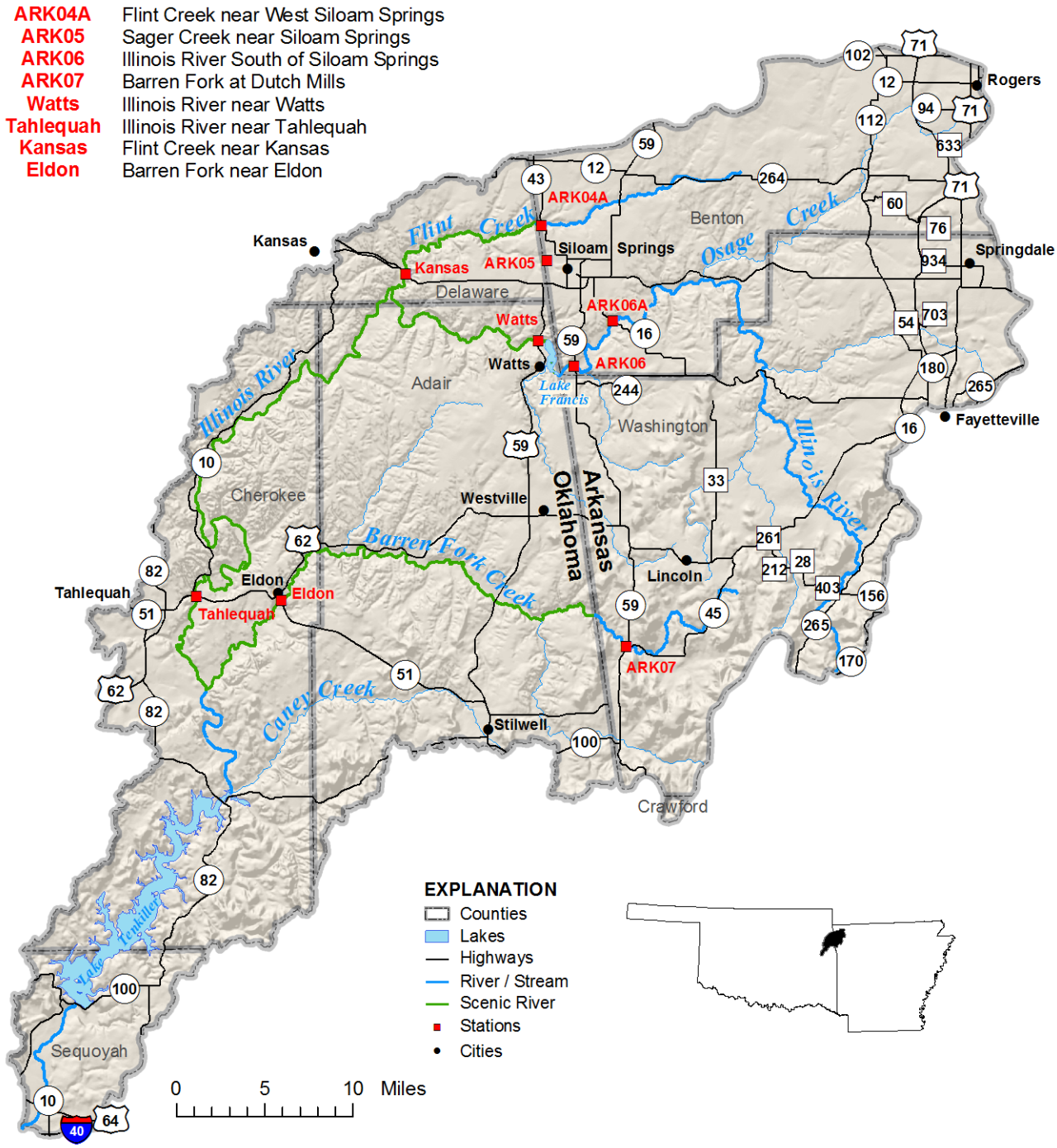
Draft

# Arkansas-Oklahoma Arkansas River Compact Commission Environmental Committee Report

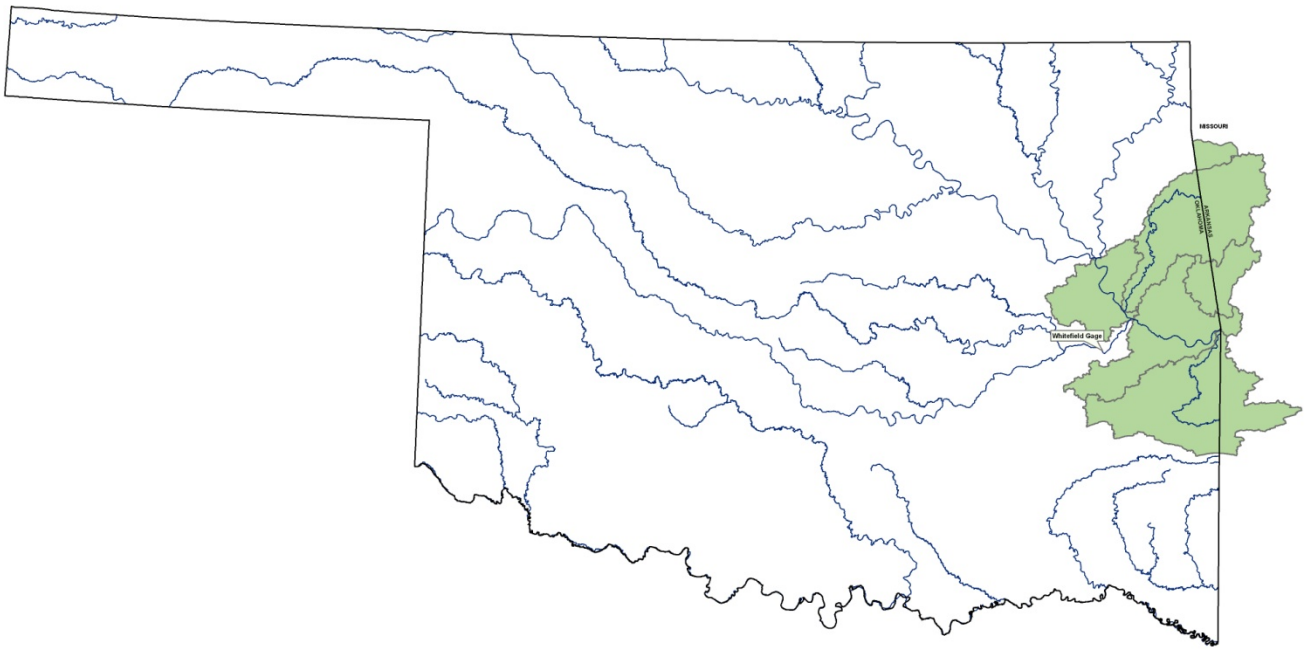



September 28, 2017

# Arkansas-Oklahoma Arkansas River Compact Commission

**Draft**

## Environmental Committee Report




**September 27, 2018**

# 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 1999-2017[1] and 2013-2017.

| Station (see footnotes) | 1999-2016 (3-month GM'S) | | | 2011-2016 (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] | 333 | 14 | 96% | 93 | 11 | 88% |
| Illinois River near Tahlequah[2] | 334 | 29 | 91% | 92 | 23 | 75% |
| Flint Creek near Kansas[2] | 295 | 0 | 100% | 91 | 0 | 100% |
| Barren Fork near Eldon[2] | 319 | 180 | 44% | 88 | 62 | 30% |
| Little Lee Creek near Nicut[1] | 101 | 99 | 2% | 60 | 60 | 0% |
| Lee Creek near Short | 214 | 212 | <1% | 65 | 64 | 1.5% |
| Mountain Fork River near Smithville | 186 | 158 | 15% | 59 | 57 | 3% |

[1]Little Lee Creek near Nicut Period of Record Dataset from 2008-2016
[2]Dataset meets USAP data requirements

**Table 2.** Waters Listed on Oklahoma's 2016 303(d) List

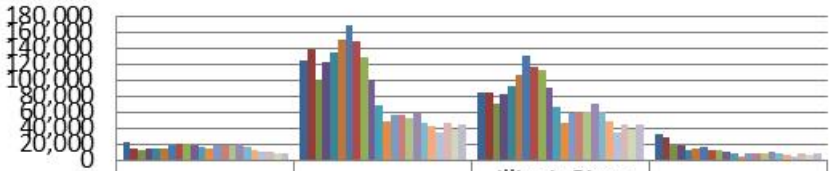
Impaired Waters in the Illinois River Basin

| 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 |

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 1993-2017 and 1999-2017, total phosphorus concentrations measured at both higher and lower flows from 1999-2017, and use assessment geometric means from 1999-2017. 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 1999-2017 are analyzed, all stations demonstrate a highly significant downward trend.
3. The Illinois River and Flint Creek show some significant downward trend when only higher flow total phosphorus concentrations are considered. The Barren Fork River shows no significant trend in total phosphorus concentrations at higher flows.
4. When only lower flow data from 1999-2017 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 2017 report, and 2017 results are in superscript.)

| Station | All Data (1993-2017) | | All Data (1999-2017) | | Higher Flow Data (1999-2017) | | Lower Flow Data (1999-2017) | | Geomtric Mean For Assessment (1999-2017) |
|---|---|---|---|---|---|---|---|---|---|
| | Unadj | Flow Adj | Unadj | Flow Adj | Unadj | Flow Adj | Unadj | Flow Adj | Unadj |
| **Illinois River near Watts** | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓↓ | NT$^{(\downarrow)}$ | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓↓ |
| **Illinois River near Tahlequah** | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓$^{(\downarrow\downarrow\downarrow)}$ | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓↓ |
| **Flint Creek near Kansas** | ↓↓↓$^{(NT)}$ | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓↓ | ↓↓↓ |
| **Barren Fork near Eldon** | NT | NT | ↓↓↓ | ↓↓↓ | NT | NT$^{(\downarrow\downarrow\downarrow)}$ | NT$^{(\downarrow)}$ | NT$^{(\downarrow\downarrow)}$ | ↓↓↓ |

↓↓↓ = 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

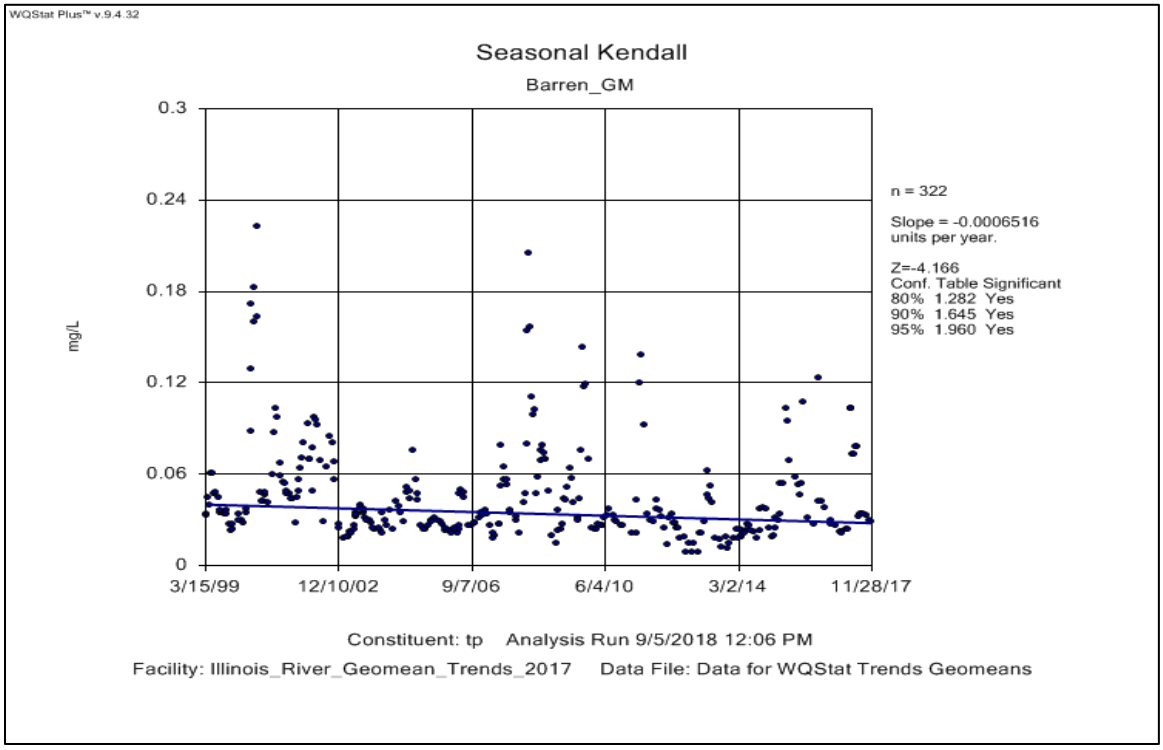



**Figure 1. Trend for use assessment geometric means (1999-2017) on the Barren Fork River near Eldon.**

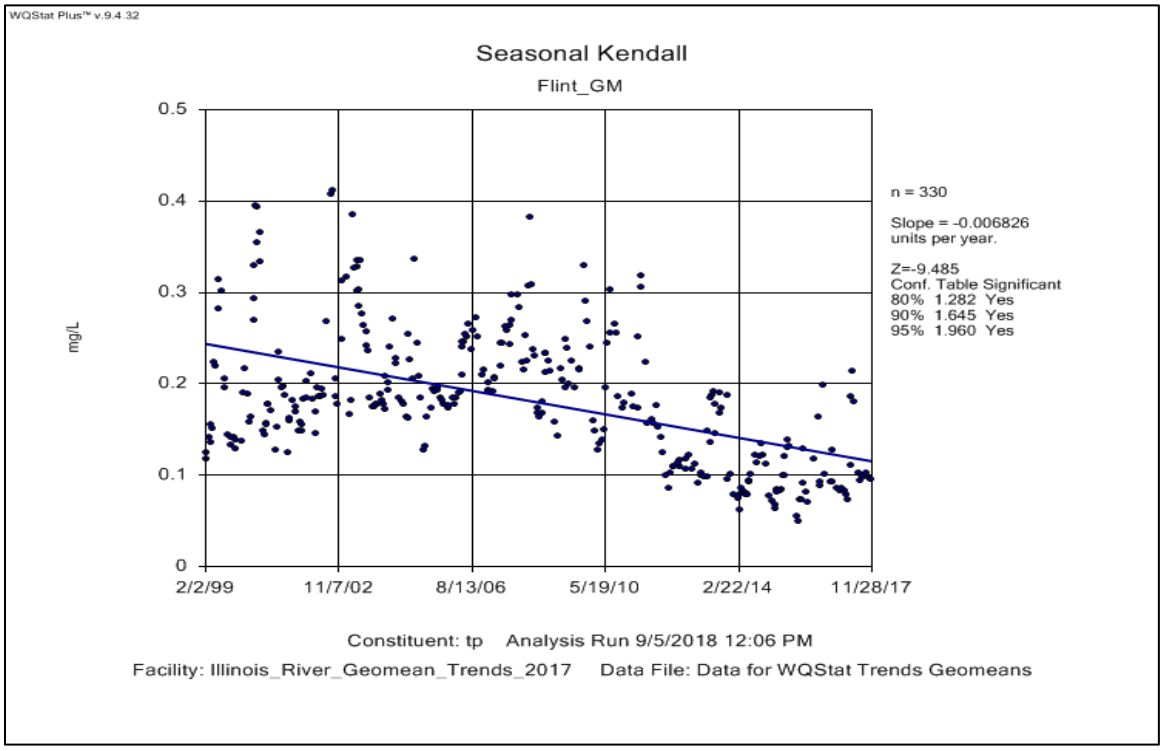



**Figure 2. Trend for use assessment geometric means (1999-2017) on Flint Creek near Kansas.**

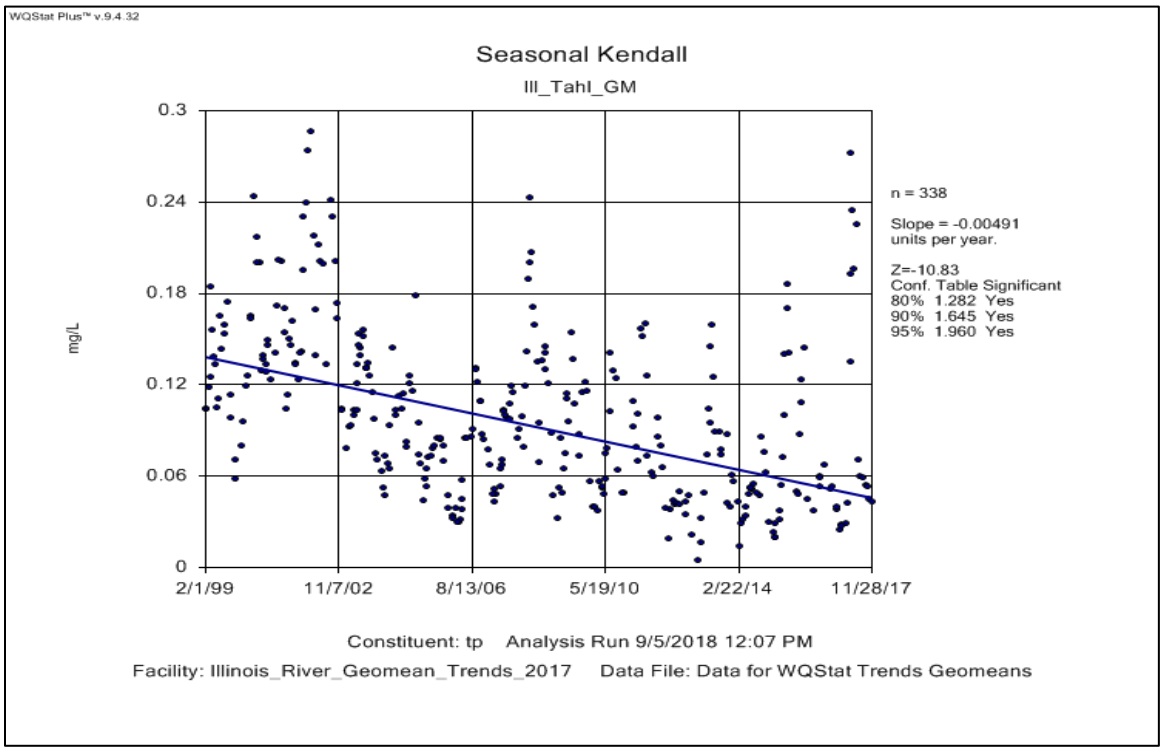



**Figure 3. Trend for use assessment geometric means (1999-2017) on Illinois River near Tahlequah.**

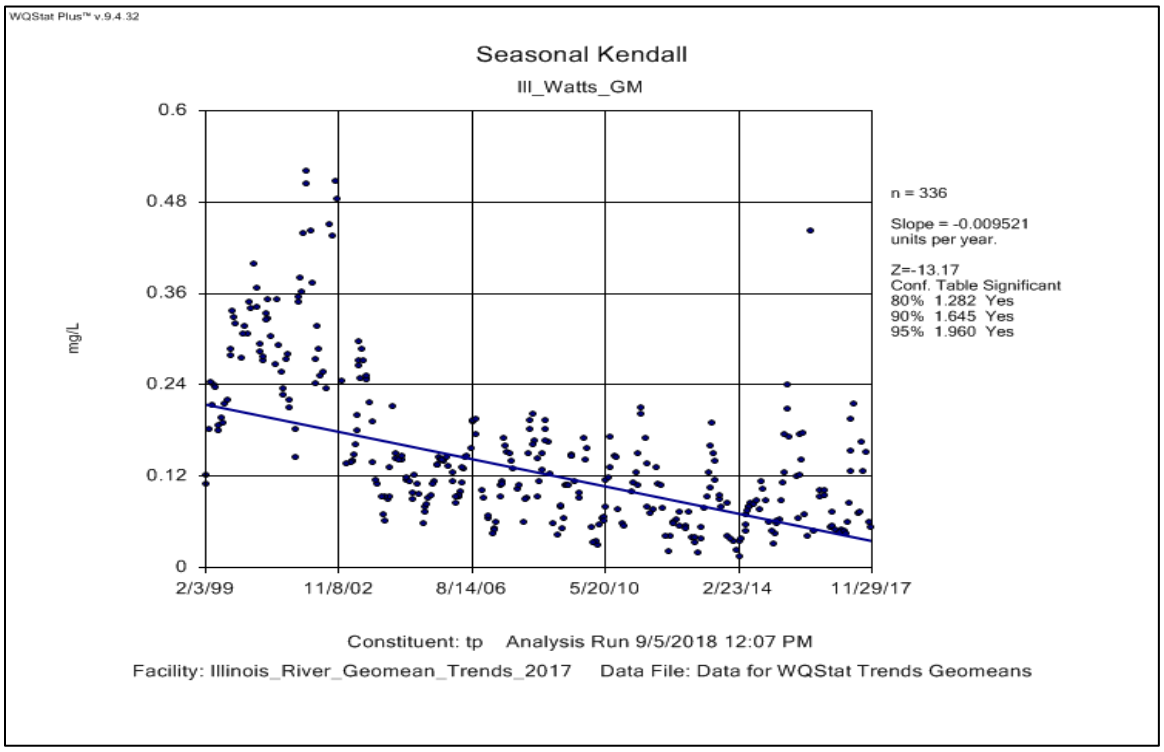



**Figure 4. Trend for use assessment geometric means (1999-2017) on Illinois River near Watts.**

# Arkansas River at Moffett

| Sample Record | Times Visited | Station ID |
|---|---|---|
| November 1998 - Current | 92 | 220200010010-001AT |

## Stream Data

| | | |
|---|---|---|
| County | Sequoyah | Request Data By Email |
| Location | East of the Town of Moffett on State 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) | 89 | 19.5 | 21.1 | 1.7/32.6 | 12.7/27.1 | |
| | Turbidity (NTU) | 92 | 34 | 22 | 7/194 | 15/44 | |
| | pH (units) | 89 | 7.83 | 7.82 | 6.87/8.97 | 7.60/8.06 | |
| | Dissolved Oxygen (mg/L) | 89 | 9.50 | 8.85 | 5.35/16.48 | 7.64/10.62 | |
| | Hardness (mg/L) | 89 | 157 | 139 | 39/658 | 125/178 | |
| Minerals | Total Dissolved Solids (mg/L) | 47 | 315 | 310 | 146/536 | 248/388 | |
| | Specific Conductivity (uS/cm) | 87 | 610 | 576 | 195/1333 | 484/732 | |
| | Chloride (mg/L) | 91 | 101 | 93 | 13/293 | 58/129 | |
| | Sulfate (mg/L) | 91 | 53 | 51 | 22/116 | 36/61 | |
| Nutrients | Total Phosphorus (mg/L) | 91 | 0.121 | 0.113 | 0.051/0.330 | 0.090/0.139 | |
| | Total Nitrogen (mg/L) | 90 | 0.97 | 0.92 | 0.45/2.82 | 0.72/1.12 | |
| | Nitrate/Nitrite (mg/L) | 91 | 0.30 | 0.24 | <0.05/1.17 | 0.09/0.46 | |
| | Chlorophyll A ($mg/m^3$) | 50 | 15.3 | 12.7 | <0.1/71.8 | 7.0/16.2 | TSI=57.4 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 24 | 955 | 10 | <10/12000 | <10/20 | |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 24 | 140 | 10 | <10/2035 | <10/18 | |

## 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 | Times Visited | Station ID |
|---|---|---|
| November 1998 - Current | 139 | 121400010260-001AT |

## Stream Data

| | | |
|---|---|---|
| County | Muskogee | Request Data By Email |
| Location | East of the Town of Muskogee on State 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) | 138 | 18.1 | 18.6 | 1.9/32.4 | 11.0/25.6 | |
| | Turbidity (NTU) | 139 | 43 | 23 | 5/387 | 15/39 | |
| | pH (units) | 136 | 8.03 | 8.02 | 7.09/9.48 | 7.73/8.32 | |
| | Dissolved Oxygen (mg/L) | 138 | 8.96 | 8.85 | 4.20/14.88 | 7.08/10.61 | |
| | Hardness (mg/L) | 136 | 183 | 170 | 91/418 | 142/217 | |
| Minerals | Total Dissolved Solids (mg/L) | 78 | 445 | 398 | 144/1040 | 305/559 | |
| | Specific Conductivity (uS/cm) | 137 | 908 | 791 | 191/2746 | 458/1201 | |
| | Chloride (mg/L) | 125 | 165 | 133 | <10/713 | 76/206 | |
| | Sulfate (mg/L) | 126 | 72 | 64 | 28/202 | 44/89 | |
| Nutrients | Total Phosphorus (mg/L) | 139 | 0.163 | 0.145 | 0.053/0.705 | 0.115/0.174 | |
| | Total Nitrogen (mg/L) | 138 | 1.18 | 1.10 | 0.40/3.90 | 0.92/1.39 | |
| | Nitrate/Nitrite (mg/L) | 139 | 0.43 | 0.39 | <0.05/1.21 | 0.17/0.63 | |
| | Chlorophyll A (mg/m$^3$) | 65 | 19.2 | 14.5 | <0.1/90.0 | 8.6/26.7 | TSI=59.6 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 31 | 3685 | 20 | <10/75000 | <10/200 | |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 31 | 378 | 20 | <10/5492 | <10/52 | |

## 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 | | | | | | | | |

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

**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 | Times Visited | Station ID |
|---|---|---|
| November 1998 - Current | 201 | 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) | 149 | 17.2 | 17.9 | 3.1/29.9 | 11.2/22.6 | |
| | Turbidity (NTU) | 147 | 4 | 2 | 1/45 | 2/3 | |
| | pH (units) | 148 | 7.63 | 7.60 | 6.37/8.82 | 7.36/7.88 | |
| | Dissolved Oxygen (mg/L) | 149 | 9.63 | 9.79 | 4.40/14.53 | 7.98/11.10 | |
| | Hardness (mg/L) | 150 | 100 | 98 | 46/159 | 90/108 | |
| Minerals | Total Dissolved Solids (mg/L) | 33 | 136 | 121 | 92/545 | 109/134 | |
| | Specific Conductivity (uS/cm) | 149 | 203 | 201 | 20/713 | 180/220 | |
| | Chloride (mg/L) | 111 | 8 | 10 | <10/44 | <5/10 | |
| | Sulfate (mg/L) | 111 | 9 | 10 | <10/40 | 6/10 | |
| Nutrients | Total Phosphorus (mg/L) | 155 | 0.032 | 0.028 | <0.005/0.217 | 0.021/0.034 | |
| | Total Nitrogen (mg/L) | 155 | 1.48 | 1.33 | <0.10/4.20 | 0.83/1.96 | |
| | Nitrate/Nitrite (mg/L) | 155 | 1.32 | 1.24 | 0.14/3.83 | 0.72/1.71 | |
| | Chlorophyll A (mg/m$^3$) | 95 | 1.4 | 1.1 | <0.1/11.7 | 0.7/1.7 | TSI=34.00 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 83 | 228 | 20 | <10/3900 | 10/80 | |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 83 | 99 | <10 | <10/2420 | 10/41 | Mean>OWQS |

## Beneficial Uses

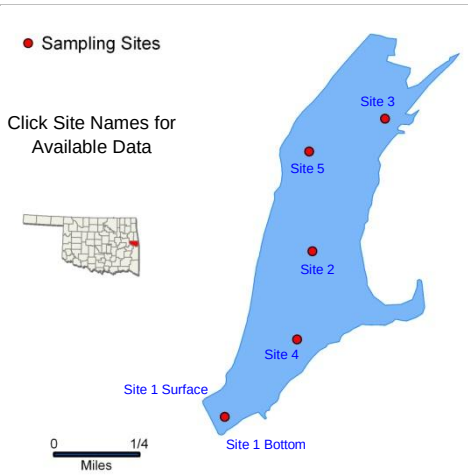
| Click to learn more about Beneficial Uses | Turbidity | pH | Dissolved Oxygen | Metals | Sulfates | Nitrates | Chlorides | Total Dissolved Solids | Bacteria | Bio. Fish | Bio. BMI | Sediment | Total Phosphorus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fish & Wildlife Propagation | 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 | | | | | | | | | |

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

**Notes**

# Brushy Creek

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




## General

| | | |
|---|---|---|
| Location | Sequoyah County | Click map for site data |
| 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 |

*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*

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 | Times Visited | Station ID |
|---|---|---|
| September 1999 - 2012 | 145 | 121700040010-001AT |

## Stream Data

| | | |
|---|---|---|
| County | Cherokee | Request Data by Email |
| Location | North of the Town of Barber off State Highway 100 | |
| Latitude/Longitude | 35.72381643, -94.85787184 | |
| 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 | 13.0/23.3 | |
| | Turbidity (NTU) | 100 | 4 | 2 | 1/103 | 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 | 8.29/11.12 | |
| | Hardness (mg/L) | 99 | 109 | 109 | 64/174 | 98/120 | |
| Minerals | Total Dissolved Solids (mg/L) | 12 | 149 | 143 | 116/237 | 133/157 | |
| | 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 | <0.005/1.532 | 0.030/0.047 | |
| | Total Nitrogen (mg/L) | 104 | 1.14 | 1.05 | 0.18/7.06 | 0.71/1.41 | |
| | Nitrate/Nitrite (mg/L) | 105 | 0.99 | 0.91 | 0.06/6.68 | 0.55/1.26 | |
| | 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 | 124 | 15 | <10/2382 | <10/41 | 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 | | | | | | | | |

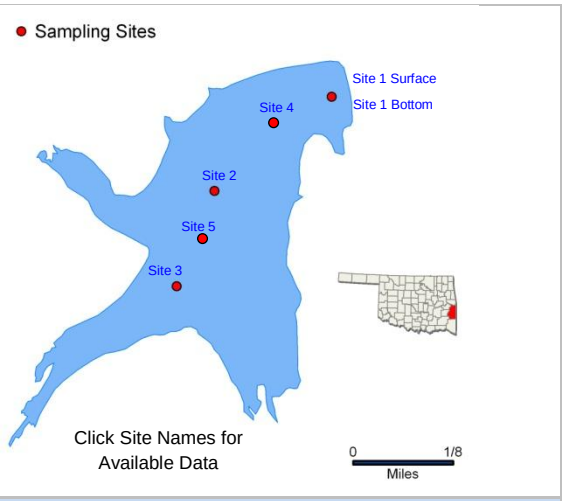
***S = Fully Supporting***
***NS = Not Supporting***
***NEI = Not Enough Information***

**Notes**

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

# Cedar

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




## General

| | | |
|---|---|---|
| Location | Le Flore County | Click map for site data |
| 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*

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

# Flint Creek at Flint

| Sample Record | Times Visited | Station ID |
|---|---|---|
| November 1998 - Current | 192 | 121700060010-001AT |

**Stream Data**

| | | |
|---|---|---|
| County | Delaware | Request Data By Email |
| Location | North of the Town of Flint on county road | |
| 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) | 147 | 17.1 | 17.0 | 2.5/28.7 | 11.0/23.0 | |
| | Turbidity (NTU) | 147 | 2 | 1 | 0/58 | 1/2 | |
| | pH (units) | 146 | 7.68 | 7.68 | 6.44/8.79 | 7.44/7.89 | |
| | Dissolved Oxygen (mg/L) | 147 | 9.46 | 9.21 | 4.97/14.94 | 8.01/10.73 | |
| | Hardness (mg/L) | 150 | 116 | 115 | <10/218 | 106/125 | |
| Minerals | Total Dissolved Solids (mg/L) | 33 | 184 | 174 | 112/552 | 158/188 | |
| | Specific Conductivity (uS/cm) | 145 | 296 | 298 | 152/452 | 262/335 | |
| | Chloride (mg/L) | 112 | 15 | 14 | <10/43 | <10/19 | |
| | Sulfate (mg/L) | 112 | 17 | 16 | <10/69 | 12/20 | |
| Nutrients | Total Phosphorus (mg/L) | 160 | 0.178 | 0.150 | 0.055/1.450 | 0.092/0.189 | See Notes |
| | Total Nitrogen (mg/L) | 155 | 2.87 | 2.77 | <0.05/7.95 | 2.13/3.53 | |
| | Nitrate/Nitrite (mg/L) | 156 | 2.70 | 2.51 | 0.80/7.55 | 2.03/3.32 | |
| | Chlorophyll A ($mg/m^3$) | 95 | 1.0 | 0.8 | <0.1/4.2 | 0.5/1.2 | TSI=30.4 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 74 | 523 | 41 | <10/18000 | <10/109 | Mean>OWQS |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 74 | 207 | 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 | Times Visited | Station ID |
|---|---|---|
| November 1998 - Current | 179 | 220100040020-001AT |

**Stream Data**

| | | |
|---|---|---|
| County | Latimer | Request Data By Email |
| Location | S.E. 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) | 160 | 17.6 | 18.9 | 1.0/31.6 | 10.5/23.8 | |
| | Turbidity (NTU) | 165 | 37 | 27 | 5/390 | 17/42 | |
| | pH (units) | 162 | 7.15 | 7.03 | 5.77/8.76 | 6.84/7.47 | |
| | Dissolved Oxygen (mg/L) | 161 | 6.05 | 6.01 | 0.84/15.69 | 3.18/8.48 | |
| | Hardness (mg/L) | 162 | 53 | 48 | <10/212 | 34/65 | |
| Minerals | Total Dissolved Solids (mg/L) | 48 | 107 | 104 | 50/175 | 84/127 | |
| | Specific Conductivity (uS/cm) | 159 | 167 | 146 | 11/1106 | 101/210 | |
| | Chloride (mg/L) | 113 | <10 | <10 | <10/22 | 10</11 | |
| | Sulfate (mg/L) | 114 | 22 | 21 | <10/49 | 17/26 | |
| Nutrients | Total Phosphorus (mg/L) | 166 | 0.081 | 0.068 | <0.005/0.867 | 0.047/0.091 | |
| | Total Nitrogen (mg/L) | 164 | 0.79 | 0.76 | 0.16/1.70 | 0.56/0.97 | |
| | Nitrate/Nitrite (mg/L) | 166 | 0.15 | 0.12 | <0.05/0.97 | <0.05/0.22 | |
| | Chlorophyll A (mg/m$^3$) | 47 | 8.3 | 3.3 | 0.8/34.0 | 2.3/13.4 | TSI=51.4 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 42 | 417 | 76 | <10/8000 | 51/214 | Mean>OWQS |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 42 | 231 | 69 | <10/1986 | 30/219 | |

**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 | | | | | | | | |

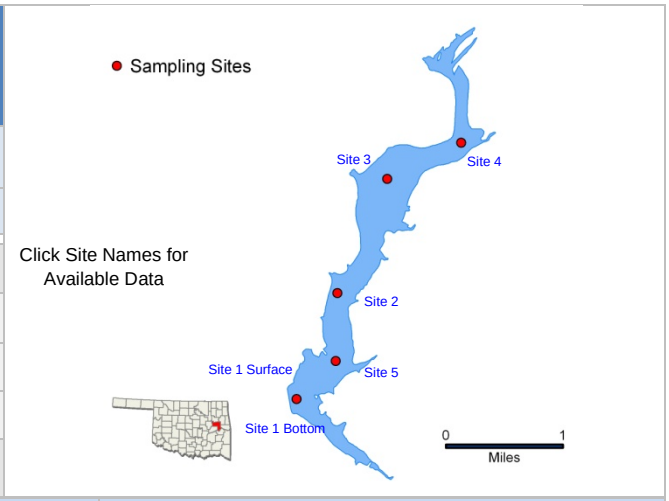
*S = Fully Supporting*
*NS = Not Supporting*
*NEI = Not Enough Information*

**Notes**

*Fish & Wildlife Propagation not supporting for Lead*

# Greenleaf

| Sample Period | Times Visited | Sampling Sites |
|---|---|---|
| October 2016 – July 2017 | 4 | 5 |




## General

| | | |
|---|---|---|
| Location | Muskogee County | Click map for site data |
| 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=12) |
| | Average Secchi Disk Depth | 92 cm | |
| | Water Clarity Rating | Good | |
| | Chlorophyll-a | 16.13 mg/m3 | |
| | Trophic State Index | 58 | Previous value = 58 |
| | Trophic Class | Eutrophic | |
| Profile | Salinity | 0.06– 0.14 ppt | |
| | Specific Conductivity | 131.9 – 303.4 µS/cm | |
| | pH | 6.48 – 8.71 pH units | <1% of recorded values <6.5 |
| | Oxidation-Reduction Potential | 9.5 – 478.4 mV | |
| | Dissolved Oxygen | Up to 72% of water column < 2 mg/L in July | |
| Nutrients | Surface Total Nitrogen | 0.45 mg/L to 0.65 mg/L | |
| | Surface Total Phosphorus | 0.022 mg/L to 0.044 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 | 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*

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

# Illinois River at Tahlequah

| Sample Record | Times Visited | Station ID |
|---|---|---|
| November 1998 - Current | 195 | 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) | 148 | 17.6 | 17.5 | 0.8/31.7 | 10.9/24.0 | |
| | Turbidity (NTU) | 147 | 7 | 4 | 0/84 | 3/6 | |
| | pH (units) | 146 | 7.88 | 7.84 | 6.47/9.29 | 7.57/8.13 | |
| | Dissolved Oxygen (mg/L) | 148 | 10.01 | 10.03 | 4.66/15.88 | 7.76/12.06 | |
| | Hardness (mg/L) | 148 | 115 | 114 | 69/161 | 106/124 | |
| Minerals | Total Dissolved Solids (mg/L) | 33 | 173 | 160 | 104/565 | 137/178 | |
| | Specific Conductivity (uS/cm) | 148 | 272 | 274 | 66/713 | 241/294 | |
| | Chloride (mg/L) | 112 | 11 | <10 | <10/24 | 8/14 | |
| | Sulfate (mg/L) | 112 | 14 | 13 | <10/48 | 11/16 | |
| Nutrients | Total Phosphorus (mg/L) | 157 | 0.077 | 0.065 | <0.005/0.438 | 0.039/0.103 | See Notes |
| | Total Nitrogen (mg/L) | 157 | 1.75 | 1.68 | <0.10/3.76 | 1.17/2.27 | |
| | Nitrate/Nitrite (mg/L) | 157 | 1.52 | 1.50 | 0.23/3.61 | 0.97/1.96 | |
| | Chlorophyll A (mg/m$^3$) | 95 | 3.6 | 2.0 | <0.1/46.4 | 1.5/3.1 | TSI=43.1 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 73 | 142 | 20 | <10/2500 | <10/100 | |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 73 | 61 | <10 | <10/884 | <10/36 | |

**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 | Times Visited | Station ID |
|---|---|---|
| November 1998 - Current | 200 | 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) | 150 | 17.2 | 17.5 | 2.0/31.5 | 10.4/24.0 | |
| | Turbidity (NTU) | 148 | 11 | 6 | 1/95 | 4/12 | |
| | pH (units) | 149 | 7.90 | 7.92 | 6.51/9.03 | 7.73/8.12 | |
| | Dissolved Oxygen (mg/L) | 150 | 10.58 | 10.29 | 4.51/18.88 | 8.65/11.96 | |
| | Hardness (mg/L) | 151 | 127 | 127 | 10/215 | 115/138 | |
| Minerals | Total Dissolved Solids (mg/L) | 33 | 194 | 180 | 116/566 | 163/212 | |
| | Specific Conductivity (uS/cm) | 150 | 310 | 315 | 149/713 | 275/341 | |
| | Chloride (mg/L) | 111 | 14 | 13 | <10/28 | <10/18 | |
| | Sulfate (mg/L) | 111 | 17 | 15 | <10/97 | 12/19 | |
| Nutrients | Total Phosphorus (mg/L) | 156 | 0.138 | 0.092 | <0.005/1.153 | 0.048/0.164 | See Notes |
| | Total Nitrogen (mg/L) | 156 | 2.49 | 2.45 | <0.10/5.06 | 2.04/2.88 | |
| | Nitrate/Nitrite (mg/L) | 156 | 2.18 | 2.18 | 0.65/4.64 | 1.70/2.51 | |
| | Chlorophyll A ($mg/m^3$) | 95 | 3.1 | 2.2 | <0.1/15.3 | 1.6/3.4 | TSI=41.7 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 74 | 526 | 20 | <10/15531 | <10/99 | Mean>OWQS |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 74 | 358 | 19 | <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 | | | | | | | | | |

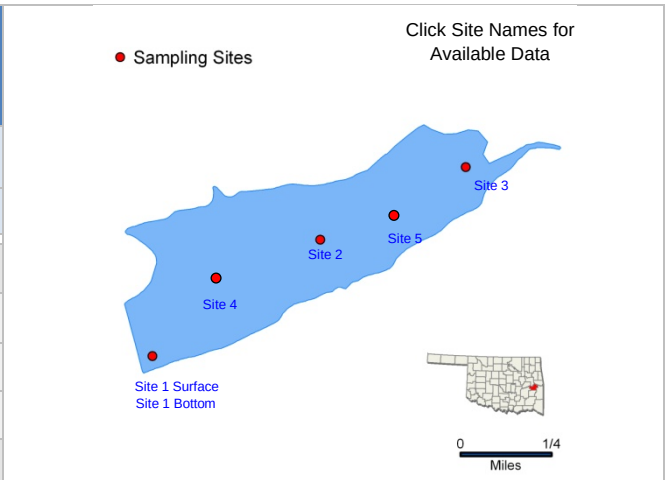
*S = Fully Supporting*
*NS = Not Supporting*
*NEI = Not Enough Information*

**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 | Click map for site data |
| 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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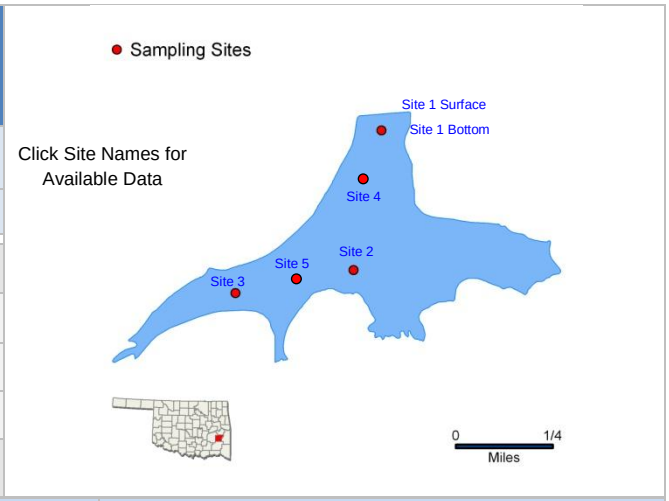
Bathy map available: http://www.owrb.ok.gov/maps/PMG/owrbdata_Bathy.html

# Lloyd Church (Wilburton)

| Sample Period | Times Visited | Sampling Sites |
|---|---|---|
| October 2014 – July 2015 | 4 | 3 |




## General

| | | |
|---|---|---|
| Location | Latimer County | Click map for site data |
| 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 | 11 NTU | 100% of values < 25 NTU (n=12) |
| | Average Secchi Depth | 84 cm | |
| | Water Clarity Rating | Good | |
| | Chlorophyll-a | 4.7 mg/m3 | |
| | Trophic State Index | 46 | Previous value = 56 |
| | Trophic Class | Mesotrophic | |
| Profile | Salinity | 0.02 – 0.06 ppt | |
| | Specific Conductivity | 42 – 123.9 µS/cm | |
| | pH | 5.72 – 8.21 pH units | 26% of values <6.5 pH units |
| | Oxidation-Reduction Potential | 76.1 -596.8 mV | |
| | Dissolved Oxygen | Up to 64% of water column < 2 mg/L in July | |
| Nutrients | Surface Total Nitrogen | 0.37 mg/L to 0.60 mg/L | |
| | Surface Total Phosphorus | 0.010 mg/L to 0.032 mg/L | |
| | 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 | 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*

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

# Lee Creek at Short

| Sample Record | Times Visited | Station ID |
|---|---|---|
| January 2003 - Present | 197 | 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) | 181 | 17.6 | 16.5 | 0.2/32.5 | 9.9/25.0 | |
| | Turbidity (NTU) | 180 | 8 | 5 | 1/124 | 4/8 | |
| | pH (units) | 181 | 7.62 | 7.60 | 6.31/8.70 | 7.38/7.84 | |
| | Dissolved Oxygen (mg/L) | 181 | 9.37 | 9.06 | 5.23/13.94 | 7.68/11.16 | |
| | Hardness (mg/L) | 178 | 47 | 44 | <10/130 | 36/55 | |
| Minerals | Total Dissolved Solids (mg/L) | 25 | 58 | 55 | 40/96 | 48/67 | |
| | Specific Conductivity (uS/cm) | 180 | 100 | 98 | <10/266 | 78/113 | |
| | Chloride (mg/L) | 92 | <10 | <10 | <10/11 | <10/<10 | |
| | Sulfate (mg/L) | 92 | <10 | <10 | <10/49 | <10/<10 | |
| Nutrients | Total Phosphorus (mg/L) | 180 | 0.013 | 0.010 | <0.005/0.149 | <0.005/0.015 | |
| | Total Nitrogen (mg/L) | 181 | 0.29 | 0.23 | 0.1/1.72 | 0.15/0.33 | |
| | Nitrate/Nitrite (mg/L) | 180 | 0.13 | <0.05 | <0.05/1.62 | <0.05/0.14 | |
| | Chlorophyll A ($mg/m^3$) | 149 | 2.1 | 0.9 | <0.1/92.0 | 0.4/1.7 | TSI=38.1 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 61 | 413 | <10 | <10/7100 | <10/41 | |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 61 | 127 | <10 | <10/2359 | <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 | 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 | Times Visited | Station ID |
|---|---|---|
| February 2008 - Current | 137 | 220200050040-001AT |

**Stream Data**

| | | |
|---|---|---|
| County | Sequoyah | Request Data by Email |
| Location | West of the Town of Short on State Highway 101 | |
| Latitude/Longitude | 35.58, -94.56 | |
| Planning Watershed | Lower Arkansas (8-digit HUC - 11110104) | |

**Parameters**

| | Parameter (Descriptions) | n | Mean | Median | Min./Max | p25/p75 | Comments |
|---|---|---|---|---|---|---|---|
| In-Situ | Water Temperature (°C) | 135 | 17.3 | 17.7 | 0.3/31.4 | 9.8/24.7 | |
| | Turbidity (NTU) | 137 | 8 | 3 | 0/223 | 2/5 | |
| | pH (units) | 137 | 7.61 | 7.57 | 6.30/8.56 | 7.41/7.87 | |
| | Dissolved Oxygen (mg/L) | 137 | 9.76 | 9.56 | 5.01/14.47 | 8.15/11.81 | |
| | Hardness (mg/L) | 133 | 64 | 62 | 36/140 | 53/72 | |
| Minerals | Total Dissolved Solids (mg/L) | 35 | 78 | 76 | 50/125 | 65/86 | |
| | Specific Conductivity (uS/cm) | 134 | 144 | 138 | 75/314 | 119/154 | |
| | Chloride (mg/L) | 57 | <10 | <10 | <10/<10 | <10/<10 | |
| | Sulfate (mg/L) | 57 | <10 | <10 | <10/15 | <10/<10 | |
| Nutrients | Total Phosphorus (mg/L) | 134 | 0.013 | <0.005 | <0.005/0.259 | <0.005/0.009 | |
| | Total Nitrogen (mg/L) | 134 | 0.24 | 0.18 | <0.10/1.41 | 0.15/0.24 | |
| | Nitrate/Nitrite (mg/L) | 133 | 0.10 | <0.05 | <0.05/0.96 | <0.05/0.09 | |
| | Chlorophyll A ($mg/m^3$) | 112 | 0.9 | 0.6 | <0.1/6.4 | 0.4/0.9 | TSI=29.0 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 23 | 241 | <10 | <10/2420 | <10/16 | |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 23 | 359 | <10 | <10/6488 | <10/13 | |

**Beneficial Uses**

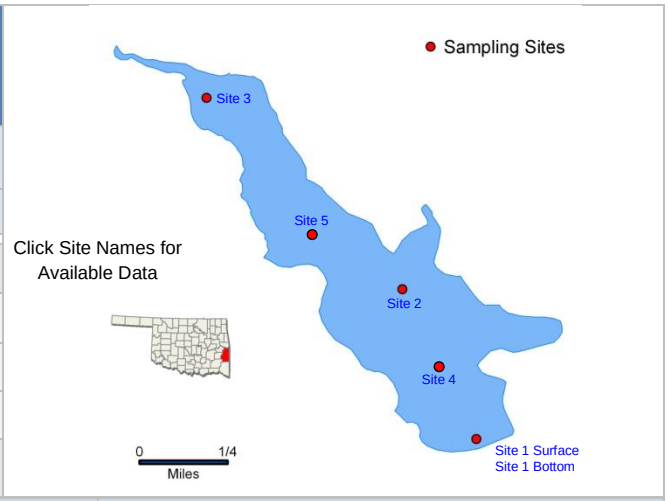
| Click to learn more about Beneficial Uses | Turbidity | pH | Dissolved Oxygen | Metals | Sulfates | Nitrates | Chlorides | Total Dissolved Solids | Bacteria | Bio. Fish | Bio. BMI | Sediment | Phosphorus |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fish & Wildlife Propagation | S | 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 |
|---|---|---|
| October 2005 – July 2006 | 4 | 5 |




## General

| | | |
|---|---|---|
| Location | Le Flore County | Click map for site data |
| Impoundment | 1960 | |
| Area | 254 acres | |
| Capacity | 2,160 acre-feet | |
| Purposes | Water Supply, Recreation | |

## Parameters

| | Parameter (Descriptions) | Result | Notes/Comments |
|---|---|---|---|
| In Situ | Average Turbidity | 18 NTU | 8% of values >OWQS of 25 NTU |
| | Average True Color | 26 units | 100% of values < OWQS of 70 |
| | Average Secchi Disk Depth | 47 cm | |
| | Water Clarity Rating | good | |
| | Trophic State Index | 68 | |
| | Trophic Class | hypereutrophic | |
| Profile | Salinity | 0.04 – 0.09 ppt | |
| | Specific Conductivity | 106.8 – 155.4 µS/cm | |
| | pH | 7.09 – 9.24 pH units | 10% of values > 9.0 pH units |
| | Oxidation-Reduction Potential | 121 - 483 mV | |
| | Dissolved Oxygen | Up to 33% of water column < 2 mg/L in August | Occurred at site 2 |
| Nutrients | Surface Total Nitrogen | 0.98 mg/L to 1.68 mg/L | |
| | Surface Total Phosphorus | 0.076 mg/L to 0.170 mg/L | |
| | Nitrogen to Phosphorus Ratio | 11:1 | 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 | | | | | 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*

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

# Poteau River at Heavener

| Sample Record | Times Visited | Station ID |
|---|---|---|
| November 1998 – December 2012 | 141 | 220100020010-001AT |

**Stream Data**

| | | |
|---|---|---|
| County | LeFlore | Request Data By Email |
| Location | South of the Town of Heavener on State 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) | 118 | 19.0 | 12.1 | 1.9/32.6 | 18.0/25.5 | |
| In-Situ | Turbidity (NTU) | 121 | 23 | 11 | 2/944 | 20/46 | |
| In-Situ | pH (units) | 118 | 7.27 | 6.92 | 7.15/9.16 | 8.13/8.37 | |
| In-Situ | Dissolved Oxygen (mg/L) | 118 | 8.19 | 6.58 | 4.51/16.94 | 9.78/11.10 | |
| In-Situ | Hardness (mg/L) | 118 | 48 | 21 | 136/490 | 239/282 | |
| Minerals | Total Dissolved Solids (mg/L) | 20 | 94 | 53 | 209/1460 | 785/973 | |
| Minerals | Specific Conductivity (uS/cm) | 118 | 136 | 57 | 411/3436 | 1418/1821 | |
| Minerals | Chloride (mg/L) | 77 | <10 | <10 | 26/815 | 283/428 | |
| Minerals | Sulfate (mg/L) | 78 | 35 | 16 | 27/205 | 104/121 | |
| Nutrients | Total Phosphorus (mg/L) | 114 | 0.075 | 0.038 | 0.073/0.810 | 0.193/0.237 | |
| Nutrients | Total Nitrogen (mg/L) | 112 | 0.67 | 0.46 | 0.40/3.18 | 1.29/1.59 | |
| Nutrients | Nitrate/Nitrite (mg/L) | 113 | 0.19 | <0.05 | <0.05/1.60 | 0.54/0.78 | |
| Nutrients | Chlorophyll A (mg/m$^3$) | 13 | 9.5 | 3.2 | 1.2/140.0 | 14.3/34.8 | TSI=52.7 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 28 | 65 | <10 | <10/2420 | 57/140 | Mean>OWQS |
| Bacteria | E. Coli (cfu/100ml)(*-Geo. Mn.) | 28 | 58 | 13 | <10/1515 | <10/104 | |

**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 | Times Visited | Station ID |
|---|---|---|
| November 1998 - Current | 191 | 220100010010-001AT |

## Stream Data

| | | |
|---|---|---|
| County | LeFlore | Request Data By Email |
| Location | West of the Town of Pocola on County Road E 1220 | |
| 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) | 184 | 18.9 | 19.9 | 2.9/34.6 | 11.2/26.0 | |
| | Turbidity (NTU) | 193 | 69 | 50 | 11/476 | 35/83 | 13% of values>OWQS |
| | pH (units) | 188 | 7.31 | 7.28 | 5.39/8.99 | 6.97/7.63 | |
| | Dissolved Oxygen (mg/L) | 189 | 8.16 | 7.97 | 3.31/15.94 | 6.54/9.58 | |
| | Hardness (mg/L) | 191 | 51 | 47 | <10/414 | 35/57 | |
| Minerals | Total Dissolved Solids (mg/L) | 37 | 114 | 96 | 16/675 | 71/132 | |
| | Specific Conductivity (uS/cm) | 185 | 144 | 134 | <10/530 | 85/177 | |
| | Chloride (mg/L) | 98 | <10 | <10 | <10/33 | <10/<10 | |
| | Sulfate (mg/L) | 98 | 36 | 33 | <10/88 | 25/45 | |
| Nutrients | Total Phosphorus (mg/L) | 191 | 0.120 | 0.104 | 0.017/0.416 | 0.072/0.146 | |
| | Total Nitrogen (mg/L) | 188 | 1.10 | 0.98 | 0.17/6.45 | 0.79/1.22 | |
| | Nitrate/Nitrite (mg/L) | 190 | 0.36 | 0.24 | 0.03/4.96 | 0.13/0.43 | |
| | Chlorophyll A (mg/m$^3$) | 104 | 16.6 | 14.9 | 1.9/77.3 | 9.7/21.5 | TSI=58.2 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 48 | 173 | 40 | <10/2420 | 20/72 | |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 48 | 136 | 26 | <10/2420 | <10/41 | |

## 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 | | | | | | | | |

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

**Notes**

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

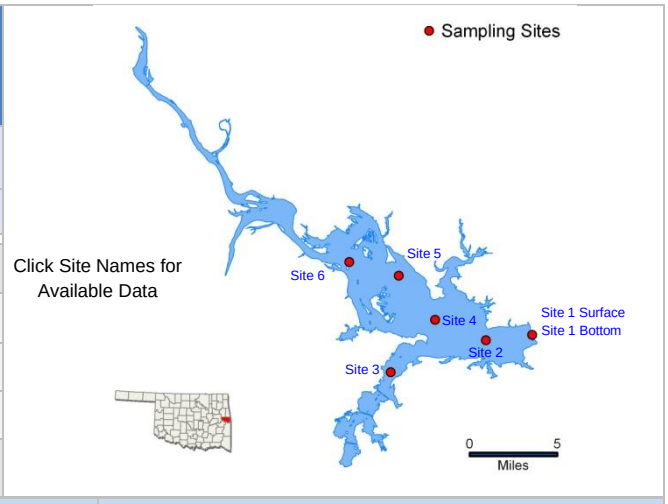
Sampling and Assessment by the **Oklahoma Water Resources Board** – 3800 Classen Blvd, Oklahoma City, OK, 73118 – 405.530.8800 – http://www.owrb.ok.gov

# Robert S. Kerr

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

## General

| | | |
|---|---|---|
| Location | Sequoyah County | Click map for site data |
| 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*

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

# Sager Creek at West Siloam Springs

| Sample Record | Times Visited | Station ID |
|---|---|---|
| November 1998 – December 2012 | 163 | 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) | 110 | 17.4 | 12.5 | 2.8/36.3 | 19.4/26.1 | |
| | Turbidity (NTU) | 111 | 3 | 1 | 3/857 | 64/118 | |
| | pH (units) | 109 | 7.71 | 7.47 | 6.71/8.21 | 7.70/7.91 | |
| | Dissolved Oxygen (mg/L) | 110 | 9.11 | 8.05 | 3.87/40.07 | 7.84/10.16 | 21% of values<OWQS and 13% of values<alt OWQS |
| | Hardness (mg/L) | 109 | 132 | 120 | 21/268 | 139/175 | |
| Minerals | Total Dissolved Solids (mg/L) | 21 | 244 | 186 | 95/921 | 263/310 | |
| | Specific Conductivity (uS/cm) | 110 | 424 | 358 | 100/937 | 380/478 | |
| | Chloride (mg/L) | 100 | 36 | 23 | <10/199 | 36/66 | |
| | Sulfate (mg/L) | 100 | 25 | 16 | 13/134 | 31/41 | |
| Nutrients | Total Phosphorus (mg/L) | 114 | 1.117 | 0.644 | <0.005/1.017 | 0.092/0.150 | |
| | Total Nitrogen (mg/L) | 113 | 7.46 | 4.88 | <0.10/2.19 | 0.74/1.06 | |
| | Nitrate/Nitrite (mg/L) | 114 | 7.02 | 4.39 | <0.05/0.88 | 0.08/0.19 | |
| | Chlorophyll A (mg/m$^3$) | 54 | 1.6 | 0.4 | <0.1/22.3 | 9.1/14.0 | TSI=35.5 |
| Bacteria | Enterococcus (cfu/100ml)(*-Geo. Mn.) | 56 | 512 | 34 | <10/8000 | 94/732 | Mean>OWQS |
| | E. Coli (cfu/100ml)(*-Geo. Mn.) | 56 | 218 | <10 | <10/2755 | 52/196 | |

**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 | | | | | | | | |

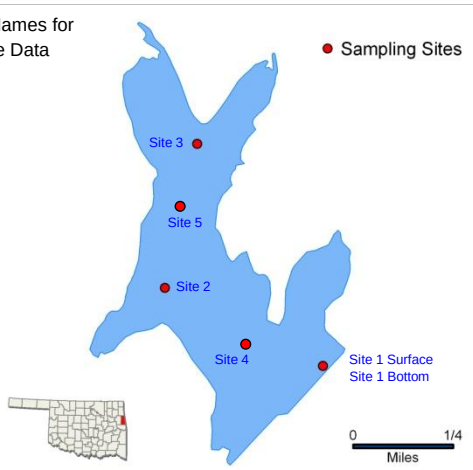
*S = Fully Supporting*
*NS = Not Supporting*
*NEI = Not Enough Information*

**Notes**

# Stilwell City

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

Click Site Names for Available Data




## General

| | | |
|---|---|---|
| Location | Adair County | Click map for site data |
| 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*

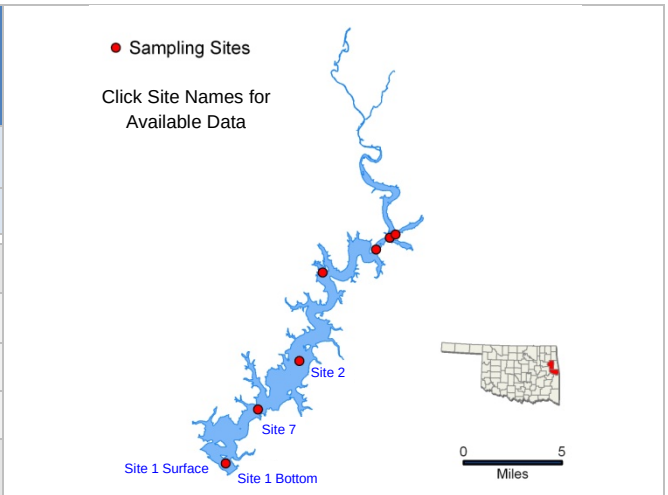
**Notes** *Standards revision, true color is for permitting purposes only

*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*

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

# Tenkiller (1,2,7)

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




## General

| | | |
|---|---|---|
| Location | Sequoyah County | Click map for site data |
| 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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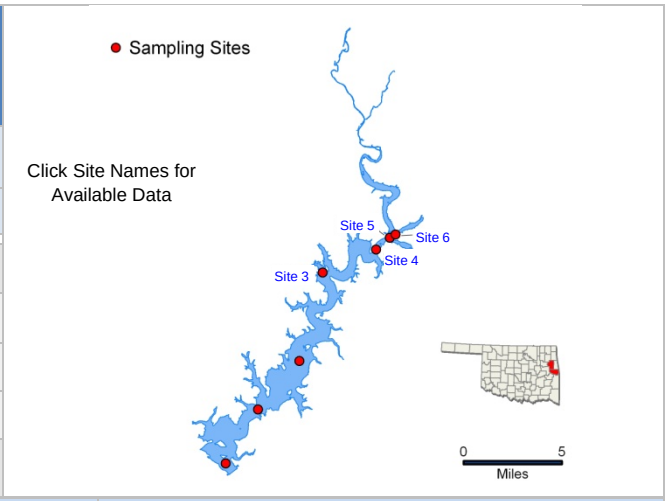
# Tenkiller, Illinois River Arm (3-6)

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




## General

| | | |
|---|---|---|
| Location | Sequoyah County | Click map for site data |
| 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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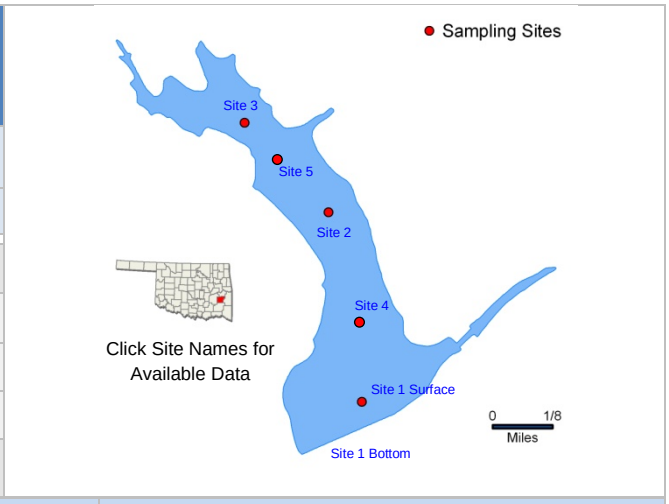
# Wayne Wallace

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




## General

| | | |
|---|---|---|
| Location | Latimer County | Click map for site data |
| 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 | | | | | | | | | | | |

*S = Fully Supporting*
*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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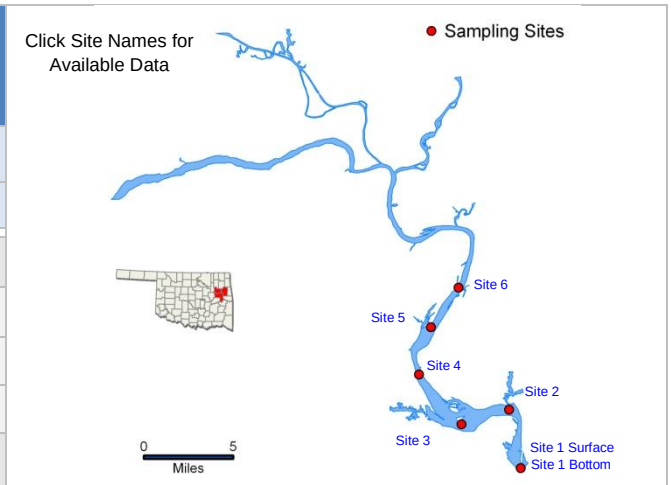
# Webbers Falls

| Sample Period | Times Visited | Sampling Sites |
|---|---|---|
| December 2015 – October 2016 | 4 | 6 |




## General

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

## Parameters

| | Parameter (Descriptions) | Result | Notes/Comments |
|---|---|---|---|
| In-Situ | Average Turbidity | 81 NTU | 100% of values > OWQS of 25 NTU |
| | Average Secchi Disk Depth | 16 cm | |
| | Water Clarity Rating | Poor | |
| | Chlorophyll-a | 8.6 mg/m3 | |
| | Trophic State Index | 52 | Previous value = 59 |
| | Trophic Class | Eutrophic | |
| Profile | Salinity | 0.13 – 0.31 ppt | |
| | Specific Conductivity | 271.8 – 645 µS/cm | |
| | pH | 7.5 – 7.74 pH units | |
| | Oxidation-Reduction Potential | 251.2 – 475.2 mV | |
| | Dissolved Oxygen | All data are above screening level of 2.0 mg/L | |
| Nutrients | Surface Total Nitrogen | 0.99 mg/L to 1.38 mg/L | |
| | Surface Total Phosphorus | 0.170 mg/L to 0.306 mg/L | |
| | Nitrogen to Phosphorus Ratio | 5:1 | 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 | | | | | | | | | | | |

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*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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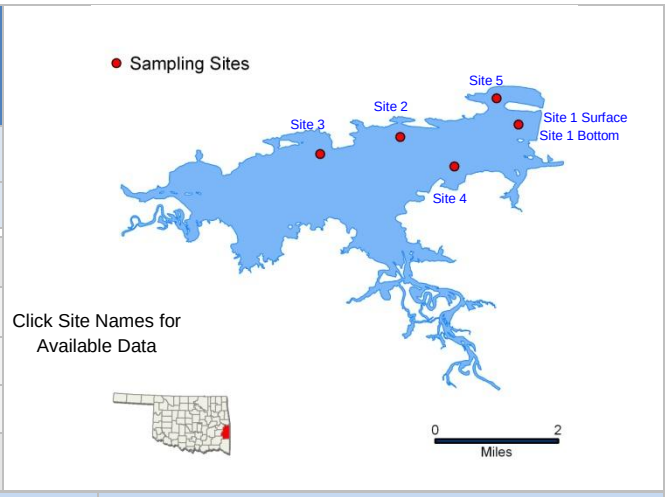
# Wister

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




## General

| | | |
|---|---|---|
| Location | LeFlore County | Click map for site data |
| 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 | 22 NTU | 30% of values < OWQS 25 NTU |
| | Average Secchi Disk Depth | 44 cm | |
| | Water Clarity Rating | Fair | |
| | Chlorophyll-a | 24 mg/m3 | |
| | Trophic State Index | 62 | Previous value =60 |
| | Trophic Class | Hypereutrophic | |
| Profile | Salinity | 0.03 – 0.04 ppt | |
| | Specific Conductivity | 75.7 – 87 µS/cm | |
| | pH | 6.45 – 7.49 pH units | 2 % of Values < 6.5 pH units |
| | Oxidation-Reduction Potential | 23 to 332.2 mV | |
| | Dissolved Oxygen | | All readings above 2 mg/L |
| Nutrients | Surface Total Nitrogen | 0.54 mg/L to 0.66 mg/L | |
| | Surface Total Phosphorus | 0.037 mg/L to 0.062 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 | NS | NS | NEI | S | | | | | | | |
| Aesthetics | | | | | NEI* | * | | | | | |
| Agriculture | | | | | | | S | S | S | | |
| Primary Body Contact Recreation | | | | | | | | | | S | |
| Public & Private Water Supply | | | | | | | | | | | NS |

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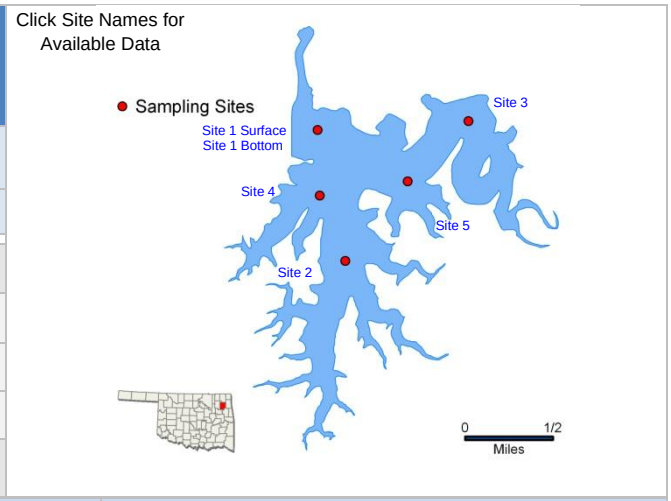
Bathy map available: http://www.owrb.ok.gov/maps/PMG/owrbdata_Bathy.html

# W.R. Holway

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




## General

| | | |
|---|---|---|
| Location | Mayes County | Click map for site data |
| 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*
*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

# Oklahoma 2016 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**<br>**4a**<br>**4b**<br>**4c** | Impaired or threatened for one or more designated uses but does not require the development of a TMDL<br>• TMDL has been completed<br>• Other pollution control requirements are reasonable expected to result in the attainment of the water quality standard in the near future<br>• 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 |

# 2016 Category 5 Waters for the Oklahoma/Arkansas Compact Area

**TMDL Development Priority Schedule**

| TMDL Priority | Proposed Initiation of TMDL Development* |
|---|---|
| 1 | 2018 |
| 2 | 2019-2021 |
| 3 | 2022-2024 |
| 4 | 2025-2027 |

*Dates are only estimates and subject to change

| Waterbody ID | HUC8 | Waterbody Name | Unit | Size | Causes | TMDL Priority | Potential Sources |
|---|---|---|---|---|---|---|---|
| OK120400010280_00 | 11110102 | Bayou Manard | MILES | 14.02 | 105 | 2 | 39, 40 |
| OK120400020010_00 | 11110102 | Dirty Creek | MILES | 44.18 | 322 | 4 | 46, 59, 87, 92, 108, 111, 133, 136, 140 |
| OK120400020030_00 | 11110102 | Dirty Creek, South Fork | MILES | 15.55 | 105, 322, 385 | 4 | 39, 46, 49, 62, 85, 87, 92, 108, 111, 133, 136, 140 |
| OK120400020110_00 | 11110102 | Dirty Creek, Georges Fork | MILES | 10.05 | 230, 441, 322 | 4 | 39, 46, 49, 59, 87, 92, 102, 108, 111, 133, 136, 140 |
| OK120400020160_00 | 11110102 | Butler Creek | MILES | 10.34 | 322 | 4 | 46, 59, 87, 92, 108, 111, 133, 136, 140 |
| OK120400020190_00 | 11110102 | Elk Creek | MILES | 13.96 | 322, 441, 385 | 4 | 46, 49, 62, 85, 87, 92, 108, 111, 133, 136, 140 |
| OK120400020240_00 | 11110102 | Shady Grove Creek | MILES | 10.80 | 399, 385, 441 | 4 | 8, 49, 102, 140 |
| OK120400010070_00 | 11110102 | Webbers Falls Lake | ACRES | 11600 | 413 | 4 | 140 |
| OK120400010130_00 | 11110102 | Greenleaf Lake | ACRES | 920 | 413, 150 | 3 | 140 |
| OK121600010050_00 | 11070209 | Fort Gibson Lake | ACRES | 12464 | 322 | 1 | 46, 108, 133, 136, 140 |
| OK121600010200_00 | 11070209 | Fort Gibson Lake, Upper | ACRES | 4814 | 322 | 1 | 140 |
| OK121600010280_00 | 11070209 | Neosho River | MILES | 14.26 | 322 | 2 | 46, 62, 85, 92, 108, 133, 136, 140 |
| OK121600010430_00 | 11070209 | Chouteau Creek | MILES | 22.25 | 322 | 2 | 46, 87, 92, 108, 136, 140 |
| OK121600020020_00 | 11070209 | Hudson Lake, Lower | ACRES | 5802 | 322 | 1 | 140 |
| OK121600020170_00 | 11070209 | Neosho River | MILES | 10.89 | 267, 322 | 3 | 46, 56, 62, 82, 85, 108, 133, 136, 140 |
| OK121600030020_00 | 11070209 | Grand Lake O' the Cherokees, Lower | ACRES | 10051 | 267, 322 | 1 | 82, 140 |
| OK121600050020_00 | 11070209 | Spavinaw Lake | ACRES | 1584 | 322, 150 | 1 | 4, 46, 59, 92, 108, 133, 136, 146, 140 |
| OK121600050070_00 | 11070209 | Eucha Lake (Upper Spavinaw) | ACRES | 2860 | 322, 150 | 1 | 4, 46, 59, 92, 108, 133, 136, 140, 146 |
| OK121600060060_10 | 11070209 | Big Cabin Creek | MILES | 4.16 | 385 | 3 | 49, 140 |
| OK121600060080_00 | 11070209 | Little Cabin Creek | MILES | 32.31 | 322 | 4 | 46, 85, 87, 92, 108, 111, 133, 136, 140 |
| OK121600060200_00 | 11070209 | Bull Creek | MILES | 10.83 | 399, 322, 138, 385 | 4 | 4, 59, 62, 68, 84, 85, 92, 140 |
| OK121600060220_00 | 11070209 | Big Cabin Creek | MILES | 11.58 | 385 | 4 | 49, 97, 140 |
| OK121600060240_00 | 11070209 | Pawpaw Creek | MILES | 18.40 | 385, 399, 322 | 4 | 46, 92, 108, 133, 136, 140, 156 |
| OK121610000050_10 | 11070209 | Pryor Creek | MILES | 4.97 | 322, 441 | 3 | 8, 46, 85, 87, 92, 102, 108, 111, 128, 133, 136, 140 |
| OK121610000090_00 | 11070209 | Pryor Creek | MILES | 2.35 | 322 | 3 | 84, 85, 92, 140, 156 |
| OK121610000090_10 | 11070209 | Pryor Creek | MILES | 12.12 | 230, 322 | 3 | 46, 49, 59, 87, 92, 102, 108, 111, 136, 140 |
| OK121700010010_00 | 11110103 | Illinois River | MILES | 9.47 | 322 | 3 | 140 |
| OK121700010020_00 | 11110103 | Deep Branch | MILES | 8.71 | 322, 441 | 3 | 39, 140 |
| OK121700020020_00 | 11110103 | Tenkiller Ferry Lake | ACRES | 8442 | 322, 462 | 1 | 140 |
| OK121700020110_00 | 11110103 | Chicken Creek | MILES | 3.54 | 230 | 1 | 46, 59, 87, 92, 108, 111, 133, 136, 140 |
| OK121700020220_00 | 11110103 | Tenkiller Ferry Lake, Illinois River Arm | ACRES | 5032 | 150, 462 | 1 | 4, 59, 108, 136, 140, 146 |
| OK121700020270_00 | 11110103 | Park Hill Branch | MILES | 6.86 | 105 | 3 | 46, 49, 59, 87, 92, 102, 108, 111, 136, 140 |
| OK121700030010_00 | 11110103 | Illinois River | MILES | 7.68 | 215, 462 | 1 | 4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146 |
| OK121700030040_00 | 11110103 | Tahlequah Creek (Town Branch) | MILES | 6.21 | 217 | 1 | 46, 92, 108, 133, 136, 140 |
| OK121700030080_00 | 11110103 | Illinois River | MILES | 31.68 | 215, 462 | 1 | 4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| OK121700030110_00 | 11110103 | Cedar Hollow Creek | MILES | 3.60 | 105 | 1 | 39, 140 |
| OK121700030280_00 | 11110103 | Illinois River | MILES | 15.65 | 215, 462, 413 | 1 | 4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146 |
| OK121700030290_00 | 11110103 | Flint Creek | MILES | 1.60 | 322, 462 | 1 | 4, 46, 59, 92, 108, 133, 136, 140, 146 |
| OK121700030350_00 | 11110103 | Illinois River | MILES | 5.18 | 462 | 2 | 4, 34, 46, 59, 92, 100, 133, 136, 140, 146 |
| OK121700030370_00 | 11110103 | Ballard Creek | MILES | 12.60 | 322, 105, 215 | 2 | 4, 39, 46, 59, 92, 108, 111, 133, 136, 140 |
| OK121700040010_00 | 11110103 | Caney Creek | MILES | 20.92 | 215, 217, 105 | 3 | 46, 59, 85, 92, 100, 108, 136, 140 |
| OK121700050010_00 | 11110103 | Illinois River, Baron Fork | MILES | 25.15 | 462 | 2 | 4, 46, 59, 92, 108, 133, 136, 140, 146 |
| OK121700050090_00 | 11110103 | Tyner Creek | MILES | 15.92 | 215 | 2 | 4, 46, 59, 92, 108, 136, 140 |
| OK121700050120_00 | 11110103 | Peacheater Creek | MILES | 10.95 | 215 | 2 | 4, 46, 59, 92, 100, 108, 128, 136, 140 |
| OK121700050170_10 | 11110103 | Illinois River, Baron Fork | MILES | 7.78 | 215 | 2 | 46, 59, 92, 108, 136, 140 |
| OK121700060010_00 | 11110103 | Flint Creek | MILES | 7.75 | 215, 462 | 1 | 4, 46, 59, 85, 92, 100, 108, 111, 133, 136, 140, 146 |
| OK121700060040_00 | 11110103 | Battle Creek (Battle Branch) | MILES | 5.43 | 215 | 1 | 4, 46, 59, 92, 108, 111, 133, 136, 140 |
| OK121700060080_00 | 11110103 | Sager Creek | MILES | 4.15 | 215, 371, 105 | 1 | 4, 46, 59, 85, 92, 108, 133, 136, 140, 146 |
| OK220200010030_10 | 11110104 | Big Skin Bayou | MILES | 18.51 | 441 | 4 | 39 |
| OK220200020020_00 | 11110104 | Robert S. Kerr Lake | ACRES | 43380 | 413 | 2 | 140 |
| OK220200020130_10 | 11110104 | Vian Creek | MILES | 21.42 | 441, 322 | 4 | 39, 140 |
| OK220200030010_10 | 11110104 | Sallisaw Creek | MILES | 9.00 | 215, 322 | 2 | 39, 140 |
| OK220200030040_00 | 11110104 | Brushy Creek Lake | ACRES | 358 | 150, 441, 413 | 2 | 140 |
| OK220200030120_00 | 11110104 | Stilwell City Lake | ACRES | 188 | 322, 413 | 2 | 46, 108, 133, 136, 140 |
| OK220200040010_10 | 11110104 | Sans Bois Creek | MILES | 10.76 | 385 | 4 | 140 |
| OK220200040010_40 | 11110104 | Sans Bois Creek | MILES | 27.80 | 322 | 4 | 4, 46, 59, 85, 92, 108, 133, 136, 140 |
| OK220200050010_00 | 11110104 | Lee Creek | MILES | 1.87 | 215, 267 | 3 | 46, 49, 92, 108, 133, 136, 140, 146 |
| OK220100010010_00 | 11110105 | Poteau River | MILES | 23.89 | 215, 267 | 2 | 46, 59, 85, 92, 100, 108, 136, 140 |
| OK220100010010_10 | 11110105 | Poteau River | MILES | 1.55 | 215 | 4 | 46, 59, 85, 92, 100, 108, 136, 140 |
| OK220100010010_40 | 11110105 | Poteau River | MILES | 21.35 | 375, 127, 163, 372, 267 | 2 | 140 |
| OK220100010050_00 | 11110105 | New Spiro Lake | ACRES | 254 | 441, 322, 150 | 1 | 46, 92, 108, 133, 136, 140 |
| OK220100010160_00 | 11110105 | Sugarloaf Creek | MILES | 15.00 | 322, 441 | 4 | 39, 140 |
| OK220100010180_00 | 11110105 | Caston Creek | MILES | 14.43 | 385, 105 | 3 | 46, 49, 59, 87, 92, 102, 108, 111, 136, 140 |
| OK220100010265_00 | 11110105 | Rock Creek Tributary! | MILES | 2.01 | 230 | 3 | 46, 49, 59, 87, 92, 102, 108, 111, 136, 140 |
| OK220100020010_10 | 11110105 | Poteau River | MILES | 27.04 | 215, 217 | 1 | 46, 59, 85, 92, 100, 108, 136, 140 |
| OK220100020020_00 | 11110105 | Wister Lake | ACRES | 7333 | 274, 150, 441, 462, 413 | 1 | 140 |
| OK220100020040_00 | 11110105 | Poteau River, Black Fork | MILES | 28.60 | 441 | 2 | 140 |
| OK220100020060_00 | 11110105 | Cedar Lake | ACRES | 78 | 441, 274, 322 | 2 | 46, 92, 108, 133, 136, 140 |
| OK220100020080_00 | 11110105 | Big Creek | MILES | 12.57 | 441, 105 | 2 | 39, 46, 62, 69, 85, 87, 92, 108, 111, 133, 136, 140 |
| OK220100040020_00 | 11110105 | Fourche Maline Creek | MILES | 36.94 | 267, 322 | 2 | 46, 49, 62, 69, 85, 87, 92, 108, 111, 133, 136, 140 |
| OK220100040050_00 | 11110105 | Red Oak Creek | MILES | 10.95 | 441, 322 | 2 | 46, 85, 92, 108, 133, 136, 140 |
| OK220100040080_00 | 11110105 | Bandy Creek | MILES | 12.44 | 230 | 2 | 46, 49, 59, 87, 92, 102, 108, 111, 136, 140 |
| OK220100040100_00 | 11110105 | Lloyd Church Lake (Wilburton City) | ACRES | 160 | 441, 413, 274 | 2 | 140 |
| OK220100040140_00 | 11110105 | Carlton Lake | ACRES | 52 | 274 | 2 | 140 |
| OK220100040150_00 | 11110105 | Wayne Wallace Lake | ACRES | 94 | 322, 441, 274 | 2 | 46, 92, 108, 133, 136, 140 |

Oklahoma Water Resources Board Water Quality Standards Update

September 27, 2018

Revision topics for the 2018-Triennial Rulemaking will include several changes to Oklahoma's Water Quality Standards (OWQS), including updated human health criteria, an updated aquatic life criterion for selenium, and changes to the water quality standards variance process. The changes to the selenium criterion will also include extensive revisions to OAC Chapter 46, Oklahoma's Standards Implementation Rules. These changes will provide implementation rules for permitting, assessment and fish tissue studies, as they are relate to the new selenium criterion. Changes to the variance process will simplify Oklahoma's rules to be compatible with the USEPA's federal regulations for variances. For information on the draft rule revisions and to view revised language, please visit the OWRB website at http://www.owrb.ok.gov/util/rules/wqs_revisions.php.

Also, standards changes proposed in the most recent interim revision were recently approved and became state rule in September. Changes relevant to the Ark/Ok compact area included:

- Revisions and updates to Oklahoma's Antidegradation Policy (OAC 785:45-5-25) and Antidegradation Implementation Rules (OAC 785:46-13)
- Rules to implement Sensitive Water Supply – Reuse (OAC 785:46-13-4)

**OKLAHOMA'S 2017-2018 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**

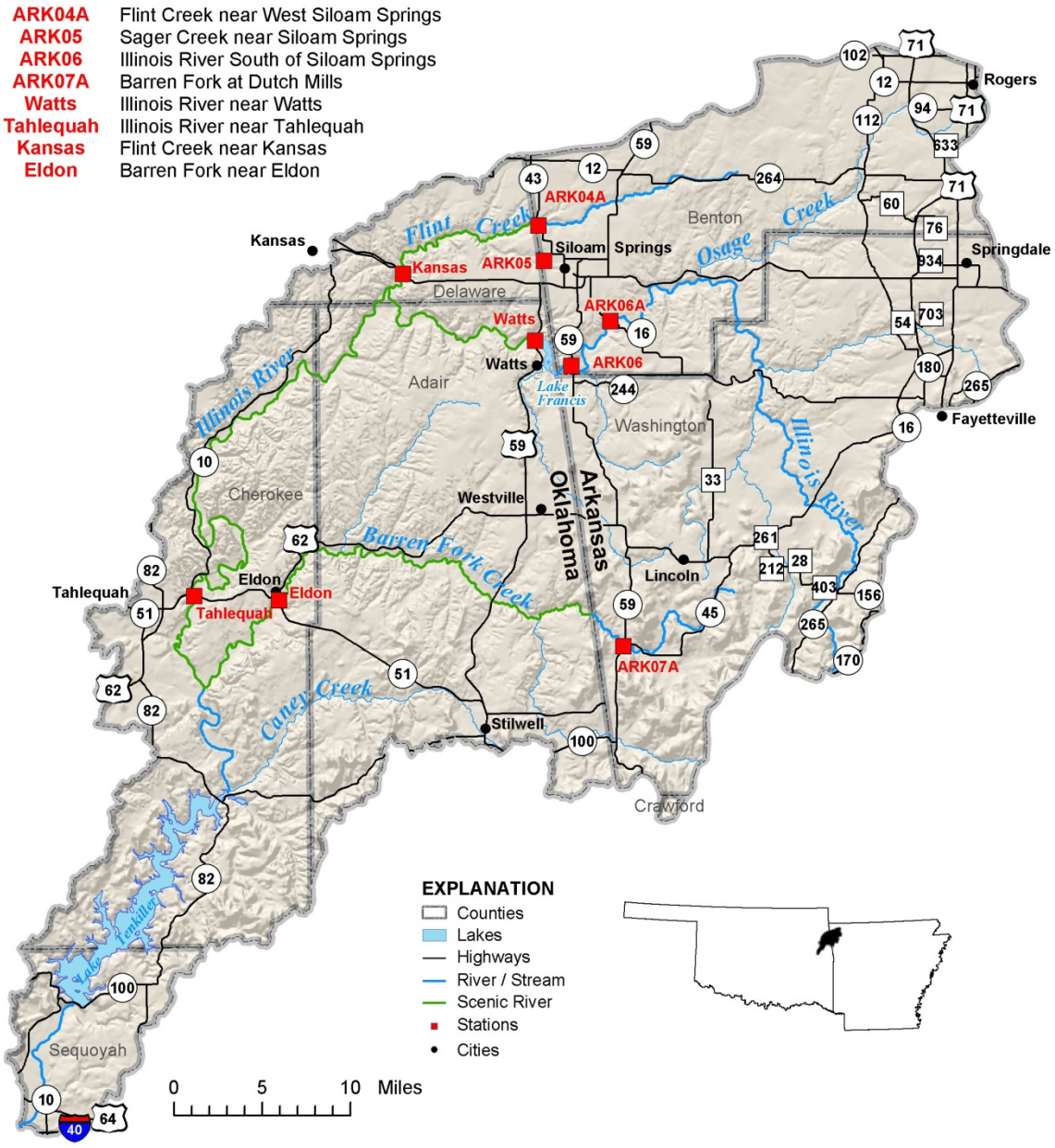
| Waterbody ID | Station Name | Parameter | Cause Code(s) | EPA TMDL ID | DATE |
|---|---|---|---|---|---|
| OK220100040020_00 | Fourche Maline Creek | Enterococcus | 215 | 35634 | 10/28/2008 |
| OK220100010010_00 | Poteau River | Turbidity | 413 | 58800 | 5/13/2014 |
| OK220100010010_40 | Poteau River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

DRAFT

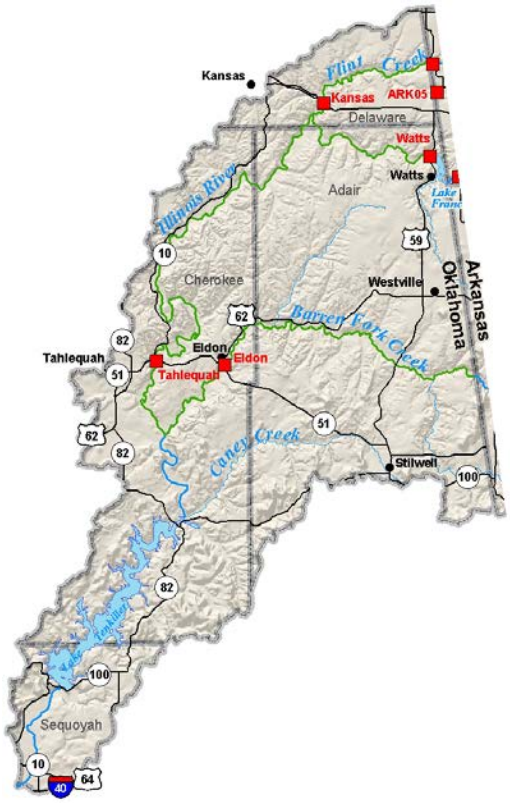
# Water Quality Monitoring Report for the Illinois River Basin

## Illinois River Basin

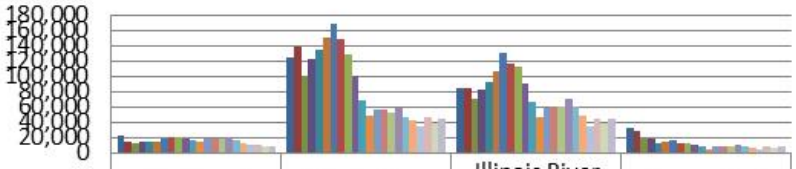
## Arkansas – Oklahoma Compact




CY 2017




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



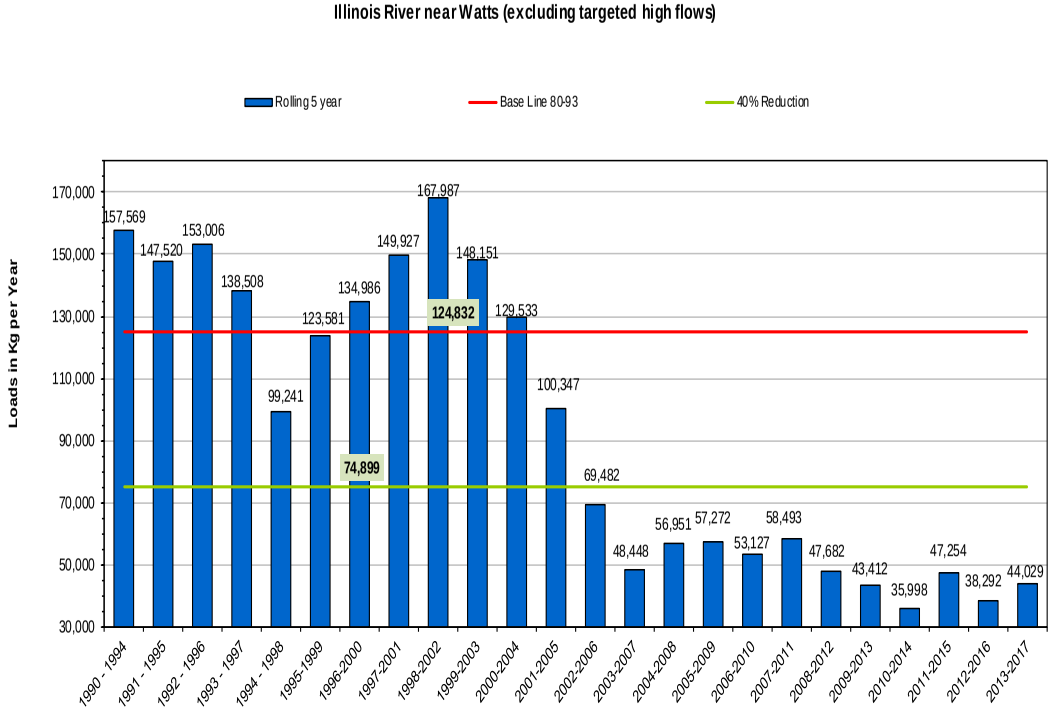

| | Flint Creek near Kansas | Illinois River near Watts | Illinois River near Tahlequah | Barren Fork near Eldon |
|---|---|---|---|---|
| Total P 80-93 | 22,279 | 124,832 | 85,235 | 33,001 |
| Total P 93-97 | 15,727 | 138,508 | 83,799 | 29,482 |
| Total P 94-98 | 12,986 | 99,898 | 70,546 | 19,163 |
| 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 |

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

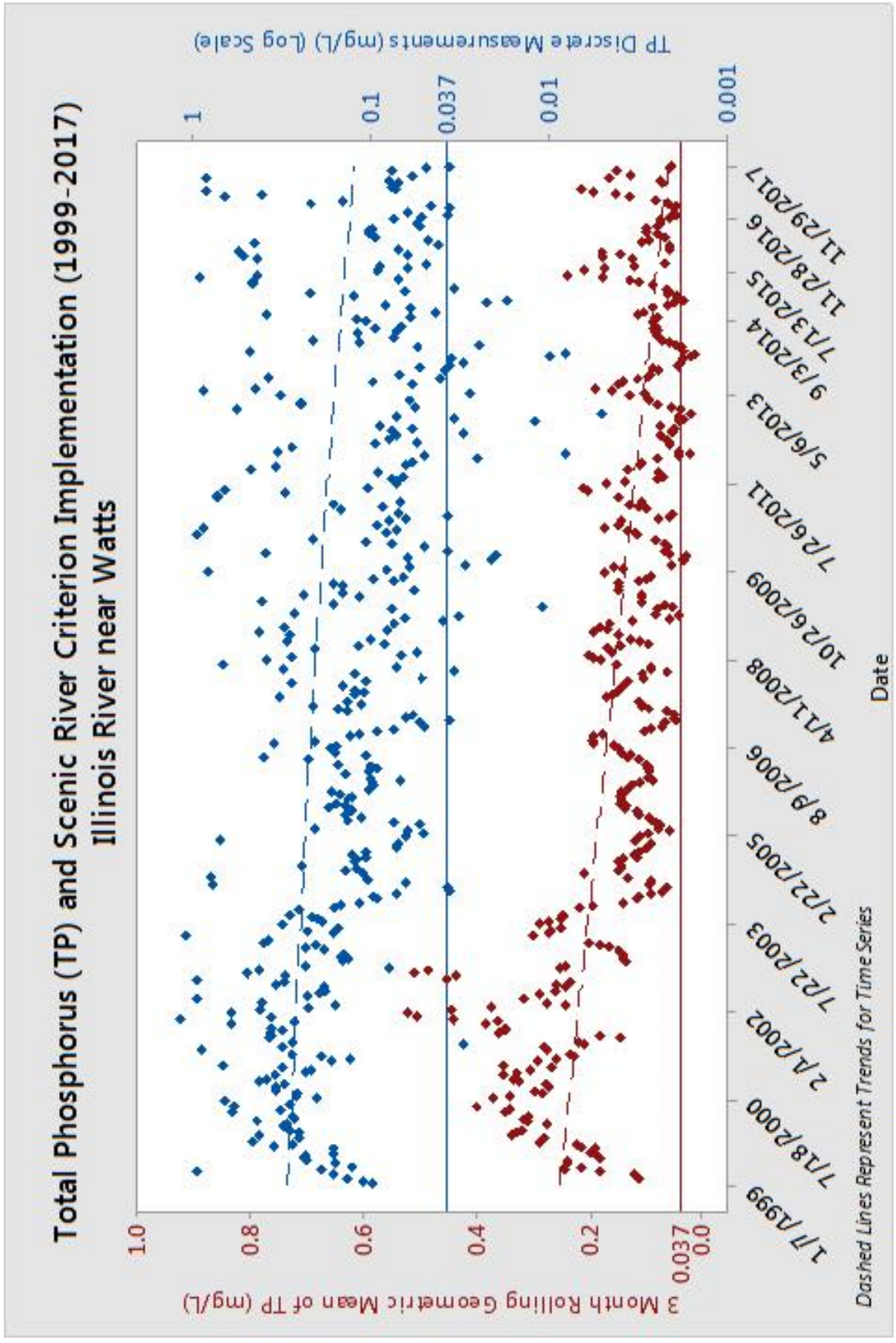
# Illinois River near Watts

| 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 |
| Average | 683 | 0.157 | 95,791 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.064 | 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 | 623 | 778 | 690 | 761 |
| 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 | 35,998 | 47,254 | 38,292 | 44,029 |
| % 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% | 71.2% | 62.1% | 69.3% | 64.7% |



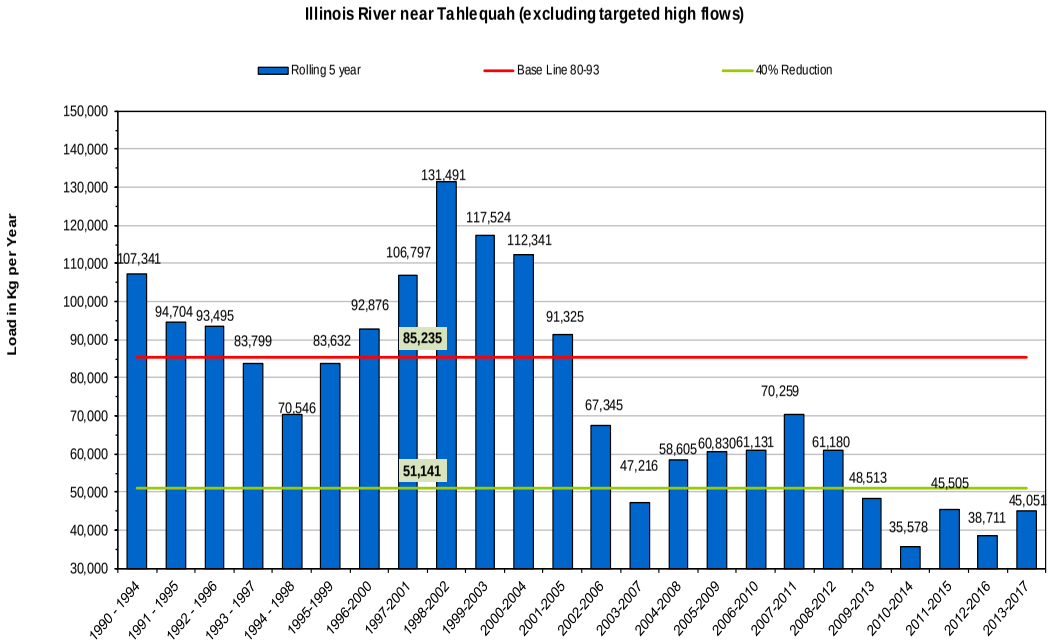

Arkansas - Oklahoma Compact

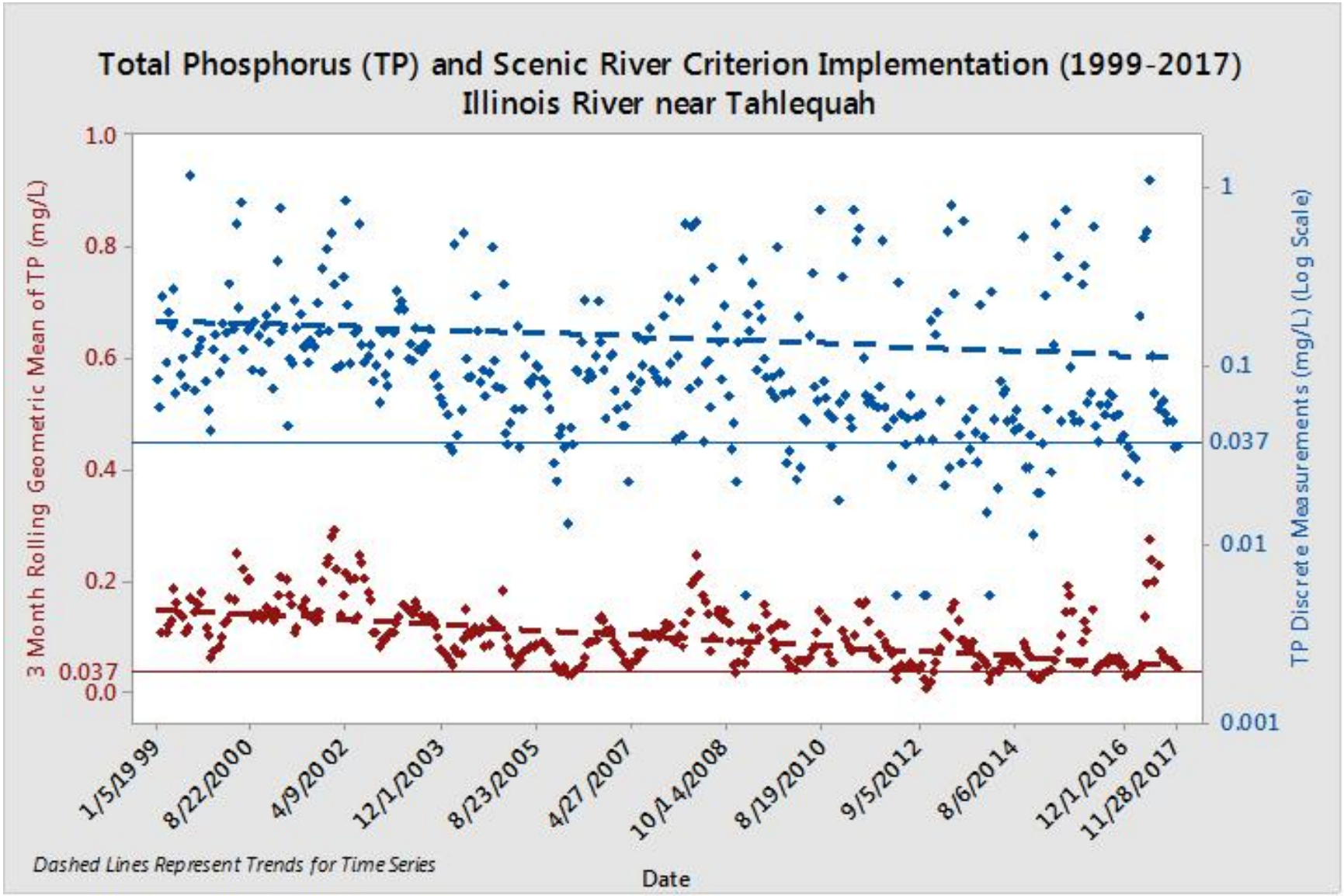

Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2017)
Illinois River near Watts
TP Discrete Measurements (mg/L) (Log Scale)
1
0.1
0.037
0.01
0.001
3 Month Rolling Geometric Mean of TP (mg/L)
1.0
0.8
0.6
0.4
0.2
0.037
0.0
1/1/1999
7/18/2000
2/1/2002
7/22/2003
2/22/2005
8/9/2006
4/11/2008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

# 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 |
| Average | 1,033 | 0.081 | 74,325 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.045 | 0.044 | 0.042 | 0.044 |
| 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 | 1032 | 1140 |
| 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 | 91,325 | 67,345 | 47,216 | 58,605 | 60,827 | 61,131 | 70,259 | 61,180 | 48,513 | 35,578 | 45,505 | 38,711 | 45,051 |
| % 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% | 54.6% | 47.1% |

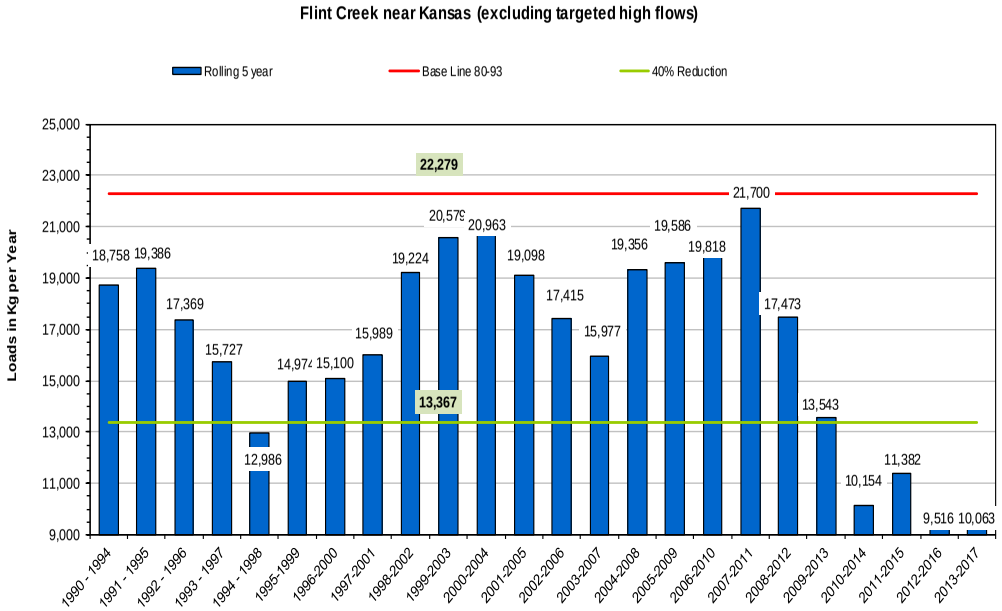


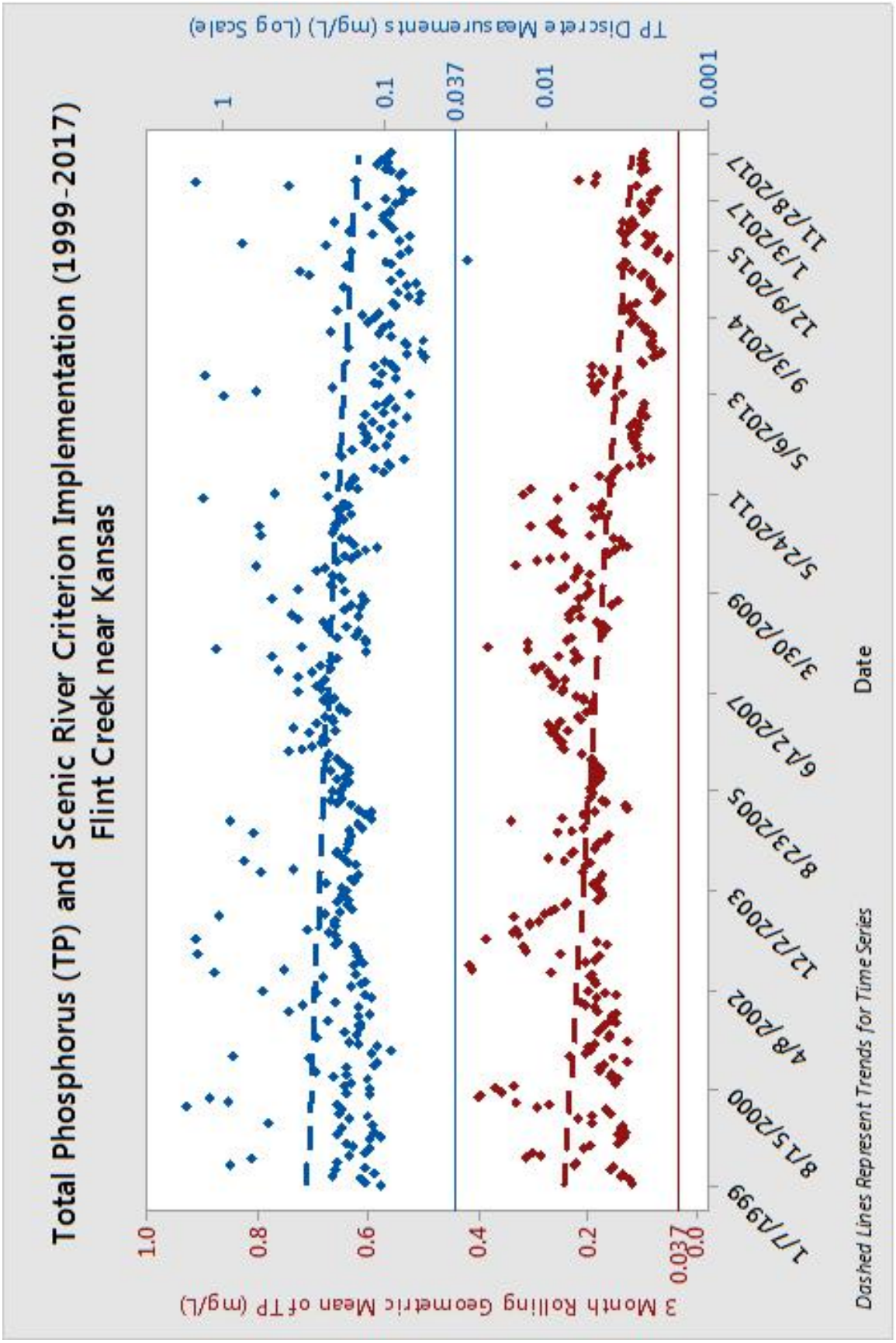

Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2017)
Illinois River near Tahlequah
3 Month Rolling Geometric Mean of TP (mg/L)
TP Discrete Measurements (mg/L) (Log Scale)
1.0
0.8
0.6
0.4
0.2
0.037
0.0
1
0.1
0.037
0.01
0.001
1/5/1999
8/22/2000
4/9/2002
12/1/2003
8/23/2005
4/27/2007
10/14/2008
8/19/2010
9/5/2012
8/6/2014
12/1/2016
11/28/2017
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 | 0 |
| 1991 | | 0.120 | 0 |
| 1992 | | 0.118 | 0 |
| 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 |
| Average | 114 | 0.181 | 18,360 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 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 |
| Pt (kg/yr) | 22,279 | 18,758 | 19,386 | 17,369 | 15,705 | 12,986 | 14,949 | 15,103 | 15,992 | 19,259 | 20,620 | 21,004 | 19,098 | 17,415 | 15,977 | 19,356 | 19,586 | 19,818 | 21,700 | 17,473 | 13,543 | 10,154 | 11,382 | 9,516 | 10,063 |
| % Decrease | 0.0% | 15.8% | 13.0% | 22.0% | 29.5% | 41.7% | 32.9% | 32.2% | 28.2% | 13.6% | 7.4% | 5.7% | 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% |

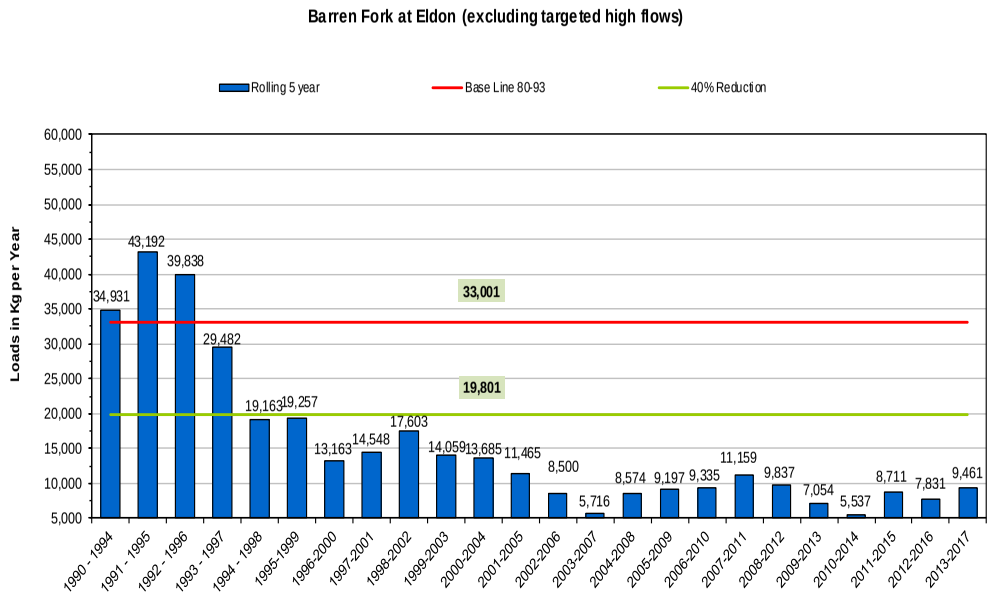


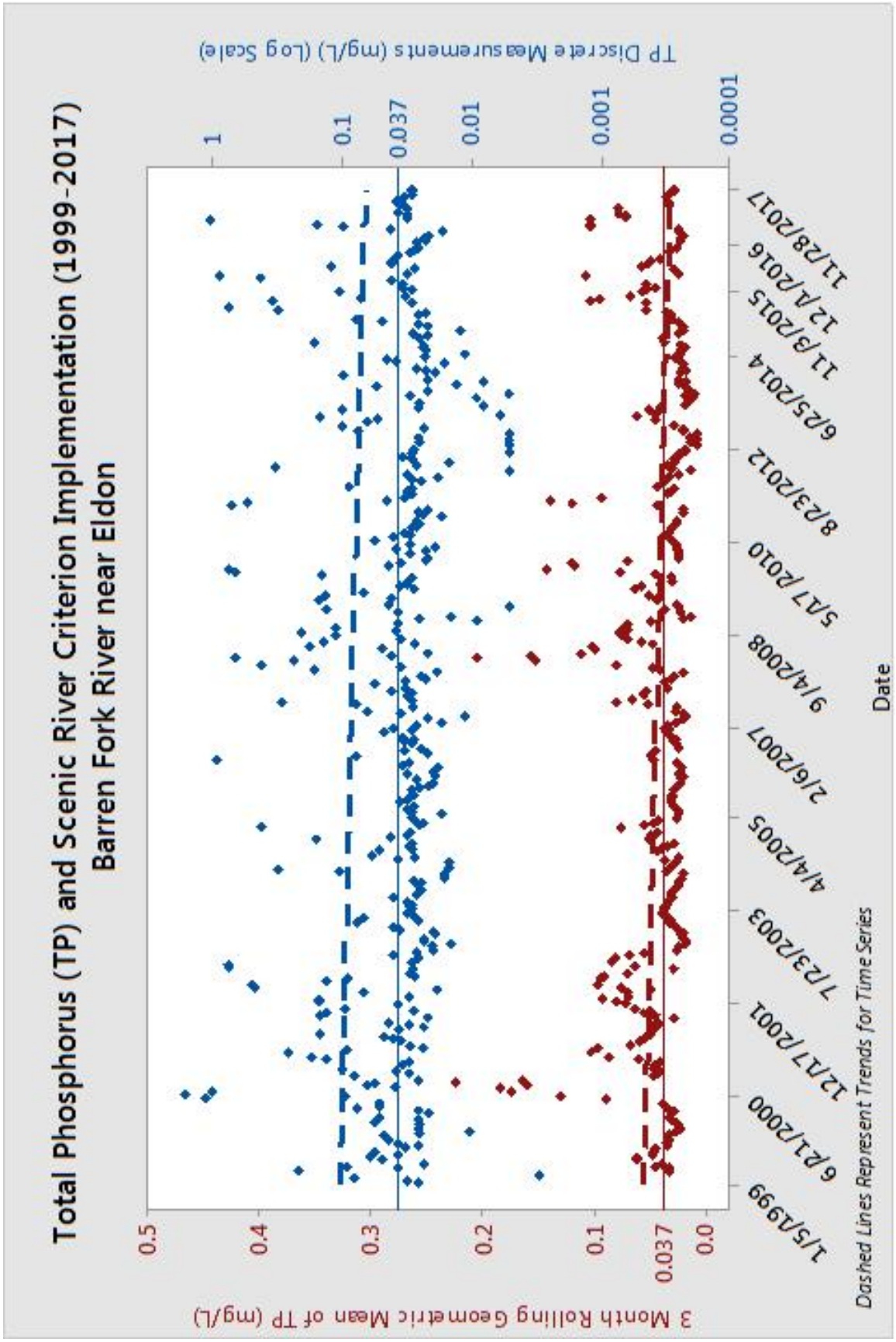

Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2017)
Flint Creek near Kansas
3 Month Rolling Geometric Mean of TP (mg/L)
1.0
0.8
0.6
0.4
0.2
0.037
0.0
TP Discrete Measurements (mg/L) (Log Scale)
1
0.1
0.037
0.01
0.001
1/1/1999
8/15/2000
4/8/2002
12/2/2003
8/23/2005
6/12/2007
3/30/2009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

# 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 |
| Average | 361 | 0.049 | 15,780 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 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 |
| 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 | 13,865 | 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 |
| % Decrease | 0.0% | -5.8% | -30.9% | -20.7% | 10.7% | 41.9% | 41.6% | 60.1% | 55.9% | 46.7% | 57.4% | 58.0% | 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% |




Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2017)
Barren Fork River near Eldon
TP Discrete Measurements (mg/L) (Log Scale)
1
0.1
0.037
0.01
0.001
0.0001
3 Month Rolling Geometric Mean of TP (mg/L)
0.5
0.4
0.3
0.2
0.1
0.037
0.0
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
11/8/2015
12/1/2016
11/28/2017
Date
Dashed Lines Represent Trends for Time Series

# 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

| 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-05-0013-G | Westville Utility Authority | Adair | $100,000.00 | 10/11/2005 | Emergency |
| FAP-05-0051-R | Westville Utility Authority | Adair | $0.00 | 7/16/2013 | REAP |
| FAP-12-0006-L | Westville Utility Authority | Adair | $1,350,000.00 | 3/13/2012 | FA Loan |
| 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-12-0010-L | Cherokee County Rural Water District #13 | Cherokee | $1,600,000.00 | 3/13/2012 | FA Loan |
| FAP-95-0060-G | Cherokee County Rural Water District #13 | Cherokee | $100,000.00 | 1/9/1996 | Emergency |
| 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-98-0052-G | Cherokee County Rural Water District #3 | Cherokee | $45,000.00 | 2/10/1999 | Emergency |
| 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-91-0057-G | Cherokee County Rural Water District #7 -- Welling | Cherokee | $23,180.00 | 9/10/1991 | Emergency |
| FAP-08-0033-R | Cherokee County Rural Water District #7 -- Welling | Cherokee | $39,069.00 | 12/9/2008 | REAP |
| FAP-06-0011-R | Cherokee County Rural Water District #8 -- Briggs | Cherokee | $99,999.00 | 6/12/2007 | REAP |
| FAP-91-0058-G | Cherokee County Rural Water District #8 -- Briggs | Cherokee | $23,180.00 | 9/10/1991 | Emergency |

| | | | | | |
|---|---|---|---|---|---|
| FAP-09-0034-R | Cherokee County Rural Water District #8 -- Briggs | Cherokee | $34,914.00 | 4/13/2010 | REAP |
| FAP-02-0001-L | Cherokee County Rural Water District #8 -- Briggs | Cherokee | $285,000.00 | 6/11/2002 | FA Loan |
| FAP-83-0021-G | Cherokee County Rural Water District #8 -- Briggs | Cherokee | $53,000.00 | 1/10/1984 | Emergency |
| 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-83-0044-G | Hulbert | Cherokee | $100,000.00 | 1/10/1984 | 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 |
| 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-96-0132-R | Depew | Creek | $59,000.00 | 1/14/1997 | REAP |
| 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-11-0015-R | Depew Public Works Authority | Creek | $0.00 | 7/16/2013 | REAP |
| FAP-85-0131-G | Drumright | Creek | $76,000.00 | 5/14/1985 | Emergency |
| FAP-83-0027-G | Drumright | Creek | $100,000.00 | 1/10/1984 | Emergency |
| 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 |
| FAP-00-0062-R | Kiefer Public Works Authority | Creek | $150,000.00 | 4/10/2001 | REAP |
| ORF-94-0008-CW | Kiefer Public Works Authority | Creek | $320,000.00 | 9/12/1995 | CWSRF |
| ORF-14-0006-CW | Kiefer Public Works Authority | Creek | $320,000.00 | 12/17/2013 | CWSRF |
| FAP-96-0186-R | Mounds | Creek | $55,200.00 | 4/8/1997 | REAP |
| FAP-83-0075-G | Oilton | Creek | $28,420.00 | 4/10/1984 | Emergency |
| FAP-09-0013-R | Oilton | Creek | $78,400.00 | 7/13/2010 | REAP |
| 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 |
| 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-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-84-0015-G | Colcord | Delaware | $95,816.00 | 4/10/1984 | 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-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 |
| 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 |
| 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 |
| FAP-83-0012-G | Kansas | Delaware | $92,516.00 | 3/13/1984 | Emergency |
| FAP-86-0002-G | Kansas Public Works Authority | Delaware | $65,000.00 | 1/12/1988 | Emergency |
| FAP-97-0040-R | Kansas Public Works Authority | Delaware | $139,270.00 | 3/10/1998 | REAP |
| FAP-97-0097-R | Kansas Public Works Authority | Delaware | $109,500.00 | 11/16/1999 | REAP |

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| FAP-02-0003-R | Kansas Public Works Authority | Delaware | $67,000.00 | 11/12/2002 | REAP |
| 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 |
| FAP-94-0013-G | West Siloam Springs | Delaware | $18,315.00 | 7/12/1994 | 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-01-0008-L | West Siloam Springs Municipal Authority | Delaware | $275,000.00 | 11/13/2001 | FA Loan |
| FAP-83-0003-G | Boynton | Muskogee | $27,695.00 | 8/12/1983 | Emergency |
| FAP-10-0001-G | Boynton | Muskogee | $13,607.53 | 3/9/2010 | Emergency |
| FAP-91-0047-G | Boynton Public Works Authority | Muskogee | $50,000.00 | 2/8/1994 | Emergency |
| FAP-00-0032-G | Boynton Public Works Authority | Muskogee | $81,591.00 | 1/9/2001 | Emergency |
| FAP-96-0077-R | Braggs | Muskogee | $36,995.00 | 1/14/1997 | REAP |
| FAP-90-0100-G | Braggs Public Works Authority | Muskogee | $70,000.00 | 2/12/1991 | Emergency |
| FAP-98-0049-G | Council Hill | Muskogee | $100,000.00 | 3/9/1999 | Emergency |
| FAP-96-0045-G | East Central OK Water | Muskogee | $97,750.00 | 4/14/1998 | Emergency |
| FAP-97-0021-R | East Central OK Water | Muskogee | $59,700.00 | 3/11/1997 | REAP |
| 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-11-0004-CW | Fort Gibson Utilities Authority | Muskogee | $980,000.00 | 4/12/2011 | CWSRF |
| 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-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 |

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| 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-14-0012-CW | Muskogee Municipal Authority | Muskogee | $7,300,000.00 | 12/17/2013 | CWSRF |
| 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-14-0012-R | Porum Public Works Authority | Muskogee | | 12/16/2014 | REAP |
| FAP-04-0064-R | Taft | Muskogee | $99,557.68 | 1/11/2005 | REAP |
| FAP-83-0091-G | Taft | Muskogee | $86,620.00 | 1/10/1984 | Emergency |
| FAP-84-0020-G | 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-02-0064-R | Gans | Sequoyah | $110,000.00 | 4/16/2006 | REAP |
| FAP-84-0090-G | Gans | Sequoyah | $100,000.00 | 5/14/1985 | Emergency |
| FAP-01-0005-R | Gore Public Works Authority | Sequoyah | $60,000.00 | 11/13/2001 | REAP |
| FAP-83-0008-G | Marble City | Sequoyah | $100,000.00 | 2/14/1984 | Emergency |
| FAP-84-0043-G | Muldrow | Sequoyah | $77,200.00 | 4/10/1984 | Emergency |
| ORF-11-0007-CW | Muldrow Public Works Authority | Sequoyah | $3,705,000.00 | 9/13/2011 | CWSRF |
| FAP-12-0001-L | Roland Utilities Authority | Sequoyah | $3,360,000.00 | 2/13/2012 | FA Loan |
| ORF-08-0003-CW | Roland Utilities Authority | Sequoyah | $3,855,000.00 | 6/10/2008 | CWSRF |
| FAP-95-0001-G | Roland Utilities Authority | Sequoyah | $75,000.00 | 5/14/1996 | Emergency |
| FAP-95-0053-L | Roland Utilities 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-89-0071-G | Utility Service Authority | Sequoyah | $20,097.00 | 1/9/1990 | Emergency |

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| 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 2017

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Permits Issues within the Illinois River Basin for Calendar Year 2017** | | | | | | | | | | | |
| | | | | | **Diversion Point Legal** | | | | | | | | | |
| Permit # | LAST NAME | FIRST NAME | 1/4 | 1/4 | 1/4 | SECT | TWP | RNG | COUNTY | STREAM SYSYTEM | DATE FILED | DATE ISSUED | PURPOSE | AMT (af/yr) |
| 20160005 | | OK Dept. of Wildlife | NW | NW | NE | 28 | 13N | 21EI | Sequoyah | 2170 | 3/25/2016 | 5/16/2017 | Recreation, Fish & Wildlife | 48324 |

Only 1 new permit was issued for in 2017.

# OKLAHOMA CONSERVATION COMMISSION
# Program Activities in the Illinois River Watershed
# for the period of October 2017 through September 2018



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 47 participants maintain 2,091 acres that are set aside at an annual cost of $127,648.

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. The Grand River Dam Authority (GRDA) has taken oversight management of Oklahoma Scenic Rivers utilizing long-time Director, Ed Fite, to still handle direct administration. In partnership with the GRDA the OCC has made $1,000,000 available for new long-term riparian easement protection along the Illinois River; Ed is already busy enrolling landowners. These riparian exclusions are funded with U.S. EPA §319 dollars.

## 2.) Blue Thumb Monitoring and Education

The OCC's Blue Thumb education division supports volunteers monitoring five sites in the watershed. The collections are quality assurance tested and the data is centrally compiled and accessible.

Town Branch is a tributary of the Illinois River. A Blue Thumb volunteer group in Tahlequah, Friends of Town Branch, continues to educate citizens regarding water quality issues, preserving the biological integrity of the natural resource, and promoting the aesthetic value of the creek.

Blue Thumb provided educational activities with support from GRDA for a youth camp, Journey to the Bottom of the Creek, on the Illinois River where kids learned about pollution, conservation, watersheds, the water cycle, and what lives in the water. A month later Blue Thumb with Project WET held a teacher workshop which imparted many of the same lessons to the educators and also presented curriculum texts.