FLOOD OF FEBRUARY 1989 IN KENTUCKY

By. Dennis L. McClain

U.S. Geological Survey

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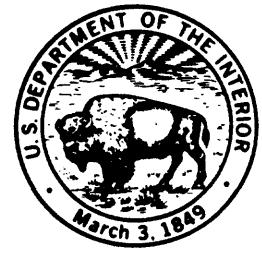

Louisville, Kentucky

1990

DEPARTMENT OF THE INTERIOR

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U.S. GEOLOGICAL SURVEY

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CONVERSION FACTORS

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

Multiply	By	To obtain
inch (in.)	25.4	millimeter (mm)
	0.0254	meter (m)
foot (ft)	0.3048	meter (m)
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot (ft^3)	0.028317	cubic meter (m^3)
acre-foot (acre-ft)	1233	cubic meter (m^3)
cubic foot per second (ft^3/s)	0.028317	cubic meter per second (m^3/s)

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

DEFINITION OF TERMS

Acre-foot is the quantity of water required to cover 1 acre to a depth of 1 foot.

Contents is the volume of water in a reservoir or lake measured in acre-feet.

Cubic foot per second (ft^3/s) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to approximately 7.48 gallons per second.

Gage-height is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the term stage.

Gaging station is a particular site on a stream, canal, lake or reservoir where systematic observation of water surface elevations and/or discharges are determined.

Recurrence interval of a flood or frequency is the probability, expressed in years, that a particular flood event may occur.

Gage heights of selected gaging stations throughout this report are referenced to a station datum which is described in the annual series of "Water Resources Data for Kentucky" published by the U.S. Geological Survey.

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ABSTRACT

The flood of February 1989 in Kentucky was the result of two storms that caused as much as 13.37 inches of rain at one site during the period February 13-22. The heaviest rainfall was in western Kentucky where rainfall amounts of 10 to 13 inches were common. Eastern Kentucky received smaller amounts, but several inches were recorded at most precipitation measurement sites. Peak discharges during this flood had recurrence intervals that exceeded 100 years at three gaging stations and 25 years at eight stations.

INTRODUCTION

The U.S. Geological Survey (USGS) has been collecting streamflow data in Kentucky since 1907. Collection and dissemination of information on floods is one of the primary goals of the USGS data collection program. Flood magnitude and frequency information is important for land-use planning, flood-insurance evaluation, and design of structures such as culverts, dams, and bridges.

STORM CHARACTERISTICS AND DATA SUMMARY

Kentucky receives most of its rainfall during the months of December through March, and most of this rainfall comes from low pressure systems moving northeast from the Gulf of Mexico. The flood of February 1989 was the result of two such storms that moved through Kentucky from the southwest during February 13-16 and February 21 and 22. Information gathered from 66 precipitation measurement sites (fig. 1) indicates that the heaviest rainfall occurred over the western part of the State, and much of this occurred during the storm period February 13-16 (table 1). Caneyville (site 18) received more than 13 inches of rain from the two storms (fig. 2 and table 1). The eastern part of the State received less rainfall, but Ashland (site 2), in northeastern Kentucky, received more than 7 inches from the two storms (table 1).

The worst flooding occurred in the Green, Salt, and Kentucky River basins. Major flooding occurred in the towns of Boston, Lebanon Junction, and Frankfort (fig. 1). The recurrence interval of peak discharges during this flood exceeded 100 years (Melcher and Ruhl, 1984) at gaging stations 03301500, Rolling Fork near Boston; 03320500, Pond River near Apex; and 03383000, Tradewater River at Olney (figs. 1 and 3 and table 2). Hydrographs at these stations (fig. 4) show that the highest stages occurred during the storm of

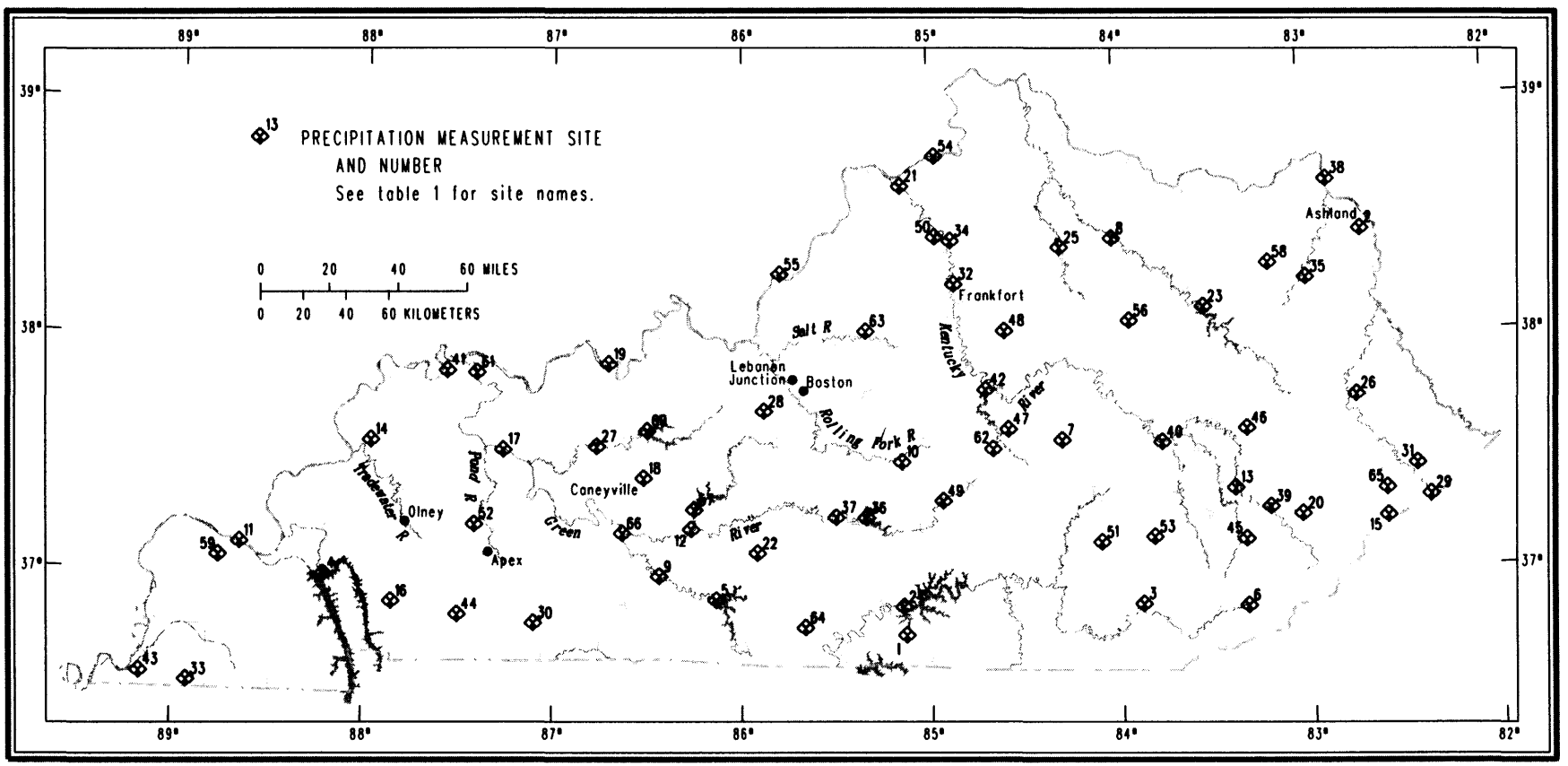

Figure 1.--Precipitation measurement sites.

Table 1.--Daily and cumulative precipitation at selected sites for the flood of February 1989
(From U.S. Department of Commerce, National Oceanic and Atmospheric Administration.
Site numbers are referenced to figure 1)

[T, trace]

	Site number and name	Precipitation for February 13-22, 1989, in inches										
		13	14	15	16	17	18	19	20	21	22	Total
1	Albany	0.27	1.58	0.94							0.20	2.99
2	Ashland State Police	.12	1.89	1.83	1.63					1.77	.16	7.40
3	Barbourville	.02	.67	1.44	.33	0.05	0.50	0.00	0.06	1.77	.17	5.01
4	Lake Barkley	1.10	6.52	2.06	1.17	.00	.00	.00	.02	1.10	T	11.97
5	Barren River Lake	.33	2.70	1.50	1.38	.00	.26	.00	T	2.72	.02	8.91
6	Baxter	.02	.42	.28	.30	.12	.75	.02	.08	1.12	.18	3.29
7	Berea	.33	1.48	1.00		T			.03			2.84
8	Blue Lick Springs	.72	2.25	1.58	1.15	.00	.00	.00		1.56	.02	7.28
9	Bowling Green	.31	3.22	1.43	1.76	T	.09	.00	.14	1.71	.03	8.69
10	Bradfordsville	.57	4.22	1.99						1.69		8.47
11	Ohio River at Lock 52	.85	5.32	1.96	1.10	.00	.00	.00	T	.96	T	10.19
12	Brownsville	.54	4.60	1.35	2.03				.04	1.57	.02	10.15
13	Buckhorn Lake	.03	.97	.45	.60	.15	.35		.02	1.83	.17	4.57
14	Buford	.43	4.25	1.53	1.26				T	1.03	.08	8.58
15	Burdine	.45	2.49	.51	.40					.80	.32	4.97
16	Cadiz	.60	5.10	2.50	1.63	.00	.00	.03	.03	.63	.02	10.54
17	Green River at Lock 2	.50	2.75	1.67	1.21	.00	.00	.00	.03	1.02	.50	7.18
18	Caneyville	.92	5.80	3.75	1.32					1.51	.07	13.37
19	Ohio River at Cannelton Dam	.68		1.33	1.06	.00	.00	.00	T	.95	.11	4.13
20	Carr Fork Lake	.04	.61	.33	.43	.08	.42		.01	1.05	.08	3.05
21	Kentucky River at Lock 1	.48	1.93	.86	.94			.00			.16	4.37
22	Cave City	.48	3.30	1.18	1.77		.05		.08	2.47		9.33
23	Cave Run Lake	.22	2.73	1.90	1.63	.01	.00	.00	.00	1.53	.14	8.16
24	Cumberland Lake	.18	1.85	1.42	.58	.08	.28	.35		2.01	.40	7.15
25	Cynthiana	.50	2.40	1.61						1.30		5.81

Table 1.--Daily and cumulative precipitation at selected sites for the flood of February 1989--Continued
(From U.S. Department of Commerce, National Oceanic and Atmospheric Administration.
Site numbers are referenced to figure 1)

[T, trace]

Site number and name		Precipitation for February 13-22, 1989, in inches										
		13	14	15	16	17	18	19	20	21	22	Total
26	Dewey Lake	0.12	1.20	0.46	0.87	0.08	T	0.00	0.00	1.52	0.05	4.30
27	Dundee	.74	2.46	1.87	.54				.04	.50		6.15
28	Elizabethtown State Police	.80	5.40	2.70	1.00						.04	9.94
29	Elkhorn City	.14	.22	.27	.45	.09	0.34	.01		.76	.33	2.61
30	Elkton	.43	3.27	1.37	1.66		.02		.04	1.82	.05	8.66
31	Fishtrap Lake	.04	.55	.12	.37						.83	1.91
32	Kentucky River at Lock 4	.49	2.64	1.38							.08	4.59
33	Fulton	.48	3.82	2.40	1.14				.07	1.65		9.56
34	Kentucky River at Lock 3	.60	1.76	1.22	.95			.00			T	4.53
35	Grayson Lake	.28	2.10	1.84	1.52	.01	.00	.00	.00	1.20	.12	7.07
36	Green River Lake	.41	2.49	1.52	1.41	.00	.07	.00	.08	2.76	.12	8.86
37	Greensburg	.45	2.98	1.36		.00	.00		.13	2.34	.05	7.31
38	Ohio River at Greenup Dam	.01	1.79	1.33	1.34	.00	.00	.00	.00	1.17	.11	6.75
39	Hazard	.02	.67	.23	.46	.13	.16	.08		1.18	.12	3.05
40	Kentucky River at Lock 14	.08	2.05	1.49		.06	T	.00	.03	2.36		6.07
41	Henderson State Police	1.10	2.10	1.35	1.10					.80	T	6.45
42	Herrington Lake	.41	3.93	2.15	1.83	.00	.00	.00	T		.05	8.37
43	Hickman	.61	3.00	2.05	1.07					1.07		7.80
44	Hopkinsville	.52	4.07	2.35	.95					1.63		9.52
45	Hyden	.17	.65	.43	.47	03	.43		.03	1.35	.13	3.69
46	Jackson	.05	1.82	.69	.85	.03	.06	.00	.00	1.60	.12	5.22
47	Lancaster	.61	3.23	2.30	1.95					1.67	.20	9.96
48	Lexington	.32	3.58	1.87	1.33	.00	.00	.00	.00	1.36	.03	8.49
49	Liberty	.74	2.29	1.59	1.35					2.55	.42	8.49

Table 1.--Daily and cumulative precipitation at selected sites for the flood of February 1989--Continued
(From U.S. Department of Commerce, National Oceanic and Atmospheric Administration.
Site numbers are referenced to figure 1)

[T, trace]

Site number and name		Precipitation for February 13-22, 1989, in inches										
		13	14	15	16	17	18	19	20	21	22	Total
50	Kentucky River at Lock 2	0.59	1.72	1.09	1.05						0.00	4.45
51	London State Police	.13	.99	.43	.42	0.05	0.50	0.00	0.01	1.90	.04	4.47
52	Madisonville State Police	.92	6.20	2.10	1.29					1.65	.05	12.21
53	Manchester	.45			.53		.47			1.73		3.18
54	Ohio River at Markland Dam	.21	1.77	.70	.92	.00	.00	.00	.00	.94	.21	4.75
55	Ohio River at McAlpine Dam	.59	2.33	1.06	1.07	.00	T	.00	.00	1.08	.09	6.22
56	Mt. Sterling	.31			1.70					1.81		3.82
57	Nolin River Lake	.55	2.94	1.86	1.53	.00	.00	.00	.09	1.50	.05	8.52
58	Olive Hill	.09	2.22	1.91	1.78	.07				1.61	.21	7.89
59	Paducah	1.10	5.33	1.89	1.19	.00	.00	.00	.03	.98	.01	10.53
60	Rough River Lake	.70	5.43	2.14	1.26	.00	.00	.00	.04	1.59	.14	11.30
61	Spottsville Lake	.72	2.19	1.05	.93	.00	.00	.00	T	0.76	.07	5.72
62	Stanford	.40	2.55	1.64		.01			.05	2.06	.37	7.08
63	Taylorsville Lake	.63		2.30	1.55	.00	.00	.00	.02	1.55	.05	6.10
64	Tompkinsville	.32	2.44	1.65	.53		.52		.10	2.65	.40	8.61
65	Virgie	.04	.62	.26	.54	.12	.08	.29	.04	.91	.10	3.00
66	Green River at Lock 4	.61	5.02	2.23	1.49	T	.00	.00	.06	1.43	T	10.84

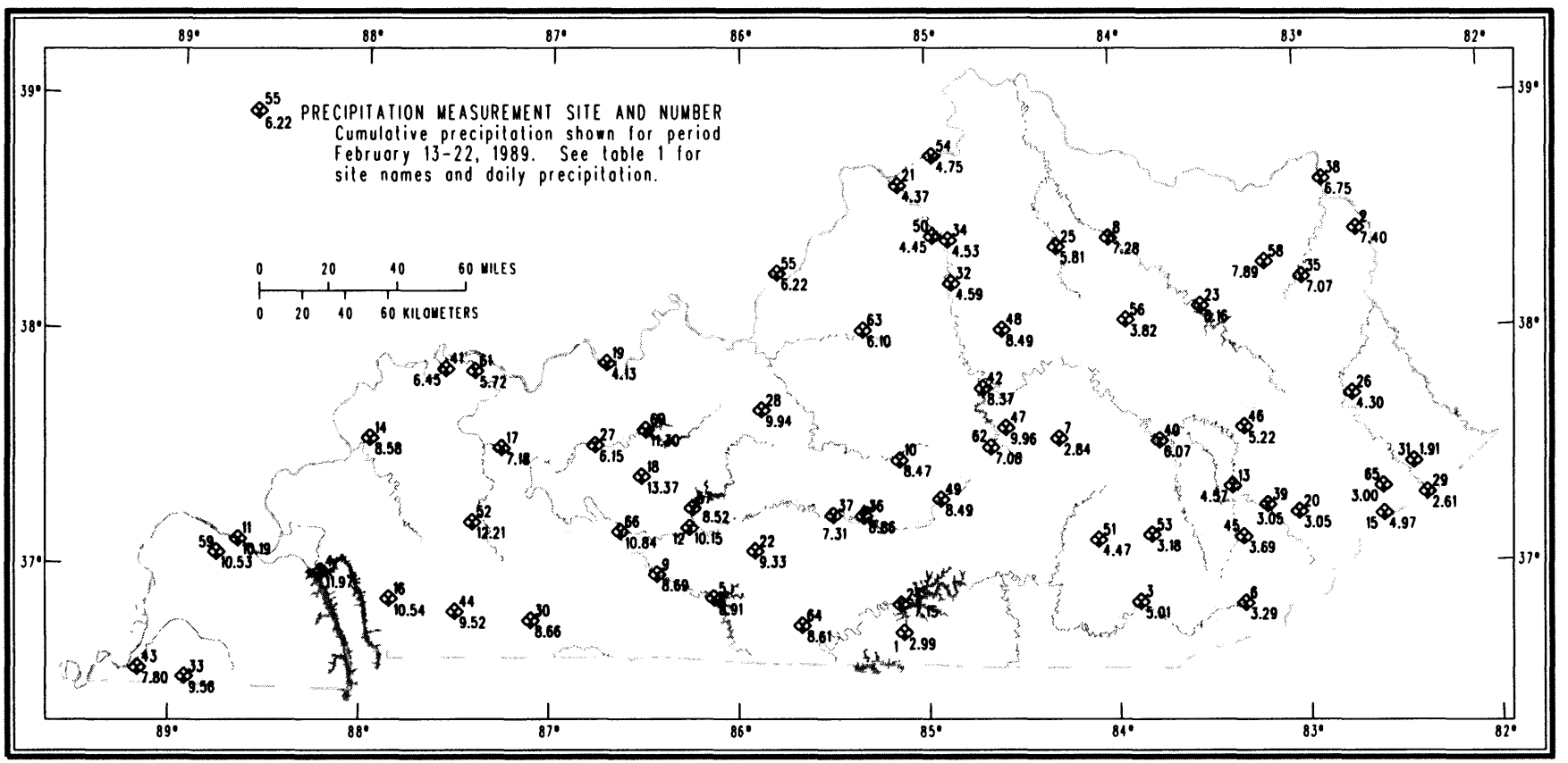

Figure 2.--Cumulative precipitation at selected sites for the period February 13-22, 1989.

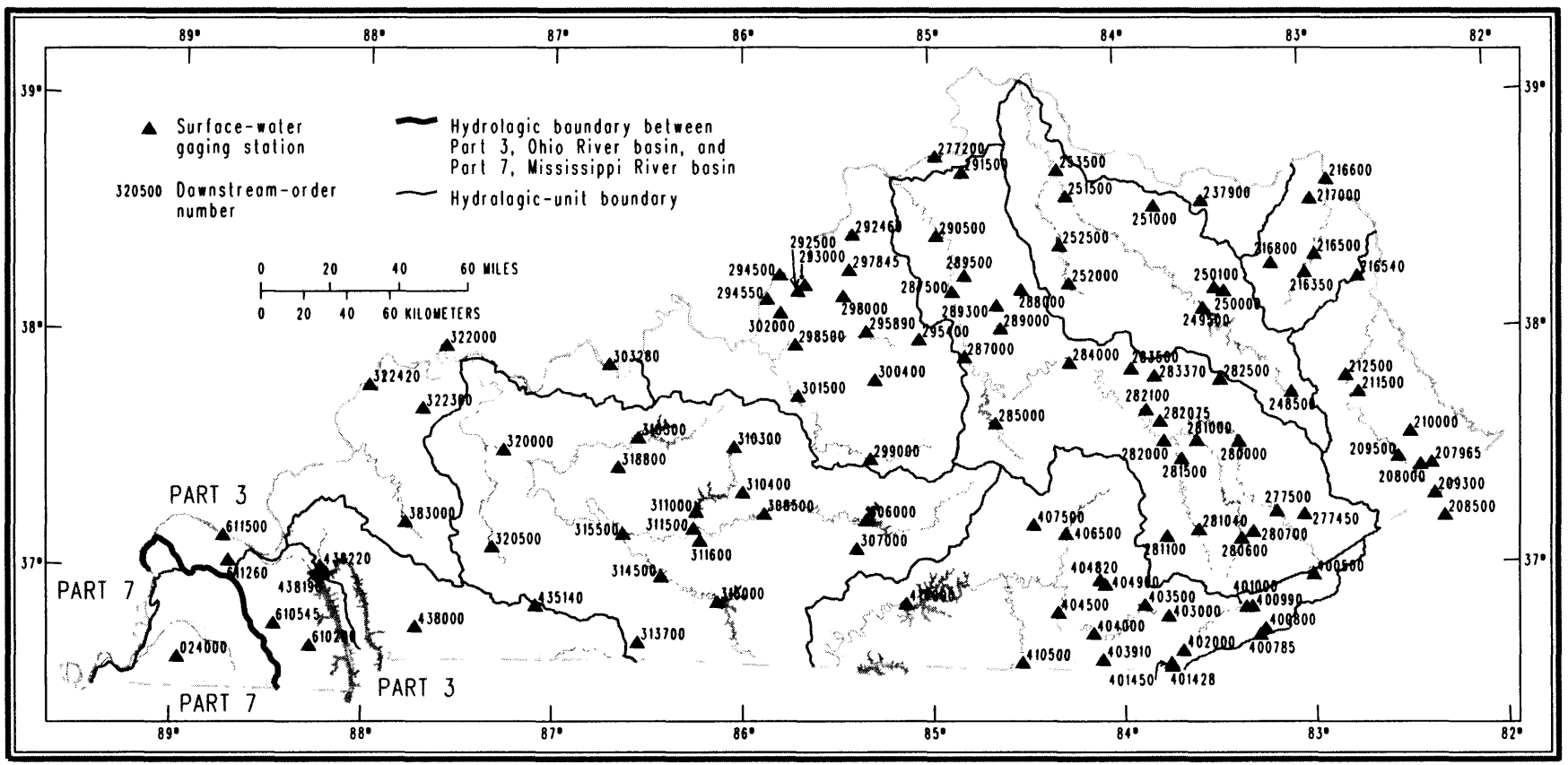

Figure 3.--Location of gaging stations in Kentucky.

Table 2.--Peak gage heights and discharges at selected gaging stations for the flood of February 1989
(Station numbers, with the first two digits omitted, are referenced in figure 3.
Recurrence interval of flood from Melcher and Ruhl, 1984.)

[ft^3/s, cubic feet per second; R, regulated; >, greater than; <, less than; --, no data or not computed]

Station number and name	Date in February	Time	Gage height, in feet	Discharge, in ft^3/s	Recurrence interval, in years
03208000 Levisa Fork below Fishtrap Lake	23	1015	17.82	3,200	R
03209300 Russell Fork near Elkhorn City	21	2300	9.91	4,950	<2
03209500 Levisa Fork at Pikeville	22	1500	18.40	8,550	<2
03210000 Johns Creek near Meta	21	2030	7.28	377	<2
03211500 Johns Creek near Van Lear	16	1400	11.47	2,120	R
03212500 Levisa Fork at Paintsville	23	0130	22.94	19,400	<2
03216350 Little Sandy River below Grayson Lake	15	1500	22.26	4,380	R
03216500 Little Sandy River at Grayson	16	0600	26.91	11,100	2-5
03216540 East Fork Little Sandy River near Fallsburg	15	1115	10.45	1,600	10-25
03216600 Ohio River at Greenup Dam	17	1800	49.47	398,000	<2
03216800 Tygarts Creek at Olive Hill	15	1100	17.70	7,780	5-10
03217000 Tygarts Creek near Greenup	16	0800	20.99	17,400	10-25
03237900 Cabin Creek near Tollsboro	15	0630	10.88	4,520	2-5
03248500 Licking River at Salyersville	21	1930	19.21	2,730	<2
03249500 Licking River at Farmers	14	1800	23.32	Back-water	R
03250100 North Fork Triplett Creek near Morehead	15	1130	20.62	10,600	25-50
03251000 North Fork Licking River near Lewisburg	15	1000	16.25	7,580	5-10
03251500 Licking River at Mckinneysburg	16	2000	43.75	44,300	5-10
03252000 Stoner Creek near Paris	16	0400	18.65	15,000	10-25
03252500 South Fork Licking River at Cynthiana	16	1500	23.02	28,300	10-25
03253500 Licking River near Catawba	16	2300	43.98	76,800	25-50
03277450 Carr Fork near Sassafrass	23	2200	9.56	589	<2
03277500 North Fork Kentucky River at Hazard	21	1900	11.48	7,630	<2
03280000 North Fork Kentucky River at Jackson	22	0300	22.16	16,500	<2
03280600 Middle Fork Kentucky River near Hyden	21	1200	10.96	6,350	<2
03280700 Cutshin Creek at Wooten	21	0845	6.77	2,560	<2
03281000 Middle Fork Kentucky River near Tallega	15	0900	13.78	3,470	<2

Table 2.--Peak gage heights and discharges at selected gaging stations for the flood of February 1989--Continued
(Station numbers, with the first two digits omitted, are referenced in figure 3.
Recurrence interval of flood from Melcher and Ruhl, 1984.)

[ft^3/s, cubic feet per second; R, regulated; >, greater than; <, less than; --, no data or not computed]

Station number and name	Date in February	Time	Gage height, in feet	Discharge, in ft^3/s	Recurrence interval, in years
03281040 Red Bird River near Big Creek	21	1130	12.03	10,400	<2
03281100 Goose Creek at Manchester	21	1700	20.92	7,100	<2
03281500 South Fork Kentucky River at Booneville	15	1300	18.58	9,790	<2
03282000 Kentucky River at Lock 14 at Heidelberg	22	0300	19.39	37,700	<2
03282500 Red River near Hazel Green	21	0800	9.17	2,660	2-5
03283500 Red River at Clay City	16	0500	22.03	17,300	5-10
03284000 Kentucky River at Lock 10	16	1400	28.66	74,600	--
03285000 Dix River near Danville	15	1900	13.18	18,400	2-5
03287000 Kentucky River at Lock 6	16	1530	41.82		--
	16	1500		105,000	10-25
03287500 Kentucky River at Lock 4	17	0200	44.17		--
	17	2100		106,000	25-50
03289000 South Elkhorn Creek at Fort Spring	15	0930	9.50	2,280	25-50
03289300 South Elkhorn Creek near Midway	15	--	21.28	7,270	--
03289500 Elkhorn Creek near Frankfort	16	0600	15.26	28,700	50-100
03290500 Kentucky River at Lock 2	17	1700	49.14	122,000	50-100
03292460 Harrods Creek near La Grange	14	0300	7.22	2,740	<2
03292500 South Fork Beargrass Creek at Louisville	14	0130	8.60	705	<2
03293000 Middle Fork Beargrass at Louisville	14	0300	5.48	914	<2
03294500 Ohio River at Louisville	19	0300	58.37	478,000	<2
03295890 Brashears Creek near Taylorsville	15	2100	21.16	13,500	--
03297845 Floyds Fork near Crestwood	14	0500	16.77	3,240	--
03298000 Floyds Fork near Fisherville	15	1500	10.88	7,600	<2
03298500 Salt River at Shepherdsville	16	1500	31.82		
	16	0500		38,300	5-10
03299000 Rolling Fork near Lebanon	14	1200	21.13	26,500	5-10
03300400 Beech Fork near Maud	16	0400	25.33	30,600	5-10

Table 2.--Peak gage heights and discharges at selected gaging stations for the flood of February 1989--Continued
(Station numbers, with the first two digits omitted, are referenced in figure 3.
Recurrence interval of flood from Melcher and Ruhl, 1984.)

[ft^3/s, cubic feet per second; R, regulated; >, greater than; <, less than; --, no data or not computed]

Station number and name	Date in February	Time	Gage height, in feet	Discharge, in ft^3/s	Recurrence interval, in years
03301500 Rolling Fork near Boston	17	0400	52.62	66,500	>100
03302000 Pond Creek near Louisville	14	0430	19.68	3,960	2-5
03306000 Green River near Campbellsville	28	1200	12.05	5,100	R
03307000 Russell Creek near Columbia	21	1100	19.72	14,600	2-5
03308500 Green River at Munfordville	16	1300	43.00	44,700	5-10
03310300 Nolin River at White Mills	14	2400	34.65	19,200	10-25
03310400 Bacon Creek near Priceville	14	1130	18.18	5,120	10-25
03311500 Green River at Lock 6	17	1000	34.03	59,500	5-10
03311600 Beaverdam Creek near Rhoda	14	0600	7.72	1,870	2-5
03314500 Barren River at Bowling Green	15	2400	34.02		--
	22	0100		35,400	2-5
03315500 Green River at Lock 4	17	1300	42.95		--
	17	0500		92,300	5-10
03318500 Rough River at Falls of Rough	14	0615	23.92	6,150	<2
03318800 Caney Creek near Horse Branch	14	--	13.80	9,000	5-10
03319000 Rough River near Dundee	15	1500	29.72	19,600	10-25
03320000 Green River at Lock 2	21	0300		80,000	5-10
	24	1800	33.37		--
03320500 Pond River near Apex	15	1500	22.60	32,300	>100
03322000 Ohio River at Evansville	21	1200		678,000	--
	22	0200	43.76		--
03322360 Beaverdam Creek near Corydon	13	1545	14.26	2,130	<2
03383000 Tradewater River at Olney	16	0200	18.85	14,600	>100
03400500 Poor Fork at Cumberland	21	1500	7.03	1,760	<2
03400785 Martins Fork above Smith	21	1600	4.12	650	--
03400800 Martins Fork near Smith	23	1900	10.75	436	<2

Table 2.--Peak gage heights and discharges at selected gaging stations for the flood of February 1989--Continued
(Station numbers, with the first two digits omitted, are referenced in figure 3.
Recurrence interval of flood from Melcher and Ruhl, 1984.)

[ft^3/s, cubic feet per second; R, regulated; >, greater than; <, less than; --, no data or not computed]

Station number and name	Date in February	Time	Gage height, in feet	Discharge, in ft^3/s	Recurrence interval, in years
03400990 Clover Fork ar Harlan	21	1300	7.47	4,340	--
03401000 Cumberland River near Harlan	21	1600	8.51	6,550	<2
03401428 Bennetts Fork near Middlesboro	21	0630	3.30	696	--
03401450 Stoney Fork at Middlesboro	21	0530	8.68	1,200	--
03402000 Yellow Creek near Middlesboro	21	1100	12.53	3,470	<2
03403000 Cumberland River near Pineville	21	2300	29.34		--
	21	2100		16,600	<2
03403500 Cumberland River at Barbourville	22	0700	25.68		--
	22	0200		17,600	<2
03403910 Clear Fork at Saxton	21	2200	23.99	7,690	<2
03404000 Cumberland River at Williamsburg	22	1200	21.53	21,900	<2
03404500 Cumberland River at Cumberland Falls	21	2200	9.58	26,600	<2
03404820 Laurel River at Municipal Dam at Corbin	21	0800	23.44	4,350	<2
03404900 Lynn Camp Creek at Corbin	21	1300	7.89	1,800	<2
03406500 Rockcastle River at Billows	21	2400	31.78	25,400	2-5
03407500 Buck Creek near Shopville	21	0730	19.00	14,600	5-10
03410500 South Fork Cumberland River near Stearns	21	2000	26.33	33,800	<2
03435140 Whippoorwill Creek near Claymour	20	2315	14.12	3,800	2-5
03438000 Little River near Cediz	14	0700	17.84	9,300	2-5
03438220 Cumberland River near Grand Rivers	15	0730		127,000	--
	24	1400	41.03		--
03610200 Clarks River at Almo	14	1600	17.35	15,800	--
03610545 West Fork Clarks River near Brewers	14	0715	16.90	8,450	5-10
03611260 Massac Creek near Paducah	13	1645	14.64	4,200	5-10
03611500 Ohio River at Metropolis	24	1500	52.61		--
	24	1600		1,060,000	--
07024000 Bayou De Chien near Clinton	14	1830	16.07	4,170	2-5

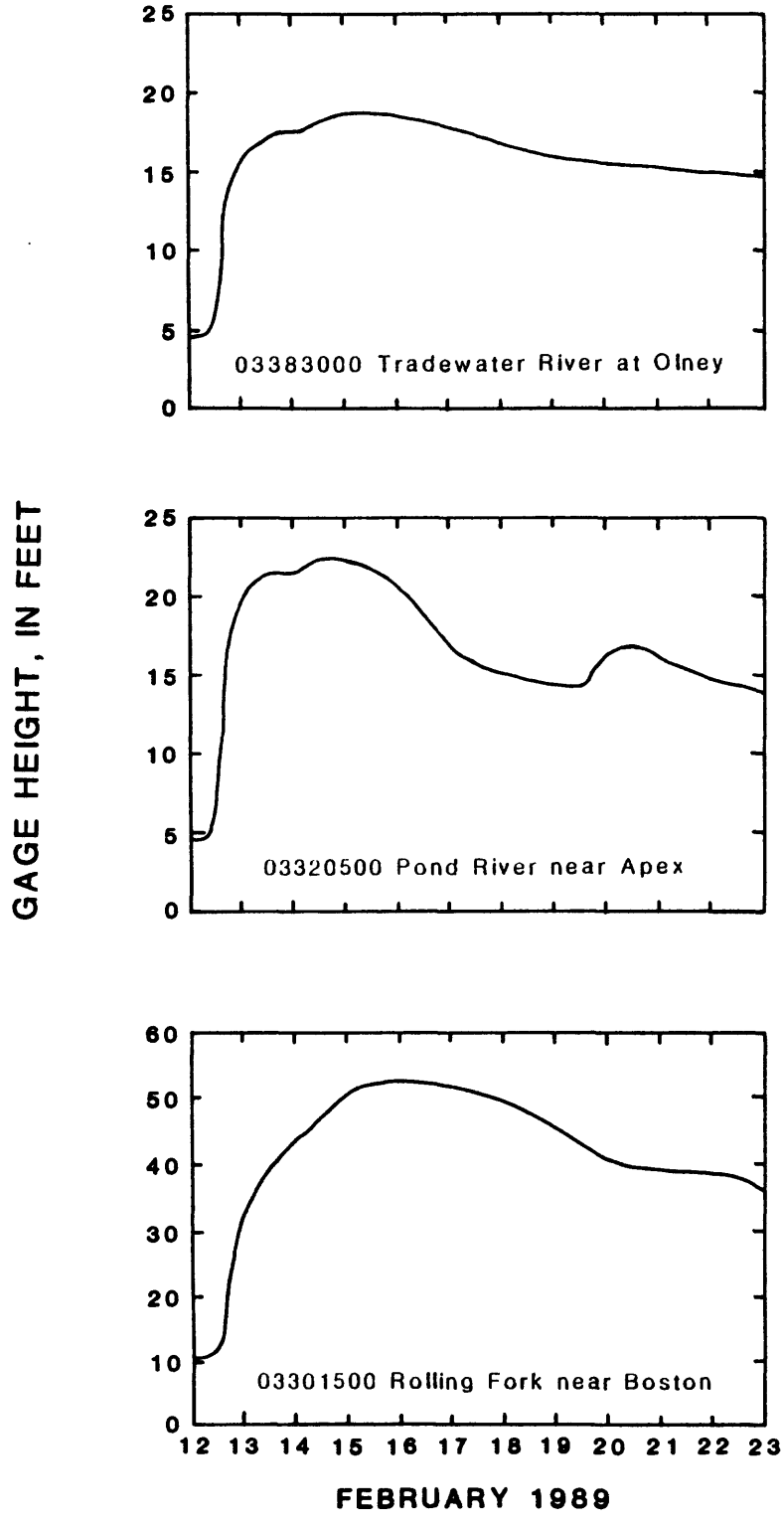

Figure 4.--Stage hydrographs for selected streams for the flood of February 1989.

February 13-16. Eight gaging stations had peak discharges with recurrence intervals that exceeded 25 years and a total of 17 gaging stations had recurrence intervals that equaled or exceeded 10 years. Even though major flooding occurred in some parts of the State, the crests at selected lakes in Kentucky did not reach flood-pool elevations (table 3).

Table 3.--Crests at selected lakes in Kentucky for the flood of February 1989

Name	Site in figure 1	Date in February of crest	Flood crest elevation, in feet above sea level	Contents at flood crest, in acre feet	Winter pool elevation, in feet above sea level	Flood pool elevation, in feet above sea level
Barren River Lake	5	25	577.35	586,700	525	590
Buckhorn Lake	13	23	794.69	50,300	757	840
Cave Run Lake	23	24	752.08	443,300	724	765
Green River Lake	36	26	699.41	502,600	644	713
Nolin River Lake	57	25,26	542.80	394,200	490	560
Rough River Lake	60	23,24	521.61	310,500	470	524
Taylorsville Lake	63	23	580.38	112,900	545	592

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