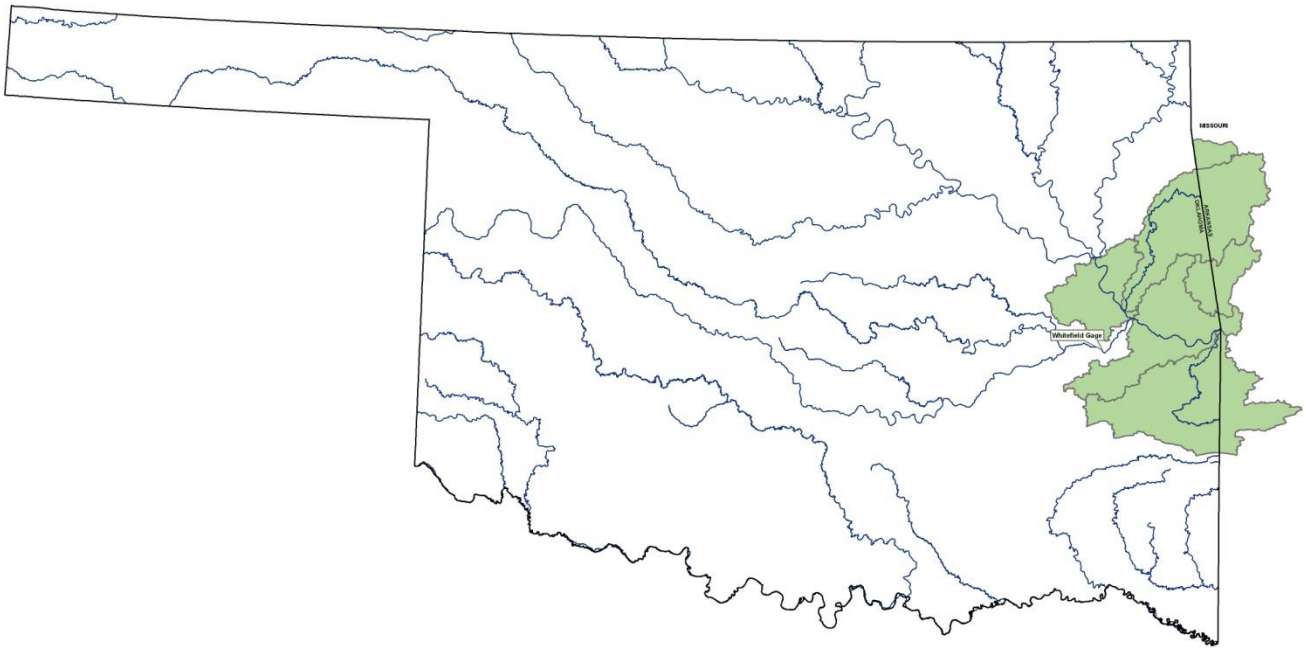
Arkansas-Oklahoma Arkansas River Compact Commission

Environmental Committee Report



September 24, 2020

INTRODUCTION

This document is a compilation of data that has been collected within the Arkansas/Oklahoma Arkansas River Compact area. Items included for review;

	Introduction
	Water Quality Trends at Different Flow Regimes
	OWRB Beneficial Use Monitoring Program - Streams/Rivers
	OWRB Beneficial Use Monitoring Program – Lakes/Reservoirs
	Compact Waters included in the Oklahoma Water Quaity Integrated Report – 303(d)
	Water Quality Standards Revisions Relevant to the Arkansas-Oklahoma Compact Commission Area
	TMDL's Completed in the Compact Area
	Oklahoma's Phosphorus Loading Report for the Illinois River Basin
	Funding Provided by OWRB's Financial Assistance Program
	Permits Issued for Water Rights in the Illinois River Watershed
	Oklahoma Conservation Commission Efforts in the Illinois River Watershed

Table 1. Comparison of geometric means to the Oklahoma Scenic River total phosphorus criterion calculated from 1999-2019[1] and 2014-2019.

Station (see footnotes)	1999-2019 (3-month GM'S)			2014-2019 (3-month GM'S)		
	N (Period)	N< 0.037	% Exceeding 0.037	N (Period)	N< 0.037	% Exceeding 0.037
Illinois River near Watts[2]	335	11	97%	63	5	92%
Illinois River near Tahlequah[2]	336	23	93%	63	11	83%
Flint Creek near Kansas[2]	327	0	100%	63	0	100%
Barren Fork near Eldon[2]	327	193	41%	66	50	24%
Little Lee Creek near Nicut[1]	110	108	2%	44	44	0%
Lee Creek near Short	226	225	0%	47	47	0%
Mountain Fork River near Smithville	197	167	15%	46	42	9%

Table 2. Waters Listed on Oklahoma's 2018 303(d) List

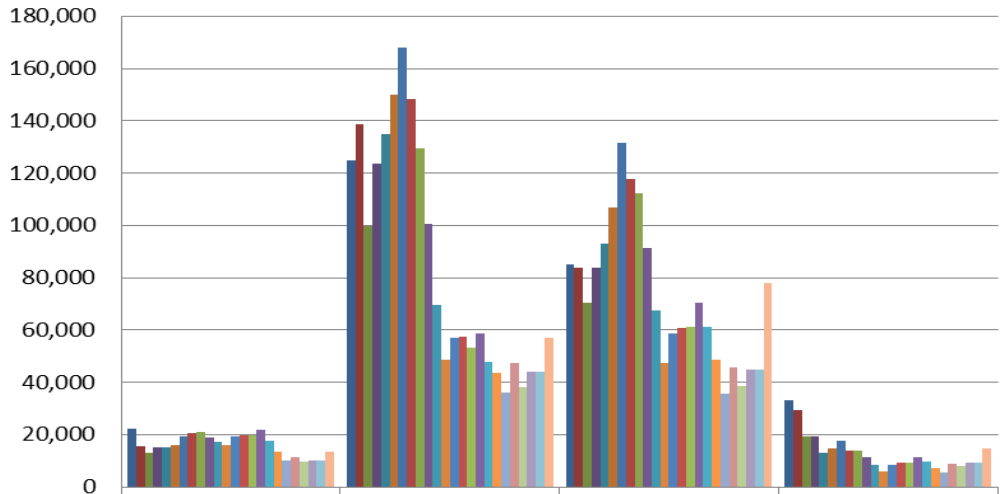
Impaired Waters in the Illinois River Basin

OKWBID	Name	Listed on 303(d) for Impairments
121700020020	Tenkiller Ferry Lake	Dissolved Oxygen, TP
121700020110	Chicken Creek	Fish Bioassessment
121700020220	Tenkiller Ferry Lake, Illinois River Arm	Chlorophyll-a, TP
121700030010	Illinois River – Tahlequah	TP, Enterococcus
121700030040	Tahlequah Creek (Town Branch)	*Eschericia coli*
121700030080	Illinois River	TP, Lead, *Eschericia coli*,
121700030280	Illinois River – Chewey Bridge	TP, *Escherichia coli.* Turbidity, Enterococcus
121700030290	Flint Creek	TP,Dissolved Oxygen
121700030350	Illinois River – Watts	TP, Enterococcus, *Escherichia coli*
121700030370	Ballard Creek	Enterococcus
121700040010	Caney Creek	Enterococcus
121700050010	Illinois River - Baron Fork	TP, Enterococcus
121700050090	Tyner Creek	Enterococcus
121700050120	Peacheater Creek	Enterococcus
121700060010	Flint Creek	TP,Enterococcus
121700060040	Battle Creek (Battle Branch)	Enterococcus
121700060080	Sager Creek	DO, Sedimentation/Siltation, Enterococcus, Macro

Other Notable Impaired Waters in the Compact Area

OKWBID	Name	Listed on 303(d) for Impairements
220100010010	Poteau River (Below Wister)	Silver, Cadmium, Copper, Lead, Selenium, Turbidty
220100020020	Wister Lake	Chlorophyll-a, pH, Dissolved Oxygen, Turbidity TP, , listed as an NLW in the OWQS
220200050010	Lee Creek	Lead, Enterococcus
220200050040	Little Lee Creek	Lead

Oklahoma's Average Annual Total P Loading in Kilograms per Year (excluding targeted high flows)



	Flint Creek near Kansas	Illinois River near Watts	Illinois River near Tahlequah	Barren Fork near Eldon
Total P 80-93	22,279	124,832	85,235	33,001
Total P 93-97	15,727	138,508	83,799	29,482
Total P 94-98	12,986	99,898	70,546	19,163
Total P 95-99	14,974	123,581	83,632	19,257
Total P 96-00	15,100	134,986	92,876	13,163
Total P 97-01	15,989	149,927	106,797	14,548
Total P 98-02	19,224	167,987	131,491	17,603
Total P 99-03	20,579	148,151	117,524	14,059
Total P 00-04	20,963	129,533	112,341	13,685
Total P 01-05	19,098	100,347	91,325	11,465
Total P 02-06	17,415	69,482	67,345	8,500
Total P 03-07	15,977	48,448	47,216	5,716
Total P 04-08	19,356	56,951	58,605	8,574
Total P 05-09	19,586	57,272	60,830	9,197
Total P 06-10	19,818	53,127	61,131	9,335
Total P 07-11	21,700	58,493	70,259	11,159
Total P 08-12	17,473	47,682	61,180	9,837
Total P 09-13	13,543	43,412	48,513	7,054
Total P 10-14	10,154	35,998	35,578	5,357
Total P 11-15	11,382	47,254	45,505	8,711
Total P 12-16	9,516	38,292	38,711	7,831
Total P 13-17	10,063	44,029	45,051	9,461
Total P 14-18	10,069	44,029	45,051	9,461
Total P 15-19	13,505	57,100	77,737	14,623

Values represent all available data, which is routinely collected and excludes targeted high flow events.

Water Quality Trends at Different Flow Regimes

Trend analyses were performed on total phosphorus concentrations as well as assessment geometric means at four BUMP permanent monitoring stations in the Arkansas River Compact area (Table 1). Using a Seasonal Kendall test, a series of trends were calculated for each station including all total phosphorus data from both 1993-2019 and 1999-2019, total phosphorus concentrations measured at both higher and lower flows from 1999-2019, and use assessment geometric means from 1999-2019. Furthermore, for each concentration data set, a trend was calculated using both unadjusted and flow-adjusted total phosphorus data. Graphical representations of these trends are not presented but may be obtained by contacting Monty Porter with the OWRB at 405-530-8933. Some general conclusions may be drawn from the data set.

1. When considering all total phosphorus data with a period of record (POR) beginning in 1993, no station demonstrated a significant upward trend regardless of flow adjusting data. The Barren Fork River demonstrated no significant trend in both flow adjusted and unadjusted data, while all other sites show a highly significant downward trend.
2. When all data from 1999-2019 are analyzed, all stations demonstrate a highly significant downward trend, except Barren Fork adjusted data which showed only a slightly significant downward trend.
3. All waterbodies show some significant downward trend when only higher flow total phosphorus concentrations are considered. The Barren Fork River shows no significant trend in unadjusted total phosphorus concentrations at higher flows.
4. When only lower flow data from 1999-2019 are analyzed, all stations except the Barren Fork demonstrate a highly significant downward trend. The Barren Fork River shows no significant trend in total phosphorus concentrations at lower flows.
5. All stations show a highly significant downward trend for use assessment geometric means. (Figures 1-4).

Table 1. Trends calculated for total phosphorus concentrations and use assessment geometric means at certain BUMP permanent monitoring stations in the Compact area. (Boxes shaded in yellow represent changes from the 2019 report, and 2019 results are in superscript.)

Station	All Data (1993-2019)		All Data (1999-2019)		Higher Flow Data (1999-2019)		Lower Flow Data (1999-2019)		Geomtric Mean For Assessment (1999-2019)
	Unadj	Flow Adj	Unadj	Flow Adj	Unadj	Flow Adj	Unadj	Flow Adj	Unadj
Illinois River near Watts	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓
Illinois River near Tahlequah	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓
Flint Creek near Kansas	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓
Barren Fork near Eldon	NT	NT	↓↓↓(↓↓)	↓(↓↓↓)	NT	↓↓↓(↓↓)	NT	NT	↓↓↓

↓↓↓ = Decreasing Trend at the 95% Confidence Level
↓↓ = Decreasing Trend at the 90% Confidence Level
↓ = Decreasing Trend at the 80% Confidence Level
No Increasing Trends
NT = No Signficant Trend

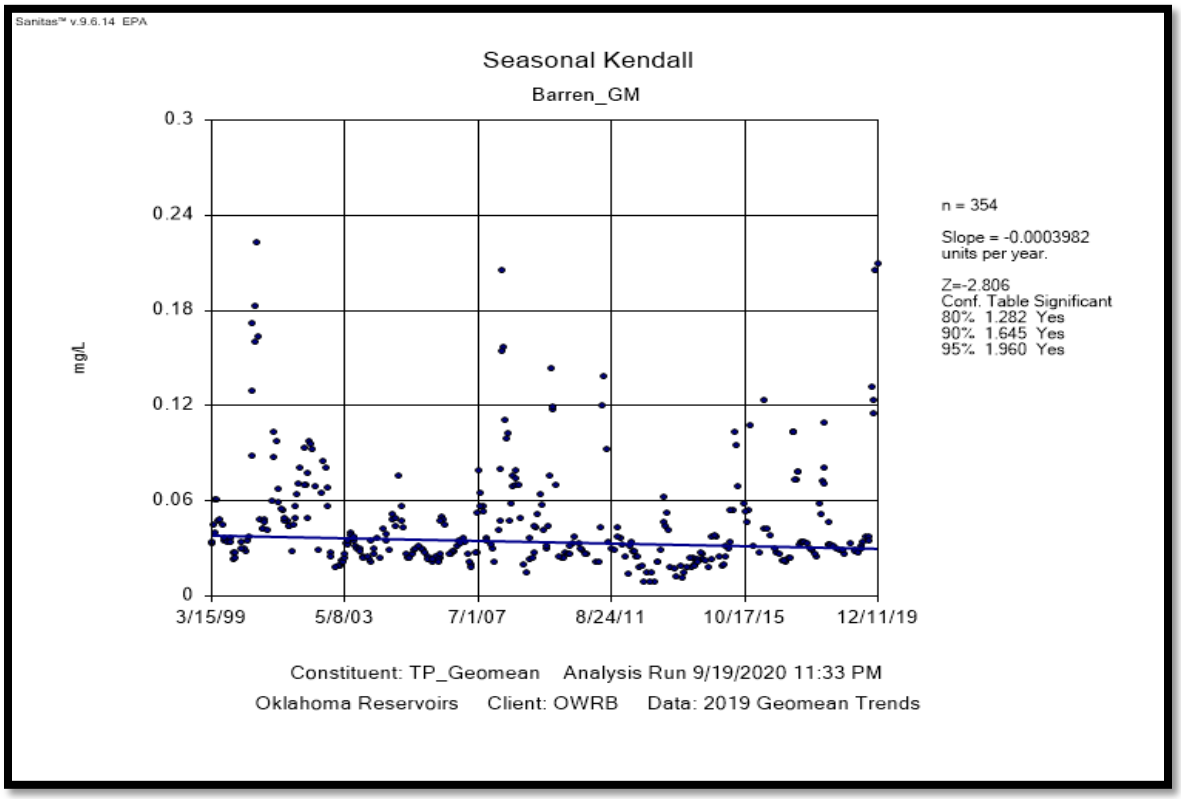


Figure 1. Trend for use assessment geometric means (1999-2019) on the Barren Fork River near Eldon.

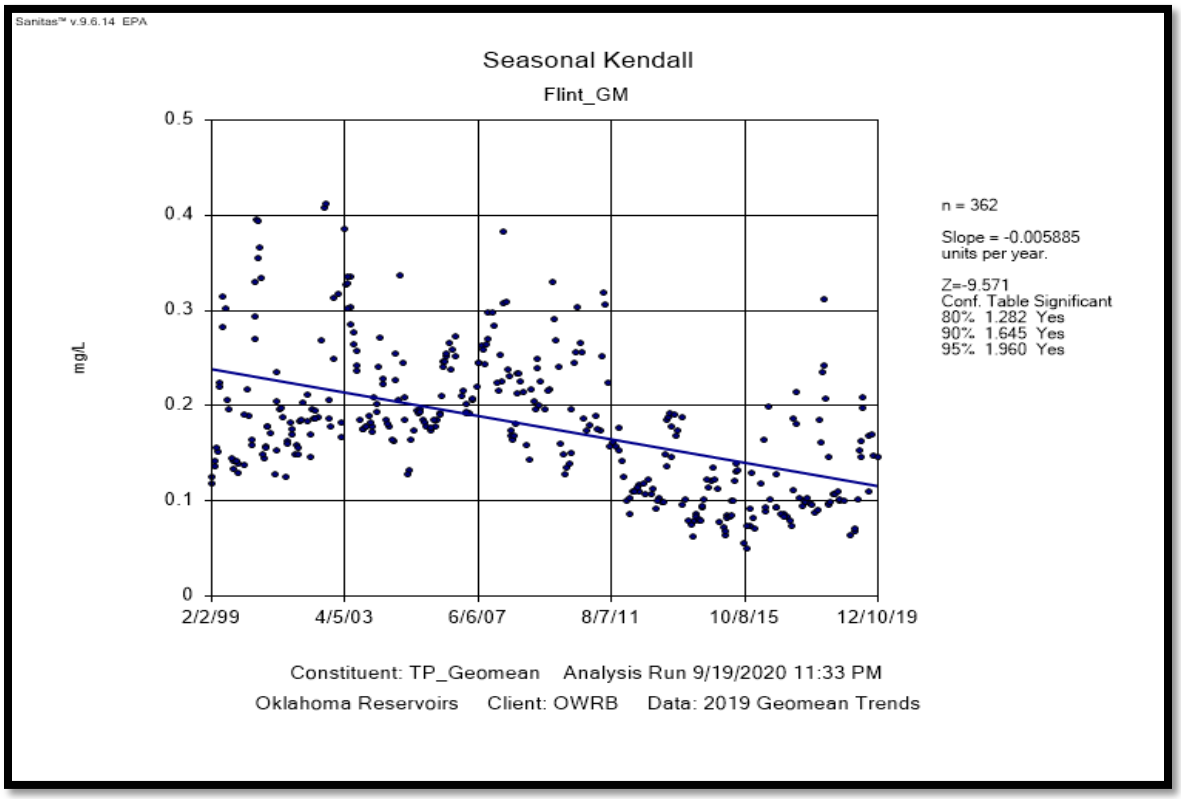


Figure 2. Trend for use assessment geometric means (1999-2019) on Flint Creek near Kansas.

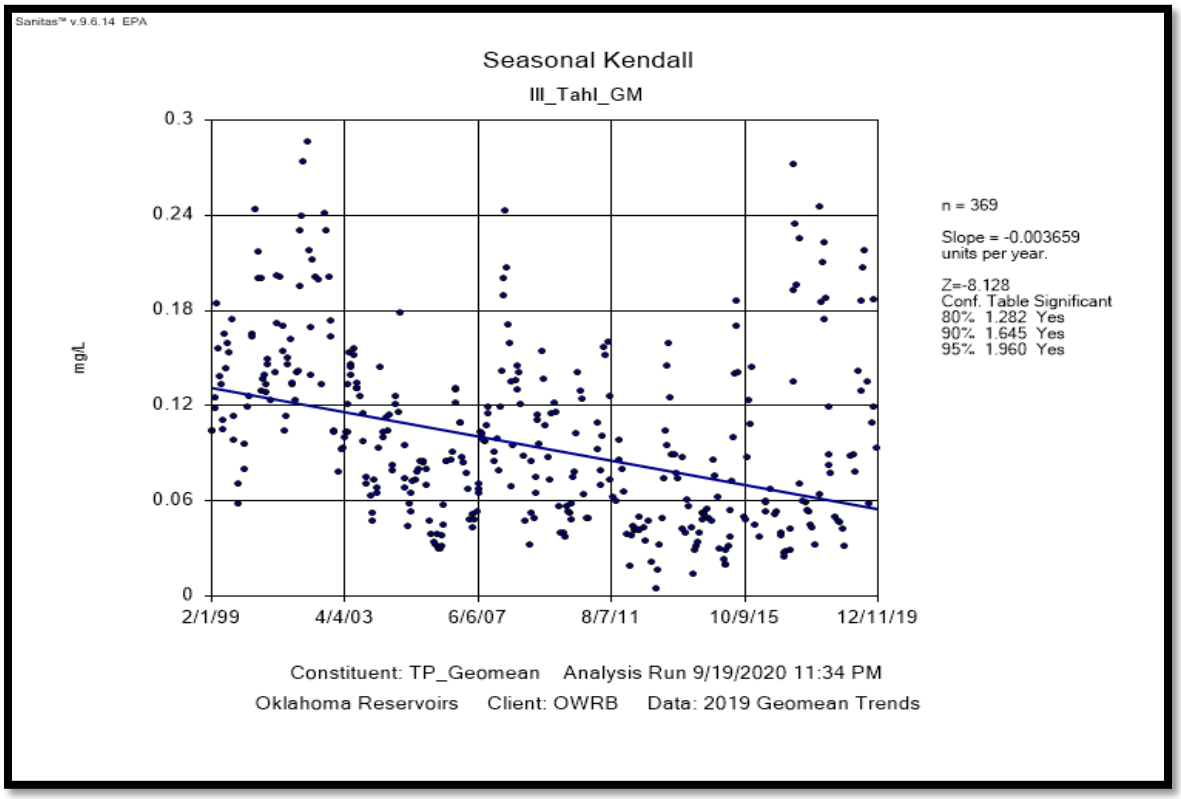


Figure 3. Trend for use assessment geometric means (1999-2019) on Illinois River near Tahlequah.

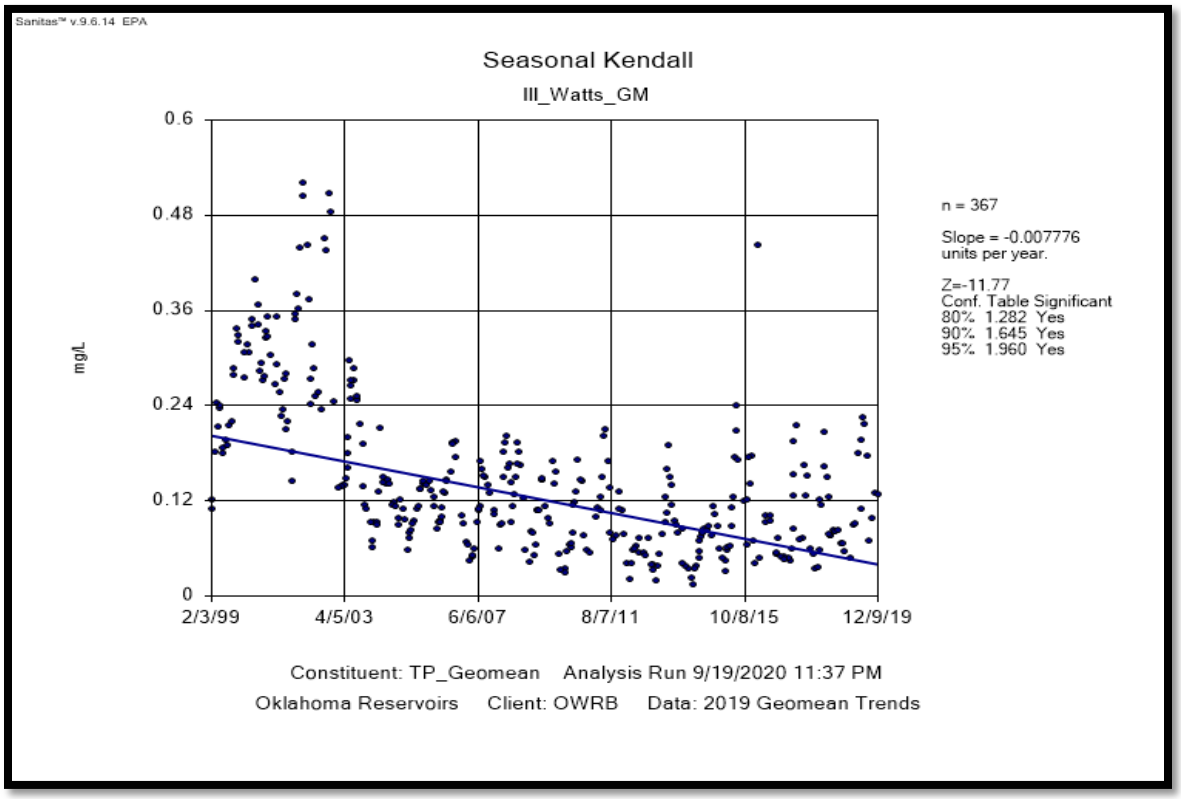


Figure 4. Trend for use assessment geometric means (1999-2019) on Illinois River near Watts.

Arkansas River at Moffett

Sample Record	Biological Collections	Station ID
November 1998 - Current	Gaging Data	220200010010-001AT

Stream Data

County	Sequoyah	Request Data By Email
Location	East of the Town of Moffett on US Highway 64	
Latitude/Longitude	35.39242903, -94.43267795	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110104)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	79	19.2	20.1	1.7/32.6	12.7/26.3	
	Turbidity (NTU)	80	33	21	7/194	15/42	
	pH (units)	79	7.85	7.85	6.87/8.97	7.64/8.04	
	Dissolved Oxygen (mg/L)	78	9.48	9.09	5.35/16.48	7.67/10.54	
	Hardness (mg/L)	79	162	141	39/658	125/182	
Minerals	Total Dissolved Solids (mg/L)	107	357	341	<10/833	257/423	
	Specific Conductivity (uS/cm)	77	612	576	195/1333	482/737	
	Chloride (mg/L)	85	100	93	13/293	57/129	
	Sulfate (mg/L)	85	54	51	22/116	39/64	
Nutrients	Total Phosphorus (mg/L)	85	0.123	0.117	0.051/0.330	0.095/0.139	
	Total Nitrogen (mg/L)	84	0.96	0.92	0.45/2.82	0.71/1.12	
	Nitrate/Nitrite (mg/L)	43	0.26	0.22	<0.05/0.66	0.10/0.38	
	Chlorophyll A (mg/m^3)	44	13.0	10.2	<0.1/71.8	6.4/15.6	TSI=55.7
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	21	1089	<10	<10/12000	<10/20	
	E. Coli (cfu/100ml)(*-Geo. Mn.)	21	158	<10	<10/2035	<10/20	

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment
Fish & Wildlife Propagation	S	S	S	S						U	S	S
Aesthetics												S
Agriculture					S		S	S				
Primary Body Contact Recreation									S			
Public & Private Water Supply				S		S			S			
Fish Consumption				S								

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

U = Assessment yielded undetermined supporting status

Arkansas River at Muskogee

Sample Record	Biological Collections	Station ID
November 1998 - Current	Gaging Data	120400010260-001AT

Stream Data

County	Muskogee	Request Data By Email
Location	East of the Town of Muskogee on US Highway 62	
Latitude/Longitude	35.77016066, -95.30031102	
Planning Watershed	Middle Arkansas (8-digit HUC - 11110102)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	111	18.0	18.6	1.9/32.4	11.2/24.8	
	Turbidity (NTU)	110	42	23	5/387	15/40	
	pH (units)	110	8.04	8.04	7.09/9.48	7.77/8.30	
	Dissolved Oxygen (mg/L)	115	8.99	8.95	4.42/14.88	7.48/10.59	
	Hardness (mg/L)	109	179	167	91/399	143/211	
Minerals	Total Dissolved Solids (mg/L)	169	500	407	<10/1580	301/647	
	Specific Conductivity (uS/cm)	110	859	765	191/2462	460/1083	
	Chloride (mg/L)	116	160	133	<10/713	77/196	
	Sulfate (mg/L)	117	73	65	28/202	45/88	
Nutrients	Total Phosphorus (mg/L)	117	0.165	0.146	0.053/0.705	0.117/0.177	
	Total Nitrogen (mg/L)	116	1.15	1.10	0.40/2.82	0.92/1.36	
	Nitrate/Nitrite (mg/L)	62	0.37	0.32	<0.05/0.88	0.20/0.51	
	Chlorophyll A (mg/m^3)	58	17.9	13.7	<0.1/90.0	7.9/25.1	TSI=58.9
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	20	5232	17	<10/75000	<10/200	
	E. Coli (cfu/100ml)(*-Geo. Mn.)	20	546	25	<10/5492	<10/65	

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment
Fish & Wildlife Propagation	S	S	S	S						S	S	S
Aesthetics												S
Agriculture					S		S	S				
Primary Body Contact Recreation									S			
Public & Private Water Supply				S		S			S			
Fish Consumption				S								

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Notes

Sampling and Assessment by the **Oklahoma Water Resources Board** – 3800 Classen Blvd, Oklahoma City, OK, 73118 – 405.530.8800 – http://www.owrb.ok.gov

Barren Fork at Eldon

Sample Record	Biological Collections	Station ID
November 1998 - Current	Gaging Data	121700050010-001AT

Stream Data

County	Cherokee	Request Data By Email
Location	South of the Town of Eldon on State Highway 51	
Latitude/Longitude	35.92173377, -94.83726494	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110103)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	145	17.3	17.8	3.1/29.9	11.3/22.9	
	Turbidity (NTU)	142	4	2	1/45	2/3	
	pH (units)	144	7.63	7.59	6.37/8.82	7.37/7.88	
	Dissolved Oxygen (mg/L)	148	9.67	9.80	4.40/14.53	8.19/11.05	
	Hardness (mg/L)	146	99	98	46/159	89/107	
Minerals	Total Dissolved Solids (mg/L)	164	128	124	13/545	110/137	
	Specific Conductivity (uS/cm)	145	200	199	20/713	178/215	
	Chloride (mg/L)	117	<10	<10	<10/44	<10/<10	
	Sulfate (mg/L)	117	<10	<10	<10/40	<10/<10	
Nutrients	Total Phosphorus (mg/L)	149	0.033	0.028	<0.010/0.217	0.022/0.034	
	Total Nitrogen (mg/L)	148	1.48	1.39	0.18/4.20	0.85/1.94	
	Nitrate/Nitrite (mg/L)	86	1.26	1.18	0.14/3.83	0.63/1.64	
	Chlorophyll A (mg/m^3)	89	1.4	1.1	<0.1/11.7	0.7/1.7	TSI=34.1
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	74	221	20	<10/3900	<10/80	
	E. Coli (cfu/100ml)(*-Geo. Mn.)	74	77	<10	<10/2420	<10/49	Mean>OWQS

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment	Total Phosphorus
Fish & Wildlife Propagation	S	S	S	S						S	S	S	
Aesthetics												S	S
Agriculture					S		S	S					
Primary Body Contact Recreation									NS				
Public & Private Water Supply				S		S			S				
Fish Consumption				S									

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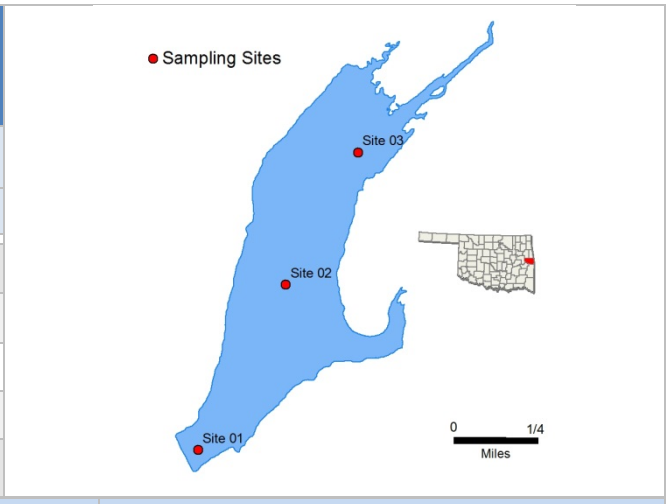
Notes

Brushy Creek

Sample Period	Times Visited	Sampling Sites
December 2014 – September 2015	4	3



General

Location	Sequoyah County
Impoundment	1964
Area	358 acres
Capacity	3,258 acre-feet
Purposes	Flood Control and Recreation

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In Situ	Average Turbidity	8 NTU	0% of values > OWQS of 25 NTU
	Average Secchi Disk Depth	79 cm	
	Water Clarity Rating	Good	
	Chlorophyll-a	13 mg/m3	
	Trophic State Index	56	Previous value = 53
	Trophic Class	Eutrophic	
Profile	Salinity	0.02 - 0.09 ppt	
	Specific Conductivity	52.3 – 179.6 µS/cm	
	pH	5.86 - 8.53 pH units	11 (11.6%) values < 6.5 units
	Oxidation-Reduction Potential	49 to 486.4 mV	
	Dissolved Oxygen	Up to 67% of water column < 2 mg/L in June	
Nutrients	Surface Total Nitrogen	0.42 mg/L to 0.89 mg/L	
	Surface Total Phosphorus	0.008 mg/L to 0.038 mg/L	
	Nitrogen to Phosphorus Ratio	21:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	S	NS	NEI	S							
Aesthetics					S	*					
Agriculture							S	S	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											NS

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Notes

*Standards revision, true color is for permitting purposes only.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

Sampling and Assessment by the Oklahoma Water Resources Board – 3800 Classen Blvd, Oklahoma City, OK, 73118 – 405.530.8800 – http://www.owrb.ok.gov

Caney Creek at Barber

Sample Record	Biological Collections	Station ID
September 1999 – November 2012	Gaging Data	121700040010-001AT

Stream Data

County	Cherokee	Request Data by Email
Location	North of the Town of Barber off State Highway 100	
Latitude/Longitude	35.785043, -94.856285	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110103)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	99	18.1	17.6	4.1/29.3	13.1/23.3	
	Turbidity (NTU)	100	4	2	0/103	1/3	
	pH (units)	97	7.77	7.76	6.46/9.06	7.56/8.02	
	Dissolved Oxygen (mg/L)	99	9.66	9.42	3.94/15.60	8.31/11.11	
	Hardness (mg/L)	99	109	109	64/174	98/120	
Minerals	Total Dissolved Solids (mg/L)	111	142	140	78/254	129/156	
	Specific Conductivity (uS/cm)	99	219	218	123/391	200/243	
	Chloride (mg/L)	90	<10	<10	<10/37	<10/<10	
	Sulfate (mg/L)	90	<10	<10	<10/33	<10/<10	
Nutrients	Total Phosphorus (mg/L)	105	0.060	0.037	<0.010/1.532	0.030/0.046	
	Total Nitrogen (mg/L)	104	1.12	1.02	0.16/7.04	0.68/1.37	
	Nitrate/Nitrite (mg/L)	51	0.85	0.85	0.06/2.89	0.48/1.06	
	Chlorophyll A (mg/m^3)	53	1.3	0.8	<0.1/12.1	0.5/1.2	TSI=32.9
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	46	94	20	<10/1408	<10/52	Mean>OWQS
	E. Coli (cfu/100ml)(*-Geo. Mn.)	46	123	15	<10/2382	<10/39	Mean>OWQS

Beneficial Uses

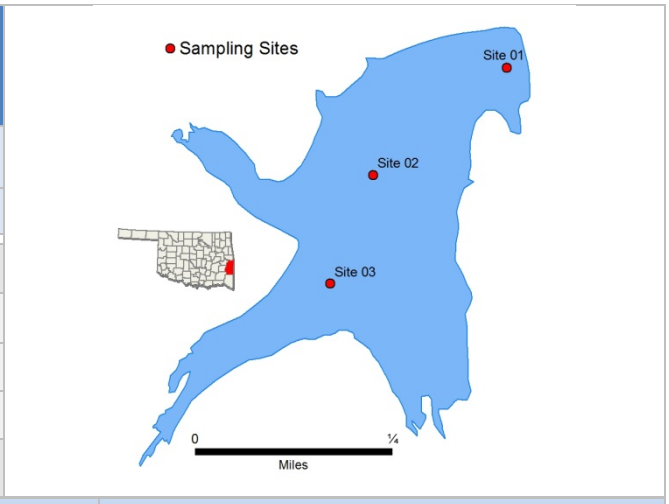
Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chloride	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment
Fish & Wildlife Propagation	S	S	S	S						S	NS	S
Aesthetics												S
Agriculture					S		S	S				
Primary Body Contact Recreation									NS			
Public & Private Water Supply				S		S			S			
Fish Consumption				S								

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Cedar

Sample Period	Times Visited	Sampling Sites
November 2015 – Sept. 2016	4	5



General

Location	Le Flore County
Impoundment	1937
Area	78 acres
Capacity	1,000 acre-feet
Purposes	Recreation

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In Situ	Average Turbidity	7 NTU	100% of values < OWQS of 25 NTU
	Average Secchi Disk Depth	92 cm	
	Water Clarity Rating	Excellent	
	Chlorophyll-a	25.3 mg/m3	
	Trophic State Index	62	Previous Value=56
	Trophic Class	Hypereutrophic	
Profile	Salinity	0.01– 0.08 ppt	
	Specific Conductivity	31.7 – 170.4 µS/cm	
	pH	5.92 – 7.36 pH units	51.56% < 6.5
	Oxidation-Reduction Potential	-58.9 – 416.9 mV	
	Dissolved Oxygen	Up to 40% of water column < 2 mg/L in summer	
Nutrients	Surface Total Nitrogen	0.56 mg/L to 0.98 mg/L	
	Surface Total Phosphorus	0.023 mg/L to 0.043 mg/L	
	Nitrogen to Phosphorus Ratio	24:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	NEI	NS	NS	S							
Aesthetics					S	*					
Agriculture							*	*	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*Standards revision, true color is for permitting purposes only.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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Flint Creek at Flint

Sample Record	Biological Collections	Station ID
November 1998 - Current	Gaging Data	121700060010-001AT

Stream Data

County	Delaware	Request Data By Email
Location	North of the Town of Flint on D0581 Rd	
Latitude/Longitude	36.1867733, -94.70680493	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110103)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	143	17.0	16.5	2.5/28.7	11.2/22.9	
	Turbidity (NTU)	140	2	1	0/58	1/2	
	pH (units)	142	7.69	7.68	6.44/8.79	7.44/7.93	
	Dissolved Oxygen (mg/L)	146	9.50	9.28	4.97/14.94	8.04/10.75	
	Hardness (mg/L)	145	115	115	<10/218	104/125	
Minerals	Total Dissolved Solids (mg/L)	160	185	182	98/552	159/205	
	Specific Conductivity (uS/cm)	141	292	295	152/452	259/326	
	Chloride (mg/L)	118	14	13	<10/43	<10/18	
	Sulfate (mg/L)	118	17	15	<10/69	12/19	
Nutrients	Total Phosphorus (mg/L)	150	0.182	0.152	0.055/1.450	0.098/0.187	See Notes
	Total Nitrogen (mg/L)	149	2.92	2.79	0.92/7.93	2.26/3.52	
	Nitrate/Nitrite (mg/L)	87	2.51	2.43	0.80/4.83	1.75/3.18	
	Chlorophyll A (mg/m^3)	89	1.0	0.8	<0.1/4.2	0.5/1.2	TSI=30.3
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	65	555	52	<10/18000	15/109	Mean>OWQS
	E. Coli (cfu/100ml)(*-Geo. Mn.)	65	194	31	<10/4611	<10/74	Mean>OWQS

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment	Total Phosphorus
Fish & Wildlife Propagation	S	S	S	S						S	S	S	
Aesthetics												S	NS
Agriculture					S		S	S					
Primary Body Contact Recreation									NS				
Public & Private Water Supply				S					S				
Fish Consumption				S									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

100%(72 of 72) of rolling Geo. Mean exceed OWQS criterion of 0.037 ppm

Fourche-Maline Creek at Red Oak

Sample Record	Biological Collections	Station ID
November 1998 - Current	Gaging Data	220100040020-001AT

Stream Data

County	Latimer	Request Data By Email
Location	Southeast of the Town of Red Oak off US Highway 270	
Latitude/Longitude	34.91232472, -95.15608416	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110105)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	157	17.4	18.8	1.0/31.6	10.4/24.0	
	Turbidity (NTU)	157	38	27	5/390	17/42	
	pH (units)	158	7.11	7.02	5.77/8.76	6.82/7.43	
	Dissolved Oxygen (mg/L)	162	6.12	6.19	0.84/15.69	3.15/8.74	
	Hardness (mg/L)	158	53	49	<10/212	34/63	
Minerals	Total Dissolved Solids (mg/L)	191	103	96	<10/719	69/125	
	Specific Conductivity (uS/cm)	156	159	138	11/1106	101/196	
	Chloride (mg/L)	120	<10	<10	<10/22	<10/10	
	Sulfate (mg/L)	120	23	22	<10/65	17/26	
Nutrients	Total Phosphorus (mg/L)	159	0.083	0.070	<0.010/0.867	0.049/0.092	
	Total Nitrogen (mg/L)	157	0.77	0.73	0.16/1.79	0.56/0.94	
	Nitrate/Nitrite (mg/L)	101	0.14	0.12	<0.05/0.97	<0.05/0.22	
	Chlorophyll A (mg/m^3)	42	6.3	2.5	0.3/34.0	1.2/8.1	TSI=48.6
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	33	460	80	<10/8000	52/200	Mean>OWQS
	E. Coli (cfu/100ml)(*-Geo. Mn.)	33	208	74	<10/1986	29/148	

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment
Fish & Wildlife Propagation	S	S	NS	NS						S	NS	S
Aesthetics												S
Agriculture					S		S	S				
Primary Body Contact Recreation									NS			
Public & Private Water Supply				NEI		NEI			NEI			
Fish Consumption				S								

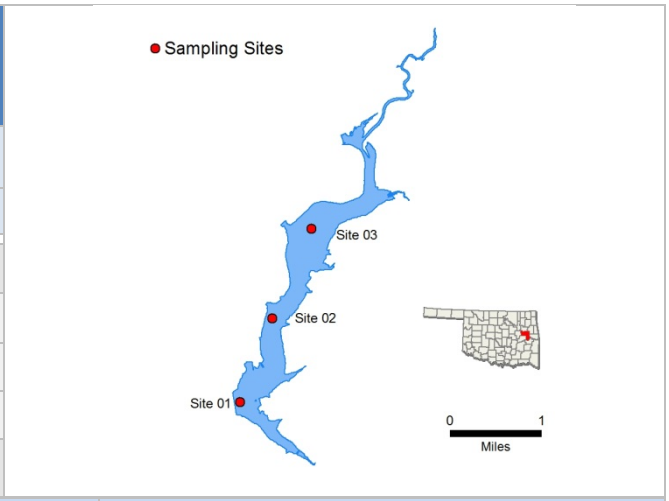
S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Fish & Wildlife Propagation not supporting for Lead

Greenleaf

Sample Period	Times Visited	Sampling Sites
February 2019 – August 2019	4	5



General

Location	Muskogee County
Impoundment	1939
Area	920 acres
Capacity	14,720 acre-feet
Purposes	Recreation

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In Situ	Average Turbidity	7 NTU	100% of values < OWQS of 25 NTU (n=9)
	Average Secchi Disk Depth	97 cm	
	Water Clarity Rating	Good	
	Chlorophyll-a	17.76 mg/m3	
	Trophic State Index	59	Previous value = 58
	Trophic Class	Eutrophic	
Profile	Salinity	0.0– 0.09 ppt	
	Specific Conductivity	0.80 – 162 µS/cm	
	pH	6.26 – 8.11 pH units	33% of recorded values <6.5
	Oxidation-Reduction Potential	48.6 – 4440.5 mV	
	Dissolved Oxygen	Up to 61% of water column < 2 mg/L in August	
Nutrients	Surface Total Nitrogen	0.36 mg/L to 0.77 mg/L	
	Surface Total Phosphorus	0.021 mg/L to 0.037 mg/L	
	Nitrogen to Phosphorus Ratio	18:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	NS	S	NEI	S							
Aesthetics					S	*					
Agriculture							N/A	N/A	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											NS

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*Standards revision, true color is for permitting purposes only.
* 50-70% range is undetermined for DO.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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Illinois River at Tahlequah

Sample Record	Biological Collections	Station ID
November 1998 - Current	Gaging Data	121700030010-001AT

Stream Data

County	Cherokee	Request Data By Email
Location	East of the Town of Tahlequah on US Highway 62	
Latitude/Longitude	35.92606447, -94.92380373	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110103)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	144	17.6	17.3	0.8/31.7	11.0/24.0	
	Turbidity (NTU)	141	7	4	0/84	3/6	
	pH (units)	142	7.88	7.83	6.47/9.29	7.58/8.13	
	Dissolved Oxygen (mg/L)	147	10.06	10.05	4.66/15.88	8.01/11.97	
	Hardness (mg/L)	144	115	114	69/168	106/123	
Minerals	Total Dissolved Solids (mg/L)	163	170	170	30/565	149/186	
	Specific Conductivity (uS/cm)	144	268	271	66/713	240/293	
	Chloride (mg/L)	118	10	10	<10/24	<10/14	
	Sulfate (mg/L)	118	14	13	<10/48	11/16	
Nutrients	Total Phosphorus (mg/L)	151	0.080	0.066	<0.010/0.438	0.043/0.103	See Notes
	Total Nitrogen (mg/L)	150	1.77	1.71	0.38/3.76	1.19/2.26	
	Nitrate/Nitrite (mg/L)	88	1.53	1.46	0.24/3.61	0.93/1.98	
	Chlorophyll A (mg/m^3)	89	3.1	2.0	<0.1/46.4	1.5/3.1	TSI=41.8
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	64	151	20	<10/2500	<10/100	
	E. Coli (cfu/100ml)(*-Geo. Mn.)	64	61	<10	<10/884	<10/34	

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dssolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment	Total Posphorus
Fish & Wildlife Propagation	S	S	S	S						S	S	S	
Aesthetics												S	NS
Agriculture					S		S	S					
Primary Body Contact Recreation									S				
Public & Private Water Supply				S		S			S				
Fish Consumption				S									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes: *92.5%(74 of 80) of 3-month rolling Geo. Mean above OWQS criterion of 0.037 ppm*

Illinois River at Watts

Sample Record	Biological Collections	Station ID
November 1998 - Current	Gaging Data	121700030350-001AT

Stream Data

County	Adair	Request Data By Email
Location	North of the Town of Watts on US Highway 59	
Latitude/Longitude	36.12994064, -94.57151225	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110103)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	145	17.2	16.5	2.0/31.5	10.6/24.0	
	Turbidity (NTU)	141	10	7	1/95	4/12	
	pH (units)	144	7.90	7.92	6.51/9.03	7.72/8.12	
	Dissolved Oxygen (mg/L)	147	10.55	10.22	4.51/18.88	8.70/11.77	
	Hardness (mg/L)	146	127	127	<10/220	116/136	
Minerals	Total Dissolved Solids (mg/L)	164	195	196	95/566	171/215	
	Specific Conductivity (uS/cm)	145	307	310	149/713	273/339	
	Chloride (mg/L)	117	13	13	<10/28	<10/16	
	Sulfate (mg/L)	117	16	15	<10/97	12/19	
Nutrients	Total Phosphorus (mg/L)	150	0.141	0.091	<0.010/1.153	0.057/0.164	See Notes
	Total Nitrogen (mg/L)	149	2.52	2.47	0.84/5.06	2.08/2.87	
	Nitrate/Nitrite (mg/L)	88	2.20	2.20	0.72/3.96	1.71/2.52	
	Chlorophyll A (mg/m^3)	89	3.0	2.3	<0.1/15.3	1.4/3.4	TSI=41.3
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	65	559	20	<10/15531	<10/100	Mean>OWQS
	E. Coli (cfu/100ml)(*-Geo. Mn.)	65	368	20	<10/12997	<10/63	Mean>OWQS

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment	Total Posphorus
Fish & Wildlife Propagation	S	S	S	S						S	S	S	
Aesthetics												S	NS
Agriculture					S		S	S					
Primary Body Contact Recreation									NS				
Public & Private Water Supply				S		S			S				
Fish Consumption				S									

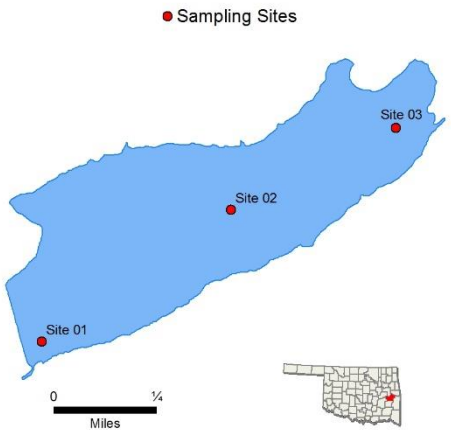
S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

91.6%(76of 83) of rolling Geo. Mean exceed OWQS criterion of 0.037 ppm

John Wells

Sample Period	Times Visited	Sampling Sites
November 2016 – August 2017	4	5



General

Location	Haskell County
Impoundment	1936
Area	194 acres
Capacity	1,352 acre-feet
Purposes	Water Supply, Recreation

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In Situ	Average Turbidity	4 NTU	100% of values < OWQS of 25 NTU (n=10)
	Average Secchi Disk Depth	146 cm	
	Water Clarity Rating	Excellent	
	Chlorophyll	5.2 mg/L	
	Trophic State Index	47	Previous value = 45
	Trophic Class	Mesotrophic	
Profile	Salinity	0.03 – 0.08 ppt	
	Specific Conductivity	75.2 – 165.2 µS/cm	
	pH	6.39 – 8.74 pH units	4.8% of values < 6.50 pH
	Oxidation-Reduction Potential	95.2 – 546.3 mV	
	Dissolved Oxygen	Up to 50% of water column < 2.0 mg/L in July	
Nutrients	Surface Total Nitrogen	0.42 mg/L to 0.55 mg/L	
	Surface Total Phosphorus	0.014 mg/L to 0.018 mg/L	
	Nitrogen to Phosphorus Ratio	31:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	En & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	S	S							
Aesthetics					S	*					
Agriculture							*	*	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply				S							

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes: Standards revision, true color is for permitting purposes only.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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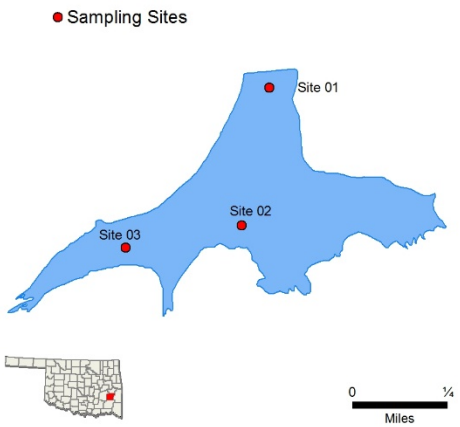
Bathy map available: http://www.owrb.ok.gov/maps/PMG/owrbdata_Bathy.html

Lloyd Church (Wilburton)

Sample Period	Times Visited	Sampling Sites
December 2018 – August 2019	4	3



General

Location	Latimer County
Impoundment	1964
Area	160 acres
Capacity	3,060 acre-feet
Purposes	Water Supply, Recreation, Flood Control

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In Situ	Average Turbidity	10 NTU	100% of values < 25 NTU (n=12)
	Average Secchi Depth	99 cm	
	Water Clarity Rating	Excellent	
	Chlorophyll-a	5.3 mg/m3	
	Trophic State Index	47	Previous value = 46
	Trophic Class	Mesotrophic	
Profile	Salinity	0.02 – 0.04 ppt	
	Specific Conductivity	42.6 – 82.6 µS/cm	
	pH	6.05 – 7.48 pH units	40% of values <6.5 pH units
	Oxidation-Reduction Potential	76.1 -596.8 mV	
	Dissolved Oxygen	Up to 53% of water column < 2 mg/L in September	
Nutrients	Surface Total Nitrogen	0.27 mg/L to 0.44 mg/L	
	Surface Total Phosphorus	0.013 mg/L to 0.029 mg/L	
	Nitrogen to Phosphorus Ratio	17:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	NS	NS	NEI	S							
Aesthetics					S	*					
Agriculture							S	S	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

* Standards revision, true color is for permitting purposes only

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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Bathy map available: http://www.owrb.ok.gov/maps/PMG/owrbdata_Bathy.html

Lee Creek at Short

Sample Record	Biological Collections	Station ID
January 2003 - Current	Gaging Data	220200050010-001AT

Stream Data

County	Sequoyah	Request Data by Email
Location	West of the Town of Short on State Highway 101	
Latitude/Longitude	35.56589868, -94.53152717	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110104)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	164	17.2	16.2	0.2/32.3	10.0/24.7	
	Turbidity (NTU)	164	9	5	1/124	4/9	
	pH (units)	164	7.60	7.58	6.31/8.70	7.36/7.84	
	Dissolved Oxygen (mg/L)	164	9.41	9.10	5.23/14.60	7.75/11.14	
	Hardness (mg/L)	162	46	42	<10/130	35/54	
Minerals	Total Dissolved Solids (mg/L)	167	61	60	<10/173	48/69	
	Specific Conductivity (uS/cm)	163	96	94	<10/266	77/107	
	Chloride (mg/L)	101	<10	<10	<10/11	<10/<10	
	Sulfate (mg/L)	101	<10	<10	<10/49	<10/<10	
Nutrients	Total Phosphorus (mg/L)	166	0.013	<0.010	<0.010/0.149	<0.010/0.016	
	Total Nitrogen (mg/L)	166	0.27	0.22	<0.10/1.67	0.13/0.33	
	Nitrate/Nitrite (mg/L)	144	0.12	0.06	<0.05/1.62	<0.05/0.14	
	Chlorophyll A (mg/m^3)	135	2.2	0.8	<0.1/92.0	0.4/1.6	TSI=38.3
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	52	437	<10	<10/7100	<10/53	
	E. Coli (cfu/100ml)(*-Geo. Mn.)	52	125	<10	<10/2359	<10/35	

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment	Total Phosphorus
Fish & Wildlife Propagation	S	S	S	NS						S	S	S	
Aesthetics												NEI	NEI
Agriculture					S		S	S					
Primary Body Contact Recreation									S				
Public & Private Water Supply				S									
Fish Consumption				S									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes: *Fish & Wildlife Propagation not supporting for Lead*

Little Lee Creek at Nicut

Sample Record	Biological Collections	Station ID
February 2008 - Current	Gaging Data	220200050040-001AT

Stream Data

County	Sequoyah	Request Data by Email
Location	West of the Town of Short on State Highway 101	
Latitude/Longitude	35.573236, -94.556816	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110104)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	119	16.7	16.0	0.3/31.4	9.8/23.3	
	Turbidity (NTU)	121	8	3	0/223	2/5	
	pH (units)	120	7.61	7.57	6.30/8.56	7.43/7.85	
	Dissolved Oxygen (mg/L)	120	9.82	9.69	5.01/14.47	8.22/11.82	
	Hardness (mg/L)	118	64	61	36/140	53/71	
Minerals	Total Dissolved Solids (mg/L)	126	86	84	48/204	72/98	
	Specific Conductivity (uS/cm)	118	141	136	69/314	115/154	
	Chloride (mg/L)	61	<10	<10	<10/<10	<10/<10	
	Sulfate (mg/L)	61	<10	<10	<10/15	<10/<10	
Nutrients	Total Phosphorus (mg/L)	120	0.013	<0.010	<0.010/0.259	<0.010/<0.010	
	Total Nitrogen (mg/L)	120	0.22	0.17	<0.10/1.41	<0.10/0.25	
	Nitrate/Nitrite (mg/L)	120	0.10	<0.05	<0.05/0.96	<0.05/0.11	
	Chlorophyll A (mg/m^3)	98	0.8	0.6	<0.1/6.4	0.3/0.9	TSI=28.8
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	14	218	<10	<10/2420	<10/16	
	E. Coli (cfu/100ml)(*-Geo. Mn.)	14	531	<10	<10/6488	<10/33	

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment	Phosphorus
Fish & Wildlife Propagation	S	S	S	S						S	S	S	
Aesthetics												NEI	NEI
Agriculture					S		S	S					
Primary Body Contact Recreation									NEI				
Public & Private Water Supply				S		S			S				
Fish Consumption				S									

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

New Spiro

Sample Period	Times Visited	Sampling Sites
November 2017 – July 2018	4	5

General

Location	Le Flore County
Impoundment	1960
Area	254 acres
Capacity	2,160 acre-feet
Purposes	Water Supply, Recreation

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In Situ	Average Turbidity	14 NTU	8% of values > OWQS of 25 NTU (n=12)
	Average Secchi Disk Depth	54 cm	
	Water Clarity Rating	Good	
	Chlorophyll-a	37.37 mg/m3	
	Trophic State Index	66	Previous value = 48
	Trophic Class	Hypereutrophic	
Profile	Salinity	0.05 – 0.09 ppt	
	Specific Conductivity	85.9 – 199.7 µS/cm	
	pH	5.91 – 7.84 pH units	39% < 6.5 pH & 8% > 9.0 pH
	Oxidation-Reduction Potential	29.8 – 577.3 mV	
	Dissolved Oxygen	Up to 47% of water column < 2.0 mg/L in July	Occurred at site 1
Nutrients	Surface Total Nitrogen	1.035 mg/L to 2.21 mg/L	
	Surface Total Phosphorus	0.068 mg/L to 0.229 mg/L	
	Nitrogen to Phosphorus Ratio	12:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	En & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	S							
Aesthetics					NEI	*					
Agriculture							S	S	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											NS

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status

*Standards revision, true color is for permitting purposes only

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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Bathy map available: http://www.owrb.ok.gov/maps/PMG/owrbdata_Bathy.html

Poteau River at Heavener

Sample Record	Biological Collections	Station ID
November 1998 – December 2012	Gaging Data	220100020010-001AT

Stream Data

County	Le Flore	Request Data By Email
Location	South of the Town of Heavener on US Highway 59	
Latitude/Longitude	34.85833476, -94.62923436	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110105)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	117	19.1	19.8	1.8/35.9	12.2/26.3	
	Turbidity (NTU)	118	22	16	0/152	10/24	
	pH (units)	117	7.28	7.25	5.96/8.97	6.92/7.64	
	Dissolved Oxygen (mg/L)	120	8.21	7.88	3.77/16.00	6.58/9.77	
	Hardness (mg/L)	117	49	36	<10/188	22/63	
Minerals	Total Dissolved Solids (mg/L)	137	88	65	<10/311	39/117	
	Specific Conductivity (uS/cm)	117	136	101	<10/486	57/183	
	Chloride (mg/L)	76	<10	<10	<10/53	<10/<10	
	Sulfate (mg/L)	76	36	21	<10/146	16/40	
Nutrients	Total Phosphorus (mg/L)	112	0.075	0.054	<0.010/0.430	0.038/0.083	
	Total Nitrogen (mg/L)	110	0.66	0.62	0.17/1.62	0.46/0.76	
	Nitrate/Nitrite (mg/L)	55	0.16	0.10	<0.05/0.74	<0.05/0.23	
	Chlorophyll A (mg/m^3)	13	9.5	9.4	1.8/29.7	3.4/13.0	TSI=52.7
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	28	65	20	<10/400	<10/80	Mean>OWQS
	E. Coli (cfu/100ml)(*-Geo. Mn.)	28	58	31	<10/393	18/51	

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment
Fish & Wildlife Propagation	S	S	S	S						S	NEI	S
Aesthetics												S
Agriculture					S		S	S				
Primary Body Contact Recreation									NS			
Public & Private Water Supply				NEI		NEI			NEI			
Fish Consumption				S								

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Poteau River at Pocola

Sample Record	Biological Collections	Station ID
November 1998 - Current	Gaging Data	220100010010-001AT

Stream Data

County	Le Flore	Request Data By Email
Location	West of the Town of Pocola on E1220 Rd	
Latitude/Longitude	35.23864842, -94.52021262	
Planning Watershed	Lower Arkansas (8-digit HUC -11110105)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	164	18.5	19.0	2.9/34.6	11.7/25.8	
	Turbidity (NTU)	166	74	51	11/476	35/86	13% of values>OWQS
	pH (units)	166	7.27	7.22	5.39/8.99	6.97/7.61	
	Dissolved Oxygen (mg/L)	167	8.13	7.87	3.31/15.94	6.28/9.76	
	Hardness (mg/L)	169	48	46	<10/197	33/57	
Minerals	Total Dissolved Solids (mg/L)	188	95	88	<10/675	56/116	
	Specific Conductivity (uS/cm)	165	141	128	<10/530	84/178	
	Chloride (mg/L)	104	<10	<10	<10/33	<10/<10	
	Sulfate (mg/L)	104	36	34	<10/88	25/45	
Nutrients	Total Phosphorus (mg/L)	172	0.128	0.112	0.017/0.416	0.078/0.152	
	Total Nitrogen (mg/L)	169	1.07	0.92	0.17/6.45	0.77/1.21	
	Nitrate/Nitrite (mg/L)	110	0.32	0.20	<0.05/1.87	0.10/0.40	
	Chlorophyll A (mg/m^3)	85	16.6	14.6	1.9/77.3	8.6/19.3	TSI=58.1
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	38	142	31	<10/2420	20/59	
	E. Coli (cfu/100ml)(*-Geo. Mn.)	38	101	23	<10/2420	<10/49	

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment
Fish & Wildlife Propagation	NS	S	S	NS						S	S	S
Aesthetics												S
Agriculture					S		S	S				
Primary Body Contact Recreation									S			
Public & Private Water Supply				NEI		NEI			NEI			
Fish Consumption				NS								

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NS = Not Supporting
NEI = Not Enough Information

Notes

Fish & Wildlife Propagation not supporting for Lead
Fish Consumption not supporting for Lead

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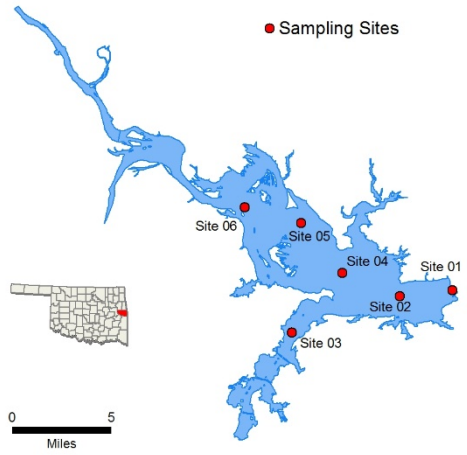
Robert S. Kerr

Sample Period	Times Visited	Sampling Sites
November 2015 – September 2016	4	6



General

Location	Sequoyah County
Impoundment	1970
Area	43,800 acres
Capacity	525,700 acre feet
Purposes	Navigation, Hydropower, and Recreation

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In-Situ	Average Turbidity	28NTU	42% of values > 25 NTU
	Average Secchi Depth	36 cm	
	Water Clarity Rating	Fair	
	Chlorophyll-a	17.9 mg/m3	
	Trophic State Index	59	Previous value = 56
	Trophic Class	Eutrophic	
Profile	Salinity	0.19– 0.44 ppt	
	Specific Conductivity	402.6 – 888.8 µS/cm	
	pH	7.66 – 8.26 pH units	Neutral to slightly alkaline
	Oxidation-Reduction Potential	-9.2.8 to 356.1 mV	
	Dissolved Oxygen	All data are above screening level of 2.0 mg/L	
Nutrients	Surface Total Nitrogen	0.61mg/L to 0.98 mg/L	
	Surface Total Phosphorus	0.062 mg/L to 0.172 mg/L	
	Nitrogen to Phosphorus Ratio	6:1	Possibly co- limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	NS	S	S	NEI							
Aesthetics					S	*					
Agriculture							S	S	S		
Primary Body Contact Recreation										NEI	
Public & Private Water Supply				NEI							

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*Standards revision, true color is for permitting purposes only

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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Sager Creek at West Siloam Springs

Sample Record	Biological Collections	Station ID
November 1998 – December 2012	Gaging Data	121700060080-001AT

Stream Data

County	Delaware	Request Data By Email
Location	West of the Town of West Siloam Springs off US Highway 412	
Latitude/Longitude	36.20164298, -94.60538182	
Planning Watershed	Lower Arkansas (8-digit HUC - 11110103)	

Parameters

	Parameter (Descriptions)	n	Mean	Median	Min./Max	p25/p75	Comments
In-Situ	Water Temperature (°C)	109	17.4	17.2	5.9/29.2	12.7/22.0	
	Turbidity (NTU)	107	3	1	1/55	1/2	
	pH (units)	108	7.71	7.72	6.59/8.65	7.47/7.97	
	Dissolved Oxygen (mg/L)	113	9.09	8.76	4.66/15.35	8.05/10.19	21% of values<OWQS and 13% of values<alt OWQS
	Hardness (mg/L)	108	132	134	<10/198	120/146	
Minerals	Total Dissolved Solids (mg/L)	129	269	269	<10/657	222/310	
	Specific Conductivity (uS/cm)	109	425	427	164/713	359/494	
	Chloride (mg/L)	100	36	34	<10/95	23/47	
	Sulfate (mg/L)	100	25	21	<10/64	16/29	
Nutrients	Total Phosphorus (mg/L)	114	1.117	1.040	0.012/3.965	0.649/1.485	
	Total Nitrogen (mg/L)	113	7.44	7.18	2.32/17.53	4.92/9.01	
	Nitrate/Nitrite (mg/L)	51	6.48	5.67	2.01/17.50	3.78/8.54	
	Chlorophyll A (mg/m^3)	54	1.6	0.7	<0.1/8.3	0.4/2.4	TSI=35.5
Bacteria	Enterococcus (cfu/100ml)(*-Geo. Mn.)	56	512	109	<10/9700	39/425	Mean>OWQS
	E. Coli (cfu/100ml)(*-Geo. Mn.)	56	217	31	<10/4360	<10/98	

Beneficial Uses

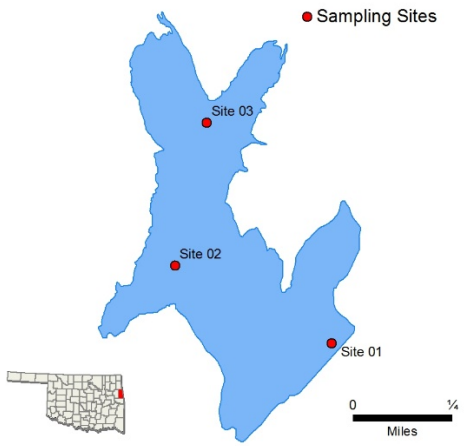
Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment
Fish & Wildlife Propagation	S	S	NS	S						S	S	S
Aesthetics												NEI
Agriculture					S		S	S				
Primary Body Contact Recreation									NS			
Public & Private Water Supply				S		S			S			
Fish Consumption				S								

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Stilwell City

Sample Period	Times Visited	Sampling Sites
December 2015 – October 2016	3	5



General

Location	Adair County
Impoundment	1965
Area	188 acres
Capacity	3,110 acre-feet
Purposes	Water Supply, Recreation, Flood Control

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In Situ	Average Turbidity	14 NTU	33% of values > OWQS of 25 NTU
	Average Secchi Disk Depth	69 cm	100% of values < OWQS of 70
	Water Clarity Rating	Average	
	Chlorophyll-a	9.6mg/m3	
	Trophic State Index	53	Previous value = 54
	Trophic Class	Eutrophic	
Profile	Salinity	0.06 – 0.12 ppt	
	Specific Conductivity	117.3 – 249.5 µS/cm	
	pH	6.74 – 8.03 pH units	
	Oxidation-Reduction Potential	64 – 459 mV	
	Dissolved Oxygen	Up to 54% of water column < 2 mg/L in October	Occurred at site 1, the dam
Nutrients	Surface Total Nitrogen	0.63 mg/L to 1.24 mg/L	
	Surface Total Phosphorus	0.027 mg/L to 0.281 mg/L	
	Nitrogen to Phosphorus Ratio	7:1	Possibly co- limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	NS	S	NS	S							
Aesthetics					S	S					
Agriculture							S	S	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes *Standards revision, true color is for permitting purposes only

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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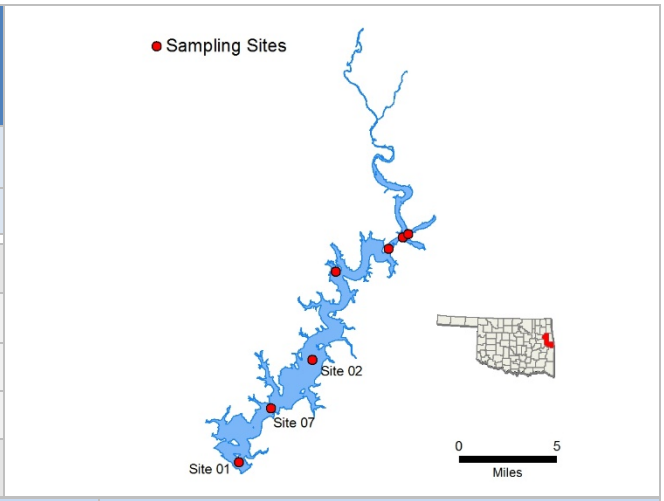
Bathy map available: http://www.owrb.ok.gov/maps/PMG/owrbdata_Bathy.html

Tenkiller (1,2,7)

Sample Period	Times Visited	Sampling Sites
October 2016 – July 2017	4	7



General

Location	Sequoyah County
Impoundment	1953
Area	12,900 acres
Capacity	654,100 acre-feet
Purposes	Flood Control, Hydropower

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In Situ	Average Turbidity	3 NTU	100% of values < OWQS of 25 NTU
	Average Secchi Disk Depth	215 cm	
	Water Clarity Rating	Excellent	
	Chlorophyll-a	7.77 mg/m3	
	Trophic State Index	51	Previous value = 56
	Trophic Class	Eutrophic	
Profile	Salinity	0.08 – 0.12 ppt	
	Specific Conductivity	165.1 – 254.9 µS/cm	
	pH	6.48– 8.71 pH units	
	Oxidation-Reduction Potential	68.9-465.5 mV	
	Dissolved Oxygen	Up to 79% of water column < 2 mg/L	
Nutrients	Surface Total Nitrogen	0.25 mg/L to 0.99 mg/L	
	Surface Total Phosphorus	0.010 mg/L to 0.021 mg/L	
	Nitrogen to Phosphorus Ratio	31:1	Possibly co-limited for this sample year

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	NEI							
Aesthetics					NEI	*					
Agriculture							N/A	N/A	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply				NEI							

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.
**N/A – parameters not collected in current sample year.*

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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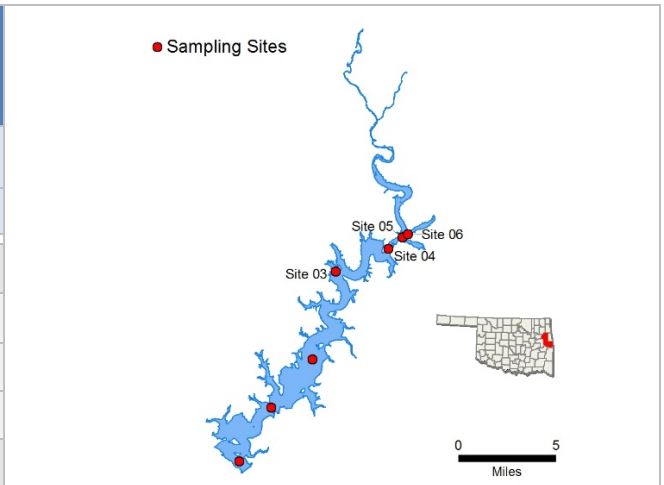
Tenkiller, Illinois River Arm (3-6)

Sample Period	Times Visited	Sampling Sites
October 2016 – July 2017	4	7



General

Location	Sequoyah County
Impoundment	1953
Area	12,900 acres
Capacity	654,100 acre-feet
Purposes	Flood Control, Hydropower

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In Situ	Average Turbidity	28 NTU	19% of values > OWQS of 25 NTU
	Average Secchi Disk Depth	66 cm	
	Water Clarity Rating	Average	
	Chlorophyll-a	21.7 mg/m3	
	Trophic State Index	61	Previous value = 59
	Trophic Class	Hypereutrophic	
Profile	Salinity	0.07 – 0.15 ppt	
	Specific Conductivity	154.4 – 316 µS/cm	
	pH	6.81 – 8.9 pH units	
	Oxidation-Reduction Potential	98.2-422.3 mV	
	Dissolved Oxygen	Up to 70% of water column < 2 mg/L at site 3.	
Nutrients	Surface Total Nitrogen	0.33 mg/L to 2.49 mg/L	
	Surface Total Phosphorus	0.022 mg/L to 0.232 mg/L	
	Nitrogen to Phosphorus Ratio	14:1	Possibly co- limited for this sample year

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NEI	NEI							
Aesthetics					NEI	*					
Agriculture							S	S	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply				NEI							NS

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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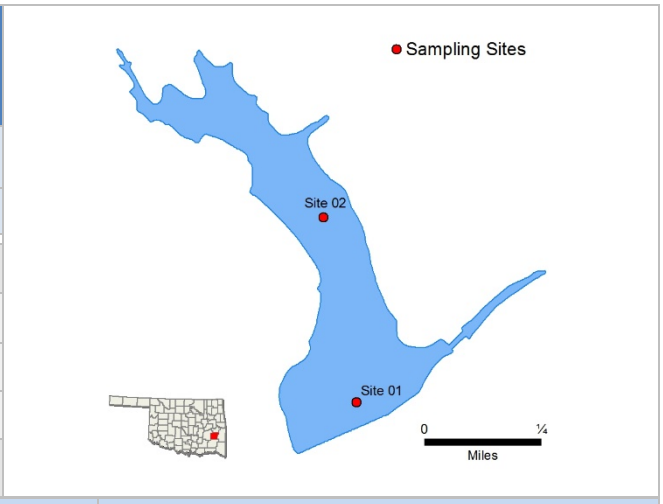
Wayne Wallace

Sample Period	Times Visited	Sampling Sites
November 2016 – August 2017	4	5



General

Location	Latimer County
Impoundment	1969
Area	94 acres
Capacity	1,746 acre feet
Purposes	Flood Control and Recreation

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
	Average Turbidity	6 NTU	100% of values < OWQS of 25 NTU (n=6)
	Average Secchi Disk Depth	90 cm	
	Water Clarity Rating	Good	
	Chlorophyll-a	13.75 mg/m3	
	Trophic State Index	56	Previous value = 63
	Trophic Class	Eutrophic	
Profile	Salinity	0.02 – 0.04 ppt	
Profile	Specific Conductivity	53.1 – 83.1 µS/cm	
Profile	pH	5.94 – 7.61 pH units	9.8% of recorded values are < 6.5 pH units
Profile	Oxidation-Reduction Potential	231.9 – 573.3 mV	
Profile	Dissolved Oxygen	Up to 40% of water column < 2 mg/L in August	
Nutrients	Surface Total Nitrogen	0.38 mg/L to 0.64 mg/L	
Nutrients	Surface Total Phosphorus	0.017 mg/L to 0.031 mg/L	
Nutrients	Nitrogen to Phosphorus Ratio	20:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	S	NS	NS	S							
Aesthetics					S	*					
Agriculture							S	S	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											

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NS = Not Supporting
NEI = Not Enough Information

Notes

Slightly acidic conditions are common in this part of the state, due to relatively low soil pH and lack of soluble bedrock. Due to these conditions it is likely that the low pH values may be due to natural causes; therefore the Water Board is looking at the applicability of developing site-specific criteria for waters in the southeastern portion of the state. * Standards revision, true color is for permitting purposes only.

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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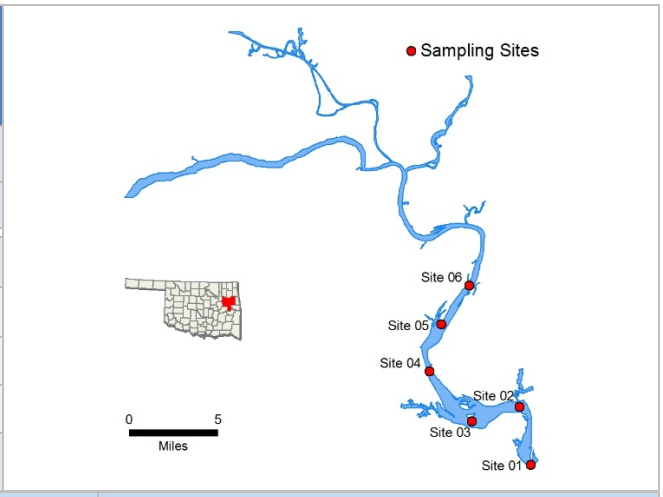
Webbers Falls

Sample Period	Times Visited	Sampling Sites
February 2019	1**	6



General

Location	Muskogee County	Click map for site data
Impoundment	1965	
Area	11,600 acres	
Capacity	170,100 acre-feet	
Purposes	Navigation, Hydropower	

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In-Situ	Average Turbidity	16 NTU	0% of values > OWQS of 25 NTU
	Average Secchi Disk Depth	56.2 cm	
	Water Clarity Rating	Poor	
	Chlorophyll-a	21.22 mg/m3	
	Trophic State Index	61	Previous value = 52
	Trophic Class	Hypereutrophic	
Profile	Salinity	0.26 – 0.49 ppt	
	Specific Conductivity	528.1 – 997.3 µS/cm	
	pH	8.07 – 8.20 pH units	
	Oxidation-Reduction Potential	395.5 – 409.0 mV	
	Dissolved Oxygen	All data are above screening level of 2.0 mg/L	
Nutrients	Surface Total Nitrogen	1.25 mg/L to 1.48 mg/L	
	Surface Total Phosphorus	0.144 mg/L to 0.154 mg/L	
	Nitrogen to Phosphorus Ratio	10:1	Possibly co-limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	En & E. coli	Chlor-a
Fish & Wildlife Propagation	NS	S	S	S							
Aesthetics					S	*					
Agriculture							S	S	S		
Primary Body Contact Recreation										NS	
Public & Private Water Supply											

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

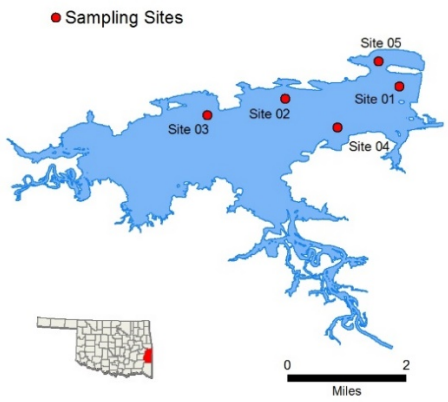
*Standards revision, true color is for permitting purposes only.
**Only one visit in SY19 due to extreme flooding

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

Sampling and Assessment by the Oklahoma Water Resources Board – 3800 Classen Blvd, Oklahoma City, OK, 73118 – 405.530.8800 – http://www.owrb.ok.gov

Wister

Sample Period	Times Visited	Sampling Sites
November 2017 – July 2018	4	5



General

Location	LeFlore County
Impoundment	1949
Area	7,333 acres
Capacity	62,360 acre feet
Purposes	Flood Control, Water Supply, Low flow Regulation, and Conservation

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In-Situ	Average Turbidity	24 NTU	25% of values > OWQS 25 NTU
	Average Secchi Disk Depth	45 cm	
	Water Clarity Rating	Fair	
	Chlorophyll-a	22.13 mg/m3	
	Trophic State Index	61	Previous value = 62
	Trophic Class	Hypereutrophic	
Profile	Salinity	0.04 – 0.07 ppt	
	Specific Conductivity	66.6 – 158.7 µS/cm	
	pH	6.00 – 7.80 pH units	2 % of Values < 6.5 pH units
	Oxidation-Reduction Potential	26.9 to 557.3 mV	
	Dissolved Oxygen	Up to 62% of water column < 2 mg/L in July	
Nutrients	Surface Total Nitrogen	0.585 mg/L to 0.97 mg/L	
	Surface Total Phosphorus	0.042 mg/L to 0.108 mg/L	
	Nitrogen to Phosphorus Ratio	10:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	En & E. coli	Chlor-a
Fish & Wildlife Propagation	NS	NS	NEI	S							
Aesthetics					NEI*	*					
Agriculture							S	S	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											NS

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*Standards revision, true color is for permitting purposes only.
*Currently, the lake is listed as a Nutrient Limited Watershed (NLW) in the Oklahoma Water Quality Standards (WQS). This listing means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics beneficial use non-support status.

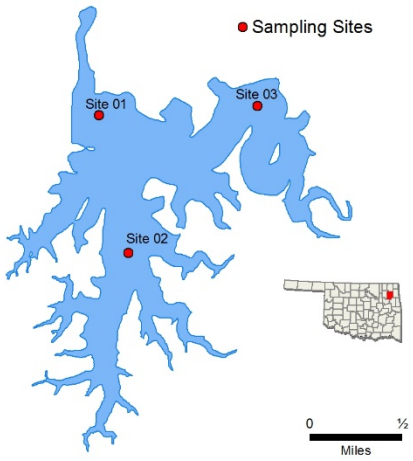
NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

Sampling and Assessment by the Oklahoma Water Resources Board – 3800 Classen Blvd, Oklahoma City, OK, 73118 – 405.530.8800 – http://www.owrb.ok.gov

Bathy map available: http://www.owrb.ok.gov/maps/PMG/owrbdata_Bathy.html

W.R. Holway

Sample Period	Times Visited	Sampling Sites
November 2015 – August 2016	4	5



General

Location	Mayes County
Impoundment	1968
Area	712 acres
Capacity	48,000 acre-feet
Purposes	Water Supply, Hydropower, Recreation

Parameters

	Parameter (Descriptions)	Result	Notes/Comments
In-Situ	Average Turbidity	2 NTU	100% of Values < OWQS of 25
	Average Secchi Disk Depth	147 cm	
	Water Clarity Rating	Excellent	
	Chlorophyll-a	18.9 mg/m3	
	Trophic State Index	59	Previous Value= 56
	Trophic Class	Eutrophic	
Profile	Salinity	0.09 – 0.22 ppt	
	Specific Conductivity	201.8 – 451.2 µS/cm	
	pH	6.66 – 9.00 pH units	
	Oxidation-Reduction Potential	128.5 to 514 mV	
	Dissolved Oxygen	Up to 48% of water column < 2 mg/L in summer	
Nutrients	Surface Total Nitrogen	0.41 mg/L to 0.59mg/L	
	Surface Total Phosphorus	0.042 mg/L to 0.067 mg/L	
	Nitrogen to Phosphorus Ratio	9:1	Phosphorus limited

Beneficial Uses

Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	TSI	True Color	Sulfates	Chlorides	Total Dissolved Solids	Enterro. & E. coli	Chlor-a
Fish & Wildlife Propagation	S	S	NS	S							
Aesthetics					S	*					
Agriculture							S	S	S		
Primary Body Contact Recreation										S	
Public & Private Water Supply											

S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

*Standards revision, true color is for permitting purposes only

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
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Bathy map available: http://www.owrb.ok.gov/maps/PMG/owrbdata_Bathy.html

Oklahoma 2018 Integrated Report
Appendix B

Legend

Legend for Attainment	
Code	**Description**
F	Fully Supporting
N	Not Supporting
I	Insufficient Information
X	Not Assessed

USE ID	Description
124	Aesthetic
125	Agriculture
129	Emergency Water Supply
130	Cool Water Aquatic Community
131	Habitat Limited Aquatic Community
132	Trout Fishery
133	Warm Water Aquatic Community
134	Hydropower
135	Indus. & Muni. Process/Cooling Water
136	Navigation
137	Primary Body Contact Recreation
138	Public and Private Water Supply
139	Secondary Body Contact Recreation
1003	Fish Consumption
1004	Outstanding Resource
1005	Sensitive Water Supply
1006	High Quality Water

Category	Description
1	Attaining the Water Quality Standard and no use is threatened
2	Attaining some of the designated uses; no use is threatened; and insufficient or no data or information is available to determine if the remaining uses are attained or threatened
3	Insufficient or no data and information to determine if any designated use is attained
4 **4a** **4b** **4c**	Impaired or threatened for one or more designated uses but does not require the development of a TMDL • TMDL has been completed • Other pollution control requirements are reasonable expected to result in the attainment of the water quality standard in the near future • Impairment is not caused by a pollutant
5	The water quality standard is not attained. The waterbody is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL

ID	Description
91	Ammonia (Unionized) -Toxin
96	Arsenic
104	Barium
127	Cadmium
138	Chloride
153	Chlorpyrifos
154	Chromium (total)
163	Copper
187	Diazinon
198	Dieldrin
215	Enterococcus
217	Escherichia coli
230	Fishes Bioassessments
267	Lead
302	Nitrates
317	Oil and Grease
322	Oxygen, Dissolved
372	Selenium
375	Silver
385	Sulfates
398	Total Coliform
399	Total Dissolved Solids
400	Total Fecal Coliform
413	Turbidity
423	Zinc
441	pH
462	Total Phosphorus

ID	Description
2	Acid Mine Drainage
33	Discharges from Biosolids (SLUDGE) Storage, Application or Disposal
62	Industrial Point Source Discharge
68	Land Application of Wastewater Biosolids (Non-agricultural)
70	Leaking Underground Storage Tanks
82	Mine Tailings
84	Municipal (Urbanized High Density Area)
85	Municipal Point Source Discharges
92	On-site Treatment Systems (Septic Systems and Similar Decencentralized Systems)
100	Runoff from Permitted Confined Animal Feeding Operations (CAFOs)
102	Petroleum/natural Gas Activities (Legacy)
119	Silviculture Harvesting
124	Spills from Trucks or Trains
127	Surface Mining
140	Source Unknown
155	Natural Sources
156	Agriculture
157	Habitat Modification - other than Hydromodification

2018 Category 5 Waters for the Oklahoma/Arkansas Compact Area

TMDL Development Priority Schedule

TMDL Priority	Proposed Initiation of TMDL Development*
1	2020
2	2021-2023
3	2024-2026
4	2027-2029

*Dates are only estimates and subject to change

Waterbody ID	HUC8	Waterbody Name	Unit	Size	Causes	TMDL Priority	Potential Sources
OK120400010070_00	11110102	Webbers Falls Lake	11600	Acres	413	4	140
OK120400010120_00	11110102	Greenleaf Creek	15.31	Miles	105	3	140
OK120400010130_00	11110102	Greenleaf Lake	920	Acres	150, 274	3	140
OK120400010280_00	11110102	Bayou Manard	14.02	Miles	105	2	39, 140
OK120400020010_00	11110102	Dirty Creek	44.18	Miles	322	4	46, 59, 87, 92, 108, 111, 133, 136, 140
OK120400020030_00	11110102	Dirty Creek, South Fork	15.55	Miles	105, 385	4	39, 46, 49, 62, 85, 87, 92, 108, 111, 133, 136, 140
OK120400020110_00	11110102	Dirty Creek, Georges Fork	10.05	Miles	322, 441	4	39, 46, 87, 92, 108, 111, 133, 136, 140
OK120400020160_00	11110102	Butler Creek	10.34	Miles	322	4	46, 59, 87, 92, 108, 111, 133, 136, 140
OK120400020190_00	11110102	Elk Creek	13.96	Miles	322, 441, 385	4	46, 49, 59, 62, 85, 87, 92, 102, 108, 111, 133, 136, 140
OK120400020240_00	11110102	Shady Grove Creek	10.80	Miles	385, 399, 441	4	8, 49, 102, 140
OK121600010050_00	11070209	Fort Gibson Lake	12464	Acres	322	1	46, 108, 133, 136, 140
OK121600010060_00	11070209	Ranger Creek	7.94	Miles	441	2	140
OK121600010200_00	11070209	Fort Gibson Lake, Upper	4814	Acres	322	1	140
OK121600010280_00	11070209	Neosho River	14.26	Miles	322	2	46, 56, 62, 85, 87, 92, 108, 133, 136, 140
OK121600010430_00	11070209	Chouteau Creek	22.25	Miles	441, 322	2	46, 59, 87, 92, 108, 111, 133, 136, 140
OK121600020020_00	11070209	Hudson Lake, Lower	5802	Acres	322	1	140
OK121600020170_00	11070209	Neosho River	10.89	Miles	322, 267	3	46, 56, 62, 82, 85, 87, 92, 108, 133, 136, 140
OK121600030020_00	11070209	Grand Lake O' the Cherokees, Lower	10051	Acres	322, 267	1	82, 140
OK121600050020_00	11070209	Spavinaw Lake	1584	Acres	150	1	4, 46, 59, 92, 108, 133, 136, 140, 146
OK121600050060_00	11070209	Spavinaw Creek	3.96	Miles	322	1	140
OK121600050070_00	11070209	Eucha Lake (Upper Spavinaw)	2860	Acres	150, 322	1	4, 46, 59, 92, 108, 133, 136, 140, 146
OK121600050140_00	11070209	Brush Creek	16.51	Miles	441	2	140
OK121600050160_00	11070209	Beaty Creek	12.44	Miles	441	2	140
OK121600060060_10	11070209	Big Cabin Creek	4.16	Miles	385	3	49, 140
OK121600060200_00	11070209	Bull Creek	10.83	Miles	138, 399, 322, 385	4	4, 59, 62, 84, 85, 92, 140
OK121600060220_00	11070209	Big Cabin Creek	11.58	Miles	385	4	49, 97, 102, 140
OK121600060240_00	11070209	Pawpaw Creek	18.40	Miles	322, 385, 399	4	46, 59, 87, 92, 108, 111, 133, 136, 140, 156
OK121610000050_10	11070209	Pryor Creek	4.97	Miles	322, 441	3	8, 46, 59, 85, 87, 92, 102, 108, 111, 128, 133, 136, 140
OK121610000090_00	11070209	Pryor Creek	2.35	Miles	322	3	84, 85, 92, 140, 156
OK121610000090_10	11070209	Pryor Creek	12.12	Miles	322, 230	3	46, 49, 59, 87, 92, 102, 108, 111, 136, 140
OK121700010010_00	11110103	Illinois River	9.47	Miles	322	3	140
OK121700010020_00	11110103	Deep Branch	8.71	Miles	322, 441	3	39, 140
OK121700020020_00	11110103	Tenkiller Ferry Lake	8442	Acres	322, 462	1	140
OK121700020110_00	11110103	Chicken Creek	3.54	Miles	230	1	46, 59, 87, 92, 108, 111, 133, 136, 140
OK121700020220_00	11110103	Tenkiller Ferry Lake, Illinois River Arm	5032	Acres	150, 462	1	4, 59, 108, 136, 140, 146
OK121700020270_00	11110103	Park Hill Branch	6.86	Miles	105	3	46, 49, 59, 72, 87, 92, 102, 108, 111, 136, 140

OK121700030010_00	11110103	Illinois River	7.68	Miles	215, 462	1	4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700030040_00	11110103	Tahlequah Creek (Town Branch)	6.21	Miles	217	1	46, 92, 108, 133, 136, 140
OK121700030080_00	11110103	Illinois River	31.68	Miles	462, 215	1	4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700030110_00	11110103	Cedar Hollow Creek	3.60	Miles	105	1	39, 140
OK121700030280_00	11110103	Illinois River	15.65	Miles	217, 462, 413, 215	1	4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700030290_00	11110103	Flint Creek	1.60	Miles	322, 462	1	4, 46, 59, 92, 108, 133, 136, 140, 146
OK121700030350_00	11110103	Illinois River	5.18	Miles	462	2	4, 34, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700030370_00	11110103	Ballard Creek	12.60	Miles	215	2	4, 46, 59, 92, 108, 111, 133, 136, 140
OK121700040010_00	11110103	Caney Creek	20.92	Miles	105, 215, 217	3	46, 59, 85, 92, 100, 108, 136, 140
OK121700050010_00	11110103	Illinois River, Baron Fork	25.15	Miles	462	2	4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700050070_00	11110103	Walltrip Branch	6.90	Miles	105	2	140
OK121700050090_00	11110103	Tyner Creek	15.92	Miles	215	2	4, 46, 59, 92, 108, 136, 140
OK121700050120_00	11110103	Peacheater Creek	10.95	Miles	215	2	4, 46, 59, 92, 100, 108, 128, 136, 140
OK121700050170_10	11110103	Illinois River, Baron Fork	7.78	Miles	215	2	46, 59, 92, 108, 136, 140
OK121700060010_00	11110103	Flint Creek	7.75	Miles	462, 215	1	4, 46, 59, 85, 92, 100, 108, 111, 133, 136, 140, 146
OK121700060040_00	11110103	Battle Creek (Battle Branch)	5.43	Miles	215	1	4, 46, 59, 92, 108, 111, 133, 136, 140
OK121700060080_00	11110103	Sager Creek	4.15	Miles	105, 215, 371	1	4, 46, 59, 85, 92, 108, 133, 136, 140, 146
OK220100010010_00	11110105	Poteau River	23.89	Miles	215	2	46, 59, 85, 92, 100, 108, 136, 140
OK220100010010_10	11110105	Poteau River	1.55	Miles	215	4	46, 59, 85, 92, 100, 108, 136, 140
OK220100010010_40	11110105	Poteau River	21.35	Miles	27, 163, 267, 372, 3	2	140
OK220100010050_00	11110105	New Spiro Lake	254	Acres	322, 441, 150	1	46, 92, 108, 133, 136, 140
OK220100010160_00	11110105	Sugarloaf Creek	15.00	Miles	441	4	140
OK220100010180_00	11110105	Caston Creek	14.43	Miles	385	3	46, 49, 59, 87, 92, 102, 108, 111, 136, 140
OK220100010265_00	11110105	Rock Creek Tributary!	2.01	Miles	230	3	46, 49, 59, 87, 92, 102, 108, 111, 136, 140
OK220100020010_10	11110105	Poteau River	27.04	Miles	215, 217	1	46, 59, 85, 92, 100, 108, 136, 140
OK220100020020_00	11110105	Wister Lake	7333	Acres	60, 413, 462, 274, 4	1	140
OK220100020060_00	11110105	Cedar Lake	78	Acres	322, 274, 441	2	46, 92, 108, 133, 136, 140
OK220100020080_00	11110105	Big Creek	12.57	Miles	105, 441	2	39, 46, 62, 69, 85, 87, 92, 108, 111, 133, 136, 140
OK220100040020_00	11110105	Fourche Maline Creek	36.94	Miles	322, 441	2	46, 62, 69, 85, 87, 92, 108, 111, 133, 136, 140
OK220100040050_00	11110105	Red Oak Creek	10.95	Miles	322, 441	2	46, 85, 92, 108, 133, 136, 140
OK220100040080_00	11110105	Bandy Creek	12.44	Miles	230	2	46, 49, 59, 87, 92, 102, 108, 111, 136, 140
OK220100040100_00	11110105	Lloyd Church Lake (Wilburton City)	160	Acres	413, 441, 274	2	140
OK220100040140_00	11110105	Carlton Lake	52	Acres	274	2	140
OK220100040150_00	11110105	Wayne Wallace Lake	94	Acres	322, 274, 441	2	46, 92, 108, 133, 136, 140
OK220200010010_00	11110104	Arkansas River	20.59	Miles	215	4	46, 59, 92, 108, 136, 140
OK220200010030_10	11110104	Big Skin Bayou	18.51	Miles	441	4	39
OK220200020020_00	11110104	Robert S. Kerr Lake	43380	Acres	413	2	140
OK220200020130_10	11110104	Vian Creek	21.42	Miles	441, 322	4	39, 140
OK220200030010_10	11110104	Sallisaw Creek	9.00	Miles	215	2	140
OK220200030040_00	11110104	Brushy Creek Lake	358	Acres	413, 150, 441	2	140
OK220200030120_00	11110104	Stilwell City Lake	188	Acres	413, 322	2	46, 108, 133, 136, 140
OK220200040010_10	11110104	Sans Bois Creek	10.76	Miles	385	4	140
OK220200040010_40	11110104	Sans Bois Creek	27.80	Miles	322	4	4, 46, 59, 85, 92, 108, 133, 136, 140
OK220200050010_00	11110104	Lee Creek	1.87	Miles	215, 267	3	46, 49, 92, 108, 133, 136, 140, 146

OKLAHOMA WATER RESOURCES BOARD

WATER QUALITY STANDARDS UPDATE

September 26, 2020

Water quality standards (WQS) define the goals for a waterbody and work to safeguard human health and aquatic life by establishing provisions to limit pollution to lakes and rivers. The Oklahoma Water Resources Board (OWRB) is the state agency responsible for developing and promulgating WQS to ensure water quality protection across the state of Oklahoma. OWRB staff, in cooperation with all stakeholders, work to develop and/or revise WQS, as necessary. The bullets below summarize recent program activities.

- OWRB staff have been completing the technical work to address the Illinois River Joint Study Committee Final Report recommendations and create proposed rule revisions to both the Oklahoma Water Quality Standards and the WQS Implementation Rules. This work has been done in collaboration with Oklahoma sister environmental agencies, the Oklahoma Office of the Secretary of Energy and Environment, the Cherokee Nation, and the Arkansas Department of Environmental Quality. The WQS proposed revisions include a revised total phosphorus criterion for the Illinois River, Barren Fork River, and Flint Creek. Additionally, proposed implementation revisions include critical condition language related to the criterion and revision of Oklahoma's assessment rules for the scenic river TP criterion. Staff have moved into informal stakeholder outreach. This outreach includes three public webinars scheduled (2 in September and one in early October), as well as meetings with stakeholders in both Arkansas and Oklahoma.

- A Biotic Ligand Model (BLM) is a metal bioavailability model that uses receiving water chemistry characteristics to develop water quality criteria on a site-specific basis. The copper BLM predicts toxic effect copper concentrations over a wide range of water chemistry conditions which improve precision in water quality protection, meaning aquatic life are not overprotected or under protected. A copper BLM project is currently underway for the Verdigris River directly downstream of Oologah Lake. The interested party for this project is Public Service Company of Oklahoma, Northeastern Power Plant. Water quality criteria rulemaking for this project is anticipated to be in 2021.

Additional information on Oklahoma's WQS is available on the OWRB site at http://www.owrb.ok.gov/quality/standards/standards.php or contact Monty Porter at monty.porter@owrb.ok.gov or Rebecca Veiga Nascimento at rebecca.veiga@owrb.ok.gov.

OKLAHOMA'S 2018-2019 WATER QUALITY STANDARDS REVISIONS RELEVANT TO THE ARK/OK COMPACT AREA

Completed TMDL's
In the Arkansas-Oklahoma Compact Area: Provided by the Oklahoma Department of Environmental Quality

COMPLETED TMDL'S PROVIDED BY THE OKLAHOMA DEPT. OF ENVIRONMENTAL QUALITY

11070209 - Lower Neosho

Waterbody ID	Station Name	Parameter	Cause Code(s)	EPA TMDL ID	DATE
OK121600050020_00	Spavinaw Lake	Phosphorus	462	38670	6/9/2010
OK121600050070_00	Lake Eucha	Phosphorus	462	38667	6/9/2010
OK121600010430_00	Chouteau Creek	Enterococcus, E. coli	215,217	42585	9/24/2012
OK121600010440_00	Crutchfield Branch	Enterococcus, E. coli	215,217	34849	7/28/2008
OK121600010060_00	Ranger Creek	Enterococcus	215	34847	7/28/2008
OK121600010100_00	Fourteenmile Creek	Enterococcus	215	34848	7/28/2008
OK121600010010_00	Neosho River	Enterococcus	215	42581	9/27/2012
OK121600020030_10	Saline Creek	Enterococcus	215	58701	5/13/2014
OK121600020070_00	Little Saline Creek	Enterococcus	215	58702	5/13/2014
OK121600050150_00	Spavinaw Creek	Enterococcus	215	58705	5/13/2014
OK121600050160_00	Beaty Creek	Enterococcus	215	58707	5/13/2014
OK121600050180_00	Cloud Creek	Enterococcus	215	58708	5/13/2014
OK121600060080_00	Little Cabin Creek	Enterococcus, E. coli	215, 217	50980	10/1/2012
OK121610000050_10	Pryor Creek	Enterococcus, E. coli	215, 217	58709	5/13/2014
OK121610000090_00	Pryor Creek	Turbidity	413	58709	5/13/2014
OK121600010430_00	Chouteau Creek	Enterococcus, E. coli	215, 217	42582	

11110102 - Dirty-Greenleaf

Waterbody ID	Station Name	Parameter	Cause Code(s)	EPA TMDL ID	DATE
OK120400010260_00	Arkansas River	Enterococcus	215	42530	9/27/2012
OK120400020160_00	Butler Creek	Enterococcus, E. coli, Turbidity	215,217,413	42538	9/27/2012
OK120400010400_00	Coody Creek	Enterococcus, E. coli	215,217	42532	9/27/2012
OK120400020010_00	Dirty Creek	Enterococcus, Turbidity	215,413	42533	9/27/2012
OK120400020110_00	Dirty Creek, Georges Fork	Enterococcus	215	42536	9/27/2012
OK120400020030_00	Dirty Creek, South Fork	Enterococcus	215	42535	9/27/2012
OK120400020190_00	Elk Creek	Enterococcus	215	42537	9/27/2012
OK120400020240_00	Shady Grove Creek	Enterococcus	215	42539	9/27/2012

11110103 - Illinois

Waterbody ID	Station Name	Parameter	Cause Code(s)	EPA TMDL ID	DATE

11110104 - Robert S Kerr

Waterbody ID	Station Name	Parameter	Cause Code(s)	EPA TMDL ID	DATE
OK220200040010_40	Sans Bois Creek	Enterococcus, E. coli	215,217	35635	10/20/2008
OK220200040050_00	Sans Bois Creek, Mountain Fork	E. coli	217	35634	10/20/2008
OK220200030010_20	Sallisaw Creek	Enterococcus	215	58780	5/13/2014
OK220200040010_10	Sans Bois Creek	Enterococcus	215	58782	5/13/2014
OK220200040050_00	Sans Bois Creek, Mountain Fork	E. coli	217	35626	

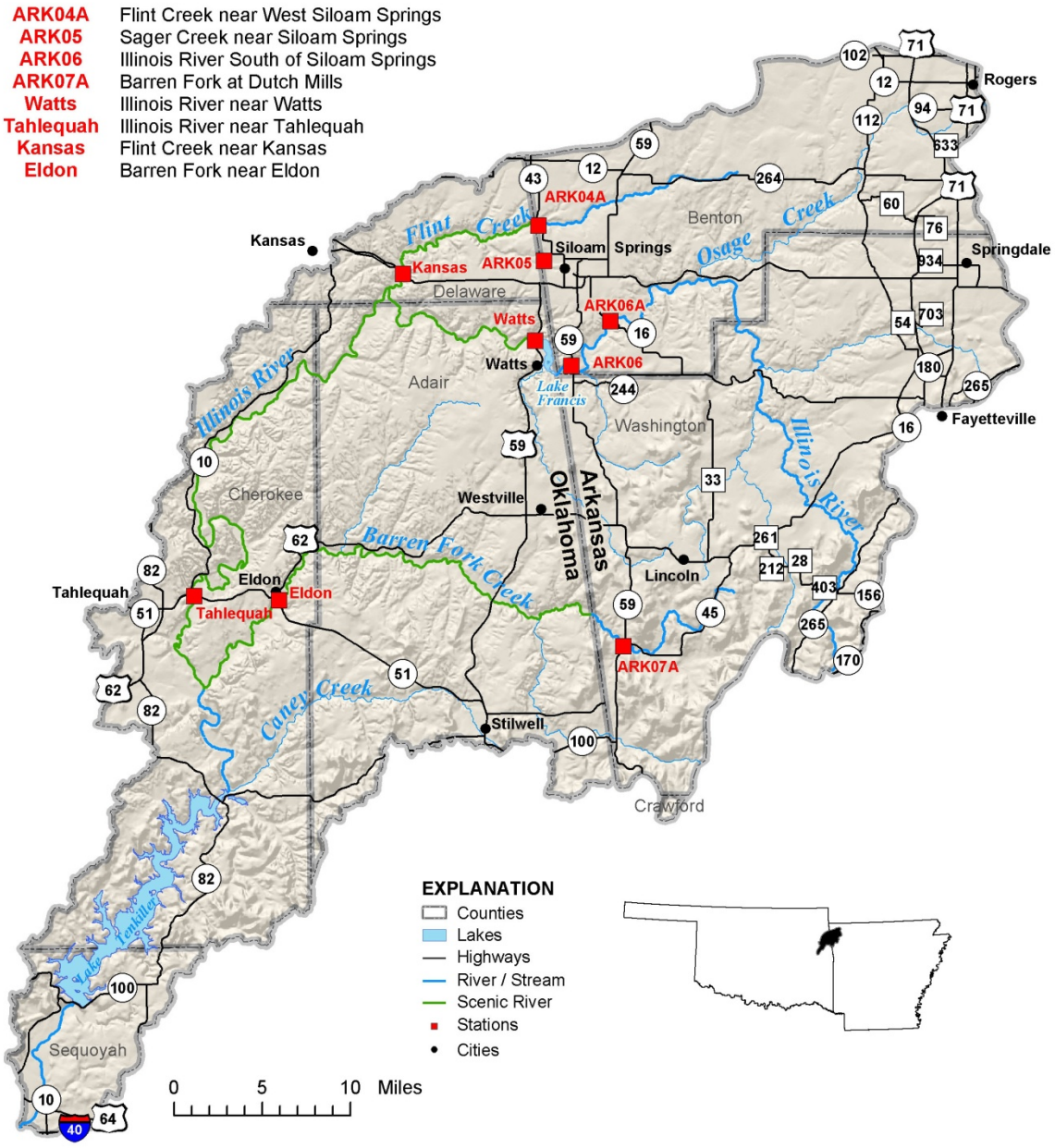
11110105 - Poteau

Waterbody ID	Station Name	Parameter	Cause Code(s)	EPA TMDL ID	DATE
OK220100040020_00	Fourche Maline Creek	Enterococcus	215	35634	10/28/2008
OK220100010010_00	Poteau River	Turbidity	413	58800	5/13/2014
OK220100010010_40	Poteau River	Turbidity	413	58820	5/13/2014
OK220100030010_00	Brazil Creek	Enterococcus	215	58760	5/13/2014

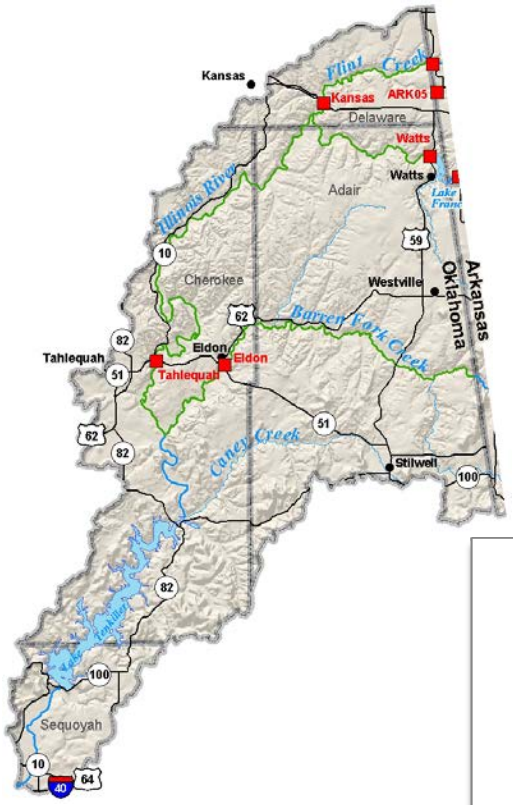
Water Quality Monitoring Report for the Illinois River Basin

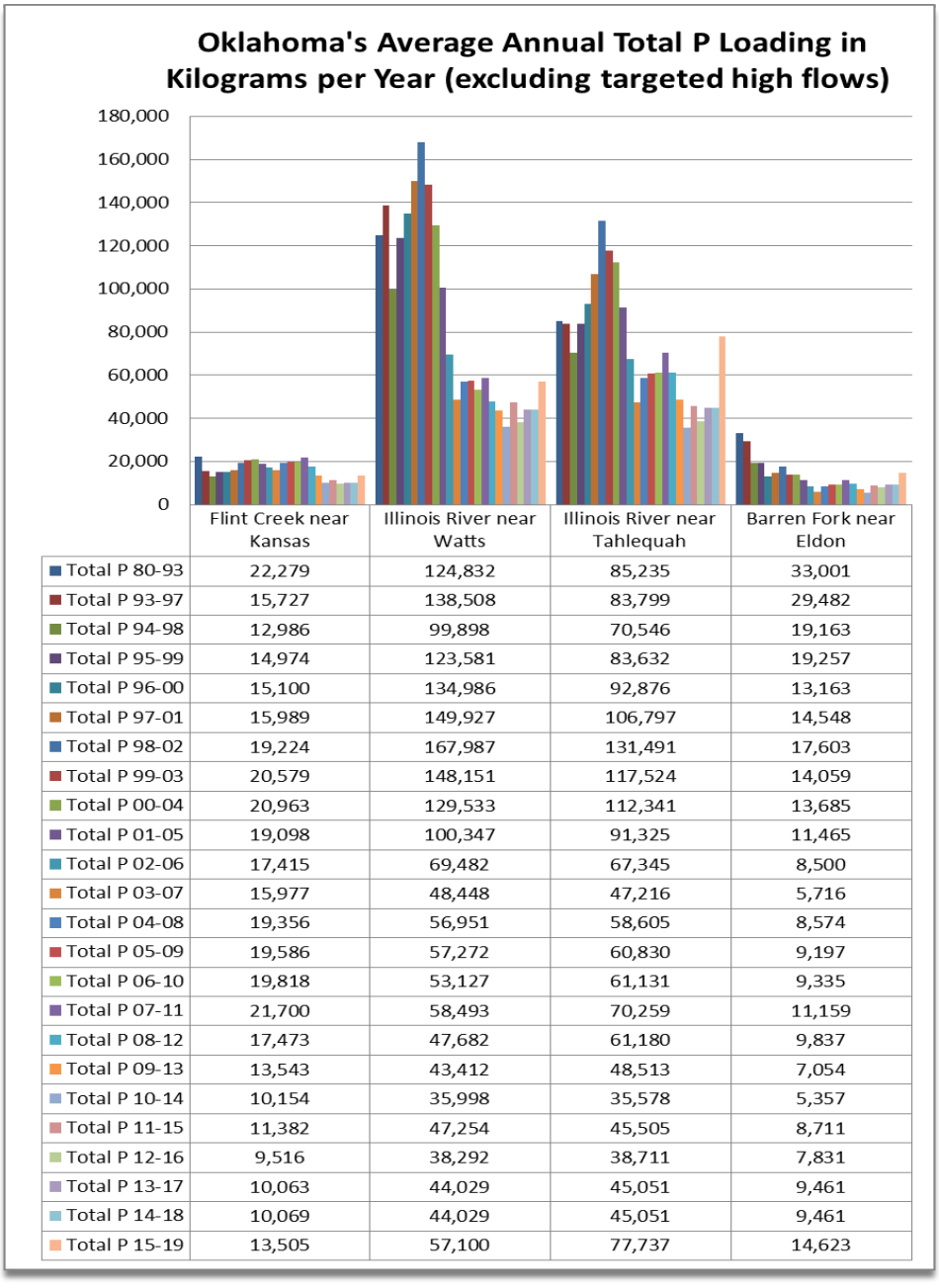
Illinois River Basin

Arkansas – Oklahoma Compact



CY 2019





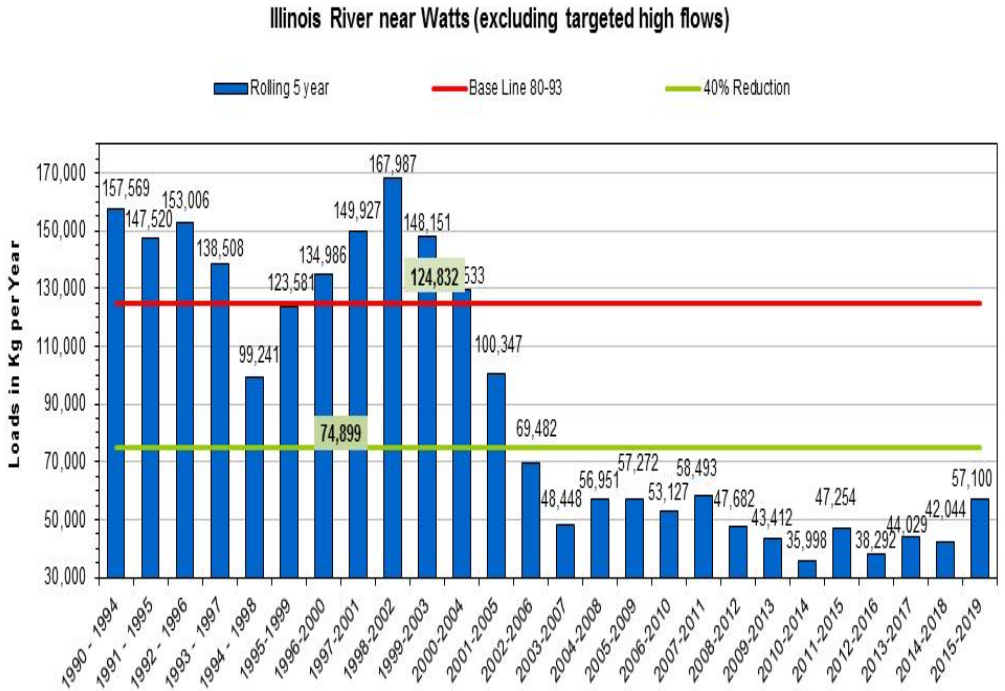
	Flint Creek near Kansas	Illinois River near Watts	Illinois River near Tahlequah	Barren Fork near Eldon
Total P 80-93	22,279	124,832	85,235	33,001
Total P 93-97	15,727	138,508	83,799	29,482
Total P 94-98	12,986	99,898	70,546	19,163
Total P 95-99	14,974	123,581	83,632	19,257
Total P 96-00	15,100	134,986	92,876	13,163
Total P 97-01	15,989	149,927	106,797	14,548
Total P 98-02	19,224	167,987	131,491	17,603
Total P 99-03	20,579	148,151	117,524	14,059
Total P 00-04	20,963	129,533	112,341	13,685
Total P 01-05	19,098	100,347	91,325	11,465
Total P 02-06	17,415	69,482	67,345	8,500
Total P 03-07	15,977	48,448	47,216	5,716
Total P 04-08	19,356	56,951	58,605	8,574
Total P 05-09	19,586	57,272	60,830	9,197
Total P 06-10	19,818	53,127	61,131	9,335
Total P 07-11	21,700	58,493	70,259	11,159
Total P 08-12	17,473	47,682	61,180	9,837
Total P 09-13	13,543	43,412	48,513	7,054
Total P 10-14	10,154	35,998	35,578	5,357
Total P 11-15	11,382	47,254	45,505	8,711
Total P 12-16	9,516	38,292	38,711	7,831
Total P 13-17	10,063	44,029	45,051	9,461
Total P 14-18	10,069	44,029	45,051	9,461
Total P 15-19	13,505	57,100	77,737	14,623

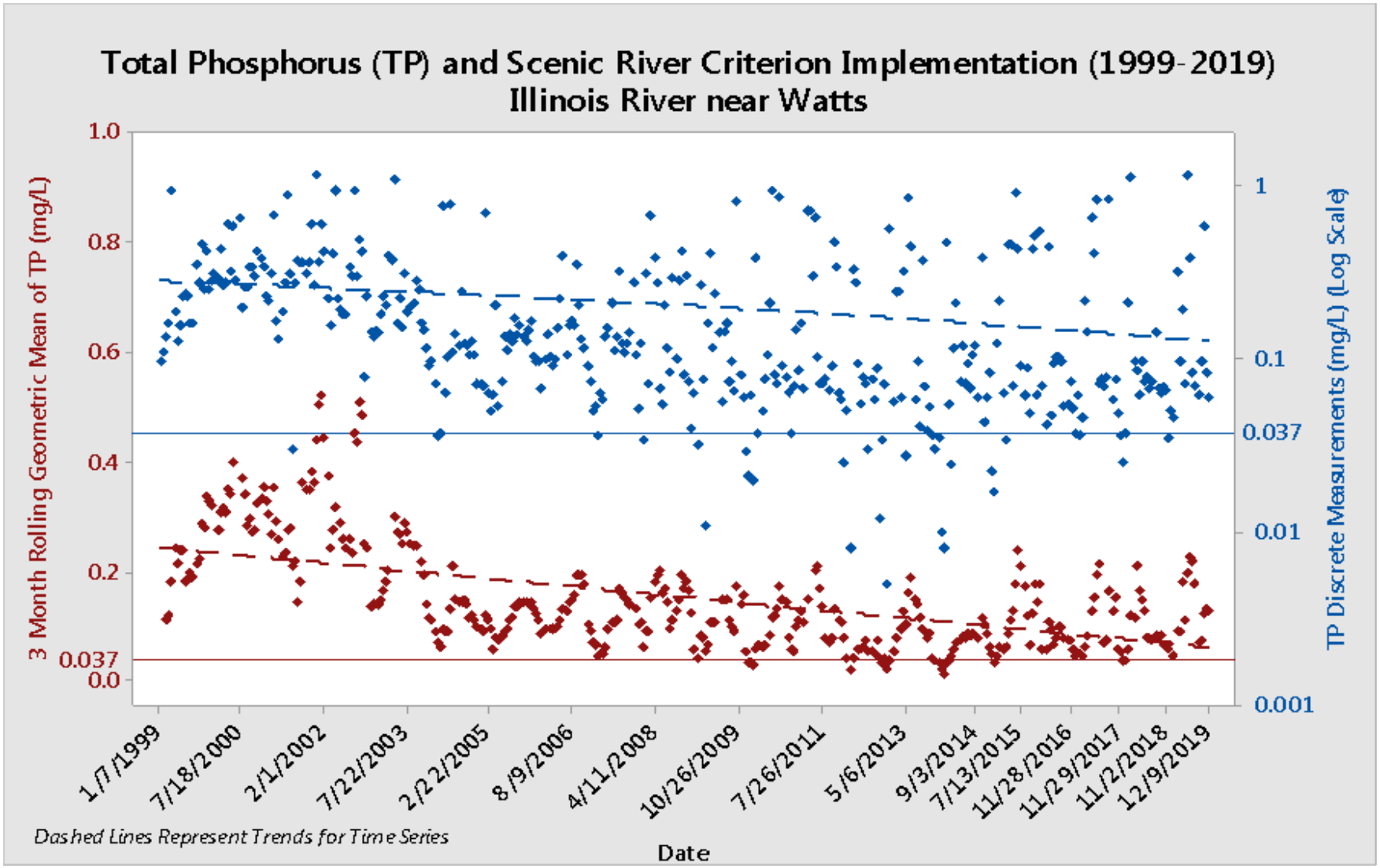
Values represent all available data, which is routinely collected and excludes targeted high flow events.

Illinois River near Watts

Illinois River near Watts			Loadings
Year	Flow (cfs)	Total P (mg/L)	Total P kg/year
1980	173	0.423	65,279
1981	260	0.190	44,119
1982	591		
1983	352		
1984	706		
1985	947		
1986	879		
1987	815		
1988	531		
1989	558	0.210	104,653
1990	1,127	0.181	182,432
1991	724	0.162	104,534
1992	760	0.161	109,571
1993	1,163	0.277	287,317
1994	674	0.168	101,127
1995	783	0.143	100,233
1996	693	0.188	116,542
1997	573	0.163	83,415
1998	713	0.138	87,876
1999	793	0.250	177,057
2000	648	0.309	178,827
2001	649	0.346	200,549
2002	619	0.316	174,694
2003	347	0.155	48,035
2004	688	0.104	63,903
2005	459	0.106	43,453
2006	349	0.116	36,156
2007	464	0.106	43,926
2008	1177	0.068	71,480
2009	915	0.069	56,386
2010	587	0.057	29,882
2011	1101	0.081	79,648
2012	336	0.052	15,594
2013	642	0.082	46,994
2014	448	0.056	22,412
2015	1364	0.061	74,303
2016	434	0.065	25,189
2017	918	0.064	52,481
2018	715	0.066	42,126
2019	1511	0.071	95,806
Average	705	0.152	95,427

Year	80-93	90-94	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19
Pt (mg/l)	0.204	0.198	0.201	0.210	0.200	0.162	0.195	0.221	0.249	0.275	0.271	0.246	0.203	0.158	0.118	0.102	0.095	0.085	0.077	0.065	0.068	0.066	0.068	0.062	0.065	0.061	0.065
Flow (cfs)	685	890	821	815	777	687	711	684	675	684	611	590	552	492	461	627	673	698	849	823	716	746	778	690	761	776	988
Pt (kg/yr)	124,832	157,569	147,520	153,006	138,508	99,241	123,581	134,986	149,927	167,987	148,151	129,533	100,347	69,482	48,448	56,951	57,272	53,127	58,493	47,682	43,412	36,806	47,254	38,287	44,029	42,044	57,100
Decrease	0.0%	-26.2%	-18.2%	-22.6%	-11.0%	20.5%	1.0%	-8.1%	-20.1%	-34.6%	-18.7%	-3.8%	19.6%	44.3%	61.2%	54.4%	54.1%	57.4%	53.1%	61.8%	65.2%	70.5%	62.1%	69.3%	64.7%	66.3%	54.3%

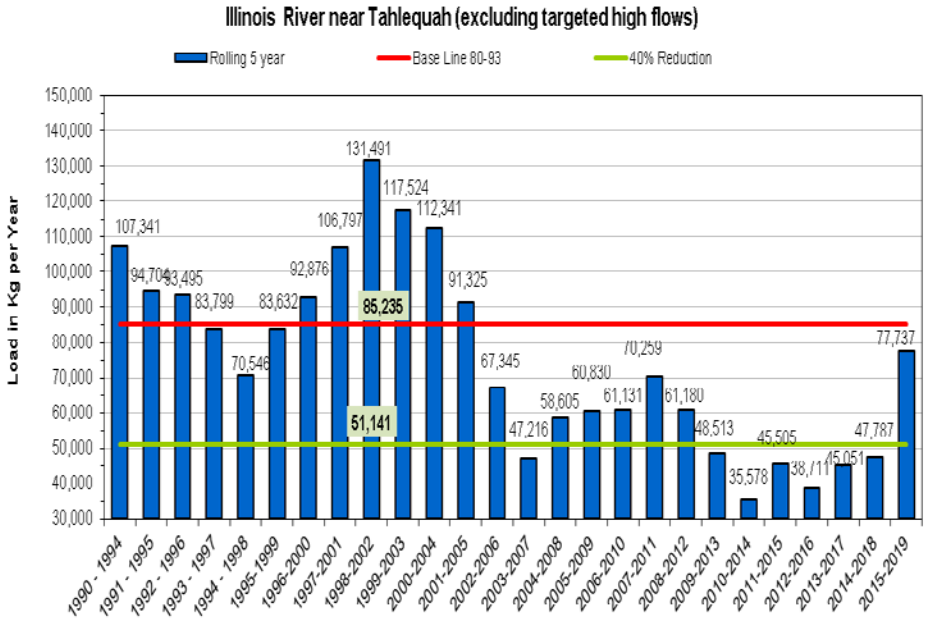


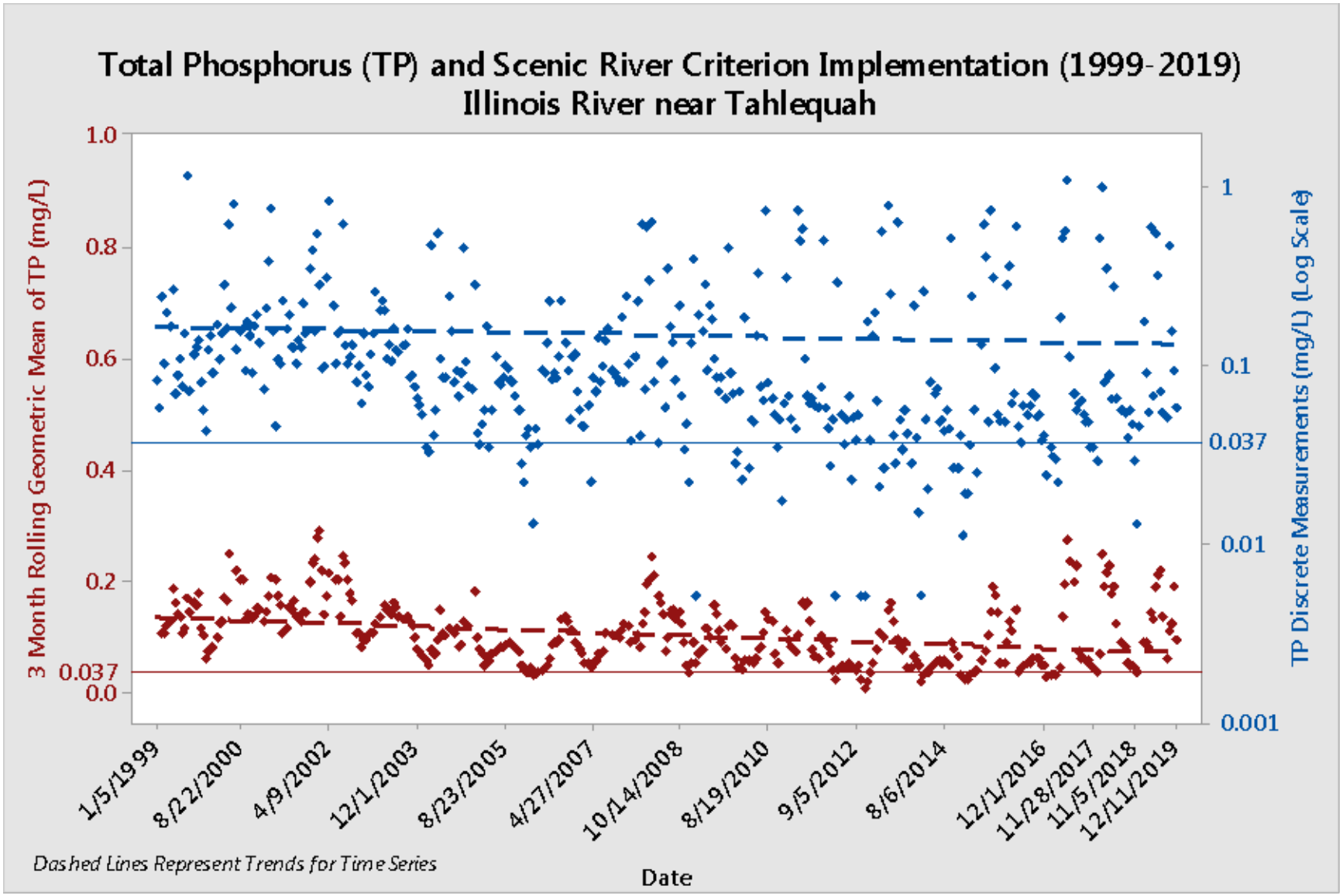

Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2019)
Illinois River near Watts
3 Month Rolling Geometric Mean of TP (mg/L)
1.0
0.8
0.6
0.4
0.2
0.037
0.0
TP Discrete Measurements (mg/L) (Log Scale)
1
0.1
0.037
0.01
0.001
1/7/1999
7/18/2000
2/1/2002
7/22/2003
2/22/2005
8/9/2006
4/11/2008
10/26/2009
7/26/2011
5/6/2013
9/3/2014
7/13/2015
11/28/2016
11/29/2017
11/2/2018
12/9/2019
Dashed Lines Represent Trends for Time Series
Date

Illinois River near Tahlequah

Illinois River Near Tahlequah			Loadings
Year	Flow (cfs)	Total P (mg/L)	Total 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	147,579
1991	1,094	0.079	76,796
1992	1,207	0.080	86,205
1993	1,751	0.099	154,647
1994	1,071	0.084	80,223
1995	1,123	0.080	80,229
1996	938	0.085	71,207
1997	812	0.069	49,797
1998	1,044	0.081	75,524
1999	1,143	0.121	123,518
2000	1,083	0.136	131,543
2001	1,033	0.158	145,766
2002	851	0.211	160,366
2003	478	0.100	42,690
2004	1,157	0.075	77,499
2005	712	0.060	38,148
2006	426	0.074	28,154
2007	736	0.066	43,383
2008	1,839	0.062	101,829
2009	1,407	0.072	90,475
2010	819.8	0.050	36,608
2011	1,540.8	0.058	79,813
2012	491.8	0.038	16,689
2013	946.1	0.043	36,331
2014	659.4	0.038	22,378
2015	2,174.6	0.041	79,628
2016	700.6	0.050	31,286
2017	1,219.7	0.050	54,465
2018	987.2	0.054	47,610
2019	2,308.0	0.100	206,129
Average	1,063	0.080	76,311

Year	80-93	90-94	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19
Pt (mg/l)	0.090	0.088	0.085	0.086	0.082	0.079	0.093	0.104	0.117	0.143	0.143	0.137	0.121	0.104	0.075	0.067	0.067	0.065	0.062	0.056	0.052	0.046	0.045	0.042	0.044	0.047	0.059
Flow (cfs)	1060	1364	1249	1218	1139	998	1012	1004	1023	1031	918	920	846	725	702	974	1024	1046	1269	1220	1041	892	1163	994	1140	1148	1478
Pt (kg/yr)	85,235	107,341	94,704	93,495	83,799	70,546	83,632	92,876	106,797	131,491	117,524	112,341	91,323	67,345	47,216	58,605	60,830	61,131	70,259	61,180	48,513	35,578	45,505	37,303	45,051	47,787	77,737
Decrease	0.0%	-25.9%	-11.1%	-9.7%	1.7%	17.2%	1.9%	-9.0%	-25.3%	-54.3%	-37.9%	-31.8%	-7.1%	21.0%	44.6%	31.2%	28.6%	28.3%	17.6%	28.2%	43.1%	58.3%	46.6%	56.2%	47.1%	43.9%	8.8%

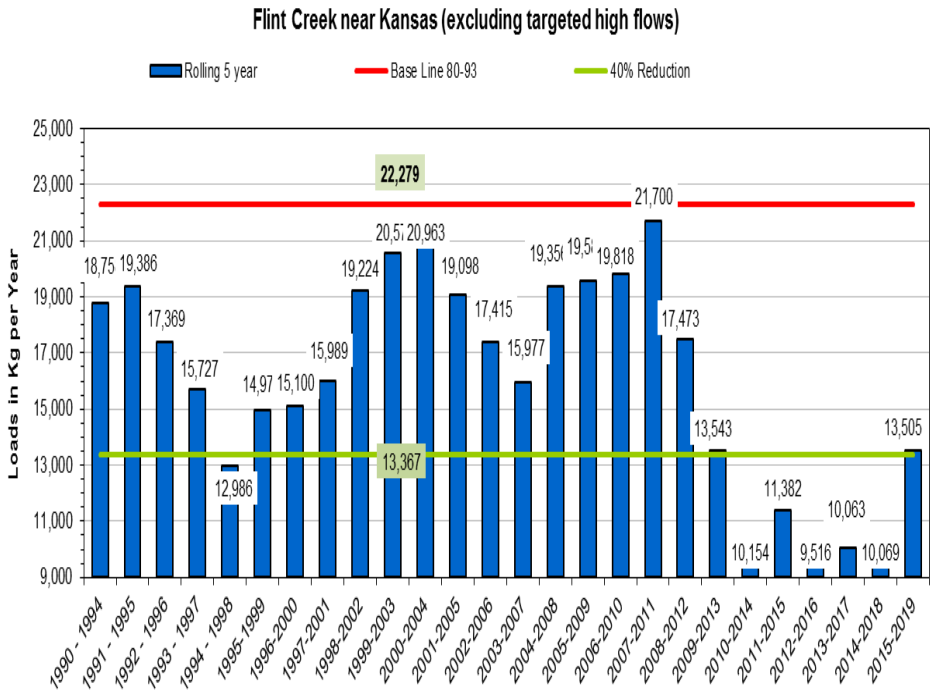


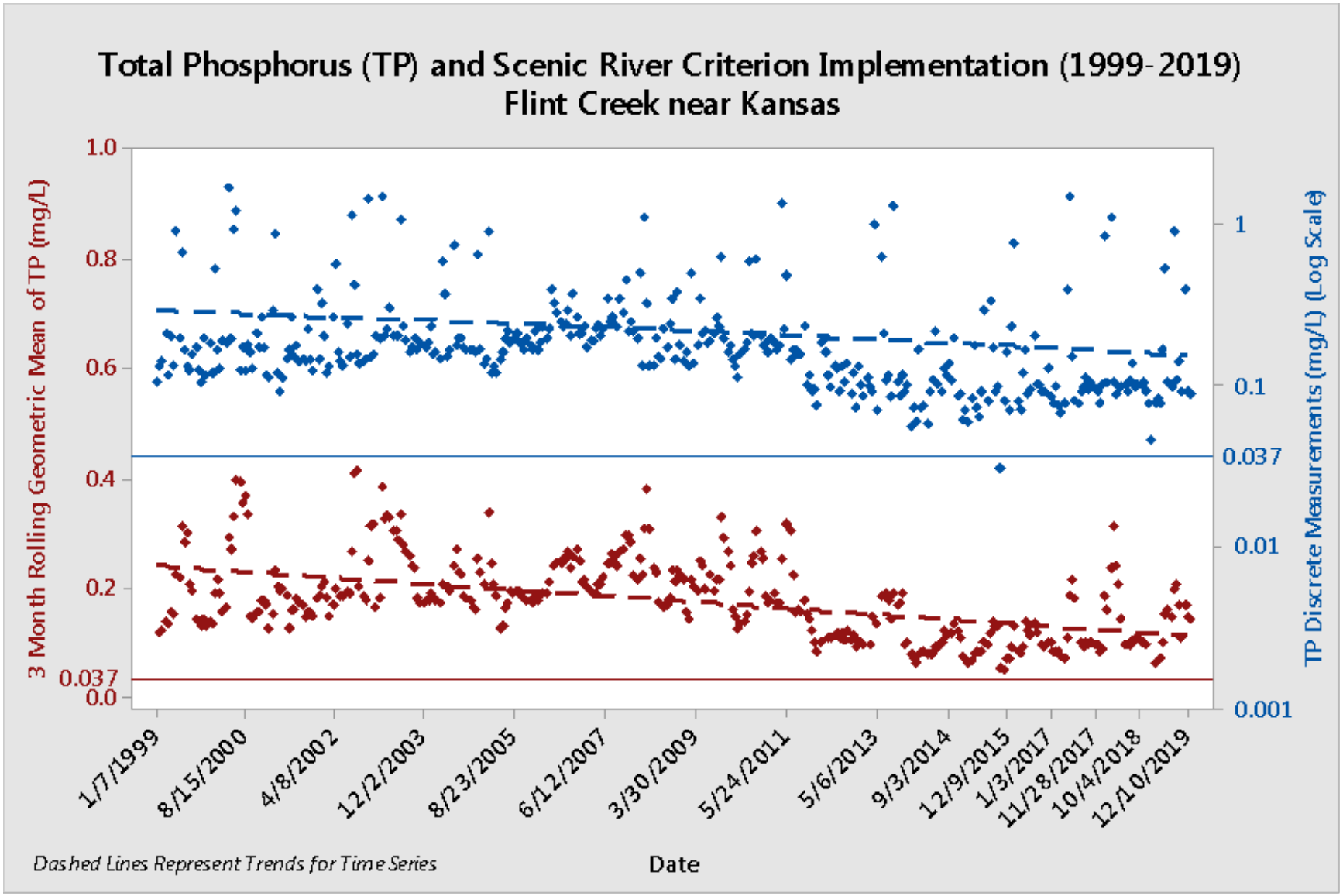

Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2019)
Illinois River near Tahlequah
3 Month Rolling Geometric Mean of TP (mg/L)
1.0
0.8
0.6
0.4
0.2
0.037
0.0
TP Discrete Measurements (mg/L) (Log Scale)
1
0.1
0.037
0.01
0.001
1/5/1999
8/22/2000
4/9/2002
12/1/2003
8/23/2005
4/27/2007
10/14/2008
8/19/2010
9/5/2012
8/6/2014
12/1/2016
11/28/2017
11/5/2018
12/11/2019
Dashed Lines Represent Trends for Time Series
Date

Flint Creek near Kansas

Flint Creek Near Kansas			Loadings
Year	Flow (cfs)	Total P (mg/L)	Total P kg/year
1980	32	0.189	5,454
1981	57	0.178	9,077
1982	69	0.186	11,537
1983	49	0.284	12,415
1984	143	0.240	30,532
1985	237	0.224	47,591
1986	183	0.223	36,430
1987	141	0.157	19,840
1988	97	0.265	22,946
1989	90	0.557	44,981
1990		0.114	
1991		0.120	
1992		0.118	
1993	182	0.156	25,359
1994	136	0.127	15,418
1995	140	0.185	23,207
1996	76	0.152	10,294
1997	95.7	0.117	9,964
1998	96.5	0.127	10,945
1999	137	0.186	22,758
2000	132	0.178	20,984
2001	101	0.164	14,793
2002	82	0.310	22,675
2003	49.8	0.316	14,055
2004	149.0	0.165	21,957
2005	91.8	0.168	13,774
2006	36.8	0.226	7,428
2007	70.3	0.240	15,068
2008	218.0	0.157	30,567
2009	141.6	0.187	23,649
2010	91.7	0.171	14,004
2011	137.8	0.152	18,707
2012	48.1	0.107	4,598
2013	121.2	0.093	10,070
2014	72.4	0.096	6,206
2015	253.8	0.070	15,864
2016	82.7	0.092	6,796
2017	130.1	0.085	9,877
2018	115.2	0.097	9,978
2019	289.9	0.090	23,299
Average	118	0.177	18,675

Year	80-93	90-94	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19
Pt (mg/l)	0.214	0.132	0.142	0.146	0.140	0.133	0.154	0.157	0.159	0.196	0.230	0.228	0.226	0.238	0.225	0.191	0.196	0.199	0.184	0.154	0.140	0.121	0.101	0.090	0.085	0.086	0.087
Flow (cfs)	117	159	153	134	126	109	109	107	112	110	101	103	95	82	80	113	112	112	132	127	108	94	127	118	132	131	174
Pt (kg/yr)	22,279	18,758	19,386	17,369	15,727	12,986	14,974	15,100	15,989	19,224	20,579	20,963	19,098	17,415	15,977	19,356	19,586	19,818	21,700	17,473	13,543	10,154	11,382	9,513	10,063	10,069	13,505
Decrease	0.0%	15.8%	13.0%	22.0%	29.4%	41.7%	32.8%	32.2%	28.2%	13.7%	7.6%	5.9%	14.3%	21.8%	28.3%	13.1%	12.1%	11.0%	2.6%	21.6%	39.2%	54.4%	48.9%	57.3%	54.8%	54.8%	39.4%

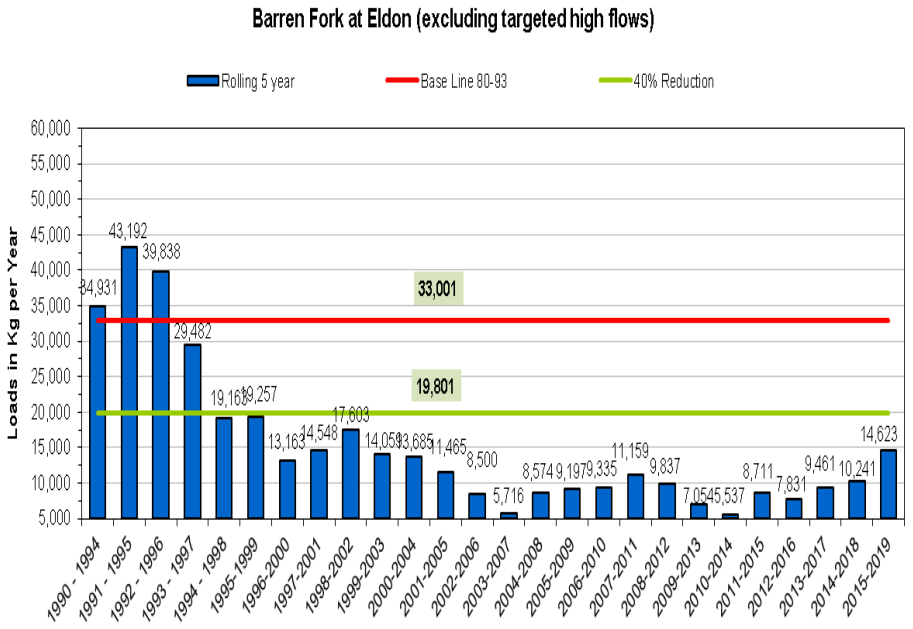


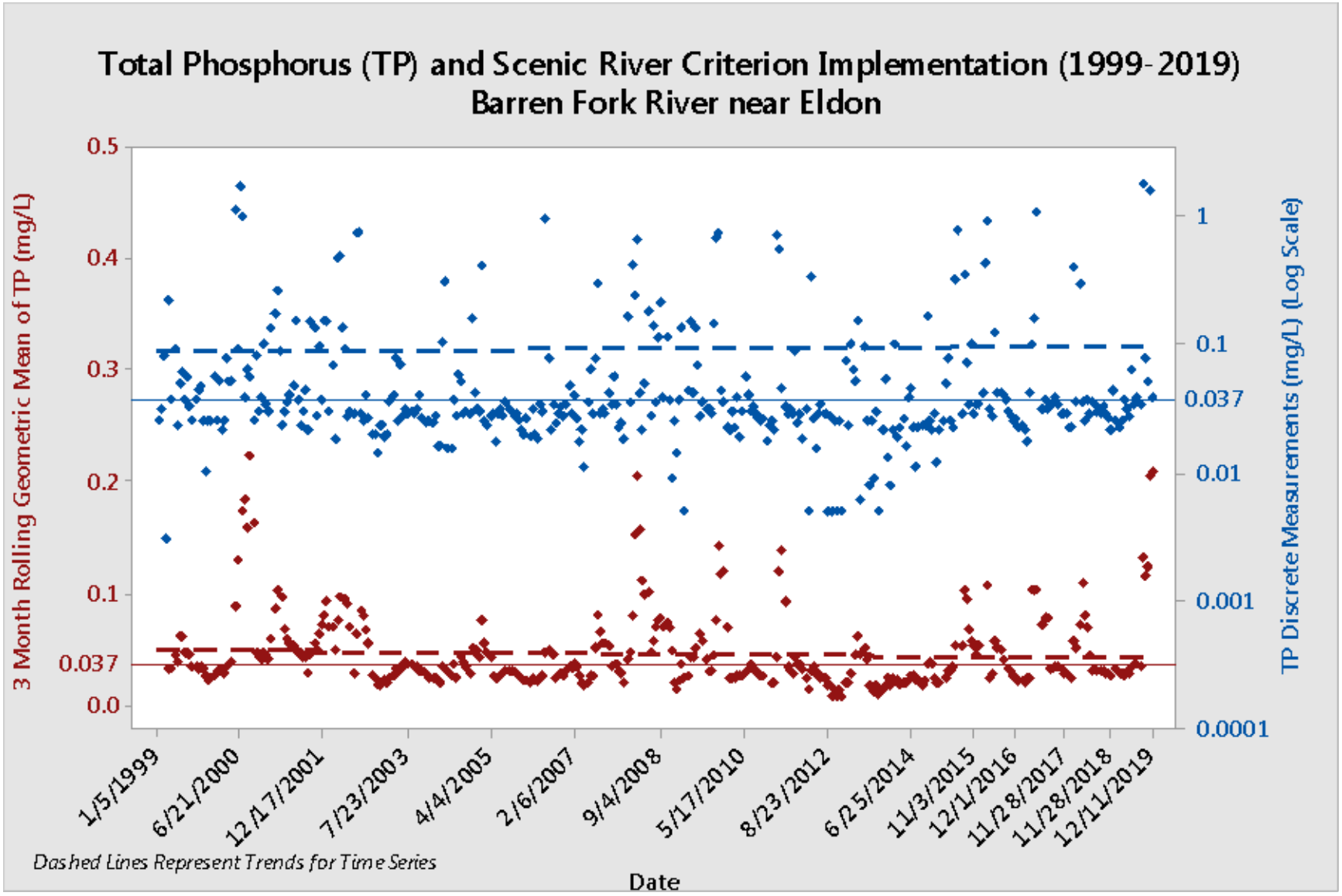

Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2019)
Flint Creek near Kansas
3 Month Rolling Geometric Mean of TP (mg/L)
1.0
0.8
0.6
0.4
0.2
0.037
0.0
TP Discrete Measurements (mg/L) (Log Scale)
1
0.1
0.037
0.01
0.001
1/7/1999
8/15/2000
4/8/2002
12/2/2003
8/23/2005
6/12/2007
3/30/2009
5/24/2011
5/6/2013
9/3/2014
12/9/2015
1/3/2017
11/28/2017
10/4/2018
12/10/2019
Dashed Lines Represent Trends for Time Series
Date

Barren Fork at Eldon

Barren Fork at Eldon			Loadings
Year	Flow (cfs)	Total Phos. (mg/L)	Total 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	24,145
1992	440	0.095	37,315
1993	700	0.108	67,234
1994	328	0.037	10,878
1995	422	0.263	98,819
1996	432	0.025	9,645
1997	332	0.023	6,671
1998	409	0.033	12,054
1999	361	0.048	15,476
2000	376	0.043	14,440
2001	343	0.064	19,605
2002	262	0.088	20,591
2003	145	0.025	3,237
2004	403	0.029	10,438
2005	228	0.027	5,498
2006	169	0.027	4,075
2007	254	0.026	5,898
2008	559	0.045	22,466
2009	460	0.033	13,557
2010	225	0.027	5,426
2011	471	0.028	11,783
2012	130	0.019	2,201
2013	219	0.026	5,083
2014	184	0.024	3,938
2015	872	0.040	31,154
2016	214	0.033	6,309
2017	320	0.028	8,013
2018	318	0.029	8,225
2019	761	0.038	25,816
Average	370	0.048	15,818

Year	80-93	90-94	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19
Pt (mg/l)	0.093	0.076	0.103	0.096	0.075	0.056	0.055	0.039	0.045	0.056	0.053	0.050	0.046	0.039	0.027	0.030	0.031	0.031	0.032	0.030	0.026	0.024	0.026	0.027	0.029	0.030	0.033
Flow (cfs)	399	517	468	464	443	384	391	382	364	350	297	306	276	241	24	323	334	333	394	369	301	246	375	323	362	382	497
Pt (kg/yr)	33,001	34,931	43,192	39,838	29,482	19,163	19,257	13,163	14,548	17,603	14,059	13,685	11,465	8,500	5,716	8,574	9,197	9,335	11,159	9,837	7,054	5,357	8,711	7,831	9,461	10,241	14,623
Decrease	0.0%	-5.8%	-30.9%	-20.7%	10.7%	41.9%	41.6%	60.1%	55.9%	46.7%	57.4%	58.5%	65.3%	74.2%	82.7%	74.0%	72.1%	71.7%	66.2%	70.2%	78.6%	83.8%	73.6%	76.3%	71.3%	69.0%	55.7%




Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2019)
Barren Fork River near Eldon
3 Month Rolling Geometric Mean of TP (mg/L)
TP Discrete Measurements (mg/L) (Log Scale)
0.5
0.4
0.3
0.2
0.1
0.037
0.0
1
0.1
0.037
0.01
0.001
0.0001
1/5/1999
6/21/2000
12/17/2001
7/23/2003
4/4/2005
2/6/2007
9/4/2008
5/17/2010
8/23/2012
6/25/2014
11/3/2015
12/1/2016
11/28/2017
11/28/2018
12/11/2019
Dashed Lines Represent Trends for Time Series
Date

Funding for Cities and Districts In the Illinois River Basin Provided by the OWRB's Financial Assistance Program

FUNDING PROVIDED BY OWRB'S FINANCIAL ASSISTANCE PROGRAM

Oklahoma Water Resources Board
Arkansas/Oklahoma Compact Report

Loan Number	Borrower	County	Closed Amount	Approved Date	App Type
FAP-00-0058-R	Adair County Rural Water District #5	Adair	$99,500.00	7/10/2001	REAP
FAP-97-0124-R	Adair County Rural Water District #5	Adair	$75,000.00	6/8/1999	REAP
FAP-89-0062-G	Adair County Rural Water District #5	Adair	$50,000.00	9/10/1991	Emergency
FAP-00-0071-R	Adair County Rural Water District #6	Adair	$146,875.00	4/9/2002	REAP
FAP-85-0155-G	Adair County RWS & SWMD #2	Adair	$100,000.00	6/11/1985	Emergency
FAP-06-0015-R	Adair County RWS & SWMD #2	Adair	$99,999.00	3/11/2008	REAP
FAP-83-0033-G	Cherry Tree Rural Water District	Adair	$10,000.00	1/10/1984	Emergency
FAP-01-0013-L	Stilwell Area Development Authority	Adair	$2,760,000.00	3/12/2002	FA Loan
FAP-93-0073-L	Stilwell Area Development Authority	Adair	$1,000,000.00	12/12/1995	FA Loan
ORF-98-0010-CW	Stilwell Area Development Authority	Adair	$4,000,000.00	8/10/1999	CWSRF
FAP-85-0129-G	Watts Public Works Authority	Adair	$10,000.00	2/12/1985	Emergency
FAP-88-0053-G	Watts Public Works Authority	Adair	$85,000.00	7/16/1990	Emergency
FAP-97-0125-R	Watts Public Works Authority	Adair	$149,750.00	2/10/1998	REAP
FAP-99-0080-R	Watts Public Works Authority	Adair	$99,800.00	11/16/1999	REAP
ORF-99-0020-CW	Westville Utility Authority	Adair	$430,400.00	12/11/2001	CWSRF
FAP-03-0019-R	Westville Utility Authority	Adair	$99,969.00	6/14/2005	REAP
FAP-05-0051-R	Westville Utility Authority	Adair	$0.00	7/16/2013	REAP
FAP-05-0013-G	Westville Utility Authority	Adair	$100,000.00	10/11/2005	Emergency
FAP-12-0006-L	Westville Utility Authority	Adair	$1,350,000.00	3/13/2012	FA Loan
ORF-20-0013-CW	Westville Utility Authority	Adair	$37,575.00	8/20/2019	CWSRF
FAP-83-0019-G	Burnt Cabin Rural Water District Incorporated	Cherokee	$24,000.00	11/2/1983	Emergency
FAP-98-0011-R	Burnt Cabin Rural Water District Incorporated	Cherokee	$65,427.00	6/9/1998	REAP
FAP-97-0110-R	Cherokee County Rural Water District #1	Cherokee	$100,000.00	12/14/1999	REAP
FAP-98-0029-L	Cherokee County Rural Water District #1	Cherokee	$380,000.00	12/12/2000	FA Loan
FAP-90-0055-G	Cherokee County Rural Water District #10	Cherokee	$27,000.00	3/12/1991	Emergency
FAP-08-0005-R	Cherokee County Rural Water District #12	Cherokee	$70,000.00	6/9/2009	REAP
FAP-95-0060-G	Cherokee County Rural Water District #13	Cherokee	$100,000.00	1/9/1996	Emergency
FAP-12-0010-L	Cherokee County Rural Water District #13	Cherokee	$1,600,000.00	3/13/2012	FA Loan
FAP-97-0098-R	Cherokee County Rural Water District #13	Cherokee	$80,000.00	3/14/2000	REAP
FAP-95-0031-L	Cherokee County Rural Water District #13	Cherokee	$170,000.00	1/9/1996	FA Loan
FAP-02-0026-R	Cherokee County Rural Water District #13	Cherokee	$135,000.00	6/8/2004	REAP
FAP-00-0007-L	Cherokee County Rural Water District #13	Cherokee	$1,810,000.00	6/11/2002	FA Loan
FAP-98-0081-R	Cherokee County Rural Water District #14	Cherokee	$54,000.00	2/10/1999	REAP
FAP-02-0004-L	Cherokee County Rural Water District #2	Cherokee	$645,000.00	8/13/2002	FA Loan
FAP-12-0002-D	Cherokee County Rural Water District #3	Cherokee	$26,870.00	9/18/2012	Drought

ORF-11-0002-DW	Cherokee County Rural Water District #3	Cherokee	$3,110,000.00	7/12/2011	DWSRF
FAP-98-0052-G	Cherokee County Rural Water District #3	Cherokee	$45,000.00	2/10/1999	Emergency
FAP-08-0033-R	Cherokee County Rural Water District #7 -- Welling	Cherokee	$39,069.00	12/9/2008	REAP
FAP-91-0057-G	Cherokee County Rural Water District #7 -- Welling	Cherokee	$23,180.00	9/10/1991	Emergency
FAP-91-0058-G	Cherokee County Rural Water District #8 -- Briggs	Cherokee	$23,180.00	9/10/1991	Emergency
FAP-83-0021-G	Cherokee County Rural Water District #8 -- Briggs	Cherokee	$53,000.00	1/10/1984	Emergency
FAP-02-0001-L	Cherokee County Rural Water District #8 -- Briggs	Cherokee	$285,000.00	6/11/2002	FA Loan
FAP-06-0011-R	Cherokee County Rural Water District #8 -- Briggs	Cherokee	$99,999.00	6/12/2007	REAP
FAP-09-0034-R	Cherokee County Rural Water District #8 -- Briggs	Cherokee	$34,914.00	4/13/2010	REAP
FAP-99-0072-R	Cherokee County Rural Water District #9	Cherokee	$69,900.00	11/14/2000	REAP
FAP-97-0126-R	Cherokee County Rural Water District #9	Cherokee	$99,900.00	1/13/1998	REAP
FAP-85-0152-G	Cherokee County Rural Water District #9	Cherokee	$13,465.00	10/16/1991	Emergency
FAP-99-0082-R	Hulbert Public Works Authority	Cherokee	$79,350.00	11/16/1999	REAP
FAP-01-0066-R	Hulbert Public Works Authority	Cherokee	$99,000.00	7/9/2002	REAP
FAP-09-0011-G	Hulbert Public Works Authority	Cherokee	$75,000.00	11/10/2009	Emergency
FAP-91-0120-G	Hulbert Public Works Authority	Cherokee	$25,000.00	9/15/1992	Emergency
ORF-09-0040-DW	Tahlequah Public Works Authority	Cherokee	$16,320,000.00	12/8/2009	DWSRF
ORF-11-0010-DW	Tahlequah Public Works Authority	Cherokee	$1,680,000.00	12/13/2011	DWSRF
ORF-18-0017-DW	Tahlequah Public Works Authority	Cherokee	$8,200,000.00	12/6/2018	DWSRF
ORF-19-0014-CW	Tahlequah Public Works Authority	Cherokee	$6,750,000.00	12/5/2019	CWSRF
FAP-83-0044-G	Town of Hulbert	Cherokee	$100,000.00	1/10/1984	Emergency
FAP-93-0047-L	Creek County Rural Water District #1	Creek	$2,255,000.00	1/11/1994	FA Loan
FAP-90-0097-G	Creek County Rural Water District #10	Creek	$40,000.00	12/8/1992	Emergency
FAP-00-0007-G	Creek County Rural Water District #11	Creek	$100,000.00	6/13/2000	Emergency
FAP-99-0001-L	Creek County Rural Water District #2	Creek	$1,345,000.00	10/10/2000	FA Loan
ORF-99-0002-DW	Creek County Rural Water District #7	Creek	$615,000.00	2/8/2000	DWSRF
ORF-08-0004-DW	Creek County Rural Water District #7	Creek	$3,230,000.00	8/12/2008	DWSRF
FAP-85-0208-G	Creek County Rural Water District #9	Creek	$90,800.00	8/12/1986	Emergency
FAP-85-0127-G	Creek County RWS & SWMD #79-1	Creek	$100,000.00	10/8/1985	Emergency
FAP-98-0093-R	Depew Public Works Authority	Creek	$38,000.00	3/14/2000	REAP
FAP-98-0094-R	Depew Public Works Authority	Creek	$79,000.00	11/16/1999	REAP
FAP-16-0003-G	Depew Public Works Authority	Creek		9/20/2016	Emergency
FAP-11-0015-R	Depew Public Works Authority	Creek	$0.00	7/16/2013	REAP
FAP-08-0023-R	Kellyville Public Works Authority	Creek	$99,990.00	7/14/2009	REAP
FAP-97-0108-R	Keystone Development Authority	Creek	$79,000.00	1/12/1999	REAP
FAP-90-0057-G	Kiefer Public Works Authority	Creek	$11,000.00	8/14/1990	Emergency

ORF-94-0008-CW	Kiefer Public Works Authority	Creek	$320,000.00	9/12/1995	CWSRF
FAP-00-0062-R	Kiefer Public Works Authority	Creek	$150,000.00	4/10/2001	REAP
ORF-14-0006-CW	Kiefer Public Works Authority	Creek	$320,000.00	12/17/2013	CWSRF
ORF-13-0012-CW	Oilton Public Works Authority	Creek	$2,850,000.00	8/20/2013	CWSRF
FAP-03-0035-R	Olive Public School	Creek	$50,000.00	12/13/2005	REAP
FAP-87-0148-L	Sapulpa Municipal Authority	Creek	$7,250,000.00	9/14/1988	FA Loan
ORF-18-0020-CW	Sapulpa Municipal Authority	Creek	$7,850,000.00	5/15/2018	CWSRF
FAP-85-0181-G	Shamrock Public Works Authority	Creek	$60,000.00	3/16/1987	Emergency
FAP-11-0023-R	Slick Public Works Authority	Creek	$81,825.00	7/17/2012	REAP
FAP-96-0132-R	Town of Depew	Creek	$59,000.00	1/14/1997	REAP
FAP-85-0131-G	Town of Drumright	Creek	$76,000.00	5/14/1985	Emergency
FAP-83-0027-G	Town of Drumright	Creek	$100,000.00	1/10/1984	Emergency
FAP-96-0186-R	Town of Mounds	Creek	$55,200.00	4/8/1997	REAP
FAP-83-0075-G	Town of Oilton	Creek	$28,420.00	4/10/1984	Emergency
FAP-09-0013-R	Town of Oilton	Creek	$78,400.00	7/13/2010	REAP
FAP-97-0009-R	Bernice Public Works Authority	Delaware	$99,500.00	12/11/2001	REAP
FAP-83-0080-G	Cherokee Housing Authority	Delaware	$64,000.00	1/10/1984	Emergency
FAP-97-0107-R	Colcord Public Works Authority	Delaware	$94,800.00	1/12/1999	REAP
FAP-13-0014-R	Colcord Public Works Authority	Delaware		7/15/2014	REAP
ORF-11-0007-DW	Delaware County Rural Water District #1	Delaware	$260,000.00	10/17/2011	DWSRF
FAP-96-0020-G	Delaware County Rural Water District #1	Delaware	$85,000.00	7/8/1997	Emergency
FAP-85-0229-G	Delaware County Rural Water District #1	Delaware	$63,000.00	9/8/1987	Emergency
FAP-97-0047-R	Delaware County Rural Water District #1	Delaware	$50,000.00	11/13/2001	REAP
FAP-97-0008-L	Delaware County Rural Water District #1	Delaware	$360,000.00	7/8/1997	FA Loan
FAP-90-0086-G	Delaware County Rural Water District #3	Delaware	$34,300.00	5/6/1991	Emergency
FAP-17-0006-L	Delaware County Rural Water District #3	Delaware	$1,040,000.00	1/17/2017	FA Loan
FAP-92-0079-G	Delaware County Rural Water District #7	Delaware	$25,000.00	7/12/1994	Emergency
FAP-07-0034-R	Delaware County RWSG & SWMD #10	Delaware	$98,653.20	5/14/2008	REAP
FAP-09-0013-G	Delaware County RWSG & SWMD #10	Delaware	$19,125.00	1/12/2010	Emergency
ORF-99-0004-DW	Delaware County RWSG & SWMD #10	Delaware	$4,865,193.00	4/9/2002	DWSRF
ORF-14-0003-DW	Delaware County RWSG & SWMD #11	Delaware	$950,000.00	4/15/2014	DWSRF
FAP-04-0025-R	Delaware County RWSG & SWMD #11	Delaware	$99,990.00	2/8/2011	REAP
FAP-95-0053-G	Delaware County RWSG & SWMD #6	Delaware	$100,000.00	10/8/1996	Emergency
FAP-92-0019-G	Delaware County RWSG & SWMD #6	Delaware	$75,000.00	4/12/1994	Emergency
FAP-96-0028-G	Delaware County RWSG & SWMD #9	Delaware	$100,000.00	8/13/1996	Emergency
FAP-96-0009-L	Delaware County RWSG & SWMD #9	Delaware	$635,000.00	8/13/1996	FA Loan
FAP-97-0068-R	Delaware County RWSG & SWMD #9	Delaware	$10,000.00	5/13/1997	REAP
FAP-99-0005-R	Grand Lake Public Works Authority	Delaware	$94,000.00	4/13/1999	REAP
FAP-00-0010-L	Grand Lake Public Works Authority	Delaware	$575,000.00	3/13/2001	FA Loan
ORF-99-0022-CW	Grand Lake Public Works Authority	Delaware	$2,700,000.00	3/13/2001	CWSRF
FAP-97-0044-L	Grand Lake Public Works Authority	Delaware	$655,000.00	12/9/1997	FA Loan

ORF-02-0020-CW	Grand Lake Public Works Authority	Delaware	$800,000.00	4/8/2003	CWSRF
FAP-01-0016-L	Grand Lake Public Works Authority	Delaware	$335,000.00	2/12/2002	FA Loan
ORF-09-0004-CW	Grand Lake Public Works Authority	Delaware	$992,500.00	9/8/2009	CWSRF
FAP-12-0016-L	Grand Lake Public Works Authority	Delaware	$1,000,000.00	7/17/2012	FA Loan
ORF-17-0007-DW	Grand Lake Public Works Authority	Delaware	$700,000.00	2/20/2018	DWSRF
ORF-17-0018-CW	Grand Lake Public Works Authority	Delaware	$1,825,182.60	6/20/2017	CWSRF
FAP-09-0001-L	Grand Lake Public Works Authority	Delaware	$1,990,000.00	9/8/2009	FA Loan
ORF-11-0003-DW	Grand Lake Public Works Authority	Delaware	$5,500,000.00	7/17/2012	DWSRF
FAP-18-0003-L	Grand Lake Public Works Authority	Delaware	$1,390,000.00	11/1/2017	FA Loan
ORF-13-0007-DW	Grove Municipal Services Authority	Delaware	$8,765,000.00	3/19/2013	DWSRF
ORF-07-0008-CW	Grove Municipal Services Authority	Delaware	$1,900,000.00	7/14/2009	CWSRF
ORF-02-0003-CW	Grove Municipal Services Authority	Delaware	$7,500,000.00	6/10/2003	CWSRF
ORF-99-0011-CW	Jay Utilities Authority	Delaware	$3,766,000.00	8/8/2000	CWSRF
ORF-07-0004-DW	Jay Utilities Authority	Delaware	$2,470,000.00	2/12/2008	DWSRF
ORF-18-0007-DW	Jay Utilities Authority	Delaware	$1,031,000.00	5/15/2018	DWSRF
FAP-97-0040-R	Kansas Public Works Authority	Delaware	$139,270.00	3/10/1998	REAP
FAP-02-0003-R	Kansas Public Works Authority	Delaware	$67,000.00	11/12/2002	REAP
FAP-97-0097-R	Kansas Public Works Authority	Delaware	$109,500.00	11/16/1999	REAP
FAP-86-0002-G	Kansas Public Works Authority	Delaware	$65,000.00	1/12/1988	Emergency
FAP-98-0017-G	Moseley School District 34	Delaware	$46,750.00	6/9/1998	Emergency
FAP-08-0004-R	Oaks Public Works Authority	Delaware	$0.00	6/18/2013	REAP
ORF-16-0004-DW	South Delaware County Regional Water Authority	Delaware	$3,000,000.00	4/18/2017	DWSRF
FAP-84-0015-G	Town of Colcord	Delaware	$95,816.00	4/10/1984	Emergency
FAP-83-0012-G	Town of Kansas	Delaware	$92,516.00	3/13/1984	Emergency
FAP-98-0044-R	West Siloam Springs	Delaware	$96,350.00	3/14/2000	REAP
FAP-84-0059-G	West Siloam Springs	Delaware	$100,000.00	6/10/1986	Emergency
FAP-94-0013-G	West Siloam Springs	Delaware	$18,315.00	7/12/1994	Emergency
FAP-01-0008-L	West Siloam Springs Municipal Authority	Delaware	$275,000.00	11/13/2001	FA Loan
FAP-00-0032-G	Boynton Public Works Authority	Muskogee	$81,591.00	1/9/2001	Emergency
FAP-91-0047-G	Boynton Public Works Authority	Muskogee	$50,000.00	2/8/1994	Emergency
FAP-90-0100-G	Braggs Public Works Authority	Muskogee	$70,000.00	2/12/1991	Emergency
FAP-97-0021-R	East Central Oklahoma Water Authority	Muskogee	$59,700.00	3/11/1997	REAP
FAP-96-0045-G	East Central Oklahoma Water Authority	Muskogee	$97,750.00	4/14/1998	Emergency
FAP-19-0009-G	East Central Oklahoma Water Authority	Muskogee	$0.00	8/20/2019	Emergency
ORF-20-0015-DW	East Central Oklahoma Water Authority	Muskogee	$1,000,000.00	8/20/2019	DWSRF
ORF-20-0015-DW	East Central Oklahoma Water Authority	Muskogee	$1,000,000.00	8/20/2019	DWSRF
FAP-17-0047-R	East Central Oklahoma Water Authority	Muskogee		8/21/2018	REAP
ORF-20-0011-CW	East Central Oklahoma Water Authority	Muskogee	$36,130.00	12/5/2019	CWSRF
ORF-11-0004-CW	Fort Gibson Utilities Authority	Muskogee	$980,000.00	4/12/2011	CWSRF
ORF-99-0017-CW	Fort Gibson Utilities Authority	Muskogee	$710,000.00	3/14/2000	CWSRF
ORF-97-0011-CW	Fort Gibson Utilities Authority	Muskogee	$445,100.00	5/12/1998	CWSRF

FAP-93-0005-L	Fort Gibson Utilities Authority	Muskogee	$820,000.00	3/9/1993	FA Loan
ORF-99-0015-CW	Haskell Public Works Authority	Muskogee	$320,000.00	12/14/1999	CWSRF
FAP-95-0064-L	Muskogee County Rural Water District #1	Muskogee	$430,000.00	8/12/1997	FA Loan
FAP-02-0058-R	Muskogee County Rural Water District #10	Muskogee	$99,999.00	4/8/2003	REAP
FAP-00-0060-R	Muskogee County Rural Water District #11	Muskogee	$150,000.00	12/12/2000	REAP
FAP-01-0075-R	Muskogee County Rural Water District #14	Muskogee	$150,000.00	8/31/2001	REAP
FAP-97-0064-R	Muskogee County Rural Water District #3	Muskogee	$65,800.00	5/13/1997	REAP
FAP-86-0059-G	Muskogee County Rural Water District #3	Muskogee	$50,000.00	12/13/1988	Emergency
FAP-02-0001-G	Muskogee County Rural Water District #3	Muskogee	$91,035.00	3/12/2002	Emergency
FAP-98-0014-R	Muskogee County Rural Water District #3	Muskogee	$91,992.00	6/13/2000	REAP
FAP-05-0023-R	Muskogee County Rural Water District #3	Muskogee	$99,999.00	6/8/2010	REAP
FAP-17-0008-L	Muskogee County Rural Water District #3	Muskogee	$1,595,000.00	5/16/2017	FA Loan
FAP-02-0011-G	Muskogee County Rural Water District #5	Muskogee	$100,000.00	6/8/2004	Emergency
FAP-02-0011-L	Muskogee County Rural Water District #5	Muskogee	$1,390,000.00	5/13/2003	FA Loan
FAP-92-0038-G	Muskogee County Rural Water District #6	Muskogee	$25,000.00	4/12/1994	Emergency
FAP-83-0041-G	Muskogee County Rural Water District #7	Muskogee	$90,000.00	4/10/1984	Emergency
FAP-91-0040-G	Muskogee County Rural Water Management District #12	Muskogee	$45,000.00	9/10/1991	Emergency
FAP-03-0005-L	Muskogee Municipal Authority	Muskogee	$4,575,000.00	6/10/2003	FA Loan
ORF-99-0007-CW	Muskogee Municipal Authority	Muskogee	$1,970,765.66	6/8/1999	CWSRF
ORF-99-0007-L	Muskogee Municipal Authority	Muskogee	$3,335,000.00	6/8/1999	FA Loan
ORF-98-0004-L	Muskogee Municipal Authority	Muskogee	$5,850,000.00	6/9/1998	FA Loan
ORF-98-0004-CW	Muskogee Municipal Authority	Muskogee	$3,480,000.00	6/9/1998	CWSRF
ORF-96-0017-CW	Muskogee Municipal Authority	Muskogee	$14,112,000.00	2/11/1997	CWSRF
ORF-90-0004-CW	Muskogee Municipal Authority	Muskogee	$11,553,000.00	2/11/1992	CWSRF
ORF-93-0001-L	Muskogee Municipal Authority	Muskogee	$3,670,000.00	3/9/1993	FA Loan
ORF-93-0001-CW	Muskogee Municipal Authority	Muskogee	$2,141,969.36	3/9/1993	CWSRF
ORF-94-0011-CW	Muskogee Municipal Authority	Muskogee	$2,479,230.64	7/12/1994	CWSRF
ORF-94-0011-L	Muskogee Municipal Authority	Muskogee	$4,390,000.00	7/12/1994	FA Loan
ORF-08-0007-DW	Muskogee Municipal Authority	Muskogee	$30,410,000.00	7/8/2008	DWSRF
ORF-09-0020-CW	Muskogee Municipal Authority	Muskogee	$1,435,000.00	8/11/2009	CWSRF
ORF-11-0008-CW	Muskogee Municipal Authority	Muskogee	$12,775,000.00	8/9/2011	CWSRF
ORF-17-0019-CW	Muskogee Municipal Authority	Muskogee	$27,360,000.00	4/18/2017	CWSRF
ORF-14-0012-CW	Muskogee Municipal Authority	Muskogee	$7,300,000.00	12/17/2013	CWSRF
ORF-17-0014-CW	Muskogee Municipal Authority	Muskogee	$110,000.00	2/21/2017	CWSRF
ORF-18-0012-DW	Muskogee Municipal Authority	Muskogee	$17,640,000.00	10/16/2018	DWSRF
ORF-18-0012-DW	Muskogee Municipal Authority	Muskogee	$17,640,000.00	10/16/2018	DWSRF
FAP-90-0019-G	Oktaha Public Works Authority	Muskogee	$19,700.00	4/10/1990	Emergency
FAP-94-0042-L	Porum Public Works Authority	Muskogee	$350,000.00	11/1/1994	FA Loan
FAP-88-0040-L	Porum Public Works Authority	Muskogee	$730,000.00	1/10/1989	FA Loan
FAP-19-0012-R	Porum Public Works Authority	Muskogee	$0.00	6/18/2019	REAP
ORF-18-0016-CW	Porum Public Works Authority	Muskogee	$496,117.00	11/1/2017	CWSRF

ORF-18-0016-CW	Porum Public Works Authority	Muskogee	$496,117.00	11/1/2017	CWSRF
FAP-14-0012-R	Porum Public Works Authority	Muskogee		12/16/2014	REAP
ORF-17-0008-CW	Porum Public Works Authority	Muskogee	$780,000.00	9/20/2016	CWSRF
FAP-10-0001-G	Town of Boynton	Muskogee	$13,607.53	3/9/2010	Emergency
FAP-83-0003-G	Town of Boynton	Muskogee	$27,695.00	8/12/1983	Emergency
FAP-96-0077-R	Town of Braggs	Muskogee	$36,995.00	1/14/1997	REAP
FAP-98-0049-G	Town of Council Hill	Muskogee	$100,000.00	3/9/1999	Emergency
FAP-04-0064-R	Town of Taft	Muskogee	$99,557.68	1/11/2005	REAP
FAP-83-0091-G	Town of Taft	Muskogee	$86,620.00	1/10/1984	Emergency
FAP-84-0020-G	Town of Warner	Muskogee	$100,000.00	5/8/1984	Emergency
FAP-00-0006-G	Warner Utilities Authority	Muskogee	$45,000.00	6/13/2000	Emergency
FAP-89-0016-L	Warner Utilities Authority	Muskogee	$240,000.00	2/13/1990	FA Loan
FAP-96-0051-L	Warner Utilities Authority	Muskogee	$435,000.00	4/8/1997	FA Loan
ORF-96-0022-CW	Warner Utilities Authority	Muskogee	$258,000.00	8/10/1999	CWSRF
FAP-01-0005-R	Gore Public Works Authority	Sequoyah	$60,000.00	11/13/2001	REAP
	Gore Public Works Authority	Sequoyah	$885,000.00	10/12/2016	DWSRF
ORF-11-0007-CW	Muldrow Public Works Authority	Sequoyah	$3,705,000.00	9/13/2011	CWSRF
FAP-12-0001-L	Roland Utility Authority	Sequoyah	$3,360,000.00	2/13/2012	FA Loan
FAP-95-0001-G	Roland Utility Authority	Sequoyah	$75,000.00	5/14/1996	Emergency
ORF-08-0003-CW	Roland Utility Authority	Sequoyah	$3,855,000.00	6/10/2008	CWSRF
ORF-20-0019-CW	Roland Utility Authority	Sequoyah	$740,000.00	10/15/2019	CWSRF
ORF-20-0021-DW	Roland Utility Authority	Sequoyah	$2,359,000.00	1/21/2020	DWSRF
FAP-95-0053-L	Roland Utility Authority	Sequoyah	$4,890,000.00	4/8/1997	FA Loan
ORF-09-0034-DW	Sallisaw Municipal Authority	Sequoyah	$5,360,000.00	11/10/2009	DWSRF
FAP-84-0067-G	Sequoyah County Rural Water District #3	Sequoyah	$18,000.00	8/14/1984	Emergency
FAP-86-0050-G	Sequoyah County Rural Water District #5	Sequoyah	$75,000.00	5/8/1990	Emergency
FAP-02-0025-G	Sequoyah County Rural Water District #5	Sequoyah	$49,384.91	11/12/2002	Emergency
FAP-98-0013-R	Sequoyah County Rural Water District #5	Sequoyah	$99,883.00	1/12/1999	REAP
FAP-01-0067-R	Sequoyah County Rural Water District #5	Sequoyah	$80,000.00	7/12/2011	REAP
FAP-99-0083-R	Sequoyah County Rural Water District #8	Sequoyah	$138,500.00	2/8/2000	REAP
FAP-83-0024-G	Sequoyah County RWS & SWMD #4	Sequoyah	$86,000.00	1/10/1984	Emergency
FAP-03-0003-R	Sequoyah County RWS & SWMD #4	Sequoyah	$99,950.00	3/13/2012	REAP
FAP-91-0069-G	Sequoyah County RWSG & SWMD #7	Sequoyah	$30,000.00	12/8/1992	Emergency
FAP-84-0090-G	Town of Gans	Sequoyah	$100,000.00	5/14/1985	Emergency
FAP-02-0064-R	Town of Gans	Sequoyah	$110,000.00	4/16/2006	REAP
FAP-83-0008-G	Town of Marble City	Sequoyah	$100,000.00	2/14/1984	Emergency
FAP-84-0043-G	Town of Muldrow	Sequoyah	$77,200.00	4/10/1984	Emergency
FAP-89-0071-G	Utility Service Authority	Sequoyah	$20,097.00	1/9/1990	Emergency
FAP-99-0081-R	Vian	Sequoyah	$59,500.00	11/16/1999	REAP
FAP-97-0089-R	Vian Public Works Authority	Sequoyah	$150,000.00	6/10/2003	REAP
ORF-98-0017-CW	Vian Public Works Authority	Sequoyah	$1,100,000.00	2/8/2000	CWSRF

FAP-07-0006-G	Vian Public Works Authority	Sequoyah	$75,000.00	1/8/2008	Emergency
ORF-11-0006-CW	Vian Public Works Authority	Sequoyah	$1,655,000.00	2/13/2012	CWSRF
FAP-10-0004-R	Vian Public Works Authority	Sequoyah	$99,999.00	2/8/2011	REAP

Permits for Water Rights in the Illinois River Watershed Issued by the OWRB's Planning and Management Division in CY 2019

			Permits Issues within the Illinois River Basin for Calendar Year 2019												
					Diversion Point Legal										
Permit #	LAST NAME	FIRST NAME	1/4	1/4	1/4	SECT	TWP	RNG	WATER TYPE	COUNTY	STREAM SYSYTEM	DATE FILED	DATE ISSUED	PURPOSE	AMT (af/yr)
20180575		New Moon Farm LLC	SE	NW	SE	30	19N	25EI	GW	Adair		7/16/2018	1/15/2019	Agriculture	70
20180575		New Moon Farm LLC	NE	NW	SE	30	19N	25EI	GW	Adair		7/16/2018	1/15/2019	Agriculture	70
20180606	Nhien	Ha	NW	NW	NE	32	19N	25EI	GW	Adair		10/26/2018	5/21/2019	Agriculture	36
20180606	Nhien	Ha	NE	NW	NW	32	19N	25EI	GW	Adair		10/26/2018	5/21/2019	Agriculture	36
20180598	Wick	Heidy	SW	NW	NW	36	16N	26EI	GW	Adair		9/21/2018	5/21/2019	Agriculture	30

OKLAHOMA CONSERVATION COMMISSION
Program Activities in the Illinois River Watershed
for the period of October 2019 through September 2020

For over twenty-five years the OCC has monitored water quality, implemented best management practices, and provided water quality education in the Illinois River watershed. The health of the watershed continues to be a priority despite funding challenges.

1) Illinois River Riparian Protection

a) Although the OCC no longer participates in the Conservation Reserve Enhancement Program (CREP), the Farm Services Agency continues landowner payments for easements protecting acres of riparian area in the Illinois River watershed. CREP provides these incentives to farmers and ranchers to remove streamside pasture or cropland from production activities for ten to fifteen years. The annual rental payment they receive for the ten/fifteen-year period is based on the average area rental rate for marginal pasture land.

b) Utilizing State funding, the OCC creates long term easements with landowners to exclude their riparian property from production, further lessening the amount of pollution entering the river. Currently 36 participants maintain 1,643 acres that are set aside at an annual cost of $92,092.40.

c) With EPA funding OCC contracted a study in the Tyner Creek watershed of the Illinois River watershed to determine which would better benefit the area: streambank stabilization or riparian easements. Easements proved to be the better use of funding. In partnership with the GRDA the OCC has made an additional $1,600,000 available for long-term riparian easement protection along the Illinois River. These riparian exclusions are funded with U.S. EPA §319 dollars. Currently, 1,094.26 acres are enrolled in this program; however, over 300 additional acres should be added to this list by September 30, 2020.

2) Rotating Basin Monitoring Program

Battle Branch, Ballard Creek, Peavine Creek, Peacheater Creek, Tyner Creek, Pumpkin Hollow Creek, Telemay Hollow Creek, and Steeley Hollow Creek, all of which join the Illinois River Watershed above Tenkiller Lake are monitored through the OCC's Rotating Basin Ambient Monitoring Program (RBMP). In addition, Elk Creek and Snake Creek, direct tributaries to Tenkiller Lake were monitored through the RBMP. Fish community assessments were completed in the summer of 2018. Macroinvertebrate collections were made at all sites in the summer of 2018, winter of 2019 and summer of 2019, and the winter of 2020. Water quality monitoring has occurred on a five week interval beginning in May 2018 through March 2020. Monitoring was paused with the two last episodes remaining due to the COVID-19 pandemic. The last two episodes are scheduled for the first week of August 2020 and the first week of September 2020. Monitoring may continue or pause for a period and resume in 2023. These sites were selected to represent Hydrologic Units within the Illinois River watershed to characterize water quality conditions and relate those conditions to manageable land units. OCC will continue to evaluate monitoring results and needs in the Illinois River Watershed and adjust monitoring efforts accordingly.

3) Blue Thumb Monitoring and Education

The OCC's Blue Thumb program supports citizen scientists who monitor four stream sites in the Illinois River watershed. Volunteers collect observational and chemical data approximately monthly. Macroinvertebrate collections are completed twice a year. Habitat assessments and fish collections are completed once every four to five years. The biological data (macroinvertebrates and fish) are submitted to the State of Oklahoma Integrated Report. The chemical data are used for education and screening purposes.

For several years, Blue Thumb has partnered with the Grand River Dam Authority (GRDA) to offer Riverology 101, a workshop for teachers focusing on the Illinois River and Grand Lake watersheds, and Journey to the Bottom of the Creek, a day camp for children in the Tahlequah area. Although we planned to support both events in 2020, both were cancelled out of concern for COVID-19.

Early in 2020, Blue Thumb began a partnership with the Illinois River Watershed Partnership (IRWP) to support monitoring and facilitate educational events in the Oklahoma portion of the Illinois River watershed. The sampling locations are on tributaries to the Illinois River and were selected by the IRWP. In April 2020, BT supported monitoring at twelve sites. At each site, BT and IRWP staff completed a macroinvertebrate collection with onsite identification to order, water quality sampling and a rapid habitat assessment. According to the project plan, GRDA was supposed to complete analysis of water quality samples. The GRDA lab was unable to analyze samples due to restrictions imposed in response to COVID-19. Because the lab was unable to analyze samples, Blue Thumb staff analyzed the water quality samples

using BT equipment, reagents and standard operating procedures. Sites are monitored three times a year in alternate years. A second sampling run will occur in August 2020, and the third sampling run will occur in November 2020. IRWP intended to involve local residents and school children in the sampling events, but chose not invite volunteers to participate during the April sampling events out of concern for COVID-19. Volunteers will be invited to participate in the August sampling events, but participation will be limited to one or two volunteers at each site. BT and IRWP also produced an educational video about the project that was posted on FB and on the IRWP website.

Volunteers collect a macroinvertebrate sample at Cedar Hollow (summer 2019).

Candice and Cheryl assist Casey Rector of the IRWP during an April 2020 sampling run.

4) Oklahoma/Arkansas Memorandum of Agreement

In November 2018, Oklahoma and Arkansas officials signed an agreement to continue working toward water quality improvement in the Illinois River Watershed, focusing on data and information sharing, monitoring and assessment, and implementation of strategies to continue nutrient reductions in the watershed. The OCC has been participating in agency coordination meetings to recruit stakeholders, agree upon a strategy and more fully develop a schedule to move this agreement forward. States continue to work on this agreement, with steps being taken to update watershed planning on both sides of the state line.

5) Upcoming programs in the Illinois River Watershed

The COVID pandemic has delayed onset of several planned efforts in the Illinois River Watershed that should begin within the next six months. These efforts include support for poultry litter transfer out of the watershed to non-nutrient limited areas in the state, soil health demonstration farms testing the efficiency of soil health-based conservation practices in reducing pollutant loss from poultry litter applications, and efforts to work with poultry growers and integrators to reduce the impacts neighbors of poultry facilities.