

Arkansas-Oklahoma Arkansas River
Compact Commission
Annual Report

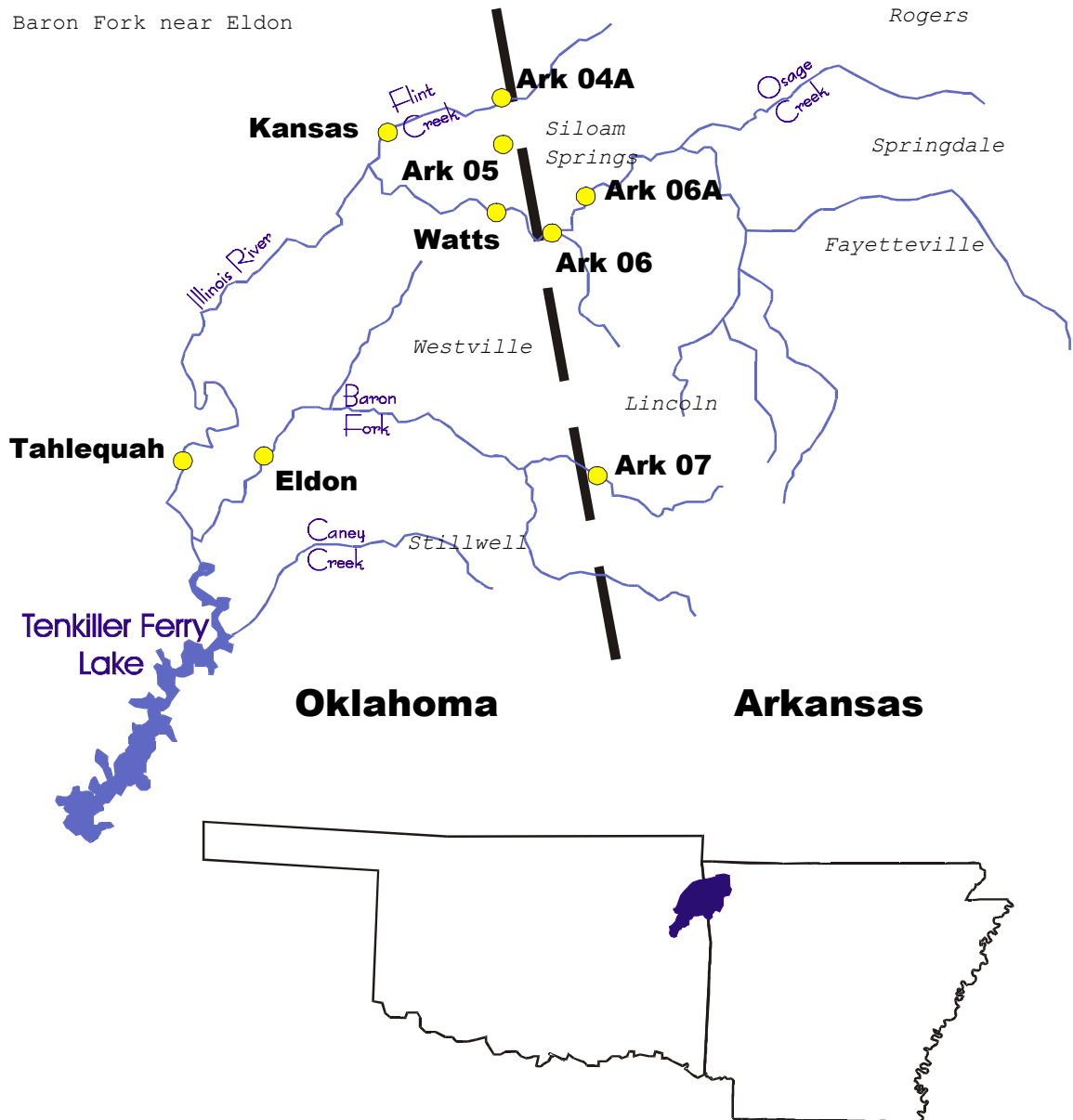
October 2001

ARKANSAS-OKLAHOMA COMPACT

Water Quality Monitoring Stations Illinois River Basin Arkansas and Oklahoma

Legend

ARK 04A	Flint Creek near West Siloam Springs, OK
ARK 05	Sager Creek near Siloam Springs
ARK 06A	Illinois River near Siloam Springs
ARK 07	Baron Fork at Dutch Mills
ARK 40	Illinois River at Savoy
ARK 41	Osage Creek near Elm Springs
Watts	Illinois River near Watts
Tahlequah	Illinois River near Tahlequah
Kansas	Flint Creek near Kansas
Eldon	Baron Fork near Eldon



COMPACT COMMISSION DATA SUMMARY:

Arkansas

The 1996-2000 five-year rolling averages for two of the gaging stations in Arkansas did not change significantly from the previous 5-year rolling average (1995-1999). Flint Creek near West Siloam Springs (04a) and Baron Fork at Dutch Mills (07) loadings both decreased in 2000 from the previous year, accounting for the lower 5-year rolling average.

Both Sager Creek and Illinois River near Siloam Springs loadings increased significantly in 2000, and were in fact, the highest loading values reported at these stations since 1980.

The annual flow values for 2000 are less than in 1999, although the concentrations are much higher. The 5-year rolling averages, in turn, were higher in 1996-2000 than in any other 5-year reporting period.

All 5-year rolling averages at the Arkansas stations are higher than the 40% reduction goal, and three of the four are above the baseline value.

Oklahoma

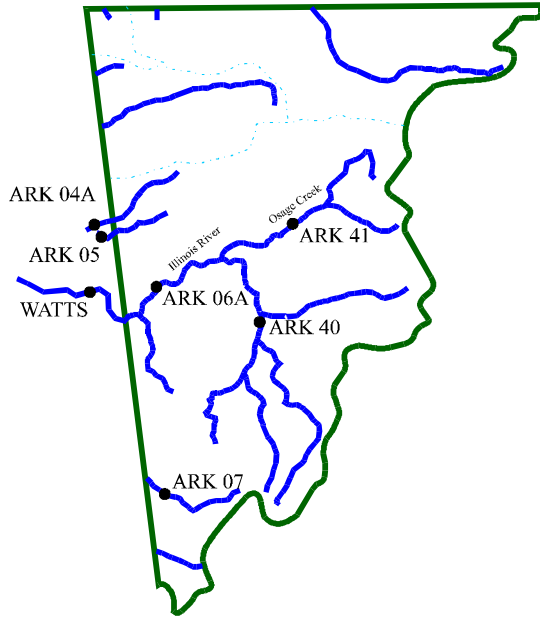
The 1996-2000 five-year rolling averages for two of the gaging stations in Oklahoma did not change significantly from the previous 5-year rolling average (1995-1999), Flint Creek near Kansas and Baron Fork near Eldon. Although the 5-year rolling averages were similar, the annual loadings calculated in 2000 were lower at Flint Creek, but much higher at Barren Fork than in 1999. A review of the annual loadings calculated for the Barren Fork site indicate great variability over the years, ranging from 6,676 kg TP/year in 1997 to 98,887 in 1995 and 55,110 kg TP/year in 2000.

The five-year rolling averages at both Illinois River sites, near Watts and Tahlequah. Were much higher from 1996-2000 than from 1995-1999. Annual loading at Watts was much higher in 2000 than in 1999, although the annual loading at Tahlequah was higher in 1999 than in 2000.

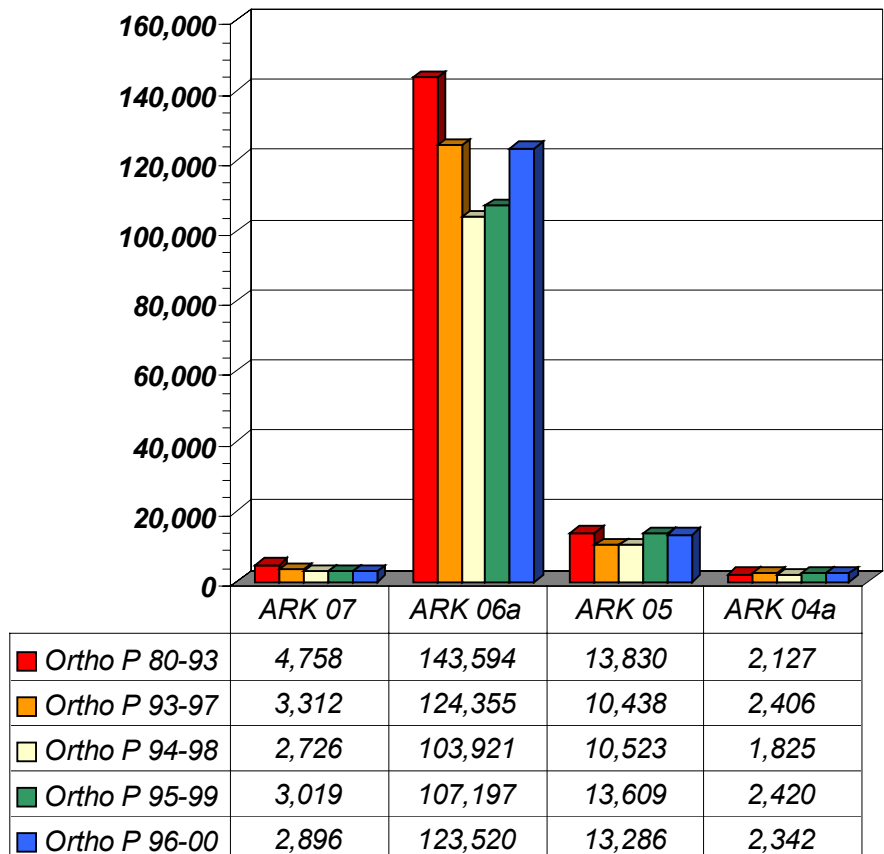
All Oklahoma stations are higher than the 40% reduction, if not near or above the baseline value.

The USGS reported record flow measurements at Barren Fork in 2000, accounting for the significant increase in the annual loading value. Record concentrations were also measured by the USGS at Flint Creek and extremely high values were reported for Illinois River at Tahlequah and Barren Fork at Eldon. It is very apparent that higher rainfall, and in turn higher flow, results in higher concentrations.

Summary Loadings Illinois River

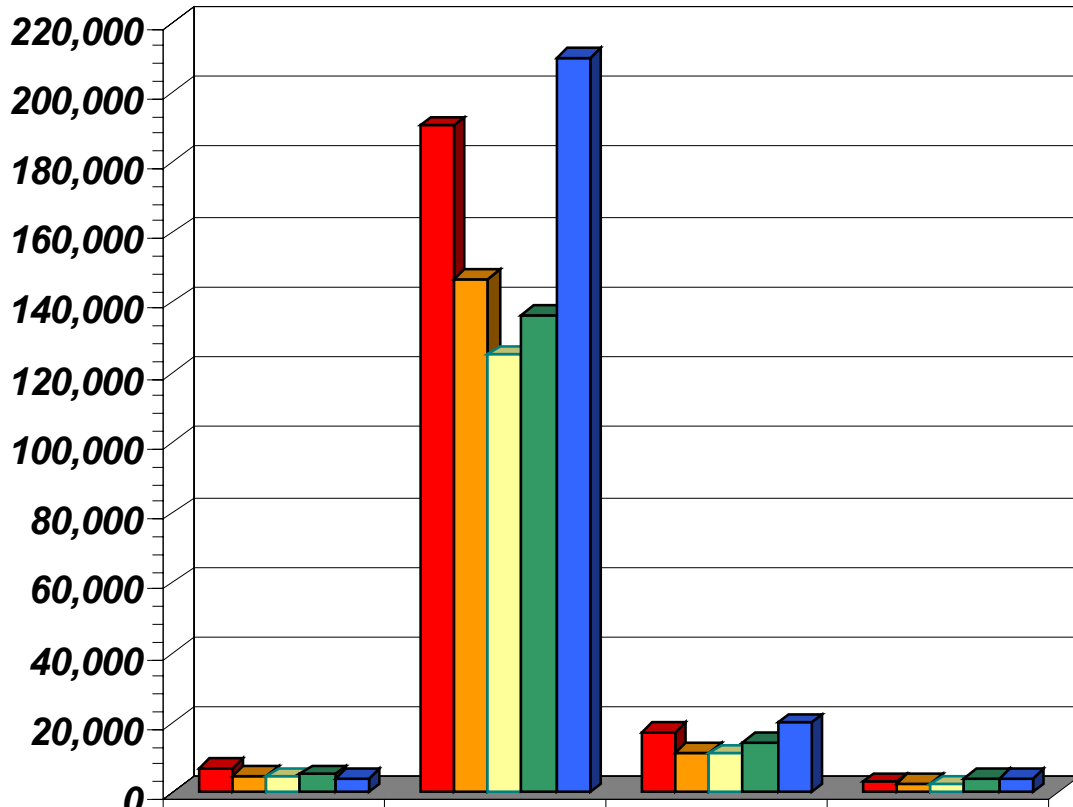


Average Annual Loading Ortho P
in Kilograms per Year



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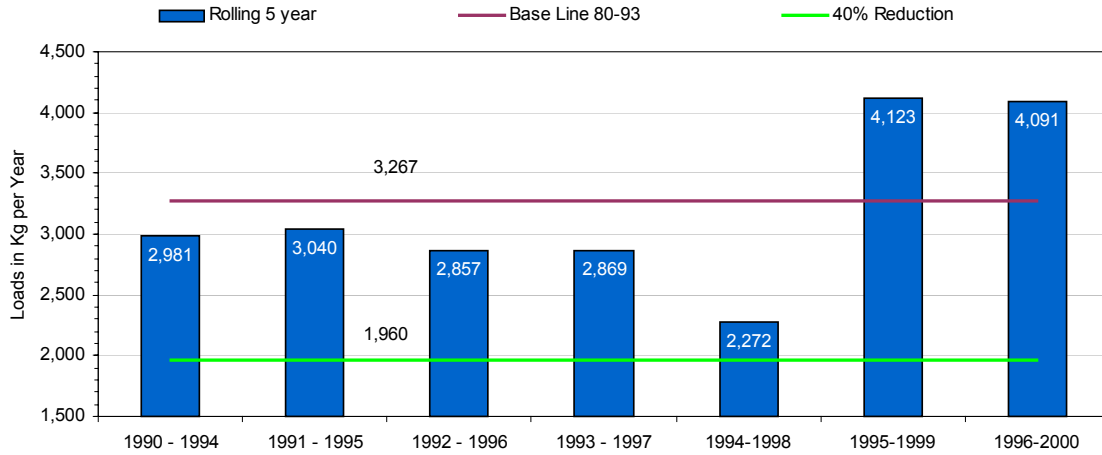
**Average Annual Loading Total P
in Kilograms per Year**



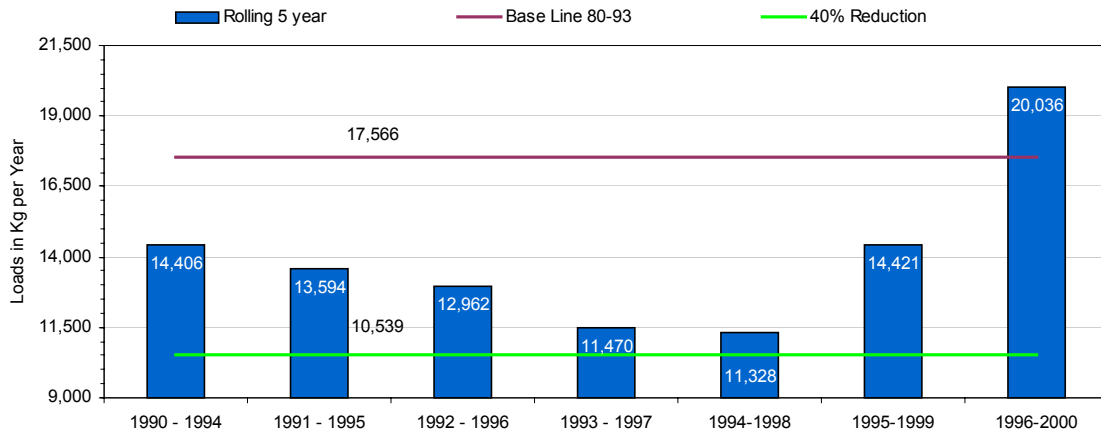
	ARK 07	ARK 06a	ARK 05	ARK 04a
■ Total P 80-93	7,160	190,577	17,566	3,267
■ Total P 93-97	4,956	146,690	11,470	2,869
■ Total P 94-98	4,513	125,191	11,328	2,272
■ Total P 95-99	5,253	136,593	14,421	4,123
■ Total P 96-00	4,328	210,033	20,036	4,091

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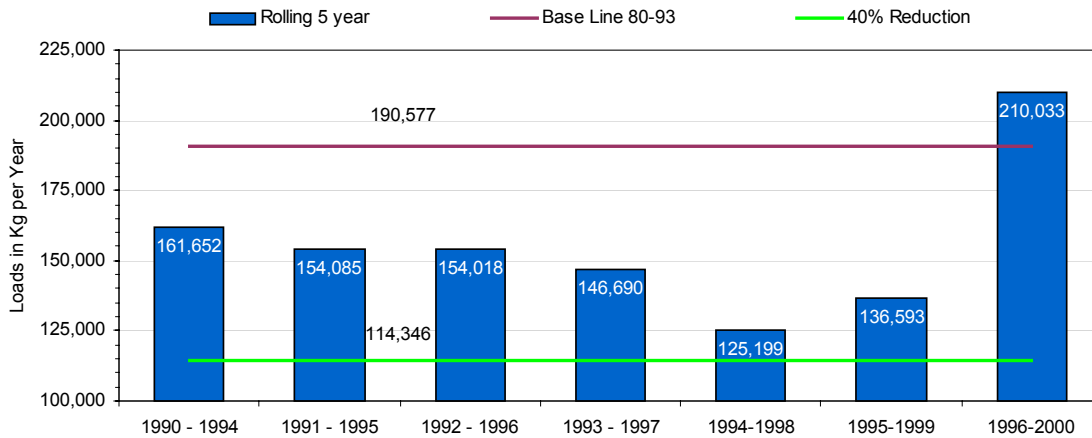
Flint Creek



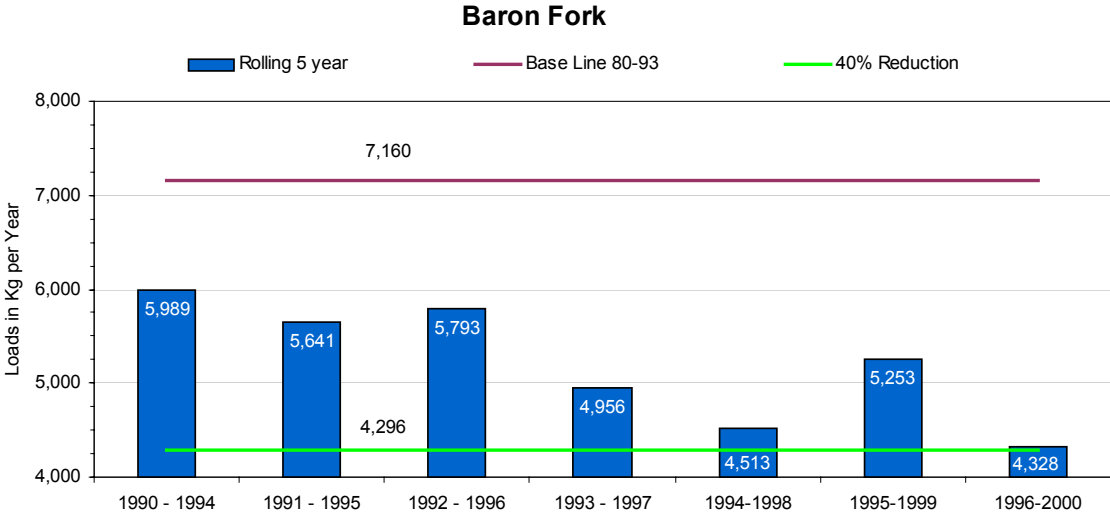
Sager Creek



Illinois River

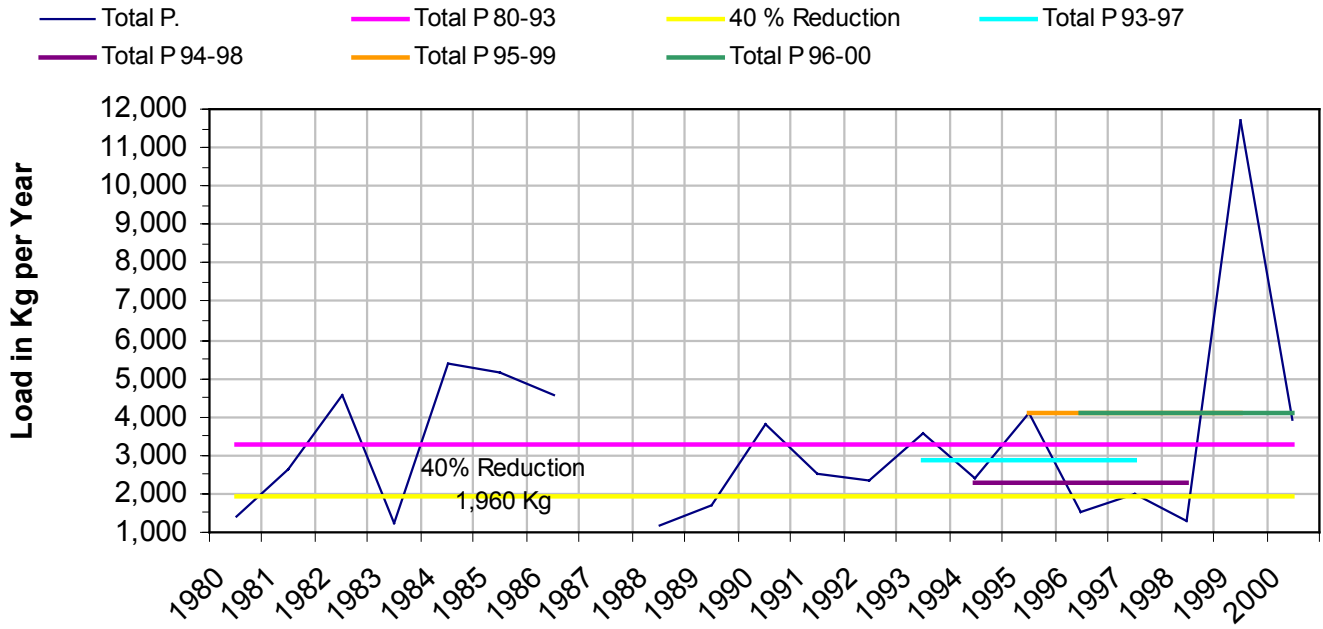


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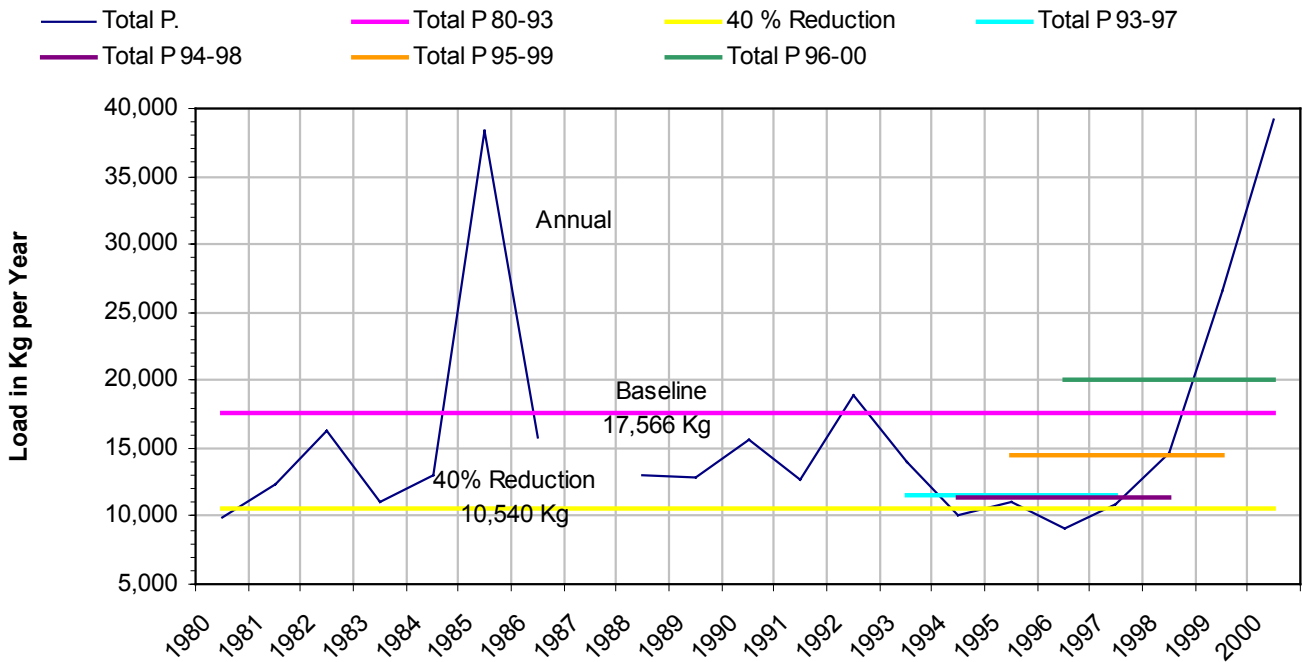


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Flint Creek Near West Siloam Springs Total P Loading

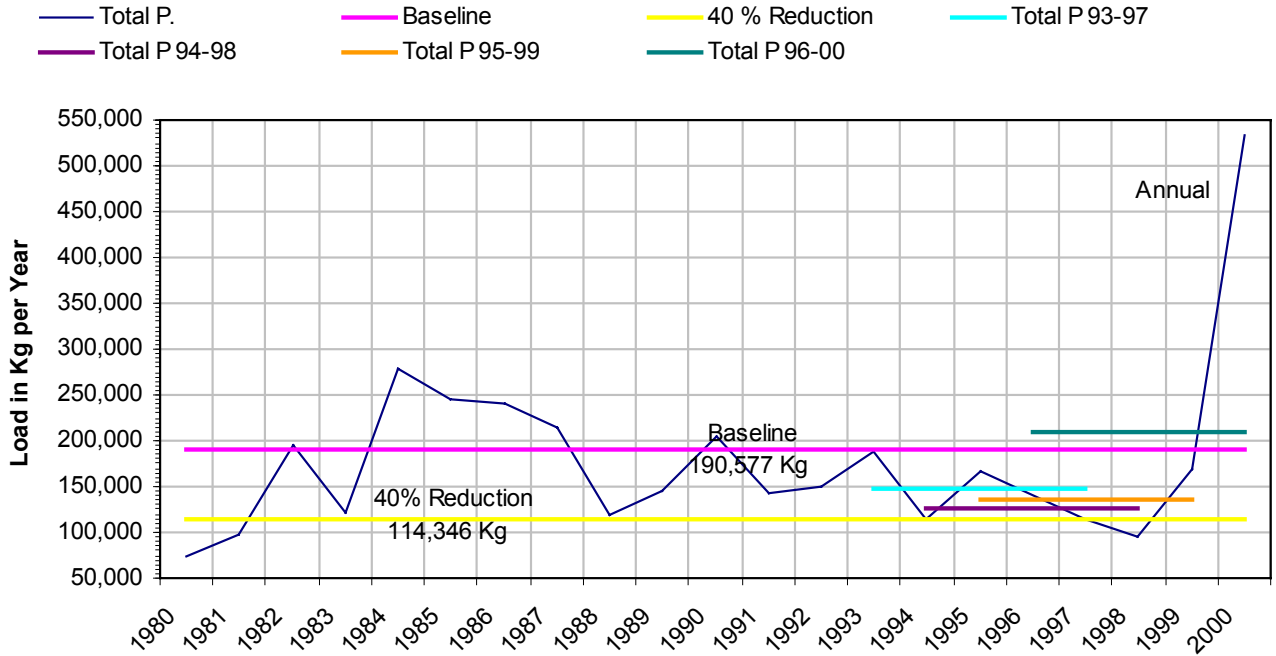


Sager Creek Near Siloam Springs Total P Loading

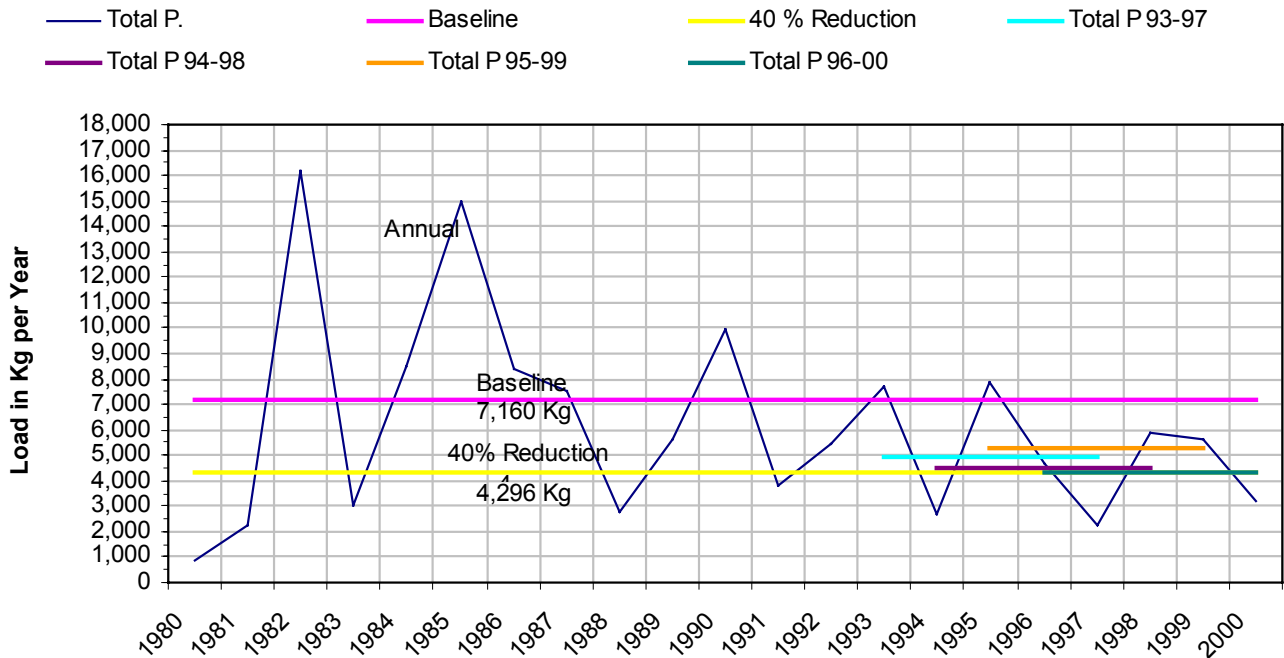


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Illinois River Near Siloam Springs Total P Loading



Baron Fork at Dutch Mills Total P Loading



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ARK 04A				Loadings	
Year	Flow (cfs)	Total Phos.	Ortho Phos.	total P kg/year	ortho P kg/year
80	11.9	0.130		1,383	
81	19.8	0.149	0.115	2,637	2,035
82	30.0	0.171	0.111	4,585	2,976
83	19.0	0.073	0.045	1,235	756
84	54.0	0.112	0.056	5,405	2,720
85	91.0	0.063	0.055	5,130	4,446
86	76.0	0.067	0.061	4,555	4,128
87		0.049	0.032		
88	42.0	0.031	0.033	1,164	1,228
89	38.0	0.050	0.043	1,698	1,460
90	71.0	0.060	0.031	3,807	1,983
91	52.0	0.054	0.037	2,530	1,732
92	56.0	0.047	0.035	2,342	1,741
93	88.2	0.045	0.059	3,578	4,632
94	53.0	0.051	0.049	2,427	2,300
95	61.3	0.075	0.061	4,099	3,355
96	33.6	0.050	0.050	1,503	1,516
97	36.8	0.069	0.032	2,259	1,062
98	42.2	0.035	0.031	1,320	1,169
99	63.4	0.207	0.109	11,719	6,199
00	53.3	0.083	0.037	3,938	1,763
Avg.	48.7	0.073	0.052	3,162	2,260

ARK 05				Loadings	
Year	Flow (cfs)	Total Phos.	Ortho Phos.	total P kg/year	ortho P kg/year
80	4.5	2.430	2.567	9,865	10,419
81	6.5	2.125	1.693	12,381	9,865
82	9.0	2.025	1.456	16,302	11,723
83	6.3	1.964	1.464	10,989	8,195
84	15.4	0.950		13,071	
85	24.8	1.736	1.403	38,433	31,063
86	21.1	0.834	0.722	15,742	13,627
87		0.948	0.842		
88	12.6	1.154	1.072	12,960	12,039
89	11.7	1.227	1.058	12,795	11,033
90	20.2	0.860	0.706	15,550	12,758
91	15.5	0.914	0.803	12,652	11,103
92	16.5	1.284	0.799	18,898	11,763
93	24.6	0.637	0.522	14,005	11,492
94	15.7	0.721	0.640	10,138	8,992
95	17.8	0.697	0.700	11,112	11,157
96	11.0	0.919	0.836	9,017	8,202
97	11.8	1.029	0.932	10,830	9,810
98	19.0	0.858	0.819	14,569	13,907
99	36.7	0.810	0.659	26,575	21,630
00	19.7	2.225	0.731	39,188	12,881
Avg.	14.7	1.227	1.057	16,080	13,858

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ARK 06A

Loadings

Year	Flow (cfs)	Total Phos.	Ortho Phos.	total P kg/year	ortho P kg/year
80	173	0.470		72,668	
81	260	0.420	0.140	97,593	32,531
82	591	0.370	0.282	195,428	149,110
83	352	0.386	0.318	121,430	100,096
84	706	0.442	0.305	278,884	192,730
85	947	0.289	0.232	244,876	196,352
86	879	0.305	0.275	239,600	216,334
87	815	0.294	0.251	213,877	182,756
88	531	0.253	0.222	119,934	105,194
89	558	0.291	0.260	145,074	129,660
90	1,127	0.204	0.137	205,639	137,652
91	724	0.220	0.183	142,350	118,086
92	760	0.222	0.176	150,515	119,845
93	1,163	0.181	0.130	188,356	135,227
94	674	0.190	0.185	114,147	111,236
95	783	0.237	0.181	166,057	126,737
96	693	0.225	0.204	139,465	126,294
97	597	0.213	0.175	113,548	93,237
98	653	0.163	0.110	95,126	64,195
99	738	0.256	0.196	168,672	129,291
00	602	0.991	0.380	533,256	204,581
Avg.	683.5	0.283	0.209	172,779	127,800

ARK 07

Loadings

Year	Flow (cfs)	Total Phos.	Ortho Phos.	total P kg/year	ortho P kg/year
80	10	0.103		878	
81	18	0.135		2,220	
82	37	0.484		16,178	
83	27	0.125		3,039	
84	52	0.183		8,472	
85	79	0.211		14,973	
86	64	0.147	0.144	8,411	8,228
87	63	0.134	0.115	7,549	6,470
88	32	0.097	0.071	2,767	2,017
89	50	0.124	0.099	5,598	4,449
90	102	0.109	0.053	9,966	4,796
91	49	0.086	0.069	3,810	3,048
92	48	0.127	0.084	5,457	3,586
93	104	0.083	0.062	7,659	5,756
94	37	0.081	0.071	2,673	2,357
95	54	0.162	0.055	7,855	2,641
96	62	0.084	0.075	4,677	4,167
97	37	0.067	0.046	2,211	1,523
98	60	0.110	0.060	5,898	3,217
99	46	0.137	0.088	5,626	3,634
00	48	0.075	0.045	3,228	1,937
Avg.	51.9	0.140	0.077	6,481	3,579

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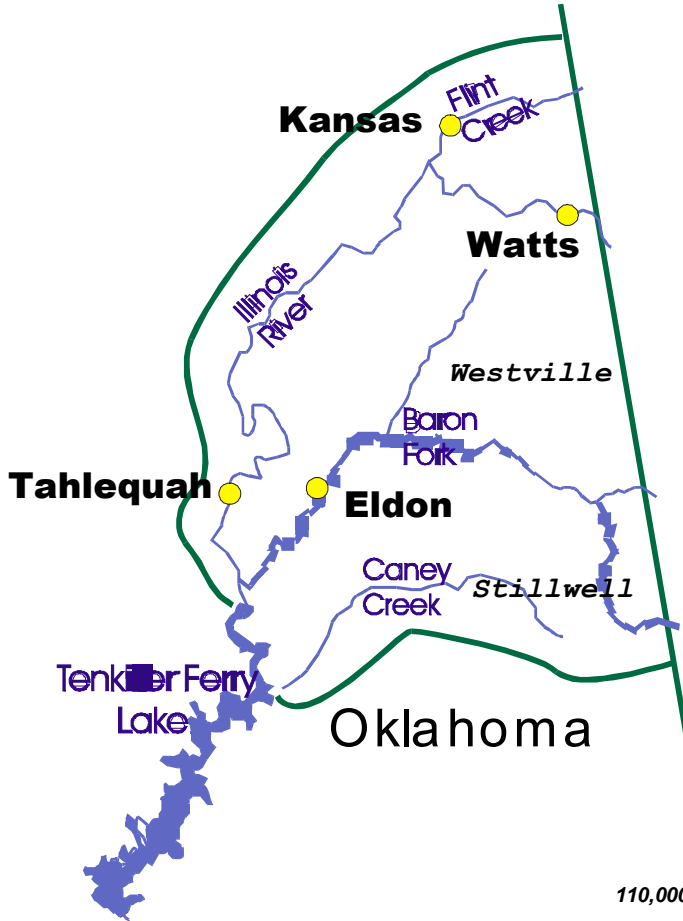
ARK 41				Loadings	
Year	Flow (cfs)	Total Phos.	Ortho Phos.	total P kg/year	ortho P kg/year
95	90	0.71	0.60	56,762	48,502
96	140	0.83	0.79	103,693	98,587
97					
98	197	0.59	0.65	103,524	114,088
99	200	0.57	0.54	101,367	96,016
00	135	0.82	0.79	98,567	95,202
Avg.	142.3	0.71	0.68	89,996	86,455

ARK 40				Loadings	
Year	Flow (cfs)	Total Phos.	Ortho Phos.	total P kg/year	ortho P kg/year
95	329	0.12	0.05	35,332	14,299
96	203	0.07	0.06	13,324	11,270
97					
98	189	0.08	0.14	13,513	23,141
99	207	0.08	0.04	15,425	6,481
00	151	0.07	0.03	9,195	3,702
Avg.	240.4	0.09	0.08	19,589	17,741

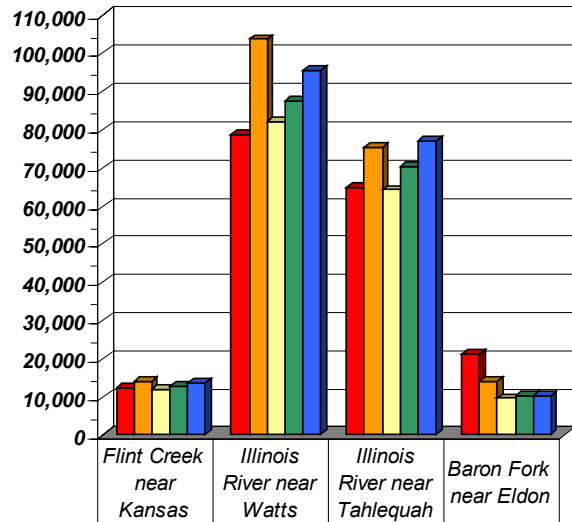
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Average Concentration Levels at Each Station					
Station Ark 04A			Station Ark 04A		
Year	Total Phos. (mg/L)	Percent Decrease	Year	Ortho Phos. (mg/L)	Percent Decrease
80-93	0.078		80-93	0.051	
90-94	0.052	33.44%	90-94	0.042	17.14%
91-95	0.055	29.99%	91-95	0.047	6.77%
92-96	0.055	30.08%	92-96	0.050	0.98%
93-97	0.059	24.85%	93-97	0.049	3.20%
94-98	0.056	28.43%	94-98	0.045	11.66%
95-99	0.087	-11.19%	95-99	0.057	-11.90%
96-00	0.089	-13.75%	96-00	0.052	-2.08%
Station Ark 05			Station Ark 05		
Year	Total Phos. (mg/L)	Percent Decrease	Year	Ortho Phos. (mg/L)	Percent Decrease
80-93	1.354		80-93	1.066	
90-94	0.871	35.69%	90-94	0.688	35.50%
91-95	0.844	37.70%	91-95	0.687	35.57%
92-96	0.847	37.47%	92-96	0.694	34.95%
93-97	0.793	41.46%	93-97	0.722	32.34%
94-98	0.845	37.61%	94-98	0.785	26.39%
95-99	0.863	36.29%	95-99	0.789	25.99%
96-00	1.168	13.77%	96-00	0.795	25.45%
Station Ark 06A			Station Ark 06A		
Year	Total Phos. (mg/L)	Percent Decrease	Year	Ortho Phos. (mg/L)	Percent Decrease
80-93	0.311		80-93	0.235	
90-94	0.203	34.71%	90-94	0.165	29.56%
91-95	0.210	32.55%	91-95	0.173	26.15%
92-96	0.212	32.07%	92-96	0.178	23.96%
93-97	0.210	32.60%	93-97	0.178	24.17%
94-98	0.206	33.86%	94-98	0.171	27.13%
95-99	0.219	29.68%	95-99	0.173	26.19%
96-00	0.369	-18.48%	96-00	0.213	9.23%
Station Ark 07			Station Ark 07		
Year	Total Phos. (mg/L)	Percent Decrease	Year	Ortho Phos. (mg/L)	Percent Decrease
80-93	0.152		80-93	0.101	
90-94	0.098	35.36%	90-94	0.069	31.95%
91-95	0.108	29.13%	91-95	0.069	31.62%
92-96	0.106	30.27%	92-96	0.071	30.19%
93-97	0.094	38.09%	93-97	0.063	37.74%
94-98	0.101	33.67%	94-98	0.061	39.71%
95-99	0.112	26.45%	95-99	0.065	35.76%
96-00	0.095	37.61%	96-00	0.063	37.74%

Summary Loadings Illinois River

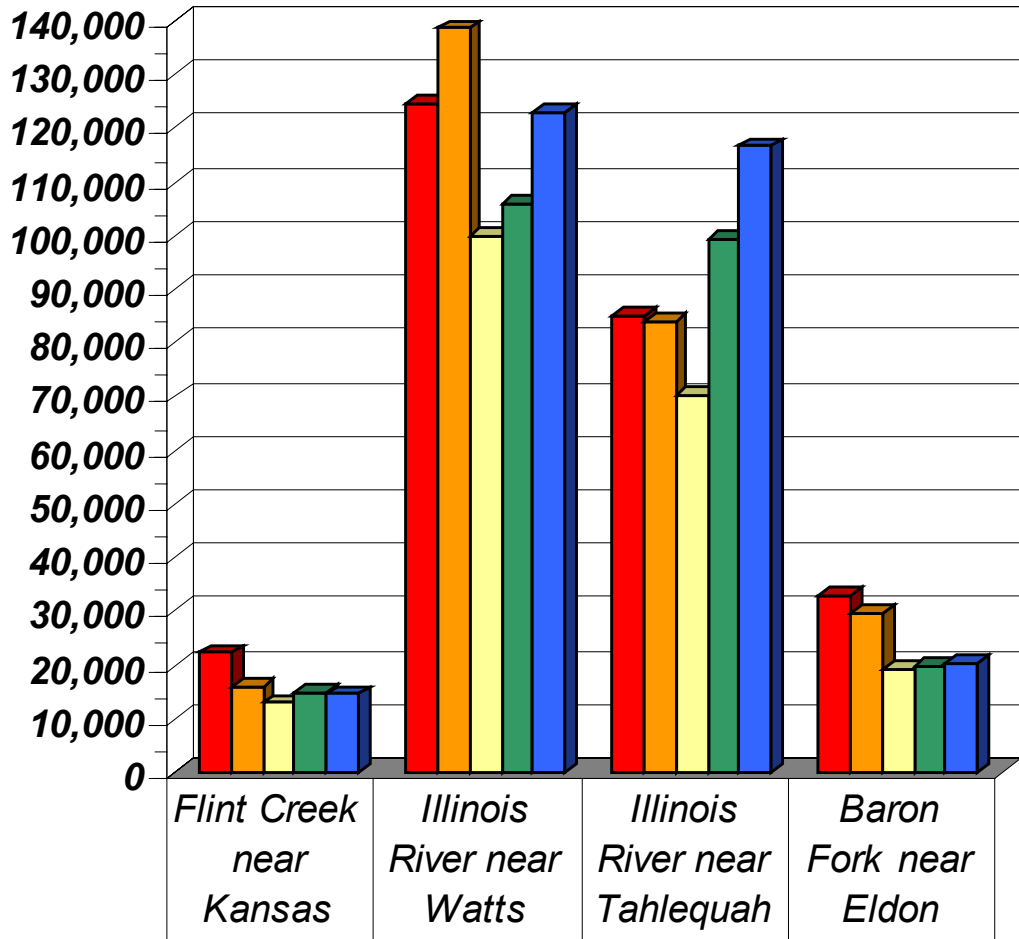


Average Annual Loading Ortho-P
in Kilograms per Year



	Flint Creek near Kansas	Illinois River near Watts	Illinois River near Tahlequah	Baron Fork near Eldon
Ortho P 80-93	12,439	78,761	64,716	21,168
Ortho P 93-97	14,156	103,720	75,458	14,036
Ortho P 94-98	11,982	82,273	64,219	9,634
Ortho P 95-99	12,753	87,629	70,498	10,127
Ortho P 96-00	13,450	95,363	77,167	10,081

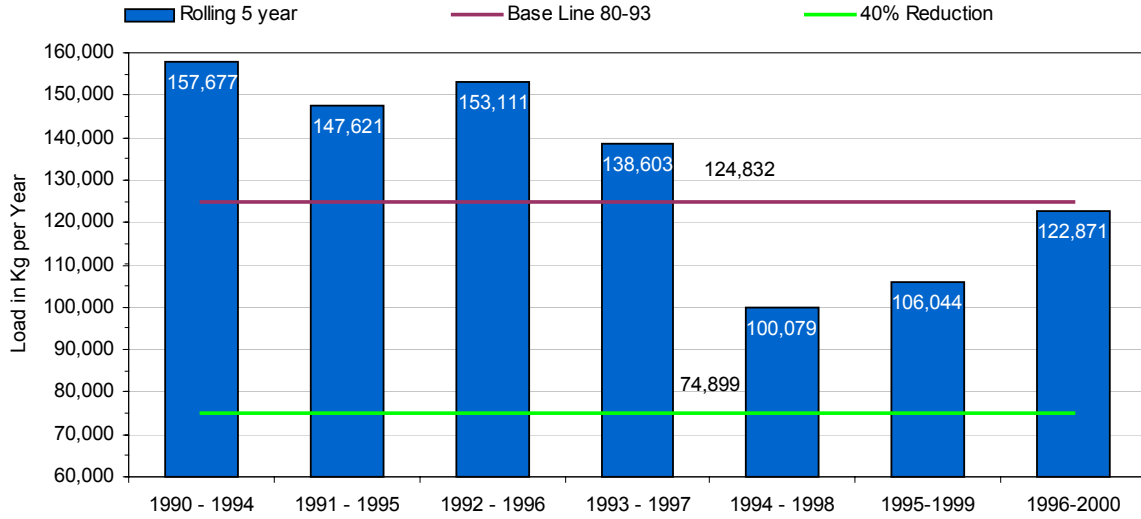
Average Annual Total P Loading in Kilograms per Year



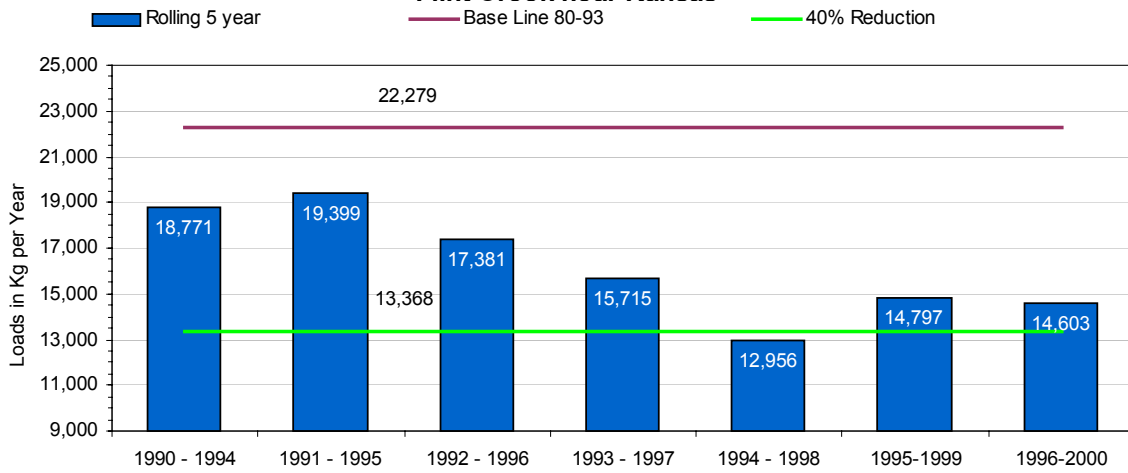
	<i>Flint Creek near Kansas</i>	<i>Illinois River near Watts</i>	<i>Illinois River near Tahlequah</i>	<i>Baron Fork near Eldon</i>
■ <i>Total P 80-93</i>	22,279	124,832	85,235	33,001
■ <i>Total P 93-97</i>	15,715	138,603	83,856	29,502
■ <i>Total P 94-98</i>	12,956	100,079	70,462	19,268
■ <i>Total P 95-99</i>	14,797	106,044	99,420	19,569
■ <i>Total P 96-00</i>	14,603	122,871	116,647	20,162

OKLAHOMA

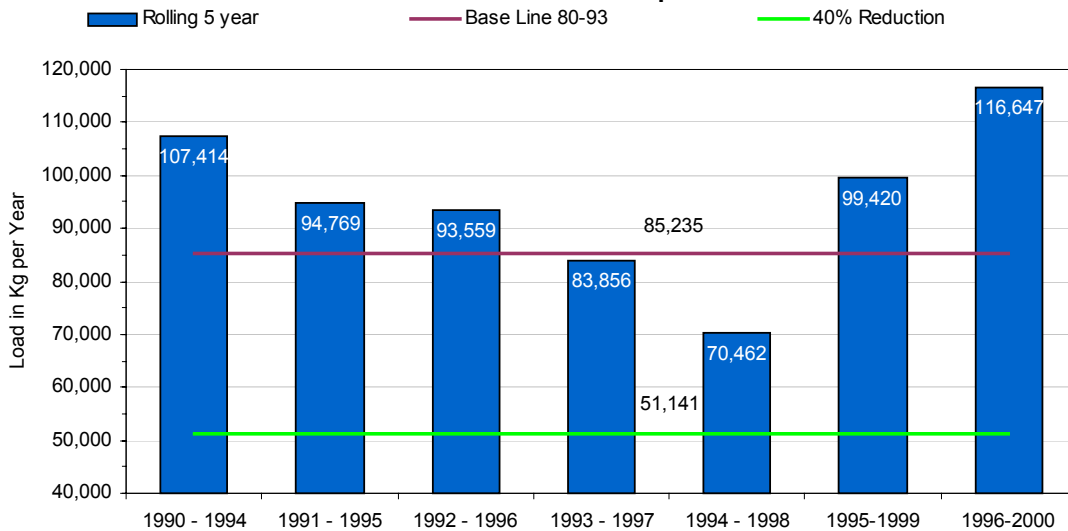
Illinois River near Watts



Flint Creek near Kansas

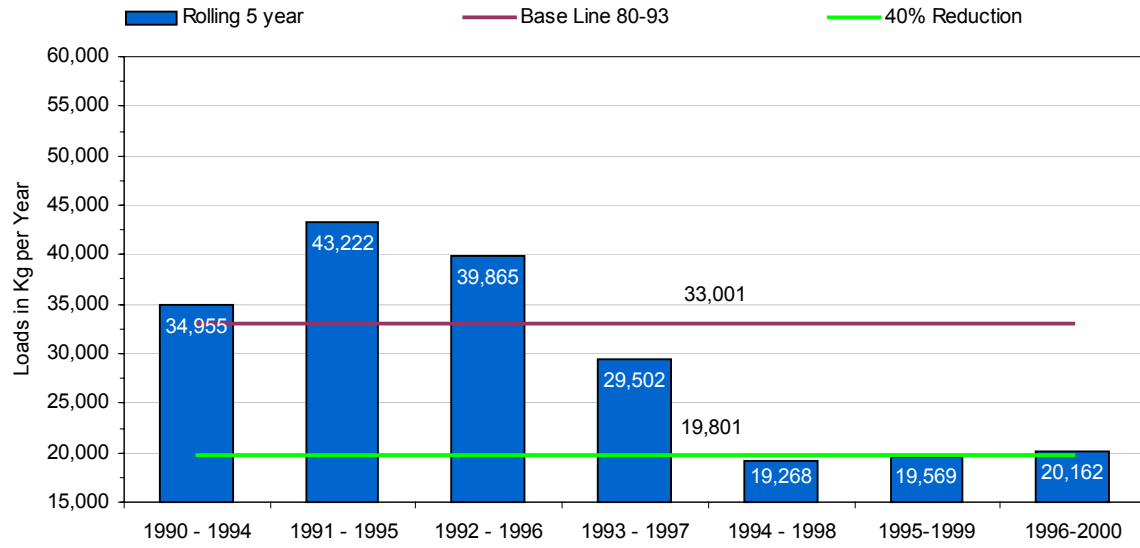


Illinois River near Tahlequah



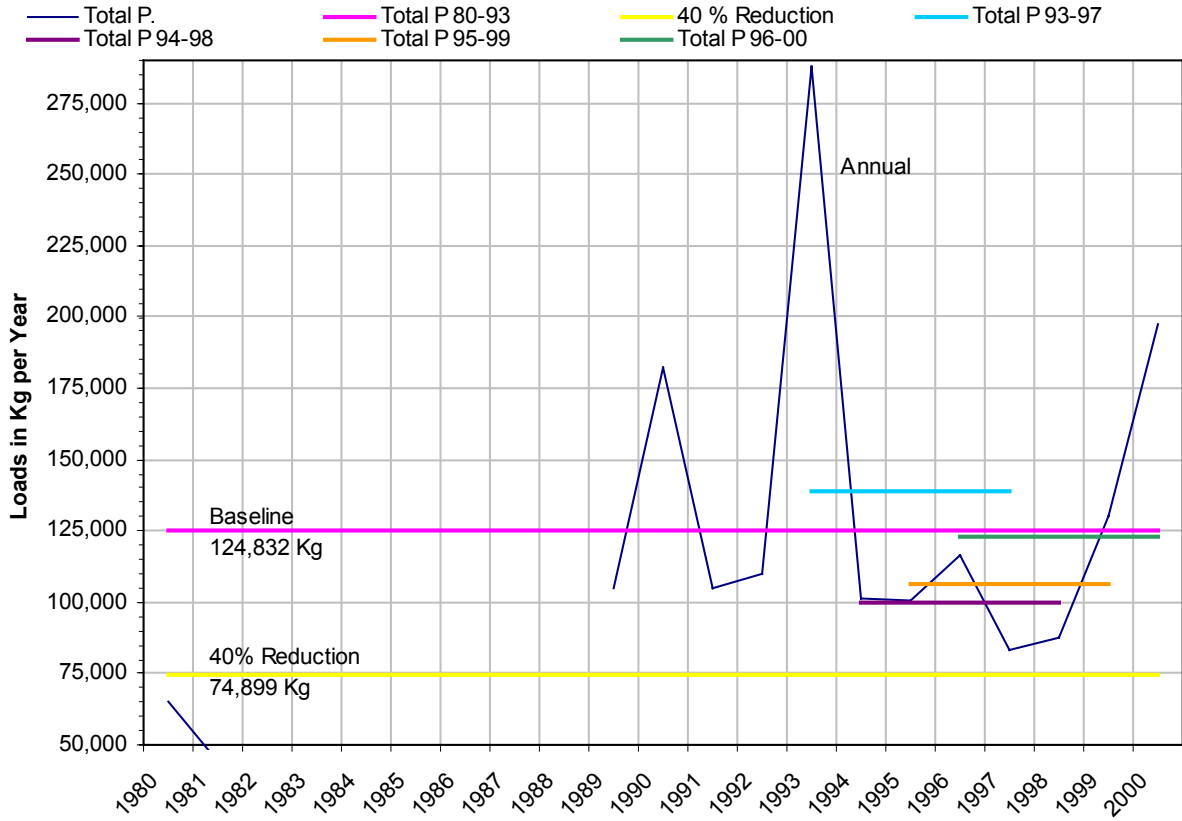
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Baron Fork at Eldon

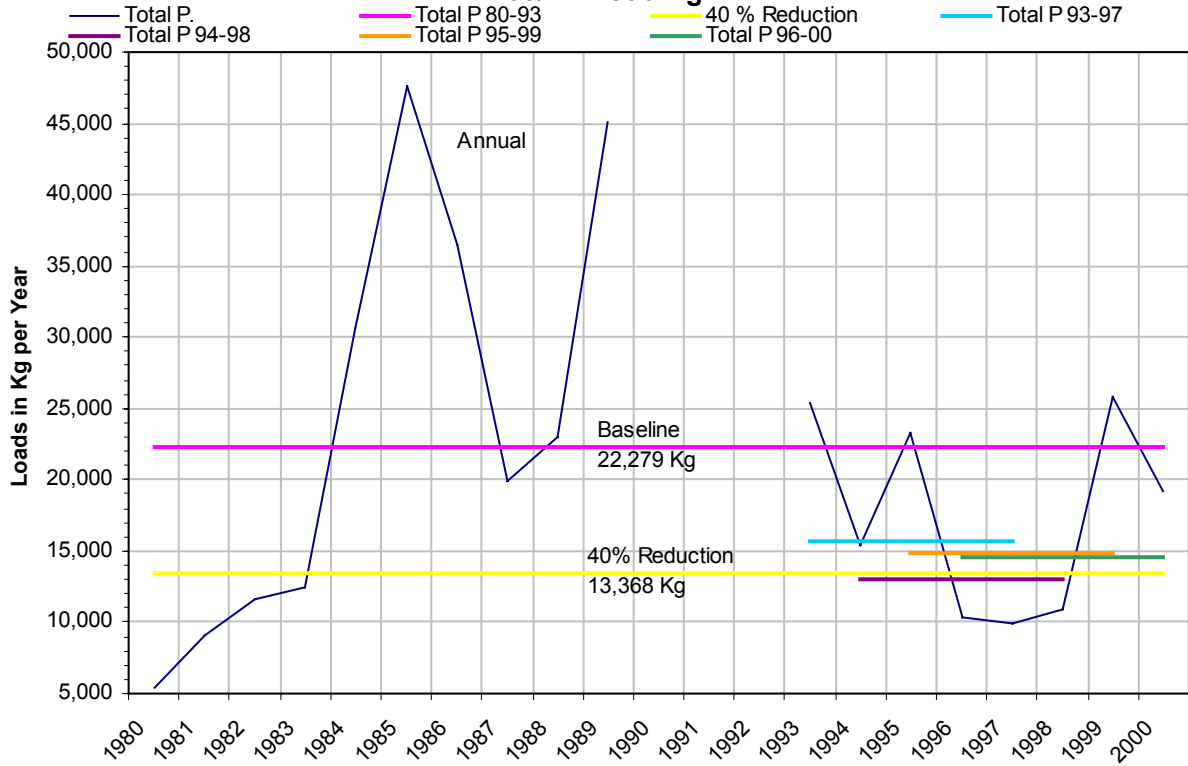


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Illinois River near Watts Total P Loading

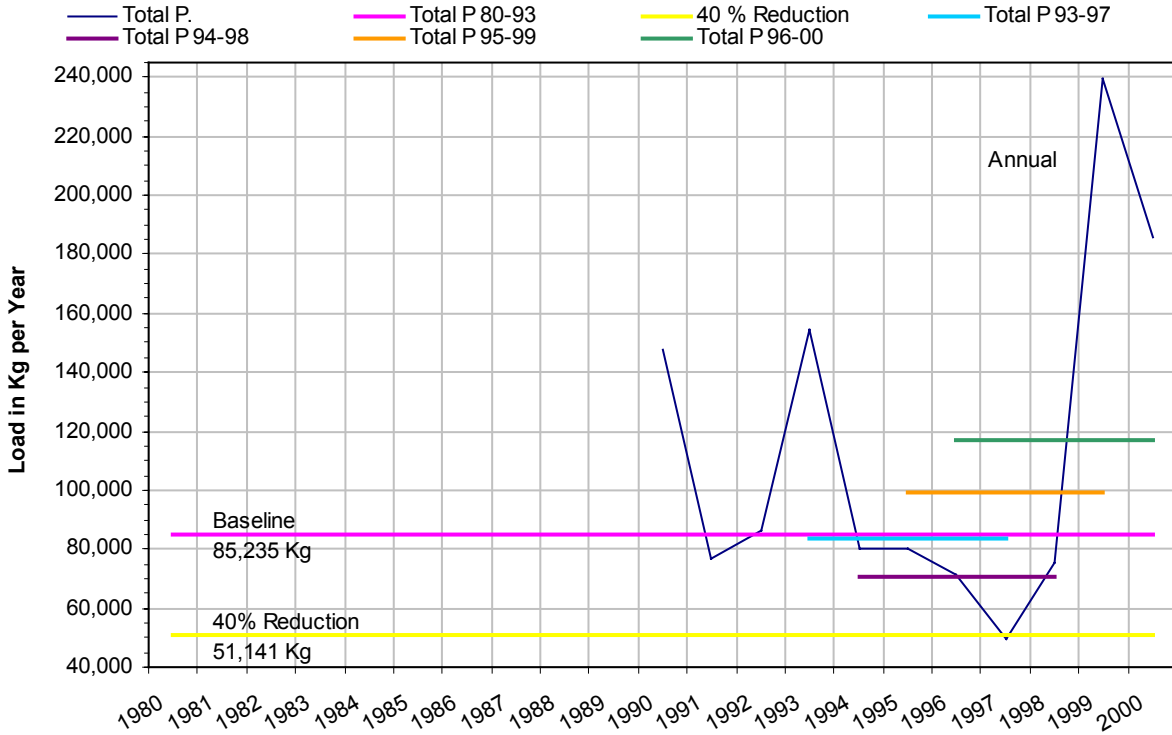


Flint Creek near Kansas, Oklahoma Total P Loading

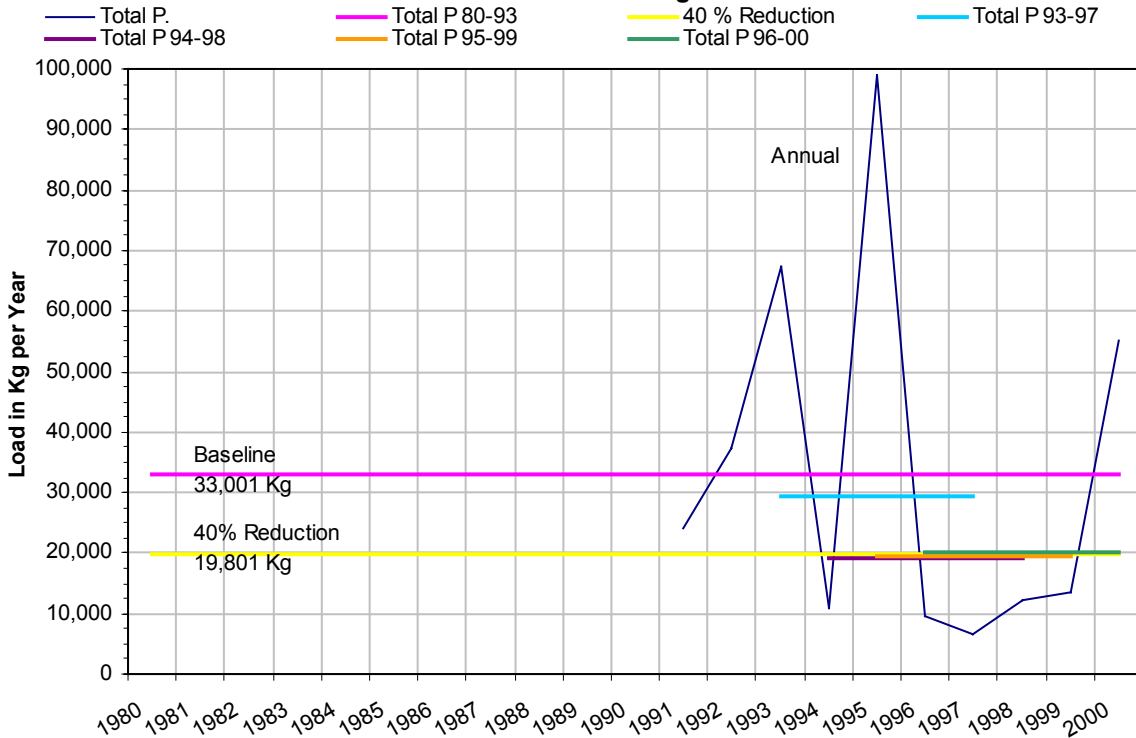


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Illinois River near Tahlequah Total P Loading



Baron Fork at Eldon Total P Loading



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Illinois River near Watts				Loadings	
Year	Flow (cfs)	Total P (mg/L)	Ortho P (mg/L)	Total P kg/year	Ortho P kg/year
1980	173	0.423		65,324	
1981	260	0.190		44,149	
1982	591				
1983	352				
1984	706				
1985	947				
1986	879				
1987	815				
1988	531				
1989	558	0.210	0.150	104,725	74,804
1990	1,127	0.181	0.118	182,557	118,347
1991	724	0.162	0.090	104,606	58,234
1992	760	0.161	0.127	109,646	86,358
1993	1,163	0.277	0.176	287,513	182,438
1994	674	0.168	0.128	101,197	77,102
1995	783	0.143	0.130	100,301	90,971
1996	693	0.188	0.192	116,622	118,709
1997	573	0.163	0.120	83,472	61,452
1998	713	0.138	0.120	87,936	76,466
1999	793	0.184	0.145	130,314	102,693
2000	648	0.341	0.227	197,482	131,461
Average	689	0.209	0.143	128,778	88,318

Flint Creek Near Kansas				Loadings	
Year	Flow (cfs)	Total P (mg/L)	Ortho P (mg/L)	Total P kg/year	Ortho P kg/year
1980	32	0.189		5,457	
1981	57	0.178		9,083	
1982	69	0.186		11,545	
1983	49	0.284		12,424	
1984	143	0.240		30,553	
1985	237	0.224		47,624	
1986	183	0.223		36,455	
1987	141	0.157		19,854	
1988	97	0.265		22,962	
1989	90	0.557		45,012	
1990		0.114			
1991		0.120	0.100		
1992		0.118	0.113		
1993	182	0.156	0.134	25,377	21,884
1994	136	0.127	0.116	15,428	14,042
1995	140	0.185	0.130	23,223	16,319
1996	76	0.152	0.147	10,302	9,962
1997	94.8	0.117	0.115	9,877	9,743
1998	96.5	0.127	0.122	10,953	10,522
1999	137	0.211	0.151	25,817	18,476
2000	133	0.162	0.182	19,256	21,633
Average	116	0.195	0.131	20,269	13,626

OKLAHOMA

Illinois River Near Tahlequah				Loadings	
Year	Flow (cfs)	Total P (mg/L)	Ortho P (mg/L)	Total P kg/year	Ortho P kg/year
1980	249				
1981	384				
1982	812				
1983	537				
1984	1,157				
1985	1,651				
1986	1,452				
1987	1,218				
1988	820				
1989	808				
1990	1,695	0.098	0.078	147,680	117,387
1991	1,094	0.079	0.044	76,849	43,315
1992	1,207	0.080	0.058	86,264	62,901
1993	1,751	0.099	0.086	154,753	133,887
1994	1,071	0.084	0.068	80,278	64,812
1995	1,123	0.080	0.071	80,284	71,503
1996	938	0.085	0.092	71,256	76,844
1997	812	0.069	0.066	49,831	47,654
1998	1,044	0.081	0.075	75,576	69,978
1999	1,143	0.235	0.093	239,891	94,936
2000	1,083	0.192	0.111	185,835	107,436
Average	1,050	0.107	0.076	100,704	71,740

Baron Fork at Eldon				Loadings	
Year	Flow (cfs)	Total P (mg/L)	Ortho P (mg/L)	Total P kg/year	Ortho P kg/year
1980	77				
1981	201				
1982	296				
1983	184				
1984	364				
1985	593				
1986	536				
1987	491				
1988	269				
1989	320				
1990	666				
1991	451	0.060	0.065	24,161	26,175
1992	440	0.095	0.056	37,340	22,011
1993	700	0.108	0.060	67,280	37,551
1994	328	0.037	0.023	10,885	6,699
1995	422	0.263	0.046	98,887	17,329
1996	432	0.025	0.033	9,652	12,869
1997	332	0.023	0.021	6,676	6,142
1998	409	0.033	0.028	12,062	10,235
1999	361	0.042	0.028	13,550	9,034
2000	376	0.164	0.045	55,110	15,122
Average	393	0.085	0.040	29,789	14,213

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Average Concentration Levels at Each Station

Watts				Watts			
Year	Total Phos. (mg/L)		Percent Decrease	Year	Ortho Phos. (mg/L)		Percent Decrease
80-93	0.204			80-93	0.129		
90-94		0.198	2.78%	90-94		0.129	0.05%
91-95		0.201	1.35%	91-95		0.133	-3.12%
92-96		0.210	-3.10%	92-96		0.155	-20.18%
93-97		0.200	2.18%	93-97		0.149	-16.02%
94-98		0.163	20.10%	94-98		0.134	-4.11%
95-99		0.167	18.14%	95-99		0.138	-7.22%
96-00		0.201	1.47%	96-00		0.156	-21.20%

Flint Creek near Kansas				Flint Creek near Kansas			
Year	Total Phos. (mg/L)		Percent Decrease	Year	Ortho Phos. (mg/L)		Percent Decrease
80-93	0.214			80-93	0.119		
90-94		0.132	38.26%	90-94		0.118	0.90%
91-95		0.142	33.61%	91-95		0.120	-0.49%
92-96		0.146	31.96%	92-96		0.127	-6.44%
93-97		0.140	34.68%	93-97		0.126	-5.38%
94-98		0.133	37.81%	94-98		0.123	-3.00%
95-99		0.152	28.93%	95-99		0.131	-9.70%
96-00		0.152	28.93%	96-00		0.140	-17.24%

Illinois River near Tahlequah				Illinois River near Tahlequah			
Year	Total Phos. (mg/L)		Percent Decrease	Year	Ortho Phos. (mg/L)		Percent Decrease
80-93	0.090			80-93	0.068		
90-94		0.088	2.07%	90-94		0.068	0.28%
91-95		0.085	5.68%	91-95		0.067	1.99%
92-96		0.086	4.50%	92-96		0.074	-8.71%
93-97		0.082	8.47%	93-97		0.074	-8.48%
94-98		0.079	12.22%	94-98		0.072	-5.37%
95-99		0.110	-22.22%	95-99		0.078	-14.15%
96-00		0.130	-44.44%	96-00		0.086	-25.85%

Baron Fork at Eldon				Baron Fork at Eldon			
Year	Total Phos. (mg/L)		Percent Decrease	Year	Ortho Phos. (mg/L)		Percent Decrease
80-93	0.093			80-93	0.059		
90-94		0.076	18.21%	90-94		0.048	19.56%
91-95		0.103	-11.71%	91-95		0.047	20.10%
92-96		0.096	-3.86%	92-96		0.044	26.60%
93-97		0.075	19.40%	93-97		0.035	40.22%
94-98		0.056	39.46%	94-98		0.028	52.81%
95-99		0.056	39.46%	95-99		0.029	51.12%
96-00		0.060	35.14%	96-00		0.030	49.44%

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Illinois River near Watts					
	tp	op	flow	kg per year TP	kg per year OP
80-93	0.204	0.129	685	124,832	78,761
90-94	0.198	0.129	890	157,677	102,277
91-95	0.201	0.133	821	147,621	97,358
92-96	0.210	0.155	815	153,111	112,610
93-97	0.200	0.149	777	138,603	103,720
94-98	0.163	0.134	687	100,079	82,273
95-99	0.167	0.138	711	106,117	87,629
96-00	0.201	0.156	684	122,871	95,363

Flint Creek near Kansas					
	tp	op	flow	kg per year TP	kg per year OP
80-93	0.215	0.119	117	22,365	12,439
90-94	0.140	0.118	159	19,877	16,822
91-95	0.142	0.120	153	19,388	16,394
92-96	0.148	0.127	134	17,618	15,181
93-97	0.140	0.126	126	15,766	14,156
94-98	0.133	0.123	109	12,956	11,982
95-99	0.152	0.131	109	14,797	12,753
96-00	0.152	0.140	108	14,603	13,450

Illinois River near Tahlequah					
	tp	op	flow	kg per year TP	kg per year OP
80-93	0.090	0.068	1,060	85,235	64,716
90-94	0.088	0.068	1,364	107,414	83,040
91-95	0.085	0.067	1,249	94,769	74,777
92-96	0.086	0.074	1,218	93,559	80,860
93-97	0.082	0.074	1,139	83,856	75,458
94-98	0.079	0.072	998	70,462	64,219
95-99	0.110	0.078	1,012	99,420	70,498
96-00	0.130	0.086	1004	116,647	77,167

Baron Fork at Edon					
	tp	op	flow	kg per year TP	kg per year OP
80-93	0.093	0.059	399	33,001	21,168
90-94	0.076	0.048	517	34,955	22,052
91-95	0.103	0.047	468	43,222	19,829
92-96	0.096	0.044	464	39,865	18,071
93-97	0.075	0.035	443	29,502	14,036
94-98	0.056	0.028	385	19,268	9,634
95-99	0.056	0.029	391	19,569	10,134
96-00	0.060	0.030	376	20,162	10,081