CHAPTER 4

FLOOD DESCRIPTION

The meteorological events which led to an unleashing of record amounts of water into the Arkansas River Basin have been described in Chapter 3. The resultant flood damages prompted the President of the United States to issue two disaster area declarations: the first, **FEMA-778-DR**, for Oklahoma on 14 October 1986, and the second, **FEMA-780-DR**, for Kansas on 22 October 1986. Thirty-three counties, the cities of Norman and Shawnee in Oklahoma and ten counties in Kansas were included in these declarations (see **Table 4-1** and **Figure 4-1**). Counties outside the area presented in this report are included to provide a measure of the total extent of flooding.

This event established new, record high, flood levels at seven stream gaging sites. Some of the previous records had stood since the 1920's. Flows at several locations exceeded those which would be expected to happen only about once in a hundred years.

Perhaps the most notable characteristic of this flood was its widespread coverage. Virtually every stream in northeastern Oklahoma and southeastern Kansas rose out of its banks at some time during the first week of October. The flood levels experienced at Muskogee, Oklahoma on the Arkansas River and points downstream were the highest since 1957. Record high flooding resulted in the Tulsa and Bartlesville, Oklahoma metropolitan areas.

Without the system of flood control lakes, the flooding along the Arkansas River, from Muskogee downstream, would have been similar to that which occurred in 1943 causing considerable damage and loss of life. Flows

TABLE 4-1

DECLARED DISASTER AREAS

Oklahoma Counties	Oklahoma Cities, County	Kansas Counties
Adair *	Norman, Cleveland *	Allen *
Beckham	Shawnee, Pottawatomie *	Bourbon *
Blaine *		Chautauqua *
Caddo		Cherokee *
Canadian *		Cowley *
Cherokee *		Elk *
Custer *		Labette *
Garfield *		Montgomery *
Grady		Neosho *
Grant *		Wilson *
Greer		
Kay *		
Kingfisher *		
Kiowa		
Logan *		
McClain *		
Major *		
Muskogee *		
Noble *		
Nowata *		
Okfuskee *		
Okmulgee *		
Osage *		
Ottawa *		
Pawnee *		
Payne *		
Rogers *		
Sequoyah *		
Tillman		
Tulsa *		
Wagoner *		
Washington *		
Washita		

* - Areas in the Arkansas River Basin

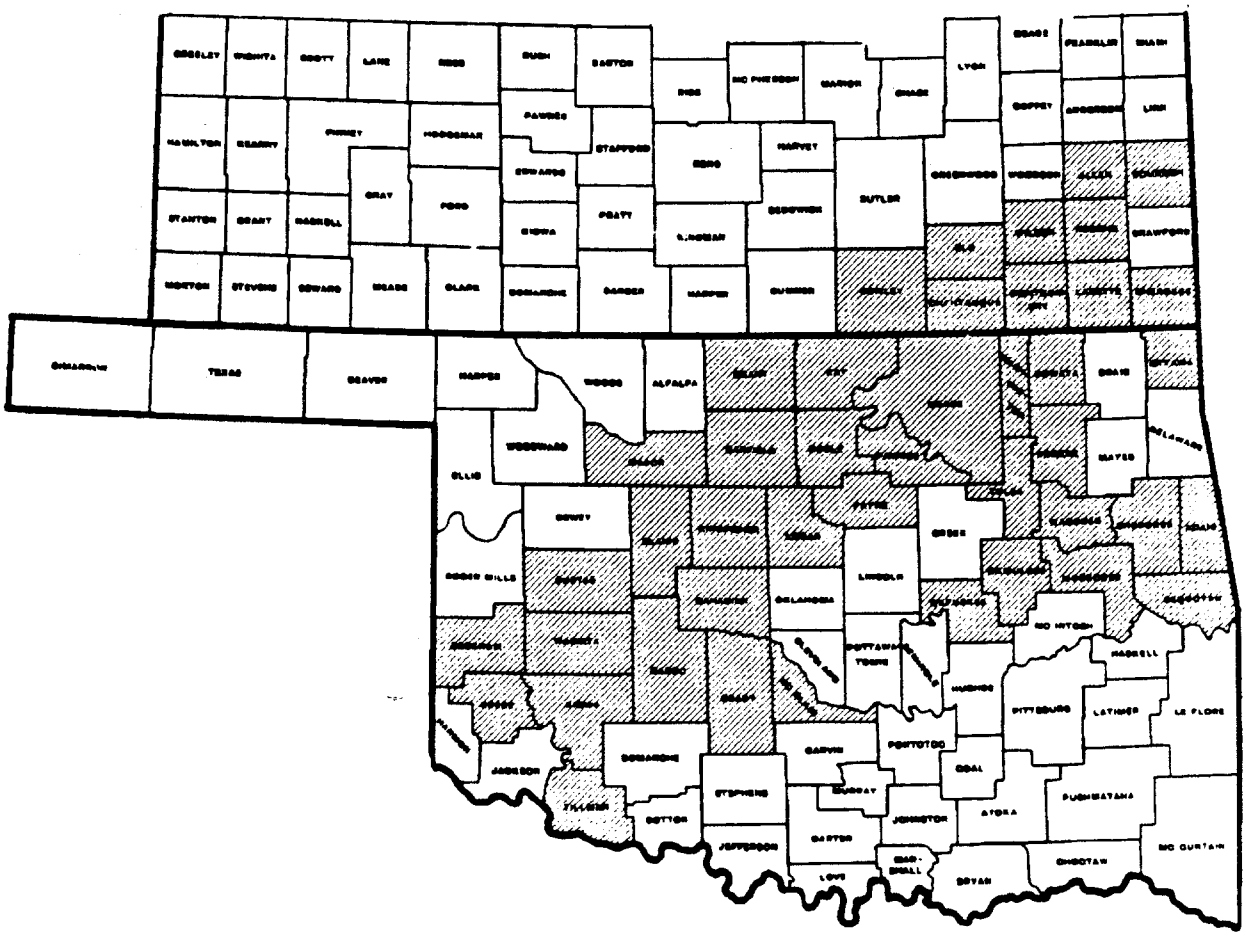

Figure 4-1 **Declared Disaster Areas**

through the Tulsa and Bartlesville areas would have been about twice the previous record high flows. **Table 4-2** shows flood levels reached at selected stream gaging sites during the September-October 1986 flood.

Appendix A contains 20 charts showing stages and flow rates from 21 September through 31 December 1986. Rivers at specific gage locations are covered in the first 6 of these; flood control lakes in the last 14. Flow rates charted for the reservoirs show both inflows and releases.

Appendix B contains aerial photographs taken at or near the peak of the flooding of several of the affected areas and flood profiles.

TABLE 4-2

FLOW AND STAGE DATA AT SELECTED GAGE SITES IN OKLAHOMA AND KANSAS

Gage Name	Stream	Bank-full Stage (feet)	Unreg-ulated Stage (feet)	Exper-ienced Stage (feet)	Stage Red-uction (feet)	Unreg-ulated Flow (cfs)	Exper-ienced Flow (cfs)	Date of Crest During Flood	Flood of Record		
									Stage (feet)	Flow (cfs)	Date
Coyville	Verdigris	28.0	39.3	31.9	7.4	60,000	8,900	10/03/86			
Altoona	Verdigris	23.0	31.8**	28.8	3.0	81,400	48,400	10/04/86	31.09	71,000	07/12/57
Fall River	Fall River	16.0	30.4	8.7	14.4	42,000	2,300	10/03/86			
Fredonia	Fall River	17.0	38.9**	32.3	6.6	70,600	30,800	10/03/86	36.17	49,000	04/16/45
Elk City	Elk River	20.0	34.1	26.3	7.8	100,700	27,500	10/03/86			
Independence	Verdigris River	30.0	53.5**	47.0	6.5	206,900	109,300	10/04/86	47.60	114,000	05/19/43
Oologah	Verdigris River	39.0	68.5	46.6	21.9	175,100	49,800	10/05/86			
Copan	Little Caney	21.0	31.0	28.7	2.3	83,400	50,800	10/03/86			
Hulah	Caney	32.0	40.9	39.6	1.3	90,700	58,000	10/03/86			
Hulah	Caney	32.0	36.6	0.0	4.6	17,000		10/08/86			
Bartlesville	Caney	13.0	33.1**	27.7*	5.4	176,000	107,800	10/04/86	25.30		10/03/26
Ramona	Caney	26.0	32.1**	31.1	1.0	139,500	90,200	10/05/86	31.70		05/19/43
Avant	Bird Creek	11.3		30.5			27,600	09/30/86			
Avant	Bird Creek	11.3	32.5**	23.3	9.2	31,700	16,100	10/03/86	32.03	32,300	03/11/74
Skiatook	Hominy	22.5	37.4	0.0	14.9	16,300		10/03/86			
Sperry	Bird Creek	21.0	31.8	30.9	0.9	67,700	50,000	10/01/86	32.60	90,000	10/03/59
Inola	Verdigris	42.0	55.9**	52.9	3.0	350,700		10/08/86	54.90	224,000	05/21/43
Council Grove	Grand (Neosho)	14.3	15.8	6.7	1.5	3,800	16	10/02/86			
Council Grove	Grand (Neosho)	14.3	16.4	10.0	2.1	4,300	1,000	10/11/86			
Burlington	Grand (Neosho)	23.0	33.6	11.9	10.6	51,700	4,500	10/03/86			
Iola	Grand (Neosho)	15.0	(1)	31.8		71,200	34,900	10/03/86	43.00	436,000	07/13/51
Parsons	Grand (Neosho)	22.0	29.6	27.2	2.4	73,100	40,500	10/04/86	40.20	410,000	07/14/51
Commerce	Grand (Neosho)	15.0	28.1	26.2	1.9	142,400	122,700	10/06/86	34.03	267,000	07/15/51
Canton Out	N. Canadian	10.0	11.9	4.1	1.9	3,800	200	10/03/86			
El Reno	N. Canadian	9.5	16.6	16.0	0.6	16,000	7,500	10/05/86	18.20	12,500	09/21/65
Wetumka	N. Canadian	11.0	16.1	13.7	2.4	23,400	21,900	10/01/86	26.90		11/02/74

TABLE 4-2 (Continued)

Gage Name	Stream	Bank-full Stage (feet)	Unreg-ulated Stage (feet)	Exper-ienced Stage (feet)	Stage Red-uction (feet)	Unreg-ulated Flow (cfs)	Exper-ienced Flow (cfs)	Date of Crest During Flood	Flood of Record Stage (feet)	Flood of Record Flow (cfs)	Flood of Record Date
Wetumka	N. Canadian	11.0	11.7	10.3	0.7	12,400	9,600	10/08/86			
Tecumseh	Little River	11.0		15.2			3,400	09/31/86	25.58		01/09/32
Tecumseh	Little River	10.0	16.2	10.2	6.0	7,800	400	10/02/86			
Winfield	Walnut	30.0	33.6	32.8	0.8	44,400	40,900	10/04/86	41.00	94,400	11/18/28
Cheney	Ninnescah	9.0	13.1	9.3	3.8	9,100	700	10/02/86			
Cheney	Ninnescah	9.0	14.8	6.2	5.8	21,100	60	10/08/86			
Peck	Ninnescah	12.0	15.5	12.6	2.9	13,000	7,780	10/03/86	26.40	70,000	06/09/23
Peck	Ninnescah	12.0	14.5	5.5	2.5	10,900	1,200	10/08/86			
Kaw	Arkansas	944.0	956.0	947.0	8.8	190,400	39,000	10/03/86			
Tonkawa	Salt Fork	17.0	27.1	26.5	0.6	72,200	64,800	10/03/86	28.98	97,300	10/11/73
Ralston	Arkansas	16.0	26.3**	22.8	3.5	388,700	178,800	10/04/86	23.80	200,000	06/11/23
Tulsa	Arkansas	15.0	31.3**	25.3*	6.0	447,800	306,000	10/05/86	22.08	244,000	06/13/23
Heyburn	Polecat	16.0	22.7	16.5	6.2	6,600	1,840	10/01/86			
Sapulpa	Polecat	19.0	28.8	28.1	0.7	20,500	15,600	10/01/86			
Jenks	Polecat	610.0	617.0	615.0	1.1	12,000	8,500	10/01/86			
Muskogee	Arkansas	26.0	52.8**	39.6	13.2	738,400	375,000	10/06/86	48.20	700,000	05/21/43
Gore	Illinois	13.0	26.2	9.5	16.7	130,000	7,200	10/01/86			
Sallisaw	Arkansas	24.0	40.5**	34.2	6.3			10/01/86	37.90	850,000	05/11/43
Van Buren	Arkansas	22.0	37.8	34.7	3.1	755,000	370,000	10/09/86	38.10	650,000	04/16/43
Arkansas City	Arkansas	17.0	(1)	20.3			34,700	10/03/86	25.55	73,100	05/18/57
Augusta	Walnut	19.0	(1)	24.6			17,900	10/04/86	37.23		06/08/79
Blackwell	Chikaskia	26.0	(2)	34.3*			46,000	10/03/86	34.00	100,000	06/10/23
Pawnee	Black Bear	17.0	(2)	27.3			16,000	10/04/86	31.43	30,200	10/03/59
Dover	Cimarron	17.0	(2)	25.6			114,000	10/03/86	26.00		05/16/57
Perkins	Cimarron	11.0	(2)	26.5*			159,000	10/04/86	22.03		05/19/82
Haskell	Arkansas	19.0	(1)	22.8			260,000	10/05/86	26.02		
Cherryvale	Big Hill	15.0	(1)	15.4			1,620	10/03/86	23.02	36,000	07/03/76
Lenapah	Verdigris	30.0	(1)	38.3			81,000	10/05/86	40.44	137,000	05/20/43
Claremore	Verdigris	35.0	(1)	44.1			72,500	10/07/86	55.05	182,000	05/21/43
Catoosa	Verdigris	566.7	(1)	553.0				10/08/86	579.57		05/21/43
Florence	Cottonwood	22.0	(1)	21.1			8,800	10/03/86	32.57		07/11/51

TABLE 4-2 (Continued)

Gage Name	Stream	Bank-full Stage (feet)	Unreg-ulated Stage (feet)	Exper-ienced Stage (feet)	Stage Red-uction (feet)	Unreg-ulated Flow (cfs)	Exper-ienced Flow (cfs)	Date of Crest During Flood	Flood of Record Stage (feet)	Flood of Record Flow (cfs)	Flood of Record Date
Plymouth	Cottonwood	28.0	(1)	33.4			17,900	10/04/86	37.80		07/11/5
Chanute	Grand	23.0	(1)	35.3			52,800	10/04/86	40.90		07/13/5
Quapaw	Spring	22.0	(2)	33.2			101,900	10/02/86	43.40	190,000	05/19/4
Tiff City	Elk	15.0	(2)	20.1			32,000	10/01/86	28.40	137,000	04/19/4
Big Cabin	Big Cabin	34.0	(2)	42.9			32,900	10/01/86	44.58	40,100	11/04/7
Watts	Illinois	13.0	(2)	24.5			49,600	10/01/86	25.96	68,000	07/25/6
Tahlequah	Illinois	11.0	(2)	22.5			66,000	10/01/86	27.94	150,000	05/10/5
Eldon	Illinois	18.0	(2)	25.6*			138,000	10/01/86	23.80		04/05/4
Calvin	Canadian	15.0	(1)	9.8			37,400	10/06/86	21.00		08/07/0
Seiling	Canadian	11.0	(1)	12.9			6,200	10/03/86	16.40		10/15/2
Watonga	Canadian	12.0	(1)	19.2*			14,700	10/03/86	14.17		10/02/5
Harrah	N. Canadian		(1)	18.9*			18,400	10/04/86	18.14	7,630	06/04/7
Beggs	Deep Fork	17.0	(1)	25.1			14,800	10/02/86	34.55	66,800	05/11/4
Whitefield	Canadian	16.0	(1)	9.2			6,200	09/30/86	23.50	281,000	05/10/4
Poteau	Poteau	20.0	(1)	7.0			1,660	10/09/86	39.00	100,000	06/18/3
Panama	Poteau	24.0	(1)	23.5			9,700	10/09/86	44.60		06/18/3

Notes:
(1) Unregulated stage and flow data not available.
(2) No upstream projects.
* Indicates that the experienced stage exceeded the stage of the flood of record.
** Indicates that the unregulated stage would have exceeded the stage of the flood of record.

Definitions:
cfs = cubic feet per second
Stage = height of the water surface above an established reference elevation.
Bankfull = the stage which occurs when a channel is full to its banks.
Unregulated Flow = the flow rate which would occur without upsteam dams.
Unregulated Stage = the stage which would occur without upstream dams.
Experienced Stage = the stage which occurred.

TABLE 4-2 (Continued)

Stage Reduction = the result of unregulated stage minus experienced stage.
Observed Flow During Flood = the peak amount of water observed flowing in a channel during flood.
Date of Crest During Flood = the date of maximum stage, as recorded at a gage, during flood.
Flood of Record = flood of greatest proportions to date (limited to those with written records).