 W., Poweshiek County, at bridge on State Highway 21, 1 mile northeast of Deep River.

Drainage area.--30.5 mi<sup>2</sup>.

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 <sup>3</sup> /s)
1960	Jan. 12, 1960	81.22	1,790
1966	June 12, 1966	82.03	2,400
1967	--	a	<660
1968	--	a	<660
1969	July 8, 1969	80.88	1,240
1970	May 20, 1970	83.85	6,200
1971	Feb. 19, 1971	80.06 c	600
1972	Aug. 6, 1972	80.78	1,220
1973	--	a	<450
1974	Apr. 29, 1974	83.28	5,000
1975	Mar. 18, 1975	80.83	1,250
1976	Apr. 24, 1976	80.52	1,100
1977	Aug. 16, 1977	80.55	1,100
1978	Apr. 18, 1978	80.19	910
1979	Mar. 29, 1979	79.70	720

a Peak stage did not reach bottom of gage.

c Affected by ice.



05-4552.80 South English River tributary near Barnes City, Iowa  
(Prior to 1967 published as "South Fork English River tributary")

Location.--Lat 41°33', long 92°38', near NE corner sec.21, T.78  
N., R.14, W., Poweshiek County, at bridge, 3 miles north of  
Barnes City.

Drainage area.-- 2.41 mi<sup>2</sup>.

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 <sup>3</sup> /s)
1953	June 28, 1953	7.38	400
1954	Aug. 26, 1954	8.21	650
1955	Oct. 10, 1954	6.19	170
1956	Aug. 12, 1956	6.77	263
1957	July 3, 1957	7.38	400
1958	Aug. 15, 1958	6.72	255
1959	July 18, 1959	8.55	793
1960	June 19, 1960	8.57	690
1961	July 27, 1961	8.81	784
1962	Nov. 16, 1961	4.85	123
1963	Mar. 4, 1963	5.21	145
1964	June 22, 1964	5.34	152
1965	July 9, 1965	8.56	686
1966	June 12, 1966	8.33	606
1967	Apr. 13, 1967	7.93	480
1968	Aug. 20, 1968	7.58	385
1969	--	6.13	b

b Discharge not determined.



05-4552.80 South English River tributary near Barnes City, Iowa--  
(continued)

## Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1970	Mar. 2, 1970	9.04	900
1971	Feb. 19, 1971	4.95	80
1972	Apr. 16, 1972	8.87	810
1973	May 26, 1973	6.44	220
1974	May 1, 1974	8.98	620
1975	Mar. 18, 1975	5.18	125
1976	Mar. 5, 1976	8.72	580

Discontinued

05-4553.00 South English River near Barnes City, Iowa  
(Prior to 1967 published as "South Fork English River")

Location.--Lat 41°31', long 92°28', near NW corner sec.34, T.78 N., R.14 W., Poweshiek County, at bridge, 1 mile north of Barnes City.

Drainage area.--11.5 mi<sup>2</sup>.

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 <sup>3</sup> /s)
1953	June 28, 1953	11.40	478
1954	Aug. 26, 1954	10.88	352
1955	Apr. 24, 1955	9.20	157
1956	Aug. 12, 1956	8.43	121
1957	July 3, 1957	9.50	172
1958	July 31, 1958	10.87	318
1959	July 18, 1959	11.73	611
1960	July 12, 1960	12.14	865
1961	July 27, 1961	13.43	1,790
1962	Mar. 19, 1962	11.49	666
1963	Mar. 4, 1963	10.80	298
1964	June 22, 1964	11.42	484
1965	July 9, 1965	12.07	812
1966	June 12, 1966	12.25	1,130
1967	Apr. 13, 1967	11.62	650
1968	Aug. 20, 1968	9.87	300
1969	July 8, 1969	12.95	1,600
1970	Aug. 5, 1970	13.16	1,850

05-4553.00 South English River near Barnes City, Iowa--(Continued)

## Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1971	Feb. 19, 1971	11.35 c	260
1972	Aug. 6, 1972	11.76	610
1973	May 26, 1973	11.77	550
1974	Apr. 29, 1974	12.84	1,100
1975	Mar. 18, 1975	10.46	360
1976	Mar. 5, 1976	11.70	480
1977	Aug. 16, 1977	11.00	310
1978	July 20, 1978	12.37	850
1979	Mar. 18, 1979	11.32	370

c Affected by ice

UNITED STATES DEPARTMENT OF THE INTERIOR

CECIL D. ANDRUS, Secretary

GEOLOGICAL SURVEY

H. William Menard, Director

05-4553.50 South English River tributary No. 2 near Montezuma, Iowa  
(Prior to 1967 published as "South Fork English River  
tributary No. 2")

Location.--Lat 41°34', long 92°27', near SW corner sec.11, t.78  
N., R.14 W., Poweshiek County, at box culvert, 4 miles  
southeast of Montezuma.

Drainage area.-- 0.62 mi<sup>2</sup>.

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 <sup>3</sup> /s)
1953	June 28, 1953	8.53	31
1954	Aug. 26, 1954	8.44	28
1955	Apr. 24, 1955	8.27	23
1956	Aug. 12, 1956	8.52	31
1957	July 3, 1957	8.29	24
1958	Sept. 10, 1958	8.39	27
1959	May 19, 1959	9.43	58
1960	June 19, 1960	11.18	134
1961	July 27, 1961	13.65	344
1962	Mar. 19, 1962	8.68	35
1963	--	a	<19
1964	--	a	<19
1965	July 9, 1965	9.99	80
1966	June 12, 1966	9.87	75
1967	--	a	<19
1968	--	a	<19

a Peak stage did not reach bottom of gage.

05-4553.50 South English River tributary No. 2 nr Montezuma, Iowa--  
(Continued)

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1969	--	a	<19
1970	May 20, 1970	9.98	77
1971	Feb. 19, 1971	8.37 c	20
1972	May 8, 1972	10.74	210
1973	--	a	<19
1974	May 28, 1974	13.53	340
1975	June 18, 1975	8.23	22
1976	Apr. 24, 1976	9.19	50
1977	Aug. 16, 1977	8.65	33
1978	July 20, 1978	9.40	60
1979	June 27, 1979	10.59	100

a Peak stage did not reach bottom of gage.

c Affected by ice.

## 05-4555.00 English River at Kalona, Iowa

Location.--Lat 41°27'59", long 91°42'56", in SE1/4 SE1/4 sec.13, T.77 N., R.8 W., Washington County, on right bank 30 ft upstream from bridge on State Highway 1, 0.8 mile south of Kalona, 1.1 mile upstream from Camp Creek, 4.5 miles downstream from Smith Creek, and 14.5 miles upstream from mouth.

Drainage area.--573 mi<sup>2</sup>.

Gage.--Water-stage recorder. Datum of gage is 633.45 ft National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers). Prior to Dec. 27, 1939, nonrecording gage 30 ft downstream at same datum.

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

Flood stage.--14 ft.

Remarks.--Base for partial-duration series, 4,000 ft<sup>3</sup>/s. Base was 2,800 prior to 1966.

## Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1930	June 30, 1930	19.90 a	18,500
1940	Mar. 19, 1940	7.35	1,400
1941	July 2, 1941	10.0	2,490
1942	Nov. 2, 1941	11.8	3,340
1943	Feb. 5, 1943	13.8 b	3,960 c
	May 1, 1943	11.1	3,000
	May 17, 1943	12.8	4,030
	Aug. 5, 1943	18.11	10,700
1944	Apr. 16, 1944	11.9	3,660
	Apr. 23, 1944	15.3	6,070
	May 22, 1944	15.9	6,810
	May 27, 1944	13.8	4,730
	June 17, 1944	13.2	4,290
1945	Apr. 17, 1945	11.7	3,720
	May 16, 1945	12.8	4,300
	May 18, 1945	11.9	3,790
	June 1, 1945	11.5	3,530
	June 12, 1945	12.7	4,280

a From floodmark, from information by local resident.

b Affected by ice.

c About.



## 05-4555.00 English River at Kalona, Iowa-- (Continued)

## Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1946	Jan. 7, 1946	19.74	16,400
	Mar. 18, 1946	11.3	3,530
	May 5, 1946	13.2	4,860
	June 20, 1946	15.3	6,400
1947	Mar. 13, 1947	10.4	2,860
	Apr. 6, 1947	16.6	7,900
	Apr. 11, 1947	12.3	3,950
	Apr. 21, 1947	14.6	5,620
	May 30, 1947	10.8	3,230
	June 3, 1947	13.3	4,830
	June 7, 1947	14.6	5,880
	June 15, 1947	13.4	4,940
	June 23, 1947	11.7	3,790
1948	July 2, 1947	14.1	5,470
	Feb. 29, 1948	15.7	6,680
	Mar. 17, 1948	15.6	6,630
	Mar. 20, 1948	13.9	5,040
1949	July 22, 1948	12.8	4,290
	Jan. 17, 1949	10.2	2,870
	Feb. 26, 1949	15.7 b	4,000 c
	Mar. 6, 1949	14.3	5,770
1950	Mar. 7, 1950	16.1	8,550
	June 19, 1950	17.33	9,450
	June 25, 1950	10.6	3,110
1951	Feb. 19, 1951	12.26 b	3,700 c
	Mar. 30, 1951	11.84	3,860
	Apr. 8, 1951	11.61	3,740
	May 11, 1951	10.46	3,080
	May 27, 1951	12.70	4,490
	June 26, 1951	11.24	3,500
	July 4, 1951	10.82	3,260
	July 10, 1951	11.06	3,440
1952	Aug. 26, 1951	14.74	6,130
	Nov. 13, 1951	12.09	3,930
	Mar. 12, 1952	15.47	6,840
	Mar. 19, 1952	10.12	2,870
	May 24, 1952	11.02	3,380
1953	June 21, 1952	10.18	2,920
	Feb. 21, 1953	14.43	5,860
	Mar. 31, 1953	10.27	2,970

b Affected by ice.

c About.



## 05-4555.00 English River at Kalona, Iowa-- (Continued)

## Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1954	Aug. 27, 1954	8.90	2,270
1955	Oct. 10, 1954	11.35	3,620
	Apr. 20, 1955	10.83	3,260
	Apr. 25, 1955	13.4	5,020
1956	Aug. 31, 1956	10.78	2,730
1957	July 15, 1957	9.17	2,000
1958	May 31, 1958	9.75	2,200
1959	Feb. 23, 1959	12.80 b	3,300 c
	Feb. 25, 1959	12.23	3,590
	Mar. 21, 1959	17.12	8,960
	Apr. 29, 1959	11.19	3,170
	May 30, 1959	12.54	4,000
1960	Dec. 27, 1959	11.32	3,030
	Jan. 14, 1960	17.59	9,700
	Mar. 31, 1960	19.89	18,500
	May 8, 1960	15.14	6,010
	June 21, 1960	11.94	3,390
	July 10, 1960	11.53	3,150
	July 14, 1960	15.01	5,900
1961	Feb. 23, 1961	11.10	2,910
	Mar. 5, 1961	11.22	2,970
	Mar. 7, 1961	13.69	4,680
	Mar. 14, 1961	15.20	6,120
	Sept. 15, 1961	13.28	4,340
1962	Nov. 4, 1961	15.63	6,560
	Nov. 17, 1961	17.07	8,700
	Nov. 23, 1961	11.24	2,970
	Mar. 21, 1962	18.53	12,000
	May 29, 1962	18.80	13,200
1963	Mar. 8, 1963	12.76 b	3,000 c
1964	June 24, 1964	10.73	3,030

b Affected by ice.

c About.

## 05-4555.00 English River at Kalona, Iowa-- (Continued)

## Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1965	Mar. 18, 1965	14.97	5,620
	Apr. 7, 1965	13.30	4,300
	Apr. 25, 1965	17.65	9,300
	July 2, 1965	11.27	3,190
	July 7, 1965	11.40	3,240
	July 10, 1965	16.31	7,020
	Aug. 31, 1965	16.31	6,900
	Sept. 9, 1965	13.60	4,500
	Sept. 21, 1965	21.45	20,000
BASE REVISED TO 4,000 ft <sup>3</sup> /s			
1966	Feb. 10, 1966	14.55	5,080
	May 19, 1966	15.18	6,100
	May 24, 1966	15.22	6,140
	June 14, 1966	17.65	7,820
	July 27, 1966	14.69	5,590
1967	June 10, 1967	14.47	5,370
1968	Nov. 29, 1967	7.93	1,590
1969	June 10, 1969	12.73	4,010
	June 27, 1969	13.24	4,340
	June 30, 1969	12.93	4,150
	July 10, 1969	15.91	6,900
	July 20, 1969	14.33	5,250
	Aug. 11, 1969	16.04	7,060
1970	Mar. 4, 1970	18.79	13,200
	Aug. 7, 1970	18.77	13,100
	Sept. 17, 1970	16.77	8,160
1971	Feb. 20, 1971	18.44 b	5,300 c
	July 11, 1971	13.57	4,560
1972	Dec. 15, 1971	14.23	5,160
	Mar. 1, 1972	--	4,100 c
	Apr. 22, 1972	14.55	5,450
	May 9, 1972	13.94	4,900
	Aug. 8, 1972	15.81	6,790

b Affected by ice.

c About.

## 05-4555.00 English River at Kalona, Iowa--(Continued)

## Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (ft <sup>3</sup> /s)
1973	Jan. 1, 1973	--	4,200 c
	Jan. 19, 1973	--	4,600 c
	Feb. 2, 1973	12.80	4,100
	Apr. 17, 1973	16.17	7,260
	Apr. 21, 1973	16.62	7,930
	May 6, 1973	15.17	6,030
	May 30, 1973	17.74	9,980
	June 6, 1973	12.98	4,190
1974	Jan. 28, 1974	13.71	4,680
	Jan. 31, 1974	13.58	4,570
	Apr. 30, 1974	19.97	17,000
	May 18, 1974	20.17	18,400
	May 29, 1974	17.80	8,600
	June 7, 1974	13.73	4,060
	June 21, 1974	14.13	4,340
	June 23, 1974	14.42	4,540
	July 11, 1974	14.23	4,410
1975	Mar. 20, 1975	16.04	6,850
1976	Apr. 25, 1976	18.05	10,100
1977	Aug. 16, 1977	11.98	3,520
1978	Mar. 22, 1978	13.90	4,950
	Apr. 10, 1978	13.68	4,690
	Apr. 19, 1978	13.23	4,360
	May 14, 1978	14.86	5,760
	July 23, 1978	15.70	6,340
1979	Mar. 19, 1979	18.59	12,100
	Mar. 30, 1979	15.49	5,930
	Apr. 22, 1979	13.81	4,570

c About.

## 05-4555.50 Bulgers Run near Riverside, Iowa

Location.--Lat 41°29', long 91°38', in SE1/4 sec.11, T.77 N., R.7 W., Washington County, at bridge on State Highway 22, 2.5 miles west of Riverside.

Drainage area.--6.31 mi<sup>2</sup>.

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 <sup>3</sup> /s)
1965	Sept. 21, 1965	89.04	3,080
1966	May 23, 1966	86.86	1,600
1967	Apr. 13, 1967	86.19	1,330
1968	June 24, 1968	85.51	1,090
1969	July 13, 1969	86.79	1,570
1970	Sept. 22, 1970	87.08	1,750
1971	Feb. 19, 1971	86.05 c	500 d
1972	Sept. 11, 1972	88.13	2,350
1973	Apr. 22, 1973	87.54	2,000
1974	May 7, 1974	88.13	2,350
1975	Mar. 19, 1975	85.65	950
1976	Apr. 24, 1976	86.47	1,370
1977	--	a	b
1978	Apr. 12, 1978	88.07	2,300
1979	Apr. 20, 1979	87.20	1,800

a Peak stage did not reach bottom of gage.

b Discharge not determined.

c Affected by ice.

d About.



## TEMPORARY BENCH MARKS

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### ENGLISH RIVER BASIN

#### IOWA

The temporary bench marks listed in this tabulation have been established by the Water Resources Division, Iowa District, U.S. Geological Survey. Elevations for the bench marks were established by the U.S. Geological Survey except those for which credit is given in the description of the bench mark. The leveling work was done as a part of a stream profile project cooperatively financed by the Highway Research Board, Highway Division, Iowa Department of Transportation and the U.S. Geological Survey.

The streams covered by the level work were the English River, the North English River to near Guernsey, the South English River to Barnes City and the lower reaches of the Middle English and Deep Rivers.

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 or from third order bench marks established and adjusted by the U.S. Geological Survey, Topographic Division. Errors of closure in the Water Resources Division's level work were adjusted throughout the line to the elevations published by the National Geodetic Survey and the Topographic Division. These bench marks are repeated in this listing. All elevations are in National Geodetic Vertical Datum of 1929.





The bench marks have been identified by an index number which is composed of the Congressional township, range, and section number 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-inch 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. Marks indicated as, (REFERENCE POINT), 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 facing in the direction of the flow of the streams.

Additional information, if available, can be obtained by writing to the following address: U.S. Geological Survey, P.O. Box 1230, 400 South Clinton Street, Iowa City, Iowa 52244.



- 7706-15 NW (1) - (REFERENCE POINT) About 2 miles east of Riverside, at highway 218 bridge over English River, at center downstream vertical truss member, on support for top guardrail, a filed arrow.  
Elev. 634.34 feet.
- 7706-17 SW (1) - (REFERENCE POINT) At Riverside, at county road W61 bridge over English River, on downstream curb at 30th guardrail post from right, a chiseled square.  
Elev. 637.07 feet.
- 7706-18 SE (1) - At Riverside, at county road W61 bridge over English River, on top right upstream wingwall, a chiseled square, TBM-E3.  
Elev. 635.70 feet.
- 7706-16 NE (1) - About 2 miles east of Riverside, at highway 218 bridge over English River, on right upstream pier, a standard USGS tablet stamped "92-4".  
Elev. 626.154 feet.
- 7707-17 SW (1) - About 2 miles southeast of Kalona, at county road bridge over English River, on left upstream wingwall, a chiseled square, "TBM-E7".  
Elev. 648.65 feet.
- 7707-17 SW (2) - (REFERENCE POINT) About 2 miles southeast of Kalona, at county road bridge over English River, on 2nd downstream vertical bridge truss member from left, a filed arrow.  
Elev. 660.36 feet.
- 7707-20 NW (1) - About 2 miles southeast of Kalona, at a county road bridge over a small creek, on right downstream wingwall, a chiseled square.  
Elev. 654.15 feet.
- 7708-07 SE (1) - About 5.2 miles west of Kalona, near a T-road south, 400 feet east and 23 feet north, a standard USGS tablet stamped "8 WEK 1969".  
Elev. 707.392 feet.
- 7708-07 SW (1) - About 1.5 miles north of Wellman, at highway 114 bridge over English River, on left end of downstream curb, a chiseled cross.  
Elev. 684.13 feet.
- 7708-07 SW (2) - (REFERENCE POINT) About 1.5 miles north of Wellman, at highway 114 bridge over English River, on top of downstream guardrail post, 17th post from right end bridge, a chiseled arrow.  
Elev. 686.93 feet.
- 7708-08 SW (1) - About 4.5 miles west of Kalona, at a county road bridge over English River, at left downstream pier, a chiseled cross on bolt, TBM12.  
Elev. 672.78 feet.
- 7708-08 SW (2) - (REFERENCE POINT) About 4.5 miles west of Kalona, at county road bridge over English River, on center downstream vertical bridge member, a filed notch, (92-5).  
Elev. 680.40 feet.
- 7708-10 SE (1) - About 2 miles west of Kalona, at highway 22 bridge over English River, on top of right upstream wingpost, a chiseled square.  
Elev. 671.39 feet.
- 7708-10 SE (2) - (REFERENCE POINT) About 2 miles west of Kalona, at highway 22 bridge over English River, on top of downstream guardrail post, 11th post from right, a chiseled U.  
Elev. 671.86 feet.
- 7708-13 SE (1) - About 1 mile south of Kalona, at highway 1 bridge over English River, at basehouse at right upstream end of bridge, on top of triangular step, at downstream streamward corner.  
Elev. 650.95 feet.
- 7708-15 NE (1) - About 0.2 mile downstream of state highway bridge over the English River, about 500 ft. west along torn up track from an abandoned and dilapidated railroad bridge over the English River, in the base of a train top rake pole, railroad spike.  
Elev. 663.70 feet.

- 7708-15 NW (1) - About 2.5 miles west of Kalona, at intersection of highway 22 and north-south county road, 106 feet north and 30 feet west of intersection, a standard USGS tablet, 9WEK1969.  
Elev. 663.038 feet.
- 7708-17 NW (1) - About 4.5 miles west of Kalona, at a T-road worth, 65 feet west and 33 feet south, railroad spike in base of power pole.  
Elev. 770.28 feet.
- 7709-03 SW (1) - About 3 miles northwest of Wellman, at highway W21 bridge over English River, on right downstream windwall curb, a chiseled square, TBM E-17.  
Elev. 691.70 feet.
- 7709-03 SW (2) - (REFERENCE POINT) About 3 miles northwest of Wellman, at highway W21 bridge over English River, on top of 21st downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 694.32 feet.
- 7709-07 NW (1) - About 5.5 miles west of Wellman, at old pony truss bridge over South English River, on top of right downstream pier, on a bolt, a chiseled cross.  
Elev. 696.46 feet.
- 7709-07 NW (2) - (REFERENCE POINT) About 5.5 miles west of Wellman, at old pony truss bridge over South English River, on center downstream vertical truss member, a filed arrow.  
Elev. 702.16 feet.
- 7709-07 SW (1) - About 5.5 miles northwest of Wellman, at junction of county roads, 136 feet north of T-road west, 14 feet south and 30 feet east of a east driveway, a standard tablet stamped 6 WEK 1969.  
Elev. 792.938 feet.
- 7709-09 SE (1) - About 3 miles northwest of Wellman, at intersection of highway 21 and county road, in center of intersection, a highway commission plus, UE6D.  
Elev. 760.50 feet.
- 7709-12 SE (1) - About 1 mile north of Wellman, at intersection of highway 114 and county road, in center of intersection, a highway commission plus, UE7D.  
Elev. 762.320 feet.
- 7710-08 NW (1) - About 4 miles northeast of South English, between T-road north and T-road south of east-west county road, 33 feet south and 228 feet west of a farm drive, 112 feet northwest of northwest corner of a large house, 11 feet north of a fence corner post, a standard tablet stamped "1 DWE 1964".  
Elev. 831.946 feet.
- 7710-08 SE (1) - About 4 miles northeast of South English, across road from Russel Bucher farm (1979), 24 feet east of road, in base of power pole, spike and collar.  
Elev. 813.90 feet.
- 7710-11 SE (1) - About 2 miles northeast of Kinross, at county road bridge over South English River, at right upstream bridge seat, on top of a 1 inch bolt, a chiseled cross.  
Elev. 704.90 feet.
- 7710-11 SE (2) - (REFERENCE POINT) About 2 miles northeast of Kinross, at county road bridge over South English River, at center and top of downstream side of pony truss bridge, about 5 feet above bridge floor, a filed arrow.  
Elev. 712.14 feet.
- 7710-12 NW (1) - About 3 miles northeast of Kinross, at county road bridge over a small creek, on top of right upstream windwall support post (12 inch dia.), a copper nail and washer. UE: 2 DWE DD.  
Elev. 706.680 feet.

- 7710-15 NE (1) - About 1.5 miles north of Kinross, at county road bridge over South English River, at right downstream bridge seat, on hex point of 6 inch nut, 2 chisel marks.  
Elev. 711.10 feet.
- 7710-15 NE (2) - (REFERENCE POINT) About 1.5 miles north of Kinross, at county road bridge over South English River, on first downstream vertical bridge member from right end bridge, a filed arrow.  
Elev. 718.28 feet.
- 7710-15 SE (1) - About 1 mile north of Kinross, near center of west-south bend in road, on top of southwest headwall of concrete box culvert, a chiseled square next to IHC plus. UE 2 DWE A.  
Elev. 743.980 feet.
- 7710-17 NE (1) - About 3.5 miles northeast of South English, at county road bridge over South English River, on downstream curb at right end of bridge, a chiseled square. TBM E24.  
Elev. 725.92 feet.
- 7710-17 NE (2) - (REFERENCE POINT) About 3.5 miles northeast of South English at county road bridge over South English River, on top of 15th downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 727.95 feet.
- 7711-13 NE (1) - About 2.5 miles northeast of South English, at county road bridge over the South English River, on a support pile for the right upstream wingwall, 3/8" spike and collar.  
Elev. 727.40 feet.
- 7711-14 SW (1) - About 1.5 miles north of South English, on county T-road west, on bridge over a small creek, on right downstream end of bridge on wooden pier, a chiseled cross on iron pin.  
Elev. 737.22 feet.
- 7711-14 SE (1) - About 1 mile north of South English, at highway 149 bridge over South English River, on right downstream wingwall, a highway commission plus.  
Elev. 741.12 feet.
- 7711-14 SE (2) - (REFERENCE POINT) About 1 mile north of South English, at highway 149 bridge over South English River, at downstream side bridge, at 2nd vertical bridge member from right, on top guardrail support, a chiseled arrow.  
Elev. 744.18 feet.
- 7711-15 SW (1) - About 1.5 miles northwest of South English, at railroad bridge over South English River, on right downstream abutment, a standard tablet stamped "D 86 1934".  
Elev. 746.212 feet.
- 7711-18 NW (1) - (REFERENCE POINT) About 2.5 miles northeast of South English, at a county road bridge over South English River, on top of 5th downstream guardrail support from right end of bridge, a chiseled arrow.  
Elev. 730.74 feet.
- 7711-19 NW (1) - About 2 miles north of Webster, at county road bridge over South English River, on right downstream wingwall, a chiseled square.  
Elev. 764.55 feet.
- 7711-19 NW (2) - (REFERENCE POINT) About 2 miles north of Webster, at county road bridge over South English River, on top of 12th downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 765.59 feet.
- 7711-20 NW (1) - About 1.7 miles north of Webster, at small pony truss bridge over South English River, on left downstream end of truss, a chiseled cross on top of a rivet.  
Elev. 749.31 feet.
- 7711-20 NE (1) - About 2 miles northeast of Webster, near a concrete bridge, 200 feet upstream on left bank, in base of power pole, a las bolt.  
Elev. 743.45 feet.

- 7711-20 NE (2) - About 2 miles northeast of Webster, at a county road bridge over a small Creek, on downstream curb at right end of bridge, a chiseled square.  
Elev. 751.36 feet.
- 7711-20 NE (3) - About 2 miles northeast of Webster, at county road bridge over South English River, on upstream curb at left end of bridge, a chiseled square.  
Elev. 752.60 feet.
- 7711-21 NE (1) - About 2.5 miles northeast of Webster, at a concrete railroad bridge over a small Creek, on right downstream abutment, a chiseled square.  
Elev. 761.03 feet.
- 7711-21 NW (1) - (REFERENCE POINT) About 2 miles northeast of Webster, at county road bridge over South English River, on top of the 14th downstream guardrail post from left abutment, a chiseled arrow.  
Elev. 754.51 feet.
- 7712-15 SW (1) - (REFERENCE POINT) About 1.25 miles north of Keswick, at county road bridge over South English River, on the 8th downstream guardrail post from left end of bridge, a chiseled arrow.  
Elev. 781.36 feet.
- 7712-16 SE (1) - About 1.25 miles north of Keswick, at county road bridge over South English River, on upstream curb at right end bridge, a chiseled square.  
Elev. 781.36 feet.
- 7712-16 NE (1) - About 1.75 miles north of Keswick, 42 feet west and 77 feet south of drive to Bowman farm (1979), in base of power pole a 60d spike. UE: 24 DWE B.  
Elev. 821.560 feet.
- 7712-16 SW (1) - About 1.5 miles northwest of Keswick, at county road bridge over South English River, at right end of downstream truss, a chiseled cross on truss bolt.  
Elev. 782.14 feet.
- 7712-16 SW (2) - (REFERENCE POINT) About 1.5 miles northwest of Keswick, at county road bridge over South English River, on top of pony truss, over 3rd vertical member from right, a chiseled open square.  
Elev. 788.17 feet.
- 7712-16 SW (3) - About 1.5 miles northwest of Keswick, at county road bridge over South English River, on right downstream bridge seat, 2 chisel marks on bolt (found loose), 1974 BM.  
Elev. 779.31 feet.
- 7712-17 SW (1) - (REFERENCE POINT) About 2.5 miles northwest of Keswick, at county road bridge over South English River, at downstream center cross member of truss, on tip of beveled end of angle iron, a chiseled arrow.  
Elev. 788.21 feet.
- 7712-18 NW (1) - (REFERENCE POINT) About 3.5 miles northwest of Keswick, at county road bridge over South English River, on top of 12th downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 798.30 feet.
- 7712-18 SE (1) - About 2.5 miles northwest of Keswick, at county road bridge over South English River, at left upstream bridge seat, a chiseled square at end of an I-beam.  
Elev. 783.73 feet.
- 7712-23 NE (1) - About 2.5 miles northwest of Webster, at county road bridge over South English River, on right upstream windpost, a chiseled square.  
Elev. 770.45 feet.
- 7712-24 NW (1) - (REFERENCE POINT) About 2.5 miles northwest of Webster, at county road bridge over South English River, on 14th downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 770.54 feet.



- 7713-05 SE (1) - About 1 mile northeast of Gibson, at top of prominent hill (original E-W road returned to cultivation), accessible from west by a dirt road almost leading to monument, between 2 wooden posts, 30 feet north of east-west fence, a standard tablet stamped "ET 14 DHB 1964".  
Elev. 890.779 feet.
- 7713-05 NW (1) - About 1.8 miles north of Gibson, at county road bridge over South English River, at downstream end of right pile pier, on downstream end of streamward C-iron, a chiseled square.  
Elev. 815.13 feet.
- 7713-05 NW (2) - (REFERENCE POINT) About 1.8 miles north of Gibson, at county road bridge over South English River, on top of 7th downstream guardrail post from right end bridge, a chiseled arrow.  
Elev. 820.98 feet.
- 7713-06 SW (1) - About 1.0 mile northwest of Gibson along E-W county road, approx. 0.1 mile east of county line, 32 ft. north of road and 18 ft. west of drive to a farm, 2 ft. south of a white fence, 4 ft. south of a power pole; a standard tablet stamped "28 DWE 1964".  
Elev. 895.977 feet.
- 7713-08 NE (1) - About 1 mile northeast of Gibson, at county road bridge over South English River, in support pile of right upstream windwall, a railroad spike.  
Elev. 805.19 feet.
- 7713-08 NW (1) - About 1 mile north of Gibson, at crossroads of county roads (T-road west), 30 feet south and 34-feet east, in base of power pole, a railroad spike.  
Elev. 881.43 feet.
- 7713-09 NW (1) - (REFERENCE POINT) About 1 mile northeast of Gibson, at county road bridge over South English River, at center of downstream edge of concrete slab, a chiseled arrow.  
Elev. 806.62 feet.
- 7713-09 SE (1) - About 2.5 miles northwest of Thornburg, at highway 21 bridge over South English River, on left upstream windwall, a department of transportation plus.  
Elev. 804.46 feet.
- 7713-10 NW (1) - About 3 miles north of Thornburg, at intersection of highway 21 and county road, 41 feet south and 58 feet east, 5 feet north of a power pole and 4 feet northwest of a corner post, a standard tablet stamped "27 DWE 1964".  
Elev. 885.357 feet.
- 7713-10 SW (1) - (REFERENCE POINT) About 2.5 miles northwest of Thornburg, at highway 21 bridge over South English River, on top of 9th downstream concrete guardrail post from left end of bridge, a chiseled open square.  
Elev. 807.50 feet.
- 7713-12 SW (1) - About 4.5 miles northwest of Keswick, at county road bridge over South English River, on downstream curb at left end of bridge, a chiseled square.  
Elev. 794.94 feet.
- 7713-12 SW (2) - (REFERENCE POINT) About 4.5 miles northwest of Keswick, at county road bridge over South English River, on top of 7th downstream guardrail post from left end of bridge, a chiseled arrow.  
Elev. 796.84 feet.
- 7713-13 NE (1) - About 3.5 miles northwest of Keswick, at county road bridge over South English River, at right end of bridge on upstream curb, a chiseled square.  
Elev. 796.10 feet.
- 7714-01 NW (1) - (REFERENCE POINT) About 2 miles east of Barnes City, at a north-south county road over the South English River, on 4th downstream guardrail post from left end bridge, a chiseled arrow.  
Elev. 832.09 feet.

- 7714-02 NE (1) - About 2.0 miles east of Barnes City, at a North-South county road bridge over the South English River, on the left end of the upstream curb, chiseled square.  
Elev. 829.96 feet.
- 7714-02 NE (2) - (REFERENCE POINT) About 1.8 miles east of Barnes City, at east-west county road bridge over South English River, on top of the 3rd downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 834.18 feet.
- 7714-12 NW (1) - About 2 miles southeast of Barnes City, at T-road north intersection, 29 feet south and 6 feet east, in base of power pole, railroad spike.  
Elev. 901.07 feet.
- 7809-31 NW (1) - (REFERENCE POINT) About 6.5 miles east of North English, at bridge over English River, on support for 16th downstream guardrail post from left end of bridge, below level of curb, 2 file marks.  
Elev. 705.47 feet.
- 7810-07 NW (1) - About 4.5 miles north of North English, south of intersection of highways 149 and V66, 41 feet east of highway 149 and 13 feet south of driveway to farm, in power pole, a railroad spike.  
Elev. 749.15 feet.
- 7810-07 SW (1) - (REFERENCE POINT) About 4 miles north of North English, at highway 149 bridge over the North English River, at 3rd downstream vertical bridge member from right end bridge, on top streamward corner of top guardrail support, a chiseled arrow.  
Elev. 731.17 feet.
- 7810-12 SE (1) - About 4 miles north of North English, at highway 149 bridge over the North English River, on the upstream end of the left streamward pier, TBM E-39, a chiseled square.  
Elev. 723.05 feet.
- 7810-20 SE (1) - About 2 miles east of North English, at county road bridge over North English River, on top of right downstream pier, a chiseled square.  
Elev. 710.45 feet.
- 7810-20 SE (2) - (REFERENCE POINT) About 2 miles east of North English, at county road bridge over North English River, on top of upper guardrail support at center downstream vertical bridge member, an arrow of punched dots.  
Elev. 716.96 feet.
- 7810-20 SW (1) - About 2.5 miles northeast of North English, at railroad bridge over North English River, on 1st downstream bolt from left end of bridge UE 39 C DWB.  
Elev. 716.870 feet.
- 7810-20 NW (1) - About 3 miles northeast of North English, at county road bridge over North English River, on right downstream end of curb, a chiseled square, TBM E 38.  
Elev. 720.64 feet.
- 7810-20 NW (2) - (REFERENCE POINT) About 3 miles northeast of North English, at county road bridge over North English River, on top of 17th downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 722.85 feet.
- 7810-27 SE (1) - About 4 miles east of North English, at highway F67 bridge over North English River, on left downstream windwall, bolt embedded in concrete.  
Elev. 710.91 feet.
- 7810-27 SE (2) - (REFERENCE POINT) About 4 miles east of North English, at highway F67 bridge over North English River, on top of 16th downstream guardrail post from left end of bridge, a chiseled arrow.  
Elev. 712.86 feet.

- 7810-28 NW (1) - About 3 miles east of North English at abandoned bridge over North English River, on downstream end of right pier, a chiseled square TBM E-29.  
Elev. 708.44 feet.
- 7810-28 NW (2) - (REFERENCE POINT) About 3 miles east of North English, at abandoned bridge over North English River, on downstream guardrail 6 foot streamward from 2nd vertical bridge member from left end of bridge, 2 file marks, RP 48-9.  
Elev. 714.96 feet.
- 7810-28 NE (1) - About 3.5 miles east of North English, at end of abandoned road, on top center of south headwall of a 5 foot culvert, a chiseled square.  
Elev. 705.74 feet.
- 7810-30 NW (1) - About 1.5 miles north of North English, at state highway 149 bridge over the North English River, on the left end of the downstream truss, on downstream - landward rivet, chiseled cross.  
Elev. 726.57 feet.
- 7810-30 NW (2) - (REFERENCE POINT) About 1.5 miles north of North English, at State Highway 149 bridge over North English River, five feet left of 2nd downstream vertical bridge member, on top of guardrail, a chiseled arrow.  
Elev. 730.44 feet.
- 7810-30 NE (1) - About 3.0 miles northeast of North English, at the C. M. St. P. & P. railroad bridge over the Middle English River, on the downstream end of the right abutment, a standard tablet stamped 'Y85'.  
Elev. 725.645 feet.
- 7810-30 NE (2) - About 3 miles northeast of North English at a small country road bridge over the Middle English River, on the right end of the downstream truss, on top of a rivet, chiseled cross.  
Elev. 716.40 feet.
- 7810-30 NE (3) - (REFERENCE POINT) About 3 miles northeast of North English, at a small country road bridge over the Middle English River, on the 1st downstream vertical bridge member from the right end of bridge, a filed arrow.  
Elev. 721.10 feet.
- 7810-36 NE (1) - About 6.5 miles east of North English, at bridge over English River, on right upstream wingwall, a chiseled cross.  
Elev. 704.91 feet.
- 7811-01 SW (1) - (REFERENCE POINT) About 5 miles north of North English, at highway F52 bridge over the North English River, on top of 17th downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 733.39 feet.
- 7811-02 SW (1) - About 5 miles north of North English, at highway F52 bridge over a small Creek, on top of curb at right upstream end of bridge, a chiseled square.  
Elev. 731.75 feet.
- 7811-02 SE (1) - About 5 miles north of North English, at highway F52 bridge over the North English River, on top of curb at left upstream end of bridge, a chiseled square. TBM E-40.  
Elev. 731.09 feet.
- 7811-03 NW (1) - About 6 miles northwest of North English, at county road bridge over North English River, on left downstream curb, a chiseled square, NE 21B CDL.  
Elev. 739.950 feet.
- 7811-03 NW (2) - (REFERENCE POINT) About 6 miles northwest of North English, at county road bridge over North English River, on 17th downstream guardrail post from left end of bridge, a chiseled arrow.  
Elev. 741.98 feet.

- 7811-04 E - About 5.5 miles northwest of North English, at intersection of highway FS2 and county road, 39 feet north and 36 feet west, a rail-road spike in base of power pole.  
Elev. 838.46 feet.
- 7811-10 SW (1) - About 4.5 miles northwest of North English, near a T-rd west, 200 ft. north and 30 ft. E, and 15 ft. south of a private drive; a standard tablet stamped "22 CDL 1966"  
Elev. 854.486 feet.
- 7811-20 NW (1) - About 5.0 miles northwest of North English, at county highway V52 bridge over the Middle English River, on top of 1st downstream guardrail post from left end of bridge; two chiseled marks.  
Elev. 760.98 feet.
- 7811-20 NW (2) - (REFERENCE POINT) About 5 miles northwest of North English, at county road V52 bridge over Middle English River, on top of 10th downstream guardrail post from left end of bridge, a chiseled arrow.  
Elev. 761.11 feet.
- 7811-22 NW (1) - About 3.5 miles northwest of North English, at a "culvert-type" bridge over the Middle English River, on top of the left end of the downstream guardrail; chiseled square.  
Elev. 743.38 feet.
- 7811-22 NW (2) - (REFERENCE POINT) About 3.5 miles northwest of North English, at a culvert-type bridge over Middle English River, on downstream edge of concrete guardrail, about 6 feet from right end, a chiseled square.  
Elev. 743.29 feet.
- 7811-22 NW (3) - About 3 miles northwest of North English, in southeast corner of intersection of country crossroads; punched hole in a 3 ft. metal culvert.  
Elev. 775.15 feet.
- 7811-25 NW (1) - About 1.75 miles north of North English, at a country road bridge over the Middle English River, on the left end of the downstream truss, on top of a rivet; chiseled cross.  
Elev. 733.36 feet.
- 7811-25 NW (2) - (REFERENCE POINT) About 1.8 miles north of North English, at county road bridge over Middle English River, at center downstream vertical bridge member, on top of guardrail support, a chiseled arrow.  
Elev. 737.84 feet.
- 7812-04 NE (1) - About 5 miles northwest of Millersburg, at a country road bridge over the North English River, on the right end of the downstream truss, on top of a rivet; chiseled cross.  
Elev. 767.60 feet.
- 7812-04 NE (2) - (REFERENCE POINT) About 5 miles northwest of Millersburg at county road bridge over North English River, on the 2nd downstream vertical bridge truss member from right end of bridge, a chiseled arrow.  
Elev. 771.98 feet.
- 7812-04 SE (1) - About 4.5 miles northwest of Millersburg, 485 ft. E of T-rd north, 34 ft. north of road, at crest in fence line, 1 ft south of E-W fence, 6 ft. SE of witness post, a standard tablet stamped "22 DWB 1966 869".  
Elev. 868.650 feet.
- 7812-05 SW (1) - About 4 miles east of Deep River, at county highway V38 bridge over Deep River, on right downstream bridge seat; two chiseled marks.  
Elev. 777.45 feet.
- 7812-05 SW (2) - (REFERENCE POINT) About 4 miles east of Deep River, at county road V38 bridge over Deep River, on top of the 9th downstream guardrail post from the right end of bridge, a chiseled arrow.  
Elev. 783.41 feet.



- 7812-05 SW (3) - About 4.5 miles east of Deer River, at an L-curve in county road, on south end of 3 ft. metal pipe culvert; punched hole.  
Elev. 768.80 feet.
- 7812-06 SW (1) - About 3 miles east of Deer River, at a county road bridge over the Deer River, on the left end of the downstream truss; on downstream landward-most rivet; chiseled cross.  
Elev. 789.39 feet.
- 7812-06 SW (2) - (REFERENCE POINT) About 3 miles east of Deer River, at county road bridge over Deer River, on the left upstream edge of the center downstream vertical bridge member, 5 inches above swardrail, a chiseled notch.  
Elev. 793.67 feet.
- 7812-14 SW (1) - About 8.0 miles northwest of North English, on east side of Junction of N-S country road and T-rd. west, in base of a power pole; a railroad spike.  
Elev. 859.33 feet.
- 7812-15 SW (1) - About 9.0 miles northwest of North English, at a country road bridge over a small creek, on the right upstream wingwall; chiseled square.  
Elev. 793.54 feet.
- 7812-22 NW (1) - About 9.0 miles northwest of North English, at a country road bridge over the Middle English River, on the left downstream wingwall; a standard tablet stamped "23 DWB 1966"  
Elev. 789.798 feet.
- 7812-22 NW (2) - (REFERENCE POINT) About 9 miles northwest of North English, at a county road bridge over Middle English River, on top of the 4th downstream swardrail post from left end of bridge, a filed arrow.  
Elev. 791.82 feet.
- 7812-23 NW (1) - About 8.0 miles northwest of North English, at a country road bridge over the Middle English River, on the left downstream wingwall; chiseled square.  
Elev. 784.09 feet.
- 7812-23 NW (2) - (REFERENCE POINT) About 8 miles northwest of North English, at county road bridge over the Middle English River, on top of 5th downstream swardrail post from right end of bridge, a chiseled square.  
Elev. 785.70 feet.
- 7812-24 SW (1) About 7.0 miles northwest of North English, at a country road bridge over the Middle English River, on the left downstream batter post at swardrail level, on a rivet; chiseled cross.  
Elev. 773.09 feet.
- 7812-24 SW (2) - (REFERENCE POINT) About 7 miles northwest of North English, at county road bridge over Middle English River, on the 1st downstream vertical bridge member from the right end of bridge, a filed arrow.  
Elev. 773.77 feet.
- 7813-01 SW (1) - About 2 miles east of Deer River, at a county road bridge over Deer River, on the left downstream batter post at swardrail level, on a rivet; chiseled cross.  
Elev. 795.05 feet.
- 7813-01 SW (2) - (REFERENCE POINT) About 2 miles east of Deer River, at a county road bridge over Deer River, on the center downstream vertical bridge member, a chiseled arrow.  
Elev. 795.51 feet.
- 7814-34 NW (1) - About 1 mile north of Barnes City, at CSG site on county road bridge over South English River, on right downstream wingwall; chiseled square.  
Elev. 844.72 feet.

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- 7814-35 SW (1) - About 1 mile northwest of Barnes City, at county road bridge over South English River, on right downstream bank, in a power pole, a spike and collar.  
Elev. 833.25 feet.
- 7814-35 SW (2) - About 1 mile northeast of Barnes City, at a county road bridge over the South English River, on the right end of the downstream curb; chiseled square.  
Elev. 837.44 feet.
- 7814-35 SW (3) - (REFERENCE POINT) About 1 mile northeast of Barnes City, at county road bridge over South English River, on top of the 4th downstream guardrail post from right end bridge, a chiseled arrow.  
Elev. 839.59 feet.
- 7814-35 SE (1) - About 1.75 miles east of Barnes City, at east-west country road bridge over the South English River, on the right end of the upstream curb; chiseled square.  
Elev. 832.02 feet.
- 7911-32 NE (1) - About 2.5 miles north of Millersburg, at crossroads of county roads near center of section, in northeast corner of intersection, in power pole, a railroad spike.  
Elev. 775.90 feet.
- 7911-32 SE (1) - About 2 miles north of Millersburg, at county road V52 bridge over North English River, on downstream curb at left end of bridge, a chiseled cross.  
Elev. 745.54 feet.
- 7911-32 SE (2) - (REFERENCE POINT) About 2 miles north of Millersburg, at county road V52 bridge over North English River, on 12th downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 747.84 feet.
- 7911-34 NW (1) - About 7 miles northwest of North English, at T-road west near quarter corner of section 34, 39 feet north and 32 feet east of intersection, in base of power pole, a railroad spike.  
Elev. 745.08 feet.
- 7912-19 NW (1) - About 3 miles east of Guernsey, at a bridge over the North English River, on the right upstream wingwall; a chiseled square.  
Elev. 790.55 feet.
- 7912-19 NW (2) - (REFERENCE POINT) About 3 miles east of Guernsey, at county road bridge over North English River, at the center downstream vertical bridge member, on top of guardrail support, a chiseled arrow.  
Elev. 793.55 feet.
- 7912-20 SW (1) - About 7.5 miles northwest of Millersburg, at county highway bridge over the North English River, on the right downstream wingwall; chiseled cross.  
Elev. 785.75 feet.
- 7912-20 SW (2) - (REFERENCE POINT) About 7.5 miles northwest of Millersburg, at county highway bridge over North English River, on top of 12th downstream guardrail post from right end bridge, a chiseled arrow.  
Elev. 788.16 feet.
- 7912-26 SE (1) - About 4 miles northwest of Millersburg, at T-road north of offset county crossroads, 50 feet south and 27 feet west, in base of power pole, a spike and collar.  
Elev. 761.24 feet.
- 7912-27 SE (1) - About 4.5 miles northwest of Millersburg, at T-road west at southeast corner of section, at bridge over small Creek, on left upstream wingwall pile, a railroad spike.  
Elev. 765.46 feet.
- 7912-28 SE (1) - About 6 miles northwest of Millersburg, at St. John's Lutheran cemetery, at center of 2nd step from bottom of main gate, a chiseled cross, UE 21A DWB.  
Elev. 846.230 feet.

- 7912-28 SW (1) - About 6 miles northwest of Millersburg, at St. John's Lutheran Church, 184 ft. north of entrance to church, 4 ft. south and 48 ft. E of T-rd W, 6 ft. NE of a power pole, 1 ft. west of a fence and 5 ft. north of a corner post; a standard tablet stamped "21 DWB 1966 859".  
Elev. 859.512 feet.
- 7912-29 SE (1) - About 6.5 miles northwest of Millersburg, at a county road bridge over the North English River, on top of the left downstream windpost; chiseled square.  
Elev. 783.55 feet.
- 7912-29 SE (2) - (REFERENCE POINT) About 6.5 miles northwest of Millersburg, at county road bridge over North English River, on top of 12th downstream guardrail post from left end of bridge, a chiseled arrow.  
Elev. 783.42 feet.
- 7912-29 NW (1) - About 7.5 miles northwest of Millersburg, in northeast corner of intersection at county highway V38 and an E-W country road, railroad spike in base of a power pole.  
Elev. 820.28 feet.
- 7912-34 SE (1) - About 4 miles northwest of Millersburg, at county road bridge over North English River, on right upstream end of curb, a chiseled cross.  
Elev. 763.27 feet.
- 7912-35 SW (1) - (REFERENCE POINT) About 4 miles northwest of Millersburg, at county road bridge over North English River, on 14th downstream guardrail support from right end of bridge, a chiseled arrow.  
Elev. 765.69 feet.
- 7912-35 NE (1) - About 3.5 miles northwest of Millersburg, at county road bridge over North English River, on left upstream pier, on edge of 12 inch C-iron, a chiseled square.  
Elev. 750.59 feet.
- 7912-35 NE (2) - (REFERENCE POINT) About 3.5 miles northwest of Millersburg, at county road bridge over North English River, on center downstream vertical truss member, a chiseled arrow.  
Elev. 754.54 feet.
- 7913-15 SW (1) - About 0.5 mile west of Guernsey, in southeast corner of Junction of state highway 21 and T-rd east, 146 ft. south and 122 ft. east of Junction, 6 ft. north of a corner post, near a witness post; a standard tablet stamped "30 DWB 1966 865".  
Elev. 865.536 feet.
- 7913-15 SE (1) - At east end of Guernsey, at southeast end of a NW-SE road leading out of town just before turning south, in last power pole along road, 26 ft. northeast of road and 61 ft. northwest of a private drive, 5 ft. southwest of a right-of-way fence; railroad spike in base of power pole.  
Elev. 810.12 feet.
- 7913-17 SE (1) - About 1.5 miles west of Guernsey, at a bridge over a small creek on west leg of crossroads, on the upstream end of the left windwall; a railroad spike in a support pile.  
Elev. 808.35 feet.
- 7913-17 SE (2) - About 1.5 miles west of Guernsey, at a bridge over the North English River, on the left upstream bridge seat; a chiseled cross.  
Elev. 807.12 feet.
- 7913-18 SE (1) - About 2.5 miles west of Guernsey, at a county road bridge over North English River, on right upstream bridge seat; chiseled cross on a 1 inch bolt.  
Elev. 813.46 feet.

- 7913-18 SW (1) - About 3.5 miles west of Guernsey, at a county road bridge over the North English River, on the right end of the downstream truss; chiseled cross on rivet.  
Elev. 819.53 feet.
- 7913-18 SW (2) - (REFERENCE POINT) About 3.5 miles west of Guernsey, at county road bridge over North English River, on the 2nd downstream vertical bridge member from the left end of bridge, a filed arrow.  
Elev. 815.36 feet.
- 7913-21 NE (1) - About 0.75 mile southwest of Guernsey, at state highway 21 bridge over the North English River, on the right end of the upstream curb; chiseled cross. UE: 30 A DWB.  
Elev. 811.040 feet.
- 7913-21 NW (1) - (REFERENCE POINT) About 1.5 miles west of Guernsey, at bridge over North English River, on the 3rd vertical bridge member from right end bridge, a chiseled arrow.  
Elev. 811.58 feet.
- 7913-22 NE (1) - About 0.8 mile southeast of Guernsey, at a county road bridge over the North English River, on the right end of the upstream truss; chiseled cross on bolt.  
Elev. 797.24 feet.
- 7913-23 NW (1) - (REFERENCE POINT) About 0.8 mile southeast of Guernsey, at county road bridge over North English River, on the 1st downstream vertical bridge member from right end of bridge, six inches above guardrail, a chiseled arrow.  
Elev. 801.64 feet.
- 7913-23 NE (1) - About 1 mile southeast of Guernsey, at a pony truss bridge over the North English River, on the left end of the downstream truss; a chiseled cross.  
Elev. 794.45 feet.
- 7913-23 NE (2) - (REFERENCE POINT) About 1 mile southeast of Guernsey, at a pony truss bridge over North English River, on right end of downstream batter post, a chiseled arrow.  
Elev. 796.84 feet.
- 7913-23 NE (3) - (REFERENCE POINT) About 1 mile southeast of Guernsey, at a pony truss bridge over North English River, on top and in center of downstream pony truss bridge, a chiseled arrow.  
Elev. 800.27 feet.
- 7913-25 NE (1) - About 2.5 miles southeast of Guernsey, at T-rd west on county line, in grassy triangle of Junction; railroad spike in base of power pole.  
Elev. 854.15 feet.
- 7914-13 SW (1) - About 4.5 miles west of Guernsey, at a county road bridge over the North English River, on the downstream end of the right wooden windwall; a railroad spike in a support pile.  
Elev. 824.56 feet.
- 7914-13 SW (2) - (REFERENCE POINT) About 4.5 miles west of Guernsey, at county road bridge over North English River, on the downstream edge of downstream truss of bridge, at Junction of truss and right batter post, enclosed by two hacksaw marks, a chiseled arrow.  
Elev. 830.62 feet.
- 7914-14 SW (1) - About 5.5 miles west of Guernsey, at county highway V18 bridge over the North English River, on the right end of the downstream curb; chiseled square.  
Elev. 834.61 feet.
- 7914-14 SW (2) - (REFERENCE POINT) About 5.5 miles west of Guernsey, at county highway V18 bridge over North English River, on top of the 10th downstream guardrail post from right end of bridge, a chiseled arrow.  
Elev. 835.77 feet.



7914-16 SE (1) - About 7 miles west of Guernsey, in northeast corner of intersection of country roads, in base of power pole, a railroad spike.

Elev. 867.73 feet.

7914-21 NE (1) - About 7 miles west of Guernsey, at a county road bridge over the North English River, on the downstream end of the left abutment wall; chiseled square.

Elev. 838.31 feet.

7914-21 NE (2) - (REFERENCE POINT) About 7 miles west of Guernsey, at county road bridge over the North English River, on top of downstream truss of pony truss bridge, over the 1st vertical member from left end of bridge, a chiseled arrow.

Elev. 843.51 feet.





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FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL  
SYSTEM UNITS (SI)

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI)

Multiply inch-pound units	By	To obtain SI units
-Length-		
inches (in)	25.4	millimeters (mm)
feet (ft)	.3048	meters (m)
miles (mi)	1.609	kilometers (km)
-Area-		
acres	4,047	square meters (m <sup>2</sup> )
square miles (mi <sup>2</sup> )	2.590	Square kilometers (km <sup>2</sup> )
-Volume-		
cubic feet (ft <sup>3</sup> )	0.02832	cubic meters (m <sup>3</sup> )
cubic feet per second-day (ft <sup>3</sup> /s-day)	2,447	cubic meters (m <sup>3</sup> )
acre-feet (acre-ft)	1,233	cubic meters (m <sup>3</sup> )
-Flow-		
cubic feet per second (ft <sup>3</sup> /s)	0.02832	cubic meters per second (m <sup>3</sup> /s)



# FLOODS IN THE ENGLISH RIVER BASIN, IOWA

by

A.J. Heinitz and D.E. Riddle

## INTRODUCTION

### Purpose and Scope

Information describing floods is essential for proper planning, design, and operation of bridges and other structures on or over streams and their flood plains. This report provides information on flood stages and discharges, flood magnitude and frequency, bench mark data, and flood profiles for the English River and some of its tributaries. It covers the English River, the North English River to near Guernsey, the South English River to Barnes City and the lower reaches of the Middle English and Deep Rivers.

### Acknowledgments

This report is the tenth in a series prepared in cooperation with the Highway Research Board, Highway Division, Iowa Department of Transportation. Various Federal, State, and local agencies cooperated in the collection of the streamflow records used in this report, acknowledgment of which is contained in the annual streamflow reports of the U.S. Geological Survey.

## BASIN DESCRIPTION

The English River is a tributary to the Iowa River in southeastern Iowa and enters the Iowa River about 10 miles south of Iowa City (fig. 1). The basin covers 638 square miles and includes parts of 6 counties. Land use in the basin is predominantly agricultural with some livestock operations.

Normal annual precipitation (1941-70) is about 33 inches in the basin. Average annual runoff is from 8 to 9 inches.

## FLOOD HISTORY

Recording of flood peaks in the English River basin began in 1939 when a stream-gaging station was established at Kalona. The historical flood of 1930 was documented from information supplied by local residents. A list of the gaging stations in the basin giving the period of flood record and maximum flood for each station is contained in table 1.

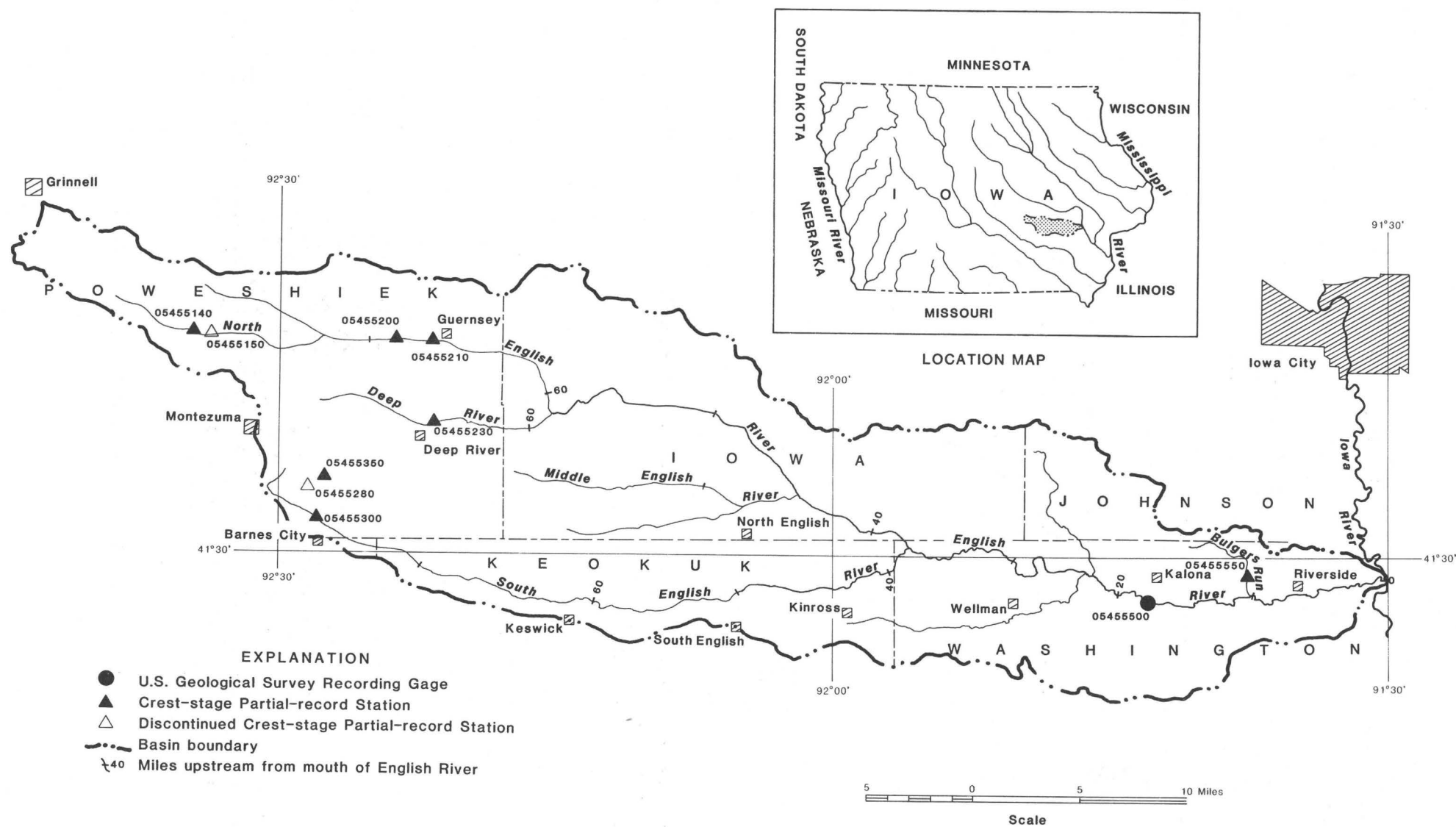


Figure 1. English River basin.



A graph of the annual peak flood discharges for the gaging station on the English River at Kalona is shown in figure 2. This graph depicts the years in which the greater floods occurred at the station. Among these are the floods of 1930, 1960, 1965 and 1974.

The 1974 flood is the 4th greatest recorded on the English River at Kalona. Two of the floods (1930 and 1960) exceeded the 1974 flood peak discharge by only 100 cubic feet per second.

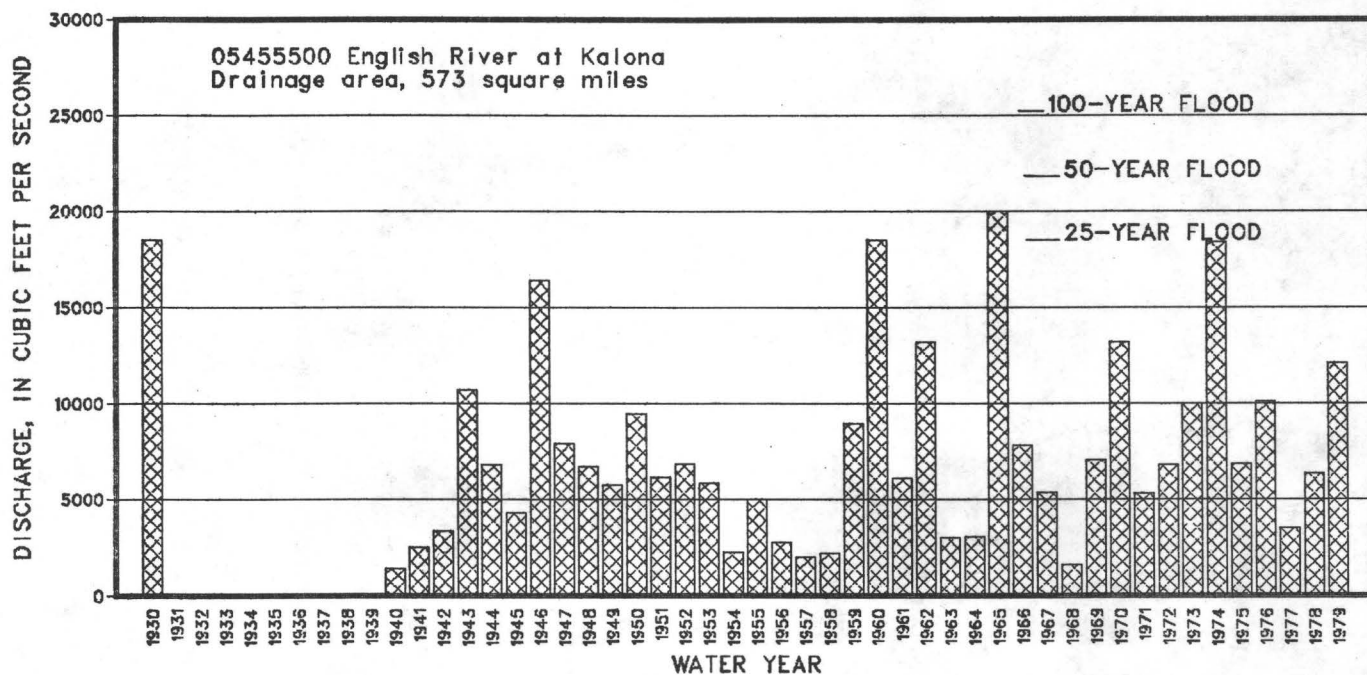


Figure 2. Annual peak discharges for period of record for English River at Kalona gaging station.

Gaging-station records provide the most useful data needed for analyzing and understanding the flood hydrology of a river basin. Flood information is obtained from data collected at stream-gaging stations where a continuous record of streamflow is obtained, and from crest-stage partial-record stations which provide flood-peak data above preselected levels. The gaging stations in the English River basin are shown in figure 1 and table 1.

The gaging station at Kalona, 05455500, is the only continuous-record station in the basin; the remainder of the stations are crest-stage partial-record gages. Discharge records for all the stations are published in the annual streamflow reports of the U.S. Geological Survey (See References). The data on flood-peak stages and discharges from these records were compiled by Lara (1976). Those compilations have been updated and are published in the section on Gaging-station Records.

The derivation of discharge records at a gaging station depends basically upon the development of a relationship between water-surface elevations (stages) and the corresponding flow rates. The highwater portion of these stage-discharge relationships, or rating curves as they are sometimes called, tends to be relatively stable if the channel downstream from a gaging site is not changed and remains

Table 1.--Maximum flood peaks at gaging stations in the English River basin, Iowa

Station number	Gaging Station	Period of flood record	Drainage area (mi <sup>2</sup> )	Maximum flood			
				Date	Gage height (ft)	Dis-charge (ft <sup>3</sup> /s)	Recurrence Interval (yrs)
05455140	North English R. nr Montezuma	1973-79	31.0	7/20/78	28.18	6,800	70
05455150	North English R. nr Montezuma	1953-73	34.0	5/24/53	13.25	4,240	15
05455200	North English R. nr Guernsey	1953-79	68.7	5/24/53	11.70	7,000	25
05455210	North English R. at Guernsey	1960, 1966-79	81.5	9/18/77	87.36	7,000	12
05455230	Deep R. at Deep River	1960, 1966-79	30.5	5/20/70	83.85	6,200	50
05455280	South English R. trib. - Barnes City	1953-76	2.41	3/2/70	9.04	900	8
05455300	South English R. nr Barnes City	1953-79	11.5	8/5/70	13.16	1,850	7
05455350	South English R. trib. no. 2 nr Montezuma	1953-79	0.62	7/27/61	13.65	344	5
05455500	English R. at Kalona	1930, 1940-79	573	9/21/65	21.45	20,000	35
05455550	Bulgers Run nr Riverside	1965-79	6.31	9/21/65	89.04	3,080	45

unobstructed. Stream-flow records at gaging stations are important control points in the definition of the flood profiles presented in this report.

In order to reference all the points along the profiles to a common datum, extensive leveling work was performed during which at least one bench mark and a reference point were established at each bridge in the profiled reaches. Bench mark and reference point descriptions and elevations are listed in the section on Temporary Bench Marks.

#### FLOOD FREQUENCIES

The discharge and frequency of flood flows listed in table 2 for the English River gaging station at Kalona were computed using methods outlined in U.S. Water Resources Council Bulletin 17A (1977).

Figure 3 shows the regionalized 100-year flood as defined by Lara (1973). This relationship of the 100-year flood to the drainage area can be used to estimate preliminary 100-year flood discharges at ungaged sites. The 100-year flood for the English River at Kalona agrees closely with the regionalized flood discharge. The annual flood peak discharges for each crest-stage gage can be evaluated for more specific flood-frequency discharges at the site of the gage.

Table 2.--Discharge and frequency of flood flows for continuous-record gaging station in the English River basin

Station number	Station name	Discharge, in cubic feet per second, for indicated recurrence interval, in years					
		2	5	10	25	50	100
05455500	English River at Kalona	6,280	10,900	14,200	18,500	21,800	25,200

Note: Discharges computed by methods given in Bulletin 17A (U.S. Water Resources Council, 1977)

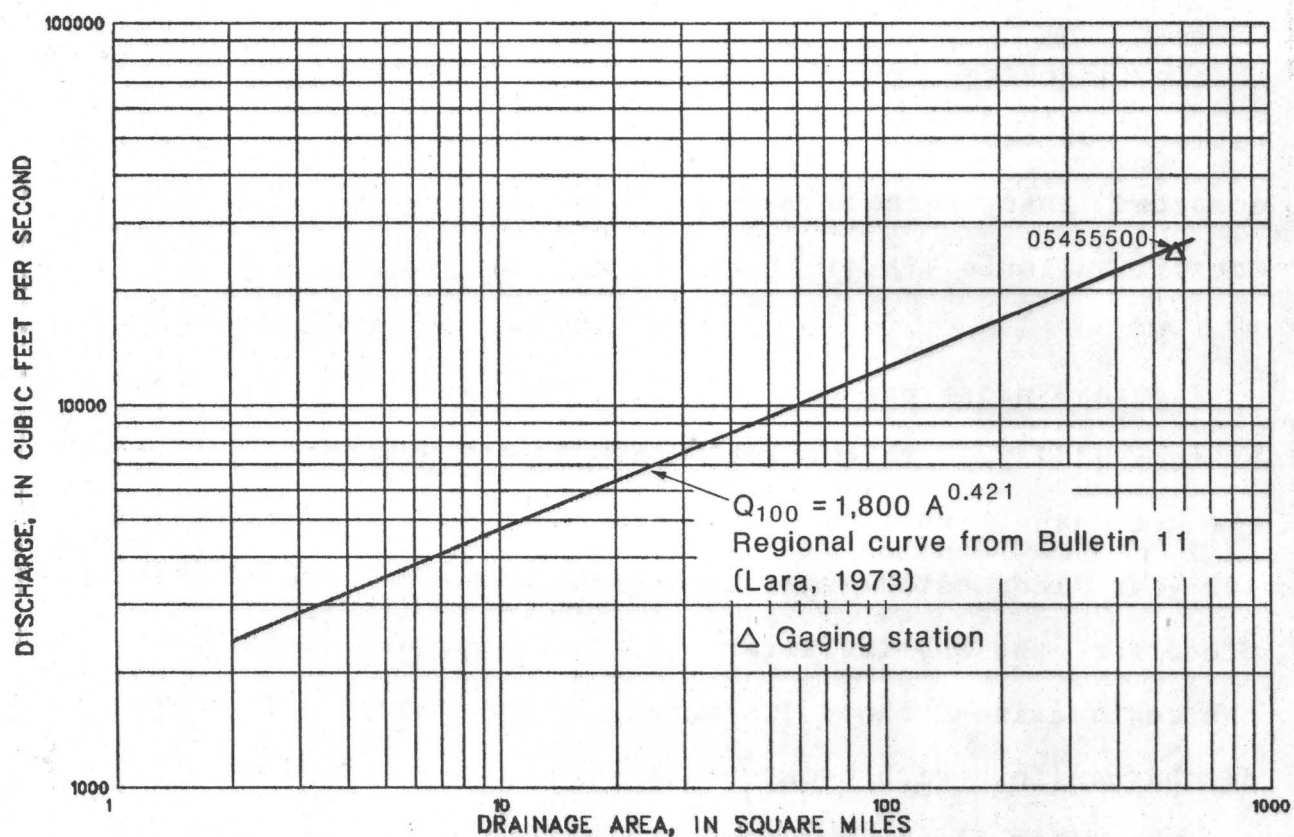


Figure 3. Relationship of regional 100-year flood discharge with drainage area for streams in English River basin.

Figures 4-14 show profiles of the May 1974 flood on the English River and some of its principal tributaries. The profiles were defined by field data obtained by the U.S. Geological Survey. To define these profiles, high-water marks located both upstream and downstream from bridges were identified and marked within a few days of passage of the flood peaks. The marks were referenced to a common datum by leveling. Low-water profiles are also shown on the figures to indicate the approximate range of stage that applies along the profiled reaches. Also shown on the figures are segments of the 1965 and 1966 floods. Discharges at gaging stations for the profiles are noted on the appropriate illustrations.

River mileages, determined from the best available maps, are referenced to the mouth of the English River. Bridges and a few other points are designated by an index number that helps to identify their location. For example, 7707-18 SW refers to a location in township 77 north, range 07 west, and the southwest quarter of section 18.



Flood magnitude-frequency relationships in this basin are not well defined except for the main stem of the English River. More flood peak data sites and longer periods of streamflow record will further improve the reliability of the magnitude-frequency relationships for streams in the basin. Furthermore, these relationships are subject to continuing modification by factors such as changing meteorologic and climatic trends, and physical changes in the basin such as urbanization, installation of drainage systems, reservoir development, and shifting land use.

The hydraulics of the English River system are also not well defined. Wide, flat flood plains are typical of a part of the basin. Stage-discharge relationships for these areas are subject to seasonal changes because of the varying vegetative cover on the flood plain throughout the year.

Debris and ice jams, both nearly impossible to predict, can cause dramatic temporary changes in stage-discharge relationships. Natural scour and fill, channel straightening and construction of bridges and levees can cause more lasting changes.

Thus, a river basin and its channel system are dynamic entities undergoing continual change. The relationships presented in this report represent the conditions existing at the time the field data were obtained.

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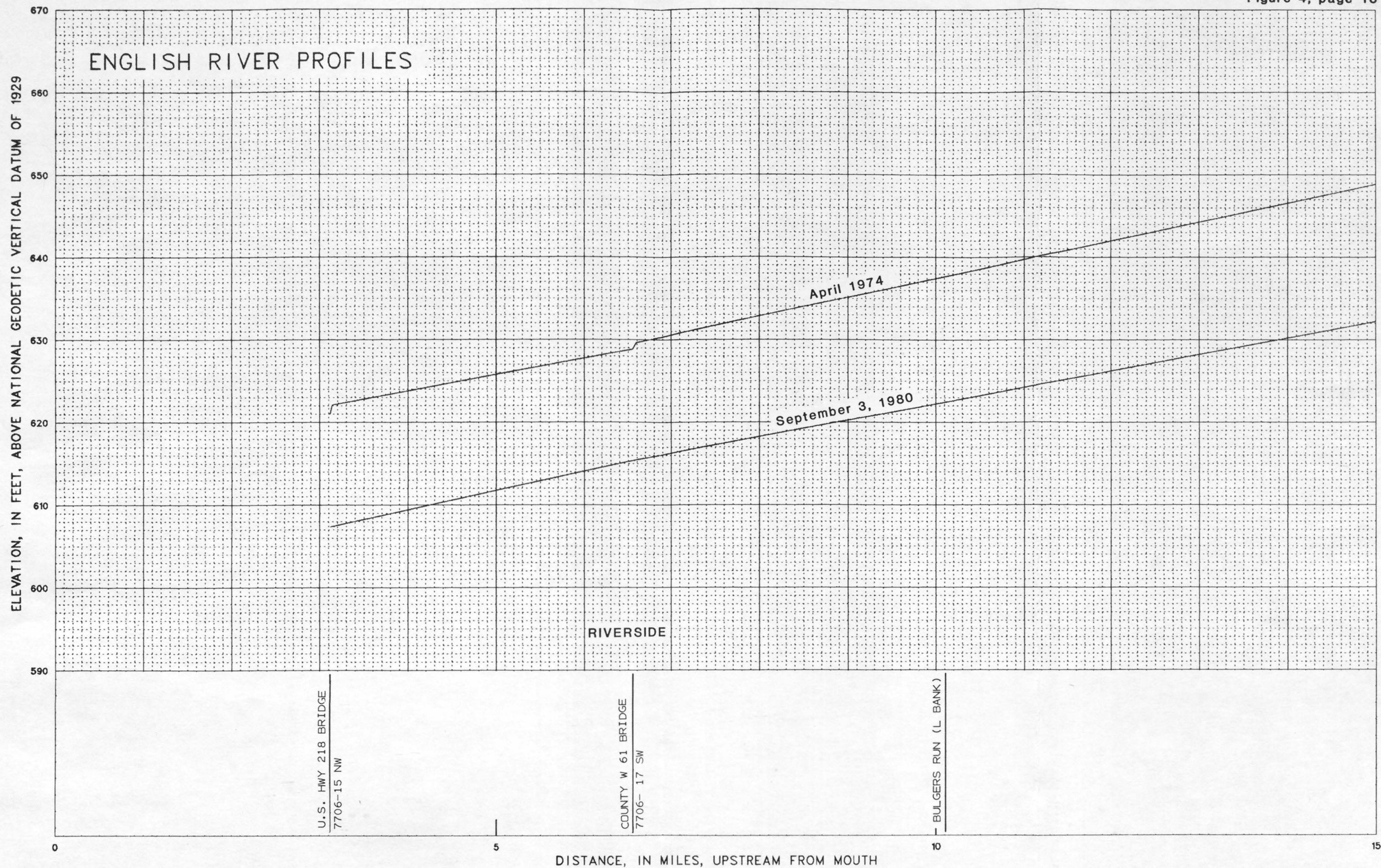
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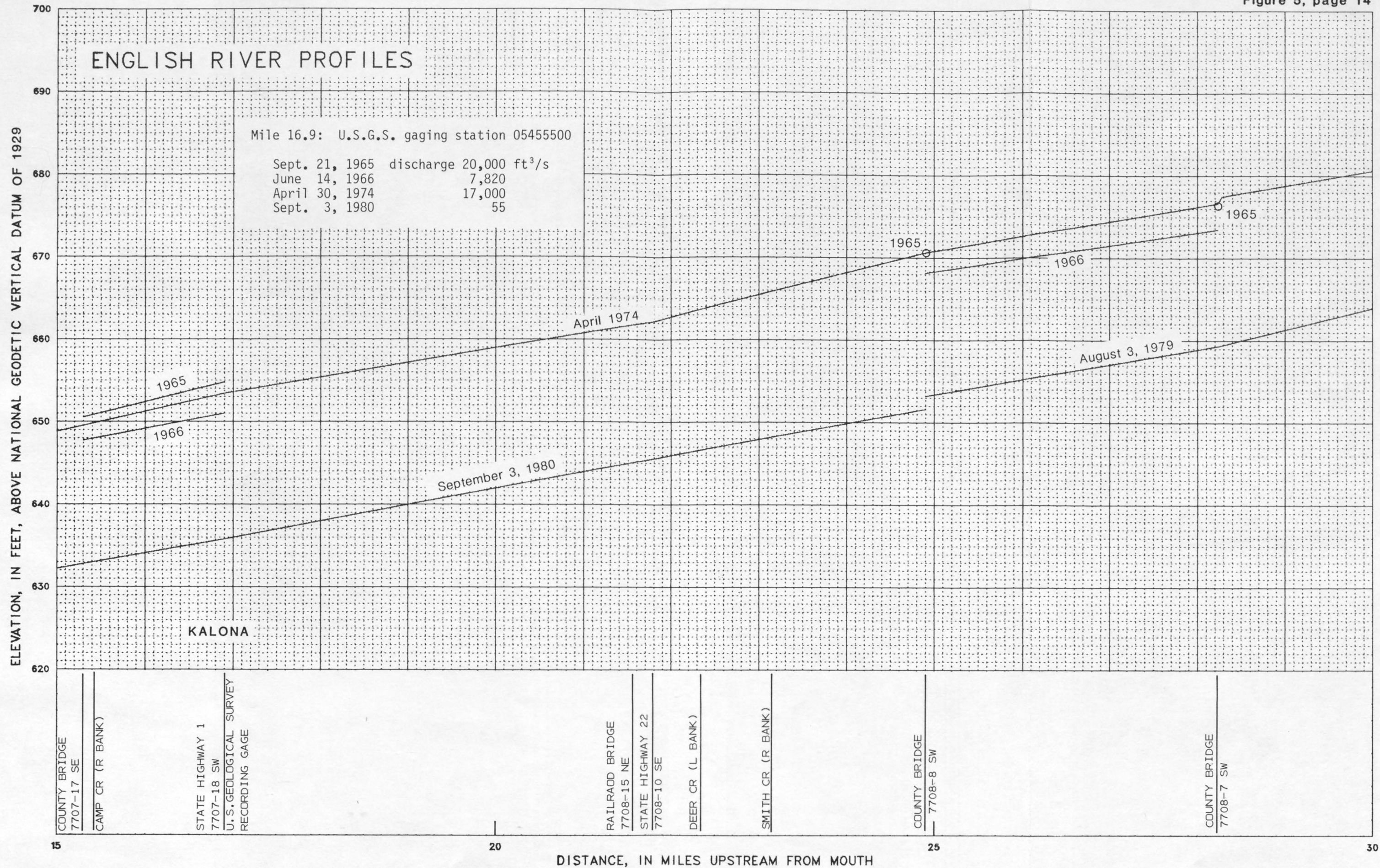
U.S. Water Resources Council, 1977, Guidelines for determining flood flow frequency, Hydrology Committee Bulletin No. 17A.



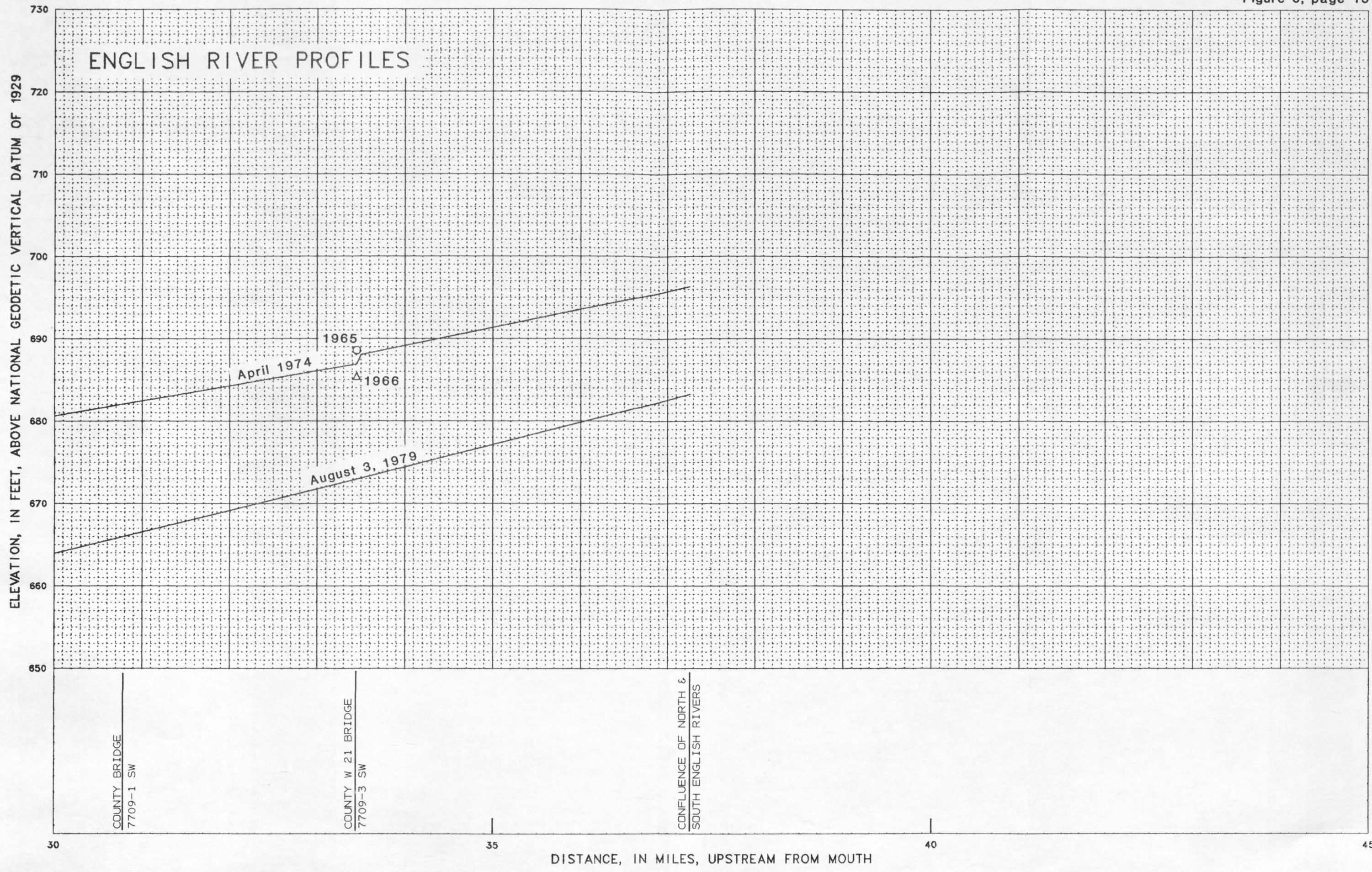






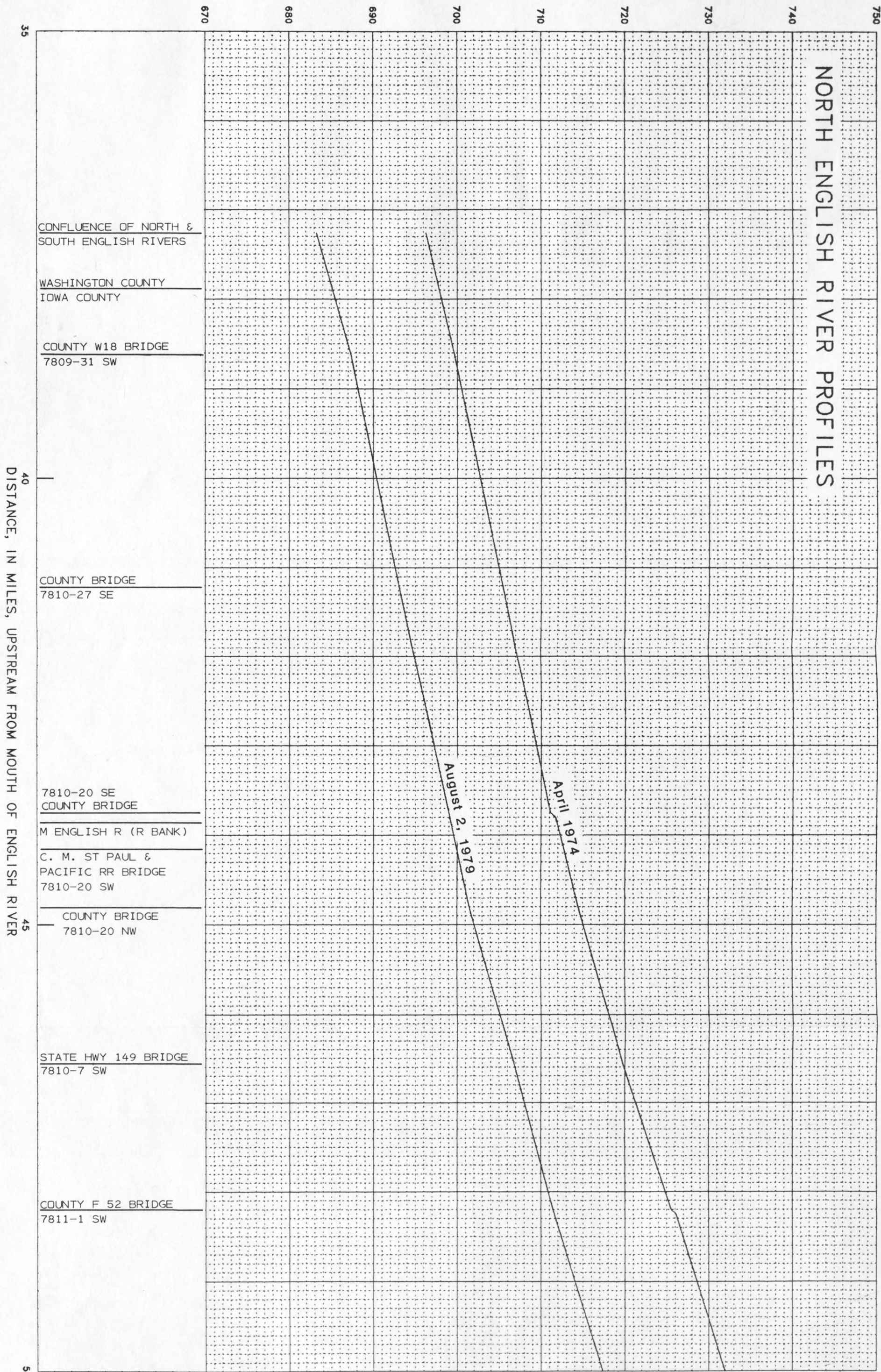








ELEVATION, IN FEET, ABOVE NATIONAL GEODETIC VERTICAL DATUM OF 1929





ELEVATION, IN FEET, ABOVE NATIONAL GEODETIC VERTICAL DATUM OF 1929

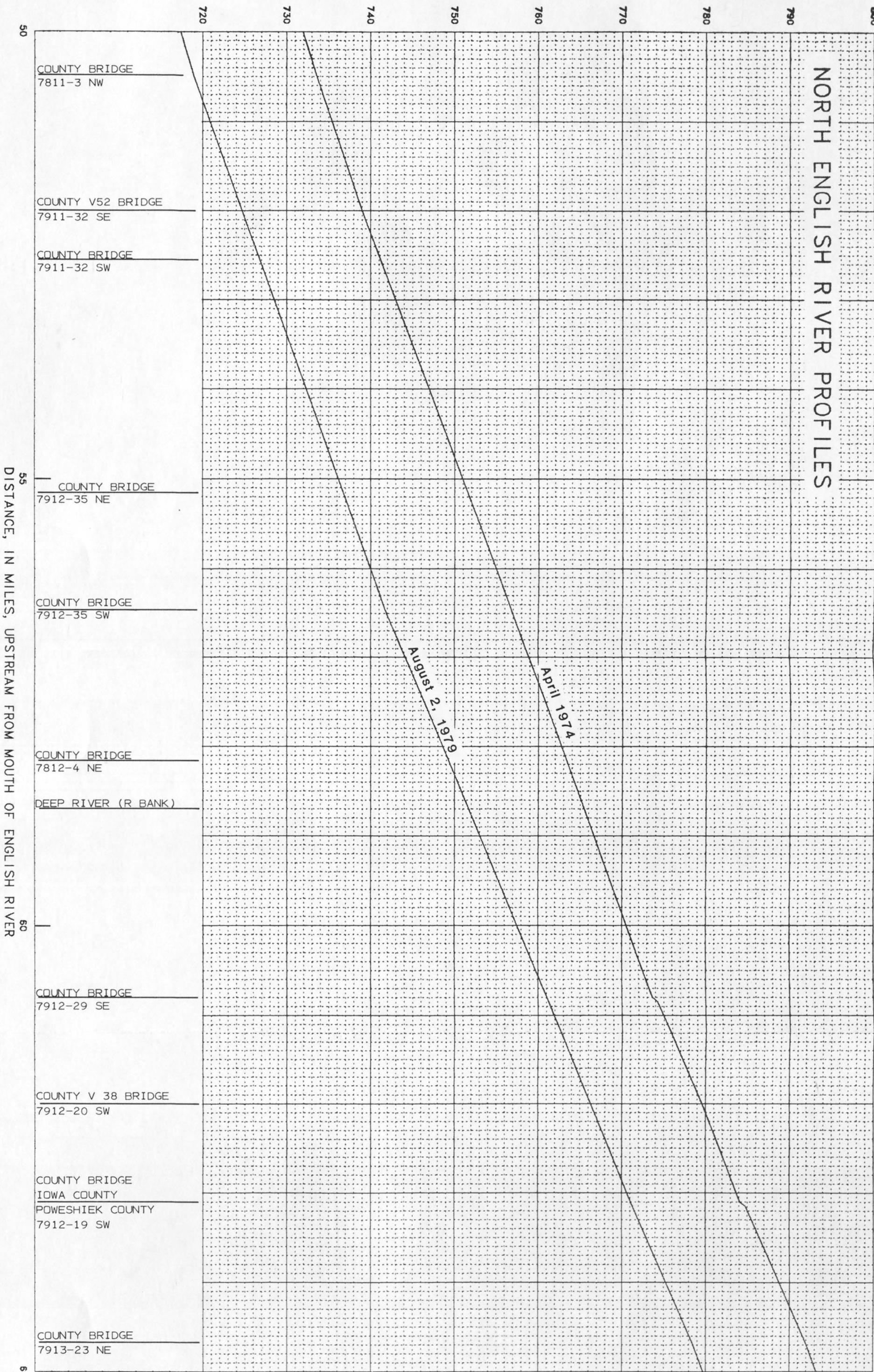
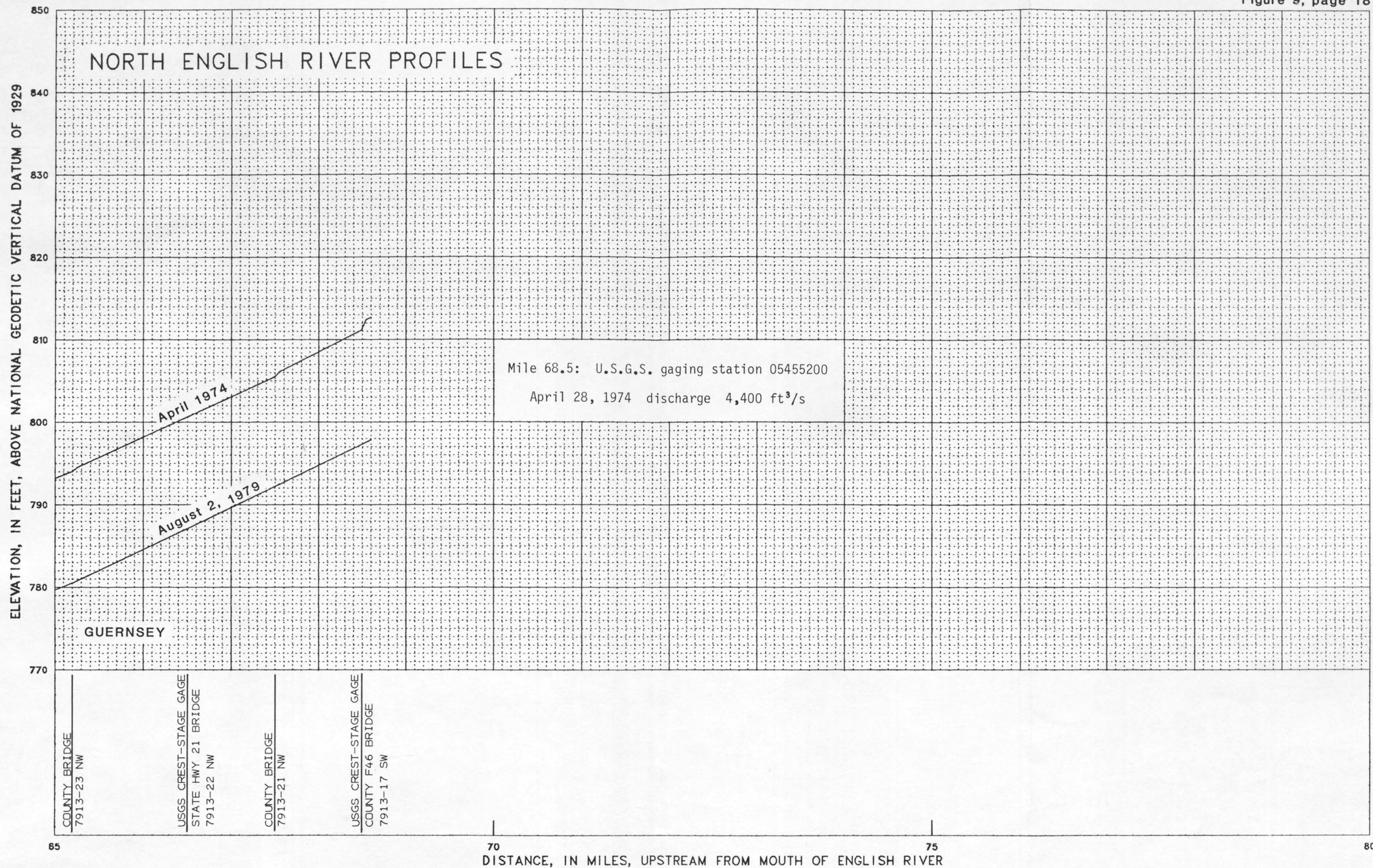
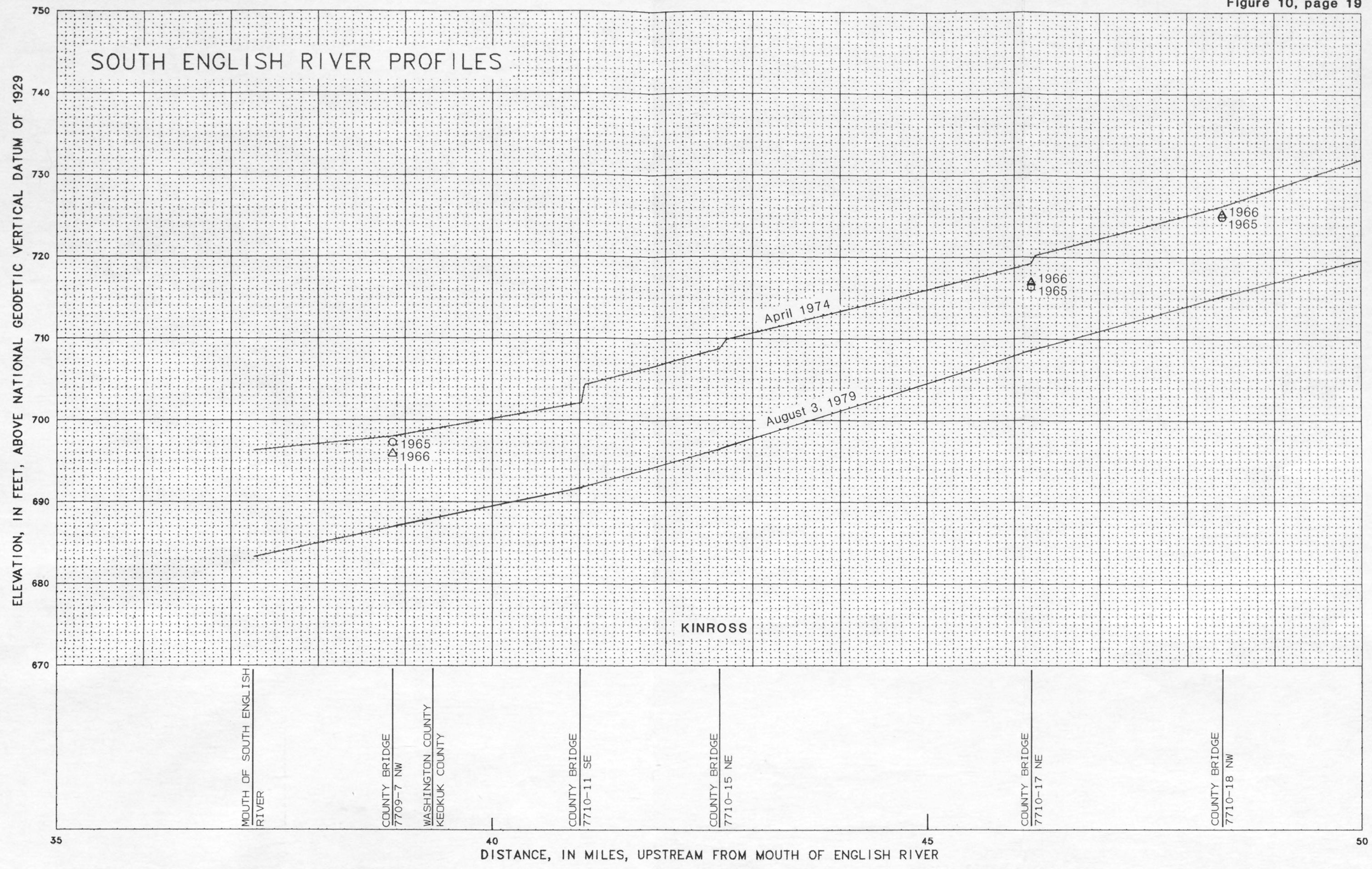


Figure 8, page 17











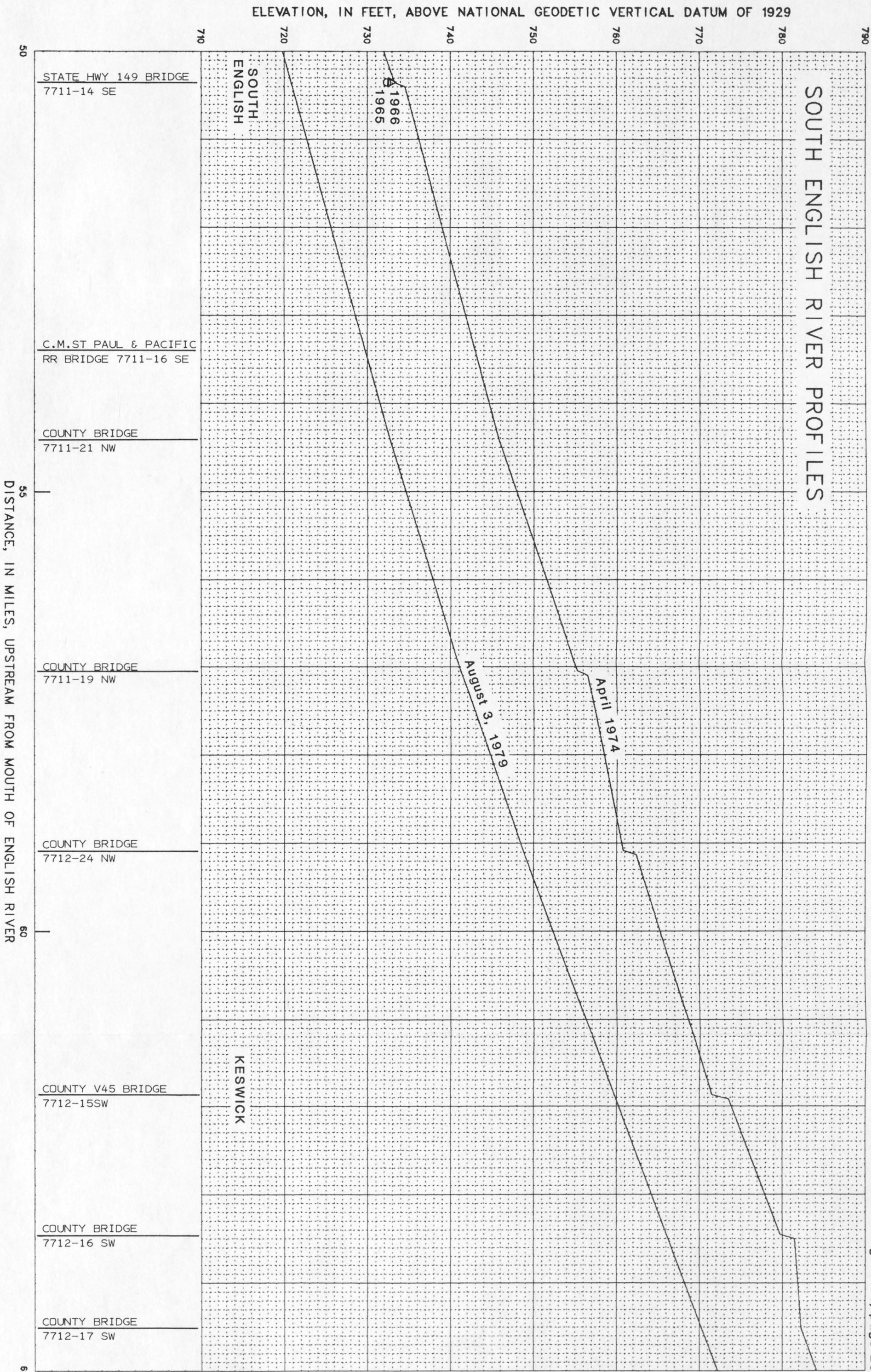
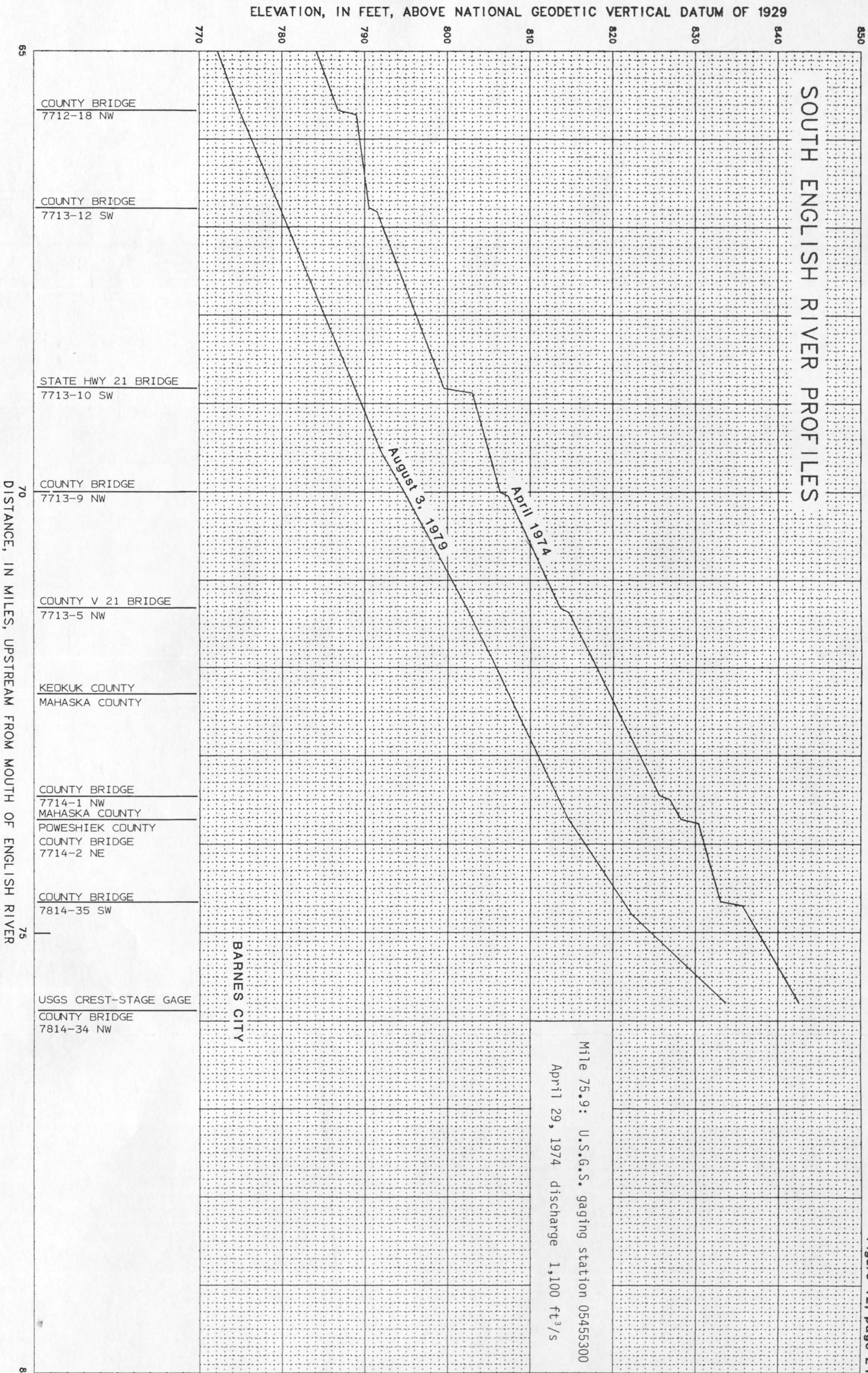


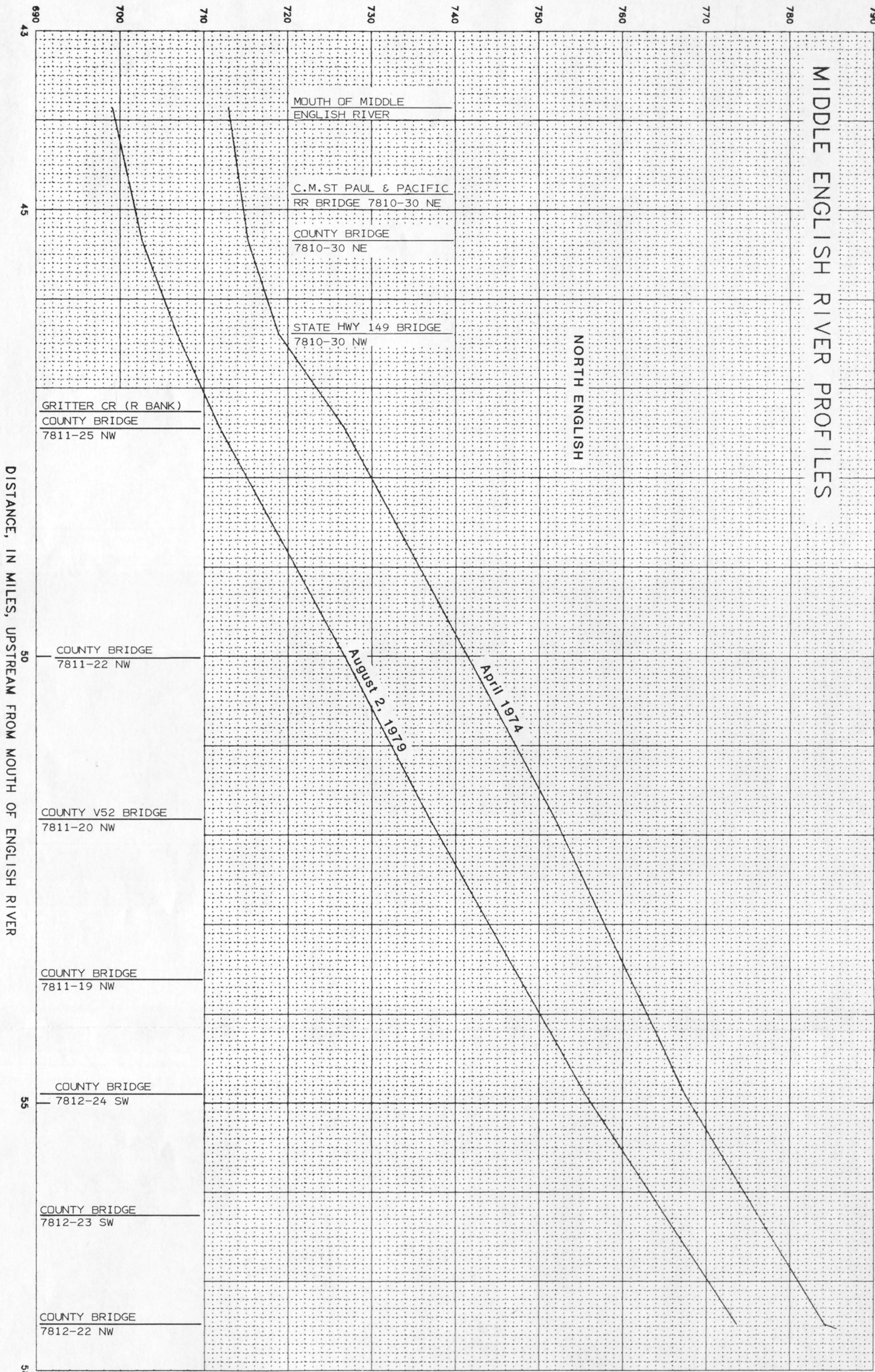
Figure 11, page 20



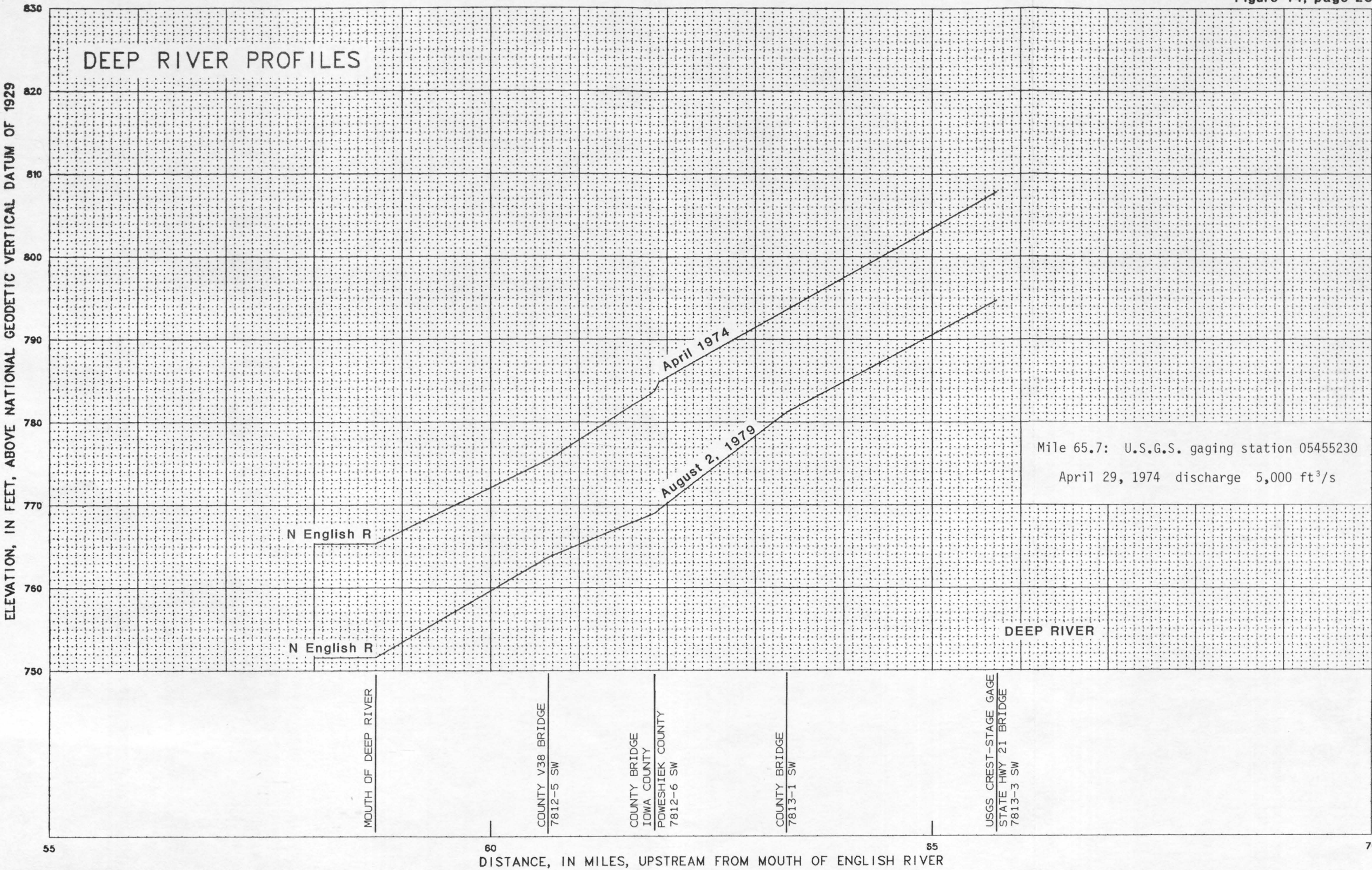




ELEVATION, IN FEET, ABOVE NATIONAL GEODETIC VERTICAL DATUM OF 1929







The following data on peak stages and discharges were compiled through Sept. 30, 1975, by Lara (1976), and were updated through Sept. 30, 1979, for this report. The flood events are designated by calendar date and grouped by water year (year ending September 30). For the partial-record stations, those equipped with crest-stage gages, only the annual flood peaks are listed. In general, for the continuous-record stations, independent flood peaks above a pre-selected base are listed (partial-duration series). This base discharge, given in the "Remarks" paragraph, was determined so that it would be equaled or exceeded on an average of about three times per year. Two flood peaks are considered independent if the discharge of the trough between them is 25 percent or more below that of the lower peak.

The gaging-station records are arranged in the downstream order explained in the annual water resources data reports of the U.S. Geological Survey (See References). Each gaging station is identified by a permanent number that is also used in figures 1 and 3 and in tables 1 and 2. The datum of the gage, when given, is in feet above National Geodetic Vertical Datum of 1929 (previously called "mean sea level, 1929"). Bankfull and flood stages are given for some of the stations. Bankfull stage, as determined by the U.S. Geological Survey, is the stage at which a stream first overflows its banks. Flood stage, however, 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 stage is measured.



