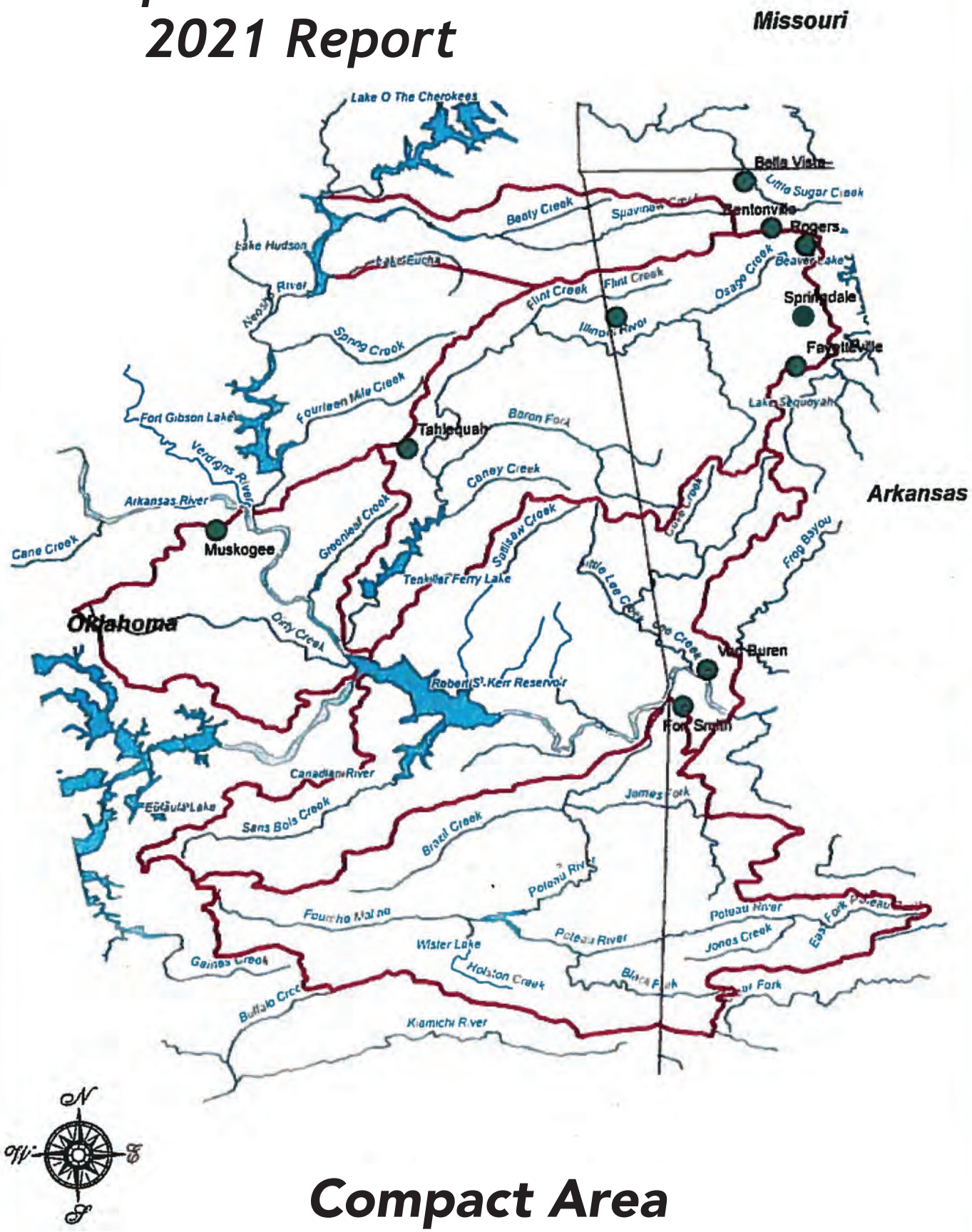
Arkansas River Compact Commission 2021 Report



Compact Area

Arkansas River Compact Commission

ARKANSAS NATURAL RESOURCES COMMISSION
10421 W Markham
Little Rock, AR 72205
Phone (501) 682-1611 / Fax (501) 682-3991
www.agriculture.arkansas.gov

OKLAHOMA WATER RESOURCES BOARD
3800 North Classen Blvd.
Oklahoma City, Oklahoma 73118
Phone (405) 530-8800 / Fax (405) 530-8900
www.owrb.ok.gov

September 23, 2022

The President
United States of America

The Honorable Kevin Stitt
Governor, State of Oklahoma

The Honorable Asa Hutchinson
Governor, State of Arkansas

Dear Mr. President and Governors:

Pursuant to Article 9B(6) of the Arkansas-Oklahoma Arkansas River Compact (AOARC), submitted herewith is a copy of the report covering the activities of the Commission for 2021. A budget covering the anticipated expenses of the Commission for July 1, 2021 – June 30, 2022 is included in the report.

The 2021 Annual Meeting was hosted by the State of Arkansas. Reports of the Budget, Engineering, Environmental and Natural Resources, and Legal Committees were presented, and the Commission approved committee assignments and appointments.

Respectfully submitted.

Delia J. Haak

Dr. Delia Haak
Federal Commissioner and Chairman
Arkansas-Oklahoma Arkansas River Compact Commission

DH/ah

2021
Arkansas-Oklahoma Arkansas River
Compact Commission Annual Report

TABLE OF CONTENTS

Page

Letter to the President and Governors…….…… i

Table of Contents……..…… ii

2021 Commission Directory…..……..……. 1

Agenda & Minutes of September 23, 2021 Annual Meeting…...…… 8

Attendee List…...……..……..……. 22

Report of the Treasurer……...……. 24

Report of the Commissioners
- Arkansas…….…… 27
- Oklahoma…….……..… 34

Committee Reports
- Budget Committee…….…… 39
- Engineering Committee…….…… 40
- Arkansas Environmental and Natural Resources Committee……..……. 51
- Oklahoma Environmental and Natural Resources Committee…..…… 80

Federal and State Government Representative Reports
- Illinois River Watershed Partnership……. 173
- Oklahoma Conservation Commission……... 207

Arkansas-Oklahoma Arkansas River Compact……... 220
- Rules, Regulations and Modes of Procedure…….....….. 256

Guidelines for the Computation of Annual Yields……...…….. 267

ARKANSAS-OKLAHOMA
ARKANSAS RIVER COMPACT COMMISSION
2021 DIRECTORY

FEDERAL CHAIRMAN
Dr. Delia Haak
Chairman/Federal Commissioner
20083 Dawn Hill East Road
Gentry, AR 72734
PH: (479) 238-4671
dhaak@jbu.edu

ALTERNATE FEDERAL CHAIRMAN
Joel West Williams
Staff Attorney
Native American Rights Fund
1514 P Street NW (Rear), Suite D
Washington, DC 20005
(202) 785-4166
williams@narf.org

ARKANSAS
Chris Colclasure, Arkansas Commissioner
Director
AR Natural Resources Division
10421 W Markham Street
Little Rock, AR 72205
PH: (501) 682-3986
FAX: (501) 682-3991
chris.colclasure@arkansas.gov

James Mardis, III
Arkansas Commissioner
P.O. Box 3036
Russellville, AR 72811
PH: (479) 263-9546
Jimmy.mardis@denaliwater.com

Becky Keogh, Arkansas Commissioner
Cabinet Secretary, AR Department of
Energy & Environment
5301 Northshore Drive
North Little Rock, AR 72118
Phone: (501) 682-0662
Cell: 501-837-0628
keogh@adeq.state.ar.us

OKLAHOMA
Julie Cunningham, Oklahoma
Commissioner
Executive Director
Oklahoma Water Resources Board
3800 N. Classen Boulevard
Oklahoma City, OK 73118
PH: (405) 530-8800
FAX: (405) 530-8900
Julie.cunningham@owrb.ok.gov

Victoria Tran, Oklahoma Commissioner
Senior Counsel and Policy Advisor,
Secretary of Energy & Environment
204 N. Robinson, Suite 1010
Oklahoma City, OK 73012
Phone: (405) 522-7226
Cell: (405) 208-9450
victoria.tran@ee.ok.gov

Scott Thompson, Oklahoma Commissioner
Executive Director, Oklahoma Department
of Environmental Quality
707 North Robinson
Post Office Box 1677
Oklahoma City, OK 73101-1677
(405) 702-7163
Scott.Thompson@deq.ok.gov

Arkansas Committee Staff

April Harris, Administrative Analyst
AR Natural Resources Division
10421 W Markham Street
Little Rock, AR 72205
501-682-3986
April.Harris@arkansas.gov

Ryan Benefield, Treasurer
AR Natural Resources Division
10421 W Markham Street
Little Rock, AR 72205
(501) 682-0959
Ryan.benefield@arkansas.gov

Wade Hodge, Chief Counsel
AR Department of Agriculture
1 Natural Resources Drive
Little Rock, AR 72205
PH: (501) 219-6361
FAX: (501) 219-1697
Wade.hodge@agriculture.arkansas.gov

Shawn Jackson
AR Natural Resources Division
10421 W Markham Street
Little Rock, AR 72205
(501) 682-3985
Shawn.jackson@arkansas.gov

Oklahoma Committee Staff

Bill Cauthron, Chief
Water Quality Programs Division
Oklahoma Water Resources Board
3800 N. Classen Boulevard
Oklahoma City, OK 73118
PH: (405) 530-8800
FAX: (405) 530-8900
Bill.cauthron@owrb.ok.gov

Chris Neel, Chief
Water Rights Administration Division
Oklahoma Water Resources Board
3800 N. Classen Boulevard
Oklahoma City, OK 73118
PH: (405) 530-8800
FAX: (405) 530-8900
chris.neel@owrb.ok.gov

Sara Gibson, General Counsel
Oklahoma Water Resources Board
3800 N. Classen Boulevard
Oklahoma City, OK 73118
PH: (405) 530-8800
FAX: (405) 530-8900
sara.gibson@owrb.ok.gov

Mary Schooley, Executive Secretary
Oklahoma Water Resources Board
3800 N. Classen Boulevard
Oklahoma City, OK 73118
PH: (405) 530-8800
FAX: (405) 530-8900
Mary.schooley@owrb.ok.gov

Julie Chambers
Water Quality Programs Division
Oklahoma Water Resources Board
3800 N. Classen Boulevard
Oklahoma City, OK 73118
PH: (405) 530-8800
FAX: (405) 530-8900
Julie.chambers@owrb.ok.gov

Yohanes Sugeng, Chief Engineer
Engineering and Planning Division,
Oklahoma Water Resources Board
3800 N. Classen Boulevard
Oklahoma City, OK 73118
PH: (405) 530-8800
FAX: (405) 530-8900
Yohanes.sugeng@owrb.ok.gov

FEDERAL, STATE AGENCIES and OTHERS

Division Engineer
Department of the Army
Southwest Division, COE
1114 Commerce Street
Dallas, Texas 75242-0216

District Engineer
Department of the Army
Corps of Engineers
Little Rock District
P. O. Box 867
Little Rock, Arkansas 72203

District Chief
Department of the Army
Corps of Engineers, Tulsa District
1645 South 101 East Avenue
Tulsa, Oklahoma 74128
(Mike Abate)
Mike.R.Abate@usace.army.mil

U. S. Geological Survey, WRD
401 Hardin Road
Little Rock, Arkansas 72211
Phone: (501) 228-3600
Fax: (501) 228-3601

Jason Lewis
U. S. Geological Survey, WRD
Building 7, 2020 Northwest 66th Street
Oklahoma City, Oklahoma 73116
jmlewis@usgs.gov

U. S. Fish and Wildlife Service
9041 E. 21st
Tulsa, Oklahoma 74127

Gary O'Neill, State Conservationist
100 USDA
Stillwater, OK 74074
Office 405-742-1000
gary.oneill@ok.usda.gov

Nathan Kuhnert
Bureau of Reclamation
5924 NW 2nd Street Suite 200
Oklahoma City, Oklahoma 73127
(405) 470-4800
NKuhnert@usbr.gov

David Yarbrough, Director
Port of Catoosa
5350 Cimarron Road
Catoosa, Oklahoma 74105

Scott Robinson, Director
Port of Muskogee
5201 Three Forks Road
P.O. Box 2819
Ft. Gibson, OK 74434

Waterways, ODOT
4002 Mingo Valley Expressway
P. O. Box 660
Tulsa, Oklahoma 74101

State Conservationist
Arkansas NRCS
Room 3416 Federal Building
700 W. Capitol
Little Rock, Arkansas 72201
PH: 301-3100

Melvin Tobin
US Fish and Wildlife Service
110 S. Amity Road
Conway, AR 72032
(501) 513-4470

Ed Fite, VP Water Quality & Scenic Rivers
Grand River Dam Authority
P.O. Box 292
Tahlequah, OK 74464
PH: (918) 456-3251
edward.fite@grda.com

2004 ADDITIONAL APPOINTMENTS BY STATES TO ENVIRONMENTAL COMMITTEE

STATE OF OKLAHOMA

Blayne Arthur, Secretary
Oklahoma Department of Agriculture, Food & Forestry
2800 North Lincoln Blvd.
Oklahoma City, OK 73015
PH: (405) 521-3864
FAX: (405) 521-4912
blayne.arthur@ag.ok.gov

Teena Gunter, General Counsel & Agricultural Environmental Management Services Director
Oklahoma Department of Agriculture, Food & Forestry
2800 North Lincoln Blvd.
Oklahoma City, OK 73015
PH: (405) 522-4659
FAX: (405) 521-4912
teena.gunter@ag.ok.gov

Caleb Whitcomb
Asst. Director, Agriculture Environmental Management Services Division
Oklahoma Department of Agriculture, Food & Forestry
2800 North Lincoln
Oklahoma City, OK 73015
(405)522-4659
caleb.whitcomb@ag.ok.gov

Trey Lam, Executive Director
Oklahoma Conservation Commission
2800 N. Lincoln Boulevard, Suite 168
Oklahoma City, OK 73105
(405) 521-2384
Trey.lam@conservation.ok.gov

J.D. Strong, Executive Director
Oklahoma Department of Wildlife Conservation
P.O. Box 53465
Oklahoma City, OK 73152
(405) 521-3851
Jd.strong@odwc.ok.gov
josh.johnston@odwc.ok.gov

STATE OF ARKANSAS

Austin Booth
Arkansas Game & Fish Commission
#2 Natural Resources Drive
Little Rock, AR 72205
PH: 501-223-6300

Jennifer Elise Sheehan, Chief
Environmental Coordination Division
Arkansas Game & Fish Commission
#2 Natural Resources Drive
Little Rock, AR 72205
PH: 501-223-6356
jennifer.sheehan@agfc.ar.gov

Dr. Nate Smith, Secretary
Arkansas Department of Health
4815 W. Markham
Little Rock, AR 72204
PH: 661-2000

Deidre Smith
Arkansas Waterways Commission
101 E. Capitol, Suite 370
Little Rock, AR 72201
PH: 682-1173

INTERESTED OTHERS

Tom Elkins, Cherokee Nation
P.O. Box 948
Tahlequah, OK 74465
(918) 453-5237
Tom-elkins@cherokee.org

Becky Keogh, Secretary
Arkansas Department of Energy and Environmental
5301 Northshore Drive
North Little Rock, AR 72118-5317
keogh@adeq.state.ar.us
Office of the Attorney General
313 N.E. 21st
Oklahoma City, Ok 73105

The OKLAHOMAN
P. O. Box 25125
Oklahoma City, OK 73125-0125

Marla Peek
Oklahoma Farm Bureau
2501 N. Stiles
Oklahoma City, OK 73105
marla.peek@okfb.com

NRCS Regional Water Management Center
101 East Capitol, Suite 212
Little Rock, AR 72201-3811

Ava Roberts, Executive Director
Arkansas Environmental Federation
415 N. McKinley, suite 835
Little Rock, AR 72201

City Desk
Arkansas Democrat-Gazette
P .O. Box 2221
Little Rock, AR 72201

Richard A. Gordon, Jr.
Public Awareness Committee, Inc.
1145 No. 57th Place
Fort Smith, AR 72904

Brian Rosenthal
The Rose Law Firm
120 E. Fourth Street
Little Rock, AR 72201
PH: 375-9131

M. Lane Crider, P.E.
Beaver Water District
P. O. Box 400
Lowell, AR 72745
lcrider@bwdh2o.org
(479) 756-3651

Bradley Dixon, Liaison
Office of the Governor
Room 120 State Capitol
Little Rock, AR 72201

Drew A. Westerman, CFM
Data Chief
U.S. Geological Survey
Lower Mississippi-Gulf Water Science Center
401 Hardin Rd.
Little Rock, AR 72211
501-228-3643
dawester@usgs.gov
http://ar.water.usgs.gov

Thomas S. Soerens, Associate Professor
University of Arkansas
Civil Engineering
Fayetteville, AR 72201

Marty D. Matlock
Room 203 – Engineering Hall
University of Arkansas
Fayetteville, AR 72701

Director of the Water Quality Lab
700 Research Center Blvd. Chemistry 101
Fayetteville, AR 72701

Northwest Arkansas Council
4100 Corporate Center Drive, Suite 205
Springdale, AR 72765

Representative Robin Lundstrum
PO Box 14
Elm Springs, AR 72728

City Administrator
P. O. Box 80
Siloam Springs, AR 72761

Mr. James Moore
Parson's Engineering
2530 Elmer King Road
Belton, Texas 76513

AGENDA
ARKANSAS-OKLAHOMA ARKANSAS RIVER
COMPACT COMMISSION ANNUAL MEETING

September 22-23, 2021

Queen Wilhelmina State Park
3877 Highway 88 West
Mena, AR 71953

Committee Meetings; September 22, 2021

a. 1:00 p.m. Environmental and Natural Resources Committee
b. 2:00 p.m. Engineering Committee
c. 3:00 p.m. Budget Committee
d. 3:30 p.m. Legal Committee

DINNER – ON OWN

7:00 P.M. AOARCC HOSTED RECEPTION

The Arkansas-Oklahoma Arkansas River Compact Commission will host a reception for all compact meeting participants with snacks and non-alcoholic beverages. Additional beverages can be purchased at the lodge restaurant.

COMMISSION MEETING; September 23, 2021
9:00 a.m.

A. Call to Order

B. Introductions and Announcements

C. Approval of Agenda

D. Consideration and Approval of Meeting Minutes of 2020 Annual Meeting

E. Report of the Chairman – Delia Haak, Federal Commissioner

F. Report of the Treasurer – Ryan Benefield

G. Report of the Commissioners
   1. Arkansas
   2. Oklahoma

H. Committee Reports
   1. Budget Committee, Ryan Benefield, Chair
   2. Engineering Committee, Shawn Jackson, Chair
   3. Environmental and Natural Resources, Shawn Jackson, Chair
   4. Legal Committee, Wade Hodge, Chair

I. Unfinished Business

J. New Business
   1. Appointments/Assignments to Committees and Selection of Chairs
      a. Budget Committee
      b. Engineering Committee
      c. Environmental and Natural Resources Committee
      d. Legal Committee
   2. Election of Officers (Secretary and Treasurer)
   3. 2022 Annual Meeting

K. Federal and State Government Representative Reports
   1. Leif Kindberg - Illinois River Watershed Partnership
   2. Jaysson Funkhouser, USACE – Cherokee Nation Flood Study Report
   3. Shanon Phillips – OK Conservation Commission Activities Update

L. Public Comment

M. Adjournment

Minutes of the
ARKANSAS-OKLAHOMA ARKANSAS RIVER COMPACT COMMISSION
Annual Meeting

September 23, 2021
9:00 a.m.

Queen Wilhelmina State Park
3877 Highway 88 West
Mena, AR 71953

A. CALL TO ORDER

Chairman and Federal Commissioner Delia Haak called the Annual Meeting of the Arkansas-Oklahoma Arkansas River Compact Commission (AOARCC) to order at 9:00 a.m. on September 23, 2021, at Queen Wilhelmina State Park, located at 3877 Highway 88 West, Mena, Arkansas.

Chairman Haak began by saying a prayer, stating the Pledge of Allegiance, and recognizing new members of the Commission. Chairman Haak thanked everyone in attendance for coming to the meeting and for their commitment of making sure the two states are using their natural resources in the best possible way.

B. INTRODUCTIONS and ANNOUNCEMENTS

Chairman Haak asked commissioners and attendees to make self-introductions. Commission members in attendance were: Federal Commissioner and Chairman Delia Haak; Oklahoma Commissioners: Sara Gibson as proxy for Julie Cunningham, Victoria Tran, and Scott Thompson; Arkansas Commissioners: Chris Colclasure, Jimmy Mardis, and Becky Keogh.

(See attendance list for state staff and other attendees present.)

C. APPROVAL OF AGENDA

Chairman Haak stated she would accept a motion to approve the agenda. There were no additions or deletions to the agenda. Commissioner Colclasure moved to approve the agenda, and Commissioner Keogh seconded the motion. The motion carried unanimously.

D. CONSIDERATION AND APPROVAL OF MEETING MINUTES OF THE 2020 ANNUAL MEETING, September 24, 2020, Virtual Meeting.

Chairman Haak asked if there was a motion to accept the minutes of the 2020 Annual Meeting as written, or if there are any changes. There were no changes or comments, and Commissioner Mardis moved to approve the minutes of the 2020 Annual Meeting of the Arkansas-Oklahoma Arkansas River Compact Commission. Sara Gibson, proxy for Commissioner Cunningham, seconded the motion. The motion carried unanimously.

E. REPORT OF THE CHAIRMAN

Chairman Haak stated it is nice to see everyone in person this year. She commended everyone for their continuous work efforts during both, natural disasters, and the public health pandemic. Unlike some other states, luckily, ours were able to carry on and conduct business with education, energy, and environment.

F. REPORT OF THE TREASURER

Mr. Ryan Benefield, Arkansas Department of Agriculture's Natural Resources Division (NRD), and Commission Treasurer, presented the Report of the Treasurer. He shared a written report covering the 2021 year from July 1, 2020 to June 30, 2021. We started the fiscal year with $29,895.60 in our checking account. Our income ($7,000.50) & expense ($7,005.69) was almost the same, however, we dropped $5.19. There were not any meeting expenses last year due to it being virtual. The majority of the expense ($6,300) was for the stream gauge to support the compact. Other expenses were for audit, bond, & miscellaneous expenses. We anticipate this year we will spend more than we bring in. This will be fine though because we have a large reserve.

During FY 2021, the Certificate of Deposit earned $33.77 which brings it up to a total of $11,189.63. The balance of the Commission accounts together is $41,090.42. Both states are current on their assessments.

Mr. Benefield provided a report showing the transactions budgeted for versus actual expenses for FY 2021. The audit cost went up from the previous year which we expected, but it cost more than we thought it would. Mr. Benefield asked for a motion to approve the audit cost being $122.50 over than budgeted for. He stated the budget committee report reflects the increase for future years. He also reported that the audit was clean and there were no concerns from the auditor.

Additionally, Mr. Benefield stated he is currently the only one with NRD who is on the bank accounts; therefore, he asked for a motion to remove Bruce Holland and Cynthia Bearden from the accounts and to add April Harris and Chris Colclasure to the accounts with him.

Commissioner Thompson moved to approve both, the budget cost increase and for the bank to make the change on the signatories. Commissioner Keogh seconded the motion. There was no discussion, and Chairman Haak called for the vote. The motion carried unanimously. Chairman Haak stated it was noted during the committee meetings that because it is a banking transaction, we do not move the accounts from state-to-state.

Chairman Haak asked if anyone had questions or suggestions; there were neither.

G. REPORT OF THE COMMISSIONERS

Chairman Haak invited Arkansas as host to present the state report of the Arkansas Commissioners.

1. Arkansas

Commissioner Chris Colclasure shared the report for the State of Arkansas. He stated during the year 2020, Arkansas had slightly warmer temperatures and more precipitation than normal. There was not a significant drought in 2020 and there were four tropical storms which both accounted for a wetter year.

Arkansas Department of Agriculture's Natural Resources Division continues (ADA NRD) to work with Illinois River Watershed Partnership (IRWP). In 2020, IRWP received a $200,000 grant from American Electric Power Foundation to help support water quality assessment and mobile learning programs in Arkansas and Oklahoma. Also, during the reporting year, three agreements were signed, and four conservation partnership plans were prepared.

NRD continues to monitor groundwater issues across the state. We find that we are pumping more water than is sustainable, therefore, we focus on the tax credit program to incentivize landowners take water conservation measures across the state. We also work closely with irrigation partners (Grand Prairie Irrigation Project and Bayou Meto Irrigation Project) to find alternative water sources in the future.

In 2020, the NRD Floodplain and Dam Safety section inspected 102 dams. Of those, 70 were classified as high hazard, 11 were classified as significant hazard, and 21 were classified as low hazard. Ten dams were inspected within the compact area (nine were classified as high hazard & one classified as low hazard).

The NRD Non-Point Source (NPS) Pollution section continues to provide technical assistance, project workplan development, project financial support, and coordination continued with minimal interruption. Workplans were developed and approved for the following: 1) continue monitoring in the Upper Saline watershed which is a Non-Point Source watershed, 2) develop watershed management plans for Bayou Meto, Lake Conway-Point Remove, White Oak and the Poteau River watersheds, 3) develop a Soil & Water Assessment Tool (SWAT) model and a watershed management plan for the Little Red River, 4) Low Impact Development/Green Infrastructure (LID/GI) conference and implementation, 5) implement Best Management Practice (BMP) for Unpaved Roads and working on increasing funding for the program, and 6) working with partners across the state on access and removal of fish passage barriers associated with unpaved roads.

There are three programs of interest due to proximity of the watersheds within the compact: BMP Demonstration Projects, Update on the Buffalo River, and Watershed Management Plans (WMP). Six BMP projects totaling over $657,000 were done across the state. These were vital in getting conservation on the ground and having an immediate impact on the reduction of NPS. The Buffalo River Conservation Committee has been actively meeting, assessing, and proposing unpaved roads projects within the watershed. Furthermore, there were four WMPs for FY 2021: Lake Conway Point Remove, Poteau River, White Oak Bayou, and Bayou Meto.

The NRD Water Resources Development (WRD) had two projects within the compact area in 2020. The City of Siloam Springs in Benton County received $30.1 million loan from the Drinking Water State Revolving Loan Fund to make improvements to the existing water treatment facility. The City of Cave Springs in Benton County received a $4.2 million loan from the Arkansas Clean Water Revolving Loan Fund to connect to the Northwest Arkansas Conservation Authority for sewer treatment.

Lastly, Commissioner Colclasure reported that ADA partnered with Natural Resources Conservation Services (NRCS) to provide grants to 18 conservation districts across the state. The Poteau River Conservation District and the Sebastian County Conservation District were two of the conservation districts who received grants. Additionally, NRD continues to collect data from poultry partners across the state.

Chairman Haak welcomed Commissioner Colclasure to the compact commission and stated he has been doing a lot of work in the state of Arkansas for a long time through other agencies & commissions.

2. Oklahoma

Sara Gibson, as proxy for Oklahoma Commissioner Cunningham, gave the report for the State of Oklahoma. She began by reporting on climate and stated they received 94% of normal rainfall statewide with some areas, such as the panhandle, seeing more rain than normal. However, August and September have taken some areas of Oklahoma back into a drought so will need to be monitored.

Currently, a major project before the Oklahoma Water Resources Board (OWRB) is the 2025 Oklahoma Comprehensive Water Plan. They are beginning that process with assistance from the U.S. Army Corps of Engineers (USACE) Planning Assistance to States (PAS) program and will be using the 2020 census data to improve water needs projections across the state to the year 2075. They will also be looking at infrastructure needs for water and wastewater.

OWRB received legislative authorization to create the first ever statewide Flood Resiliency Plan. This will exam flood risk and potential mitigation projects. Furthermore, during the last legislative session, the legislature approved a nutrient trading program and authorized OWRB to update its water quality standards however necessary to allow their environmental agency partners to implement nutrient trading programs.

Ms. Gibson provided a list of infrastructure investment projects. Together with the OK Department of Environmental Quality, 18.6 million dollars in projects was approved in the compact region during 2021-2022. This past year was one of the highest infrastructure funding years.

There were no other questions, and Ms. Gibson concluded the Oklahoma Report.

Commissioner Tran stated she was glad to be working with Arkansas and looks forward to seeing partners again next week in Oklahoma City when Oklahoma hosts the Southern States Energy Board meeting September 27-29, 2021.

Chairman Haak welcomed Commissioner Tran to the compact commission and stated she is transferring from the federal level with Environment Protection Agency to the state level in Oklahoma. Chairman Haak also welcomed Becky Keogh as the other new Arkansas

commissioner. Commissioner Keogh is with the Arkansas Department of Energy & Environment (E&E).

H. COMMITTEE REPORTS

1. Budget Committee

Mr. Ryan Benefield served as Chair of the Budget Committee and presented the proposed 2022 budget covering July 1, 2021 through June 30, 2022. He stated we began the year with a cash balance of $41,090.42 on July 1, 2021. Mr. Benefield proposed that dues are kept the same at $3,500 per state. This would put us at $48,090.42 plus a small amount of interest to be earned. The budget is the same as last year except the audit amount has been increased to $600. If we were to spend all proposed budget expenditures totaling $11,200, we would have a remaining balance of $36,890.46. However, it is not anticipated that we will spend the full proposed amount. Nonetheless, if we did, we would still be able to go 10 years without exhausting our reserves. Mr. Benefield asked the Commission to approve the proposed budget and to keep yearly dues at the same cost. Chairman Haak asked if there were any questions; there were not.

Commissioner Scott Thompson moved to approve the Budget Committee Report, and Commissioner Mardis seconded. Chairman Haak called for the vote, and the budget was approved unanimously.

Chairman Haak addressed concern of the reserve fund from the Certificate of Deposit. She stated some money could be put in a new CD starting January 1, 2022 and asked the Commission if they agreed this would be best to do. Discussion was had around the amount of funds to transfer, and Commissioner Colclasure motioned to move $16,890.46 to a new CD and leave $20,000 in the checking account. Commissioner Thompson seconded the motion, and the motion carried unanimously.

2. Engineering Committee

Ms. Shawn Jackson, Arkansas Chair of the Engineering Committee, began by presenting a view of the flow of water within the compact showing the interstate movement of water. She stated the Engineering Committee looks at what takes place on the Arkansas River, and we are very fortunate for the lock-and-dam system and the reservoirs on it.

She shared the written Engineering Committee Annual Compact Compliance Report (which was done by Oklahoma engineering staff, Yohanes Sugeng) and presented the report findings. First, Ms. Jackson reported on the annual depletions by major reservoirs on the Arkansas River. These reservoirs are Webber Falls, Tenkiller Ferry, Robert S. Kerr, and Wister. She also reported on the annual yield from sub-basins (Spavinaw Creek, Illinois River, Lee Creek, Poteau River, and Arkansas River). Other topics reported on for the year 2020 were Water Balance for Large Reservoirs in the Compact Area and Sub-basin Drainage Areas.

Chairman Haak stated last year was the 50th year of the compact commission, however, the two states have been working on water quality & water quantity data for 80 years. The basis

for the compact commission was formed in 1969, but the five sub-basins have been monitored since at least 1938.

3. Environmental and Natural Resources Committee

Ms. Shawn Jackson, Arkansas Chair, presented the Arkansas portion of the report for the Environmental and Natural Resources Committee. She began with the climate report which she stated impacts the phosphorus levels. Drake Field located in Fayetteville, Arkansas, is the monitoring station utilized for records representing climate conditions for the Illinois River Watershed. Climate data such as average maximum temperature, average minimum temperature, precipitation, and outliers is collected there. For the year of 2020, the precipitation total was 1.4" greater than normal. January, February, March, May, July, and October were months with above average precipitation. April, June, August, September, November, and December were months with below average precipitation. Temperatures were about the same but were a little bit warmer.

Ms. Jackson also discussed the top six daily flows of the four monitoring stations within the Illinois River Watershed (Flint Creek, Sager Creek, Illinois River, and Baron Fork). The top flow dates were in January March, and May. The high flows are usually taken out when calculating the phosphorus. Arkansas and Oklahoma try to be consistent and mirror one another on reporting (AR has the upper part of the watershed; OK has the lower part).

Ms. Jackson discussed the Water Quality Monitoring section of the Arkansas Environmental Committee report and presented the five-year rolling average of total phosphorus loading (excluding targeted high flows) dating back to 1980, with 1980-1993 being the base line, for each of the four monitoring stations. Illinois River has higher flow than the other three. There was a downward trend of total phosphorus loading with all four creeks. All in all, we are trending in the right direction and getting close to the 0.0370 mg.

In keeping with the two-year rotation for producing the Arkansas 303 (d) list, the Arkansas Department of Energy and Environment- Division of Environmental Quality (DEQ), Office of Water Quality, has prepared the draft 2020 303 (d) list. A public hearing was conducted on September 20, 2021. There are three watersheds within the Compact that are of concern within the Illinois River. Ms. Jackson listed notable stretches of impaired waters and their parameters: an unnamed tributary to Brush Creek (dissolved oxygen), three stretches of water in the Illinois River (sulfates), Sager Creek (ammonia-n), Baron Fork (dissolved oxygen), and Moores Creek (sulfates). These are all on the 303 (d) Category 5 list.

Ms. Jackson stated Flint Creek phosphorus levels were high in 2008 due to two incidents that occurred (a canning factory incident and a storm water incident).

Ms. Jackson concluded the Arkansas portion of the Environment Report.

Julie Chambers, Oklahoma Chair, presented the Oklahoma portion of the report for the Environmental and Natural Resources Committee. She stated the Oklahoma report looks very similar to the Arkansas report and began discussing the five-year rolling average annual of total phosphorus loading in kilograms per year (excluding targeted high flows) for the monitoring stations in Oklahoma (Flint Creek near Kansas, Illinois River near Watts, Illinois River near Tahlequah, and Barren Fork near Eldon). The chart began with the base line years, 1980-1993, then five year periods (1993-1997, 1994-1998, etc) up to 2016-2020.

Additionally, Ms. Chambers presented a water quality trend analysis chart for the four monitoring stations of the Illinois River Basin at various flow regimes. This chart depicts there is

no upward trend in phosphorus concentrations since 1993 for each of the four monitoring stations, regardless of the flow.

Ms. Chambers provided a Water Quality Standards Update which referenced the revisions of the total phosphorus criterion and listed websites for more information. She also provided a list of 2020 Category 5 Waters for the Oklahoma/Arkansas Compact Area (303 d list) which provided the waterbody ID, name, cause, total maximum daily load priority ranking, and other information.

Next, Ms. Chambers presented data on the four monitoring stations (Illinois River near Watts, Illinois River near Tahlequah, Baren Fork River near Eldon, and Flint Creek near Kansas) for the annual flow, annual phosphorus concentration, and annual loading in kilograms per year since 1980 through 2020. She also presented the five year rolling average, the base line from 1980-1993, and the 40% reduction of loads in Kg per year. Additionally, the total phosphorus and scenic river criteria implementation from 1999-2020 were presented for each of the four monitoring stations.

Lastly, Ms. Chambers highlighted funding for cities & districts in the Illinois River Basin provided by the OWRB's financial assistance program. She also listed permits for water rights in the Illinois River Watershed issued by OWRB's planning and management division in CY 2019 and touched on Oklahoma Conservation Commission program activities in the Arkansas-Oklahoma Compact Commission Area from October 2020 through September. Activities included Illinois River Riparian Protection, Rotating Basin Monitoring Program, Blue Thumb Monitoring and Education, Oklahoma/Arkansas Memorandum of Agreement, Hydrologic and Water Quality Systems Modeling for Oklahoma, and lastly, Neighborhood Solutions to Natural Resource Concerns Regional Conservation Partnership Program.

4. Legal Committee

Mr. Wade Hodge, Arkansas Chair, reported there were no assignments this past year, therefore, nothing to report. He stated to the commission to please let him know if he can be of service to anyone. There were no comments by the Commissioners.

Sara Gibson, Oklahoma Chair, reported Mary Schooley is retiring after 35 years as Executive Assistant for the Oklahoma Water Resources Board. Chairman Haak stated Mary served over 41 years with the state of Oklahoma, and 35 years with this compact commission. Both announced their appreciation of Mary and thanked her for her years of service to the compact commission and to OWRB.

I. UNFINISHED BUSINESS

There were no items of unfinished business brought before the Commission for consideration.

J. NEW BUSINESS

1. Appointments/Assignments to Committee and Selection of Chairs, Election of Officers, and 2022 Annual Meeting

Chairman Haak stated appointments for the committees are typically rotated state-to-state each year. Sara Gibson stated Oklahoma is the host state next year, therefore, Oklahoma members will chair the committees.

a. Budget Committee - Yohanes Sugeng (OWRB)
b. Engineering Committee – Yohanes Sugeng
c. Environmental and Natural Resources Committee – Julie Chambers (OWRB)
d. Legal Committee – Sara Gibson (OWRB)

Arkansas members appointed to the committees will be:

a. Budget Committee – Ryan Benefield (NRD) & Alan York (E&E)
b. Engineering Committee – Ryan Benefield & Carrie McWilliams/Bailey Taylor (E&E)
c. Environmental and Natural Resources Committee – Katie Mann (NRD) & Julie Linck/Joe Martin (E&E)
d. Legal Committee – Kolton Jones (ADA) & Shane Khoury/Stacie Wassell (E&E)

2. Election of Officers (Secretary and Treasurer)
   a. Treasurer – Ryan Benefield (NRD)
   b. Secretary – Stephany Lively (OWRB)

Chairman Haak called for a motion to accept election of officers for 2022. Sara Gibson, proxy for Commissioner Cunningham, made a motion, and it was seconded by Commissioner Mardis. The motion carried unanimously.

3. 2022 Annual Meeting

Chairman Haak stated in the legislation for the compact it states for meetings to be held on the fourth Thursday in September, unless there is a conflict. In 2022, this date would be September 22, 2022. Oklahoma will host.

There were no other New Business items for the Commission's consideration.

K. FEDERAL AND STATE GOVERNMENT REPRESENTATIVE REPORTS

1. Travis Chaney, Restoration Specialist, Illinois River Watershed Partnership (IRWP).

Mr. Chaney thanked the chairman & commission for allowing him to report today. He stated the new IRWP director, Leif Kindberg, would have liked to participate in the meeting today but, unfortunately, could not.

Mr. Chaney began his report by pointing out the rapid population increase within the watershed. In northwest Arkansas, there has been an increase of nearly 100,000 new people within the past ten years, and over the next 20 years a much larger population is expected. This has and will change land use quite a bit. Additionally, there has been changes in precipitation and flow. There was record flooding within the water shed in April 2021 and most major cities in northwest Arkansas saw some sort of nature damage from flooding.

A list of streams was prioritized from no erosion to extreme erosion for the Streambank Erosion Assessment from 2017-2020. There were 15 sites representing 5% of the watershed. Data indicates an average erosion rate of 6.6 feet/year (as high as 32 feet/year). The sediment

loading of study area was 37,500 tons/year, and phosphorus loading of study area was 56,250 lbs/year (5% of watershed). Many farmers and ranchers have become very discouraged over the amount of land they're losing each year.

IRWP is proactively trying to conserve and restore natural areas to reduce risk, improve water quality, and preserve our heritage. IRWP is offering a "toolbox" of voluntary water quality management solutions to as many different types of landowners as they can. Additionally, IRWP is helping to connect urban and rural landowners to organizations for these tools and helping to find solutions that fit landowners' short-term and long-term needs.

There have been several stakeholder events held and more to be held soon. The big one for the year is the Northwest Arkansas Lower Impact Development Conference which focuses on reaching out to landscape architectures, city planners, and others who are implementing the practices in urban areas that have a large potential impact on water quality.

The Riparian Restoration Program is a $2.8 million cost-share program which focuses on impaired watersheds and proven, low-cost, water quality better management practices. IRWP works with multiple municipalities, farmers and ranchers, residential homeowners, and more to restore 20 miles of streambank over five years. So far, IRWP is about halfway into the program and halfway into meeting deliverables.

Septic Tank Remediation Program is another program and started this year with funding from NRD. This program has been a big success. Through state revolving loan funds, $1M is being spent over three years. The purpose is to improve and protect water quality by assisting residents in remediating their failing onsite septic systems. Currently, four projects have been completed and there are 44 in process.

Over the past two years, IRWP has been working with Benton County roads on Unpaved Roads Demonstration Projects. These projects show BMP for reducing sediment run-off from unpaved roads. Some rural watersheds estimate that nearly 50% of sediment loading comes from unpaved roads. Hopefully over the next few weeks all projects will be completed.

IRWP is continuing their Ecological Assessment of Priority Subwatersheds. This looks at macroinvertebrate diversity, water chemistry, habitat assessment, and land use assessment. This includes four years of data at 21 Arkansas sites (even years) and 12 sites in Oklahoma (odd years).

Two new initiatives have been started by IRWP this year, Blue Cities and Blue Neighborhoods. A program goal of Blue Cities is to contact city and county elected officials, planning commissions, and relevant staff. The short-term goal is to drive awareness among these audiences regarding the Illinois River, impacts to it, and tools available to improve water quality. The long-term goal is to increase implementation of best management practices for water quality improvement by major cities and counties. The goals of Blue Neighborhoods are to identify the high-impact neighborhoods, reach out to neighborhoods and put together a storm water reduction plan for the neighborhood, and create plans for low impact development practice implementation.

Mr. Chaney concluded his report.

2. Shanon Phillips, Water Quality Division Manager, Oklahoma Conservation Commission (OCC).

Ms. Phillips reported on Oklahoma Conservation Commissions Programs from over the past year. OCC has been working in the Illinois River Basin for a long time and has implemented several programs over time. Ms. Phillips pointed out that especially within the Illinois

Watershed, there was extensive work to do with riparian protection, therefore, for the last decade they have focused on this. For long-term riparian protection, OCC has partnered with conservation districts, landowners, and Grand River Dam Authority (GRDA). Within the Illinois River Watershed, 563.91 acres in 30+ year easements have been added. OCC is maintaining 1,524.9 acres of 10-15 year easements in partnership with conservation districts and 33 landowners. Additionally, OCC is maintaining 3,588.09 acres in 46 different 30+ year easements in partnership with GRDA and 41 landowners.

In partnering with other state agencies to do water quality monitoring, OCC monitors at least 30 streams in the compact commission area on a rotating basis for two out of every five years. The compact commission area is considered Basin group 3 and the latest round was scheduled from May 2018 to June 2020; however, COVID challenges meant that sampling was suspended in April and May and resumed for these sites in August and September 2020. In 2023 those sites will be picked back up. The report is currently under final review by Environmental Protection Agency.

The Blue Thumb Monitoring and Education program is important to OCC. With assistance from IRWP, this program consists of volunteers who monitor four streams in the Illinois River Basin, five in the Poteau River Basin, and one in the Dirty/Greenleaf Creek Basin. These streams are monitored twelve months a year. Also, through partnership with GRDA, educational camps returned in 2021. Riverology camp was held for 14 teachers and Journey to the Bottom of the Creek camp was held for 14 kids. Blue Thumb education has also enabled OCC to do field work with IRWP and collect water quality samples. Yard by Yard is another education program through Blue Thumb which started in urban areas to support landscaping and focus on at-home conservation to produce better water quality management, more pollinators, low pesticide use, and more. Although initiated towards urban areas, many conservation districts have become interested, and the program has expanded to Delaware, Muskogee, and Cherokee Counties.

OCC is also working with Arkansas on a Memorandum of Agreement between the two states for updating the Non-Point Source Management Plan. Additionally, OCC is also working with other entities on programs such as Neighbors Helping Neighbors, Upstream Flood Control Structure Program, and Poultry Litter Transfer.

OCC oversees the Locally-Led Cost Share Program. Funding from the OK legislature and receipts from oil and gas production tax help to support this program. Since the beginning of the program in 2000, over $3 million in conservation practices have been installed within the compact commission area.

Another program that the OCC oversees is the Abandoned Mine Lands Program which is made possible through funding from current active mining companies. This program focuses on the protection of public health and safety from abandoned coal mines. Although focusing on public health, water quality and water quantity are also benefits from the program. To date, the Abandoned Mine Lands Program has reclaimed 186 historical mines sites in Oklahoma. The compact commission area contains at least 51,660 acres of these areas. This past year, the program administered, completed, or managed long-term vegetative management on five sites.

Ms. Phillips concluded her report.

L. PUBLIC COMMENT

Ed Fite, Vice-President for Rivers Operations and Water Quality, Grand River Dam Authority (GRDA), thanked Dr. Darrell Townsend and Dan Sullivan for all of their hard work in implementing projects on the ground.

Commissioner Keogh thanked Arkansas's Secretary of Agriculture Wes Ward, Oklahoma's Secretary of Agriculture, Blayne Arthur, Oklahoma's Secretary of Energy & Environment, Ken Wagner, and all other counterparts in Arkansas and Oklahoma for their hard work.

M. ADJOURNMENT

There being no further business, Federal Commissioner and Chairman Delia Haak thanked everyone for their attendance and adjourned the 2021 Annual Meeting of the Arkansas-Oklahoma Arkansas River Compact Commission.

Delia Haak
Federal Commissioner and Chairman

9-23-2022
Date

April Harris, Arkansas Natural Resources Division
2021 Commission Secretary

PROXY

ARKANSAS-OKLAHOMA ARKANSAS RIVER COMPACT COMMISSION

Pursuant to Title 82, Section 1085.12a of the Oklahoma Statutes, Julie Cunningham, Executive Director of the Oklahoma Water Resources Board ("Board"), hereby delegates to Sara Gibson, General Counsel for the Board, full authority to act on behalf of the Executive Director of the Board at the Compact's 2021 annual meeting.

Julie Cunningham
Julie Cunningham (Sep 20, 2021 15:01 CDT)

Julie Cunningham
Oklahoma Commissioner
Executive Director
Oklahoma Water Resources Board

09/20/2021
Date

ARKANSAS-OKLAHOMA ARKANSAS RIVER COMPACT COMMISSION
September 23, 2021
9:00 a.m.
3877 Hwy 88 West
Mena, Arkansas 71953

PLEASE PRINT NAME/TITLE	PLEASE PRINT BUSINESS
Tom Elkin	Cherokee Nation
jon sheehan	AR Game & Fish Commission
Travis Chaney, Restoration Specialist	IRWP
Caleb Whitcomb	OK Department of Agriculture, Food + Forestry
Shanon Phillips	OK Conservation Commission
Bailey Taylor Associate Environment Administrator	AR Dept Energy & Environment
Joe Martin	AR DEQ
Trey Lam	Ok Conservation Comm
Yohanes Sugeng	OK Water Resources Board
Grey Knox	OK Cons Comm
Ed Fite	GRDA
Teena Gunter	OK Dept of Ag, Food & Forestry

ARKANSAS-OKLAHOMA ARKANSAS RIVER COMPACT COMMISSION
September 23, 2021
9:00 a.m.
3877 Hwy 88 West
Mena, Arkansas 71953

PLEASE PRINT NAME/TITLE	PLEASE PRINT BUSINESS
Victoria Tran, Sr. Counsel + Policy Advisor	SOEE
Katie Mann Ecologist Coordinator ADA-NRD	

Report of the Treasurer

Arkansas Oklahoma Arkansas River Compact Commission

September 24, 2021

The 2021 Year-end Financial Report covering July 1, 2020 through June 30, 2021.

Regions Bank Balance on July 1, 2020		$ 29,895.60
Total Income	$ 7,000.50	
Total Expenses	$ 7,005.69	
NET TOTAL	-$5.19	
Regions Bank Balance June 30, 2021		$ 29,900.79
Certificate of Deposit Balance July 1, 2020		$ 11,155.86
Total Income	$ 33.77	
Regions Bank Balance June 30, 2021		$ 11,189.63

Account Balances as of June 30, 2021

Regions Bank Balance	$ 29,900.79
Certificate of Deposit Balance	$ 11,189.63
TOTAL	**$ 41,090.42**

Assessments for both states are current.

ARKANSAS-OKLAHOMA ARKANSAS RIVER COMPACT COMMISSION
2021 BUDGET VERSUS ACTUALS
(7/1/2020 - 6/30/2021)

	ACTUAL FY - 2021 7/1/2020 6/30/2021	BUDGET FY - 2021 7/1/2020 6/30/2021	OVER/UNDER BUDGET FY - 2021 7/1/2020 6/30/2021	% OF BUDGET FY - 2021 7/1/2020 6/30/2021
Income				
State Annual Dues	$7,000.00	$7,000.00	$0.00	100.00%
Interest on Checking	$5.69	$0.00	$5.69	
Interest on Certificate of Deposit	$33.77	$0.00	$33.77	
Total Income	$7,039.46	$7,000.00	$39.46	100.56%
Expenses				
Chairman Hosting Expenses	$0.00	$600.00	$600.00	0.00%
Report Printing/Reproduction	$0.00	$2,000.00	$2,000.00	0.00%
Personnel Service & Office Expenses	$0.00	$250.00	$250.00	0.00%
Audit	$522.50	$400.00	($122.50)	130.63%
Meeting Space Rental	$0.00	$900.00	$900.00	0.00%
Security Bond/Insurance	$178.00	$550.00	$372.00	32.36%
Stream Gage Reimbursement	$6,300.00	$6,300.00	$0.00	100.00%
Total Expenses	$7,000.50	$11,000.00	$3,999.50	63.64%

ARKANSAS-OKLAHOMA ARKANSAS RIVER COMPACT COMMISSION
TRANSACTION SUMMARY - CHECKING ACCOUNT
(7/1/2020 - 6/30/2021)

Date	Category	Payee	Purpose	Payment	Deposit	Balance
6/30/2020		Beginning Balance				$29,895.60
7/31/2020	Interest	Regions Bank	Interest on Checking Account		$1.27	$29,896.87
8/31/2020	Interest	Regions Bank	Interest on Checking Account		$1.27	$29,898.14
9/30/2020	Interest	Regions Bank	Interest on Checking Account		$1.23	$29,899.37
10/6/2020	Stream Gage Reimbursement	OWRB	FY2021 Stream Gage Expenses	$6,300.00		$23,599.37
10/31/2020	Interest	Regions Bank	Interest on Checking Account		$0.20	$23,599.57
11/30/2020	Interest	Regions Bank	Interest on Checking Account		$0.20	$23,599.77
12/31/2020	Interest	Regions Bank	Interest on Checking Account		$0.20	$23,599.97
1/31/2021	Interest	Regions Bank	Interest on Checking Account		$0.19	$23,600.16
2/16/2021	Security Bond/Insurance	The Bond Exchange	Crime Bond Renewal	$178.00		$23,422.16
2/26/2021	Interest	Regions Bank	Interest on Checking Account		$0.18	$23,422.34
3/19/2021	State Annual Dues	Arkansas Agriculture Department	20-21 Annual Dues - Arkansas		$3,500.00	$26,922.34
3/31/2021	Interest	Regions Bank	Interest on Checking Account		$0.22	$26,922.56
4/6/2021	Audit	Johnson-Jones Accounting	Biannual Audit	$522.50		$26,400.06
4/15/2021	State Annual Dues	OWRB	20-21 Annual Dues - Oklahoma		$3,500.00	$29,900.06
4/30/2021	Interest	Regions Bank	Interest on Checking Account		$0.23	$29,900.29
5/28/2021	Interest	Regions Bank	Interest on Checking Account		$0.23	$29,900.52
6/30/2021	Interest	Regions Bank	Interest on Checking Account		$0.27	$29,900.79
		Ending Balance		$7,000.50	$7,005.69	$29,900.79

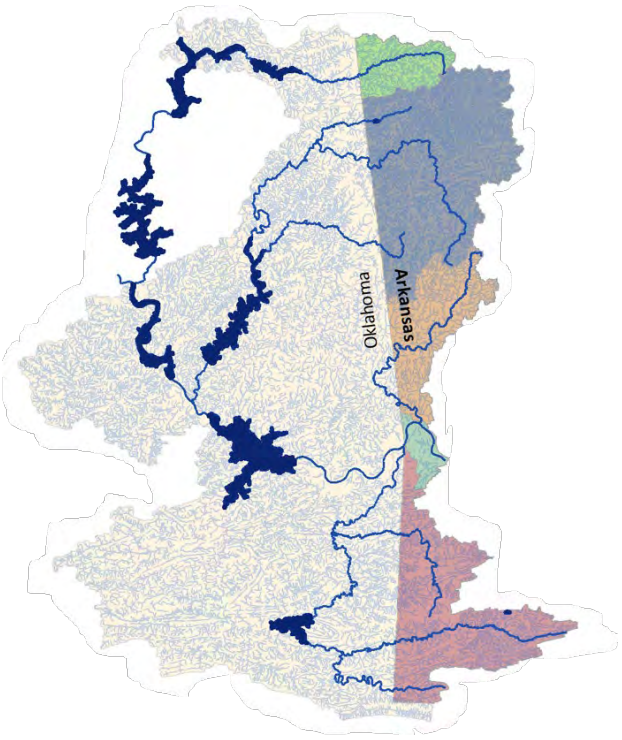
ARKANSAS COMMISSIONERS' REPORT

Arkansas -Oklahoma

Arkansas River Compact Commission

Queen Wilhelmina State Park, Arkansas

September 23, 2021



CLIMATE

A summary report of 2020 weather conditions can be found on the Little Rock Weather Service's website at https://www.weather.gov/lzk/cli2020atxt.htm. This narrative focuses on temperature and precipitation as presented at the statewide levels, then provides more detail regarding precipitation at the regional level. Drought conditions are provided to conclude the climate review.

Climate conditions at the statewide level are noted as being slightly warmer and wetter than normal. The statewide conditions vary slightly from those recorded at the regional level especially where precipitation is concerned.

Temperature

The summary states that the temperature for Arkansas was similar to 2019 and notes of the 125 years on record, 2020, ranked the 31st warmest. The months of January, February, March, July, November, and December were warmer than average with April, May, June, August, September, and October being cooler than average.

Precipitation

The summary reports statewide precipitation was greater than normal in 2020 with only two months being below average for rainfall (November and December) with March being

the wettest month. August is noted for its departure from normal with 3.22 inches above average. Arkansas' precipitation was influenced by four tropical systems.

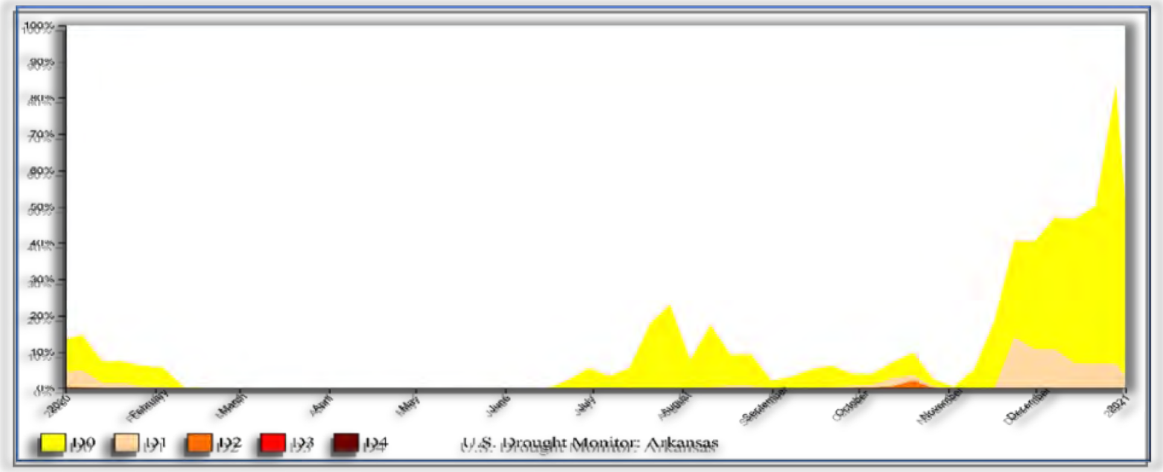
2020 Tropical Systems

Storm Designation	Date(s) Impacting State	Impacted Area(s)
Tropical Storm Cristobal	June 8, 9, 2020	Statewide
Hurricane Laura	August 27, 2020	Central and Northeast
Tropical Storm Beta	September 22 – 24, 2020	Southern Half
Hurricane Delta	October 10, 2020	Southeast

Drought Monitoring

Given higher-than-normal precipitation values for 2020, drought conditions did not inhibit precipitation runoff. Consultation of the National Integrated Drought Information System's website (www.drought.gov) provides a monthly timeline which does indicate a percentage of the state experienced drought conditions January into February, and again from mid-June through December. Figure 5 illustrates that during the January into February period less than 20 percent of the state saw abnormally dry conditions as indicated by the symbol D0 and less than 10 percent of the state saw moderate drought conditions as indicated by the symbol D1. The second period of drought is sustained over the last six months with approximately 80 percent of the state seeing abnormally dry conditions by December, less than 15 percent of the state experiencing moderate drought conditions during October and beginning mid-November through the end of the year, and less than 5 percent of the state experiencing severe drought conditions as indicated by the symbol D2 during the month of October.

Arkansas Drought Monitor for 2020



ILLINOIS RIVER WATERSHED PARTNERSHIP (IRWP)

The American Electric Power Foundation announced April 20, 2020, it awarded $200,000 to the IRWP. The grant supports water quality assessment and mobile learning programs in Arkansas and Oklahoma over two years. American Electric Power Foundation receives its funding from American Electric Power (AEP) which is the parent company of America Electric Power (AEP), parent company of Southwestern Electric Power Company (SWEPCO). SWEPCO serves approximately 119,000 customers in Arkansas. Resources associated with SWEPCO within the Illinois River watershed include Flint Creek Power Plant, Gentry Power Plant, and SWEPCO Lake.

The IRWP Riparian Restoration Program promotes riparian buffer protection and streambank restoration by providing 75% of eligible project costs to landowners who participate in the program. The following table is an example of participation in the program

IRWP Riparian Restoration Program

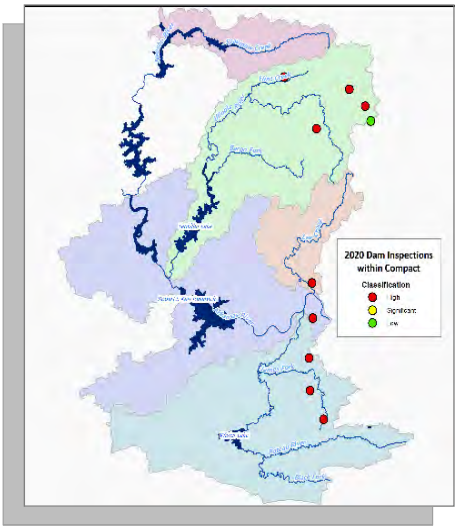
Signed Agreements			
Watershed	**Stream Miles**	**Rotational Grazing Acres**	**States of Projects**
Clear Cree	2.66	N/A	Completed or Ongoing
Sager Creek	2.20	N/A	Ongoing
Lower Muddy Fork	3.17	200	Ongoing

Conservation Plans Prepared			
Clear Creek	0.51	N/S	Ongoing
Moores Creek	3.89	164	Ongoing
Lake Wedington	1.02	20	Ongoing
Sugar Creek	3.92	300	Ongoing

GROUNDWATER PROTECTION AND MANAGEMENT PROGRAM

The Groundwater Protection and Management Program continues to monitor, evaluate, and report on the state's groundwater resources and trends in water-level and water-quality fluctuations with federal partners in the USDA-NRCS and the USGS. ADA NRD maintains a cooperative agreement with USGS. In 2020, wells were monitored in the Mississippi River Valley, Sparta/Memphis aquifer, and Sparta aquifer in South Arkansas.

While seeing positive average change values in defined monitoring ranges, groundwater levels continue to decline in the areas of the Mississippi River Valley alluvial aquifer and the Sparta aquifer where water use is the highest. A continued exceedance in the sustainable yield will ultimately result in depletion of the resource. ADA NRD continues to promote conservation, education, and conjunctive uses of groundwater coupled with surface water for a more viable option to meet current and future water use needs.



FLOODPLAIN/DAM SAFETY PROGRAM

The Dam Safety Section meet the challenge of remote work by focusing on state inspections. In all, 102 Dams were inspected. Of those: 70 were classified as high hazard; 11 were classified as significant hazard; and 21 were classified as low hazard. The graphic to the left represents the dams inspected within the compact area. Ten dams are displayed in the graphic. Of the ten dams, nine are classified as high hazard and one is classified as low hazard.

NONPOINT POLLUTION PROJECTS

Although 2020 presented challenges with physical working locations, ADA NRD and the Nonpoint Source Management Program staff continued to provide technical assistance, project workplan development, project financial support, and coordination continued with minimal interruption. Workplans were developed and approved to:

- Continue monitoring in the Upper Saline watershed, an NPS Priority watershed
- Develop watershed management plans for Bayou Meto, Lake Conway-Point Remove, White Oak and the Poteau River watersheds
- Develop a SWAT model and a watershed management plan for the Little Red River
- LID/GI conference and implementation
- Unpaved roads BMP implementation
- Access and removal of fish passage barriers associated with unpaved roads

Three programs of interest are detailed due to proximity to the watersheds of the compact: Best Management Practice Demonstration Projects, Update on the Buffalo River, and Watershed Management Plans (WMP).

Best Management Practice Demonstration Projects

Best Management Practice (BMP) Demonstration projects are vital in getting conservation on the ground and having an immediate impact on the reduction of nonpoint source pollution. For FY 2020, the Arkansas 319(h) program worked with several partners implementing various BMP focused projects around the State. Below are some of the partners and projects that have or are currently implementing BMPs throughout various watersheds in the State:

Project #	Project Title	County/Watershed	Total Federal $
16-200	Hicks Creek – White River Watershed Project	Baxter / Middle White	$190,000.00
16-300	Big Creek – White River Watershed Project	Marion / Bull Shoals	$215,000.00
17-700	Lower St. Francis River Watershed Cost-Share Project	St. Francis / St. Francis River	$55,000.00
17-800	Poteau River Sub Watershed Project	Scott / Poteau River	$62,284.67
19-600	Boone County Crooked Creek Project	Boone / Crooked Creek	$60,000
19-1000	North Fork White Sub Watershed Project	Fulton / North Fork White River	$75,000

Update on the Buffalo River

The Buffalo River Conservation Committee (BRCC) has been actively meeting, assessing, and proposing unpaved roads projects within the watershed. The goal was to identify high priority sites that had a direct impact on the watershed. Two sites were selected and sent for Legislative approval. Legislators approved the recommended two sites and agreements were developed for Searcy and Newton County. The agreements were signed, and work was approved to begin. For the Newton County site, an Environmental Assessment must be completed before work can begin because most of the road traverses through the National Park Service. Once the assessment is complete the Newton County Project will be allowed to begin. The Searcy County Project is on target to start just as soon as the weather allows.

Watershed Management Plans (WMPs)

For FY 2021 four Watershed Management Plans will be initiating: Lake Conway Point Remove, Poteau River, White Oak Bayou, and Bayou Meto. Of particular interest is the Poteau River Watershed Management Plan. The goal of this project is to develop a 9-element watershed management plan (WMP) on the Poteau River and its major tributaries in Arkansas. The WMP will include identification of critical sub-watersheds at a small scale (12-digit HUC and smaller) and ranked implementation measures to reduce non-point source pollution loading from key areas. The Poteau River is a priority watershed in Arkansas and is listed on the Arkansas 303(d) list for nutrients and metals. The project will also include a community involvement task that will be used to educate the community and acquire watershed information and gain support for WMP implementation, and a task designed to address funding for WMP implementation. The WMP will ultimately be used by the City of Waldron and its partners to direct watershed protection activities and watershed restoration activities with the ultimate goal being reduction of pollutant loading and protection of the watershed into the future. It is expected that this project will conclude in December 2022.

NUTRIENT MANAGEMENT REPORTING

Statistical data collected and related to poultry farms by the Nutrient Management Reporting Program within the Conservation Program of ADA NRD is supplied in the table below for CY2020.

County	Acres	Tons Generated	Tons Removed From Houses	Applied	Stored	Transferred or Sold	Other	Litter Use Difference
BENTON	11,462	170,387	102,809	6,561	29,264	89,684	32,818	55,518
CRAWFORD	2,680	11,145	3,417	2,573	26	818	0	0
POTEAU RIVER (SCOTT)	8,377	52,110	31,998	4,929	3,827	24,638	2,088	3,484
SEBASTIAN	3,930	20,011	19,341	3,153	400	14,338	0	-1,450
WASHINGTON	19,937	129,166	89,981	10,757	9,415	70,929	154	1,274

County	No. of Houses	Bird Capacity	Farms Reported (2020)	2019 Reg	Difference 2019 to 2020	% short or long	% Complete
BENTON	899	36,848,128	196	207	-11	-5.3%	94.7%
CRAWFORD	32	5,934,400	11	16	-5	-31.3%	68.8%
POTEAU RIVER (SCOTT)	288	7,963,483	74	89	-15	-16.9%	83.1%
SEBASTIAN	172	3,454,800	41	55	-14	-25.5%	74.5%
WASHINGTON	705	73,149,955	147	209	-62	-29.7%	70.3%

WATER RESOURCES DEVELOPMENT PROJECTS

ADA NRD Water Resources Development (WRD) provides funding for p0ublic water and sewer projects through its federal and state low-interest loan and grant programs annually. Over the course of 2020, WRD approved the following projects within the compact region.

January 16, 2020

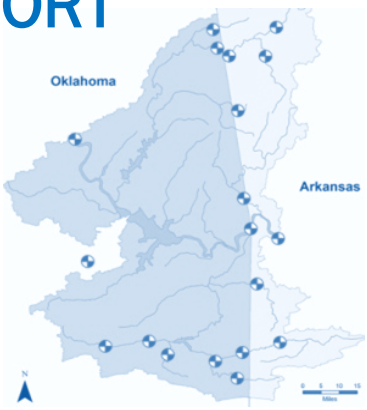
The **City of Siloam Springs** in Benton County received a $30.1 million loan from the Drinking Water State Revolving Loan Fund to make improvements to the existing water treatment facility. Customers served by the project total 7,492.

The **City of Cave Springs** in Benton County received a $4.2 million loan from the Arkansas Clean Water Revolving Loan Fund to connect to the Northwest Arkansas Conservation Authority for sewer treatment. Customers served by the project total 1,887.

CONSERVATION DISTRICTS

The Arkansas Department of Agriculture (ADA) partnered with USDA Natural Resources Conservation Service (NRCS) to provide grants to 18 conservation districts across the state. The funds may be used on natural resource enhancement, restoration, or protection activities. The Poteau River Conservation District received $1,500.00 for Outreach Meetings and the Sebastian County Conservation District received three grants totaling $38,600.00 for NMP Mapping Technology, Multi-County Pollinator Project, Urban Agri Hoop House.

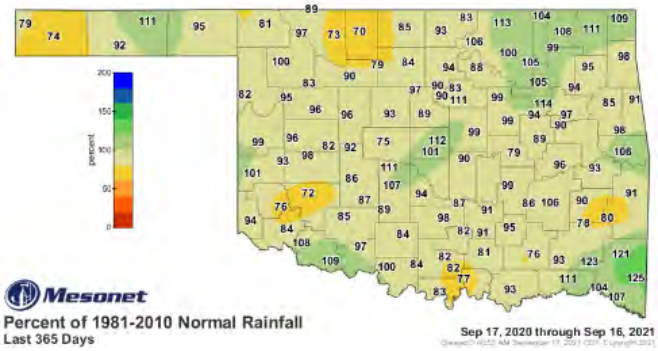
OKLAHOMA COMMISSIONERS' REPORT

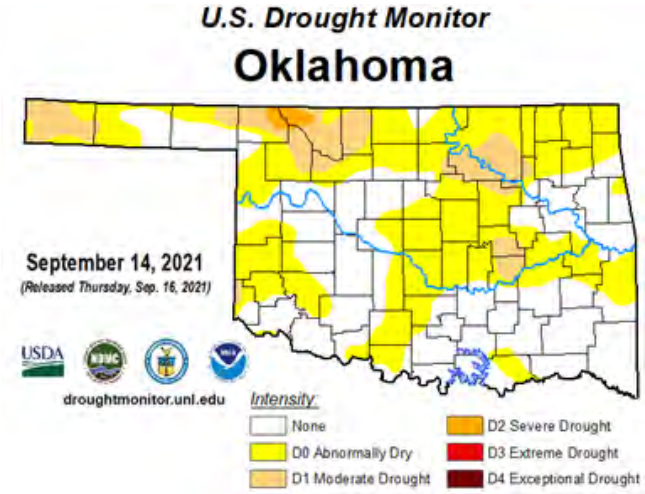


Oklahoma-Arkansas
Arkansas River Compact Commission
September 23, 2021

CLIMATE

The Oklahoma portion of the Oklahoma-Arkansas Arkansas River Compact area falls mostly in Oklahoma's East Central climate region. In the past year, the region has received 94% normal rainfall. The region is listed as Abnormally Moist on NOAA's Standardized Precipitation Index for the 12-month period. However, conditions are currently abnormally dry in some parts of the region, according to the U.S. Drought Monitor.





OKLAHOMA COMPREHENSIVE WATER PLAN (OCWP)

The OCWP is the defining water resource management guide for the state of Oklahoma. Work on the 2025 decennial update began in July of 2020 with the development of the Programmatic Work Plan (PWP), now being vetted with representatives from across the state from various use-sectors, tribes, and regional planning groups. While the PWP will be a living document throughout the remaining years of the OCWP process, a completed Version 1.0 will be submitted in August 2021 to the U.S. Army Corps of Engineers for the shared funding of the OCWP through their Planning Assistance to States program. The 2025 OCWP has begun the Analysis Phase, the second of four total phases. The OCWP Team is currently gathering data by basin for supply and demand, developing provider level surveys, and projecting results to 2075 based upon receipt of 2020 census data. This OCWP update will have an emphasis on infrastructure assessment, needs analysis, potential funding solutions, and alternatives for Hot Spot Basins identified around the state. Engagement will be more focused in nature, with

meetings centered on water-use interests, tribal water issues, and regional planning groups to develop water policy solutions. More information including a vision document and draft PWP can be found online at www.owrb.ok.gov/ocwp.

STATEWIDE FLOOD RESILIENCY PLAN

Oklahoma Senate Bill 1269, a request bill from the Oklahoma Water Resources Board (OWRB), directing the agency to develop a Statewide Flood Resiliency Plan, was signed into law by Governor J. Kevin Stitt on May 18, 2020. In addition to the creation of a statewide flood mitigation plan, the law creates the State Flood Resiliency Revolving Fund to fund both the development of the Plan as well as future flood hazard mitigation projects.

The flood plan will examine flood risks, and potential flood mitigation projects beyond the local level, along an entire runoff area within a larger watershed. The plan will examine the need for additional flood risk information, such as flood maps, and will ultimately feature a State inventory of specific flood control infrastructure projects that will include cost-benefit analyses. Flood risk needs and assessments within watersheds could also be coordinated between communities in those watersheds.

OWRB developed a partnership with Oklahoma Department of Emergency Management (OEM) and Oklahoma Department of Commerce (ODOC) to develop a funding strategy for the inaugural Oklahoma Flood Plan:

1. OEM, who managed two Federal Emergency Management Agency (FEMA)'s Building Resilient Infrastructure and Communities (BRIC) and Hazard Mitigation Grant Program (HMGP), would contribute a total of $484,868.00.
2. ODOC, who managed US Department of Housing and Urban Development (HUD)'s Community Development Block Grant – Disaster Recovery (CDBG-DR), would contribute a match fund for the FEMA's program in the amount of $880,000.

2021 OKLAHOMA LEGISLATIVE SESSION

During the 2020 Oklahoma legislative session two bills related to Oklahoma water law and water resource management programs were approved.

House Bill 1093 establishes a date by which the Oklahoma Water Resources Board must update the Oklahoma Water Quality Standards to include a provision to allow for the development of nutrient trading programs by state environmental agencies.

Senate Bill 1022 allows the Executive Director of the Oklahoma Water Resources Board to issue certain temporary and regular permits for water use, except those requesting water from the Arbuckle-Simpson groundwater basin, which are not the subject of protest. All other permits must be approved by the Board.

ARKANSAS RIVER BASIN INFRASTRUCTURE INVESTMENT

The OWRB approved funding for 1 wastewater project totaling nearly $2,575,000 in the compact region from July 2021 to June 2022:

Wastewater System Projects

- $2,575,000 loan for Bristow Municipal Authority

TOTAL $2,575,000

HYDROLOGIC INVESTIGATIONS IN THE ARKANSAS RIVER BASIN

The OWRB conducts statutorily mandated hydrologic investigations to determine the amount of fresh groundwater available for appropriation. Two investigations are currently underway in the compact area of the Arkansas River basin:

- The OWRB initiated a hydrologic investigation of the Salt Fork of Arkansas River aquifer in August 2018 through a contract with the United States Geological Survey (USGS).
- The OWRB also has an ongoing hydrologic investigation of the Boone minor aquifer and Roubidoux major aquifer through a contract with the USGS, initiated in 2017.

FLOODPLAIN MANAGEMENT

The OWRB acts as the State Floodplain Board and National Flood Insurance Program (NFIP) coordinating agency as directed by the Oklahoma Floodplain Management Act. Currently, Oklahoma has 343 NFIP Participating Communities.

In FY-2021, Oklahoma's Floodplain Management Community Assistance Program received a Proficient rating in FEMA Tiered State Framework Assessment Tool. There were 90 NFIP Insurance claims totaling $1.7 million in payments during the year.

The OWRB works with communities throughout the state to identify flood risks and update flood maps through FEMA's Cooperating Technical Partners program. Currently there are eight Active Cooperating Technical Partners (CTP) projects receiving a total of 1.3 million in FEMA funding. The program recently completed a CTP Special Project to develop an NFIP Outreach Dashboard for community officials to see the potential for damages associated with flood risk and policies in their communities or in similar communities in the NFIP.

The OWRB Cooperating Technical Partners Program in partnership with FEMA, is conducting a watershed Discovery project in the Poteau watershed. The project will collect and assess current and historic flood-related data and then meet with communities in the project area to review this data and collect feedback to get a

complete picture of the area's flood risk. This information helps determine whether a future flood risk project is needed and, if so, what the scope of the project will be.

The agency has begun identifying funding partners to initiate development of Oklahoma's first statewide flood plan, which will identify flood risks and potential flood mitigation projects on a watershed basis. The plan will also examine the need for additional flood risk information, such as flood maps, and will ultimately feature a state inventory of specific flood control infrastructure projects that will include cost-benefit analyses.

WATER RIGHTS PERMITTING

The OWRB appropriates freshwater resources as directed by Oklahoma statutes. In the Arkansas/Oklahoma Compact Basin, there are currently 190 active long-term groundwater permits allocated for approximately 29,615 acre-feet per year and 261 active long-term surface water permits for more than 501,000 acre-feet per year. The OWRB's permitting staff issued 0 stream water permits in FY-2021, along with 1 provisional temporary SW permit totaling 1 acre-feet. To support water rights administration, the agency conducted surface water allocation modeling and availability analyses, coordinated statewide water use reporting, and responded to public complaints.

DAM SAFETY

The Oklahoma Dam Safety Program ensures the safety of a total of 4,700 dams statewide, including 113 high hazard-potential dams. In 2020, the program received inspections reports for 95% of high hazard-potential dams. New condition assessment guidelines that better define the different condition classifications were adopted and applied to last year's inspections. Overall, 72% of the state-regulated high hazard-potential dams are rated as either satisfactory or fair condition. The remaining condition rating percentages are 20% poor, 4% unsatisfactory, and 4% not rated. Last year the Oklahoma Dam Safety Program prioritized reviewing high-hazard dam inspection reports, developing training opportunities, and locating available funding for dam rehabilitation projects.

In the Arkansas-Oklahoma Compact Area there are a total of 137 dams including 46 high hazard-potential dams. Thirty-seven of the high hazard-potential dams are NRCS-dams which are operated by local conservation districts, five are Federally owned and operated, and four are regulated by the OWRB. According to the 2020 inspections, two of the OWRB regulated dams were found to be in satisfactory condition and two were in poor condition.

In order to aid dam owners in improving the condition and safety of their dams, the OWRB has applied for grant funding for the past three years through FEMA's Rehabilitation of High Hazard Potential Dams (HHPD) grant program. Currently, four dams have been selected from previous years' grant awards with two dams awaiting final project approval, one of these is Carlton Lake dam which is in the Arkansas River Basin at Robbers Cave State Park.

WELL DRILLER AND PUMP INSTALLER PROGRAM

There are currently 355 well drilling and pump contractors as well as 624 certified operators licensed by the OWRB. The OWRB frequently provides technical assistance for water well drilling and pump contractors and for the public at large. The OWRB also assists drillers with required well log reporting, and to date, just under 209,000 well logs are available to the public online. Every year, the OWRB cooperates with the Oklahoma Ground Water Association to provide continuing education training, which is required for water well and pump contractors to maintain a license. The OWRB works with the Well Driller Advisory Council and stakeholders to develop, update, and advance water well drilling rules. Additionally, in response to the ongoing public health situation, the program instituted online certification testing for firms and operators.

WATER QUALITY MONITORING, MAPPING AND WATER QUALITY STANDARDS

Beneficial Use Monitoring Program: After nearly 24 years, the Beneficial Use Monitoring Program (BUMP) is undergoing a major redesign, primarily focused on the enhancement of a trend monitoring network to help study the long-term health of Oklahoma's waters. Full implementation of this monitoring scheme will minimize data gaps, facilitate annual continuity, and provide greater sensitivity. For additional information, visit www.owrb.ok.gov/bump.

Water Quality Standards: During the February March 2021 meeting of the OWRB, the board adopted revisions to the Oklahoma Scenic River total phosphorus criterion for Illinois River, Barren Fork Creek, and Flint Creek. These revisions were subsequently approved by the Oklahoma Legislature, and the Governor signed the resolution in June 2021. OWRB staff worked in cooperation with Oklahoma partner environmental agencies, Cherokee Nation, and Arkansas Department of Environmental Quality staff on the revised total phosphorus criterion. The adopted revisions were an outgrowth of recommendations from the Arkansas Oklahoma Joint Study Committee.

Additional information on the revised total phosphorus criterion is available on the OWRB website at https://www.owrb.ok.gov/rules/wqs/revisions/totalphosphorous.php and https://www.owrb.ok.gov/rules/wqs/index.php.

Report of the Budget Committee

Arkansas Oklahoma Arkansas River Compact Commission

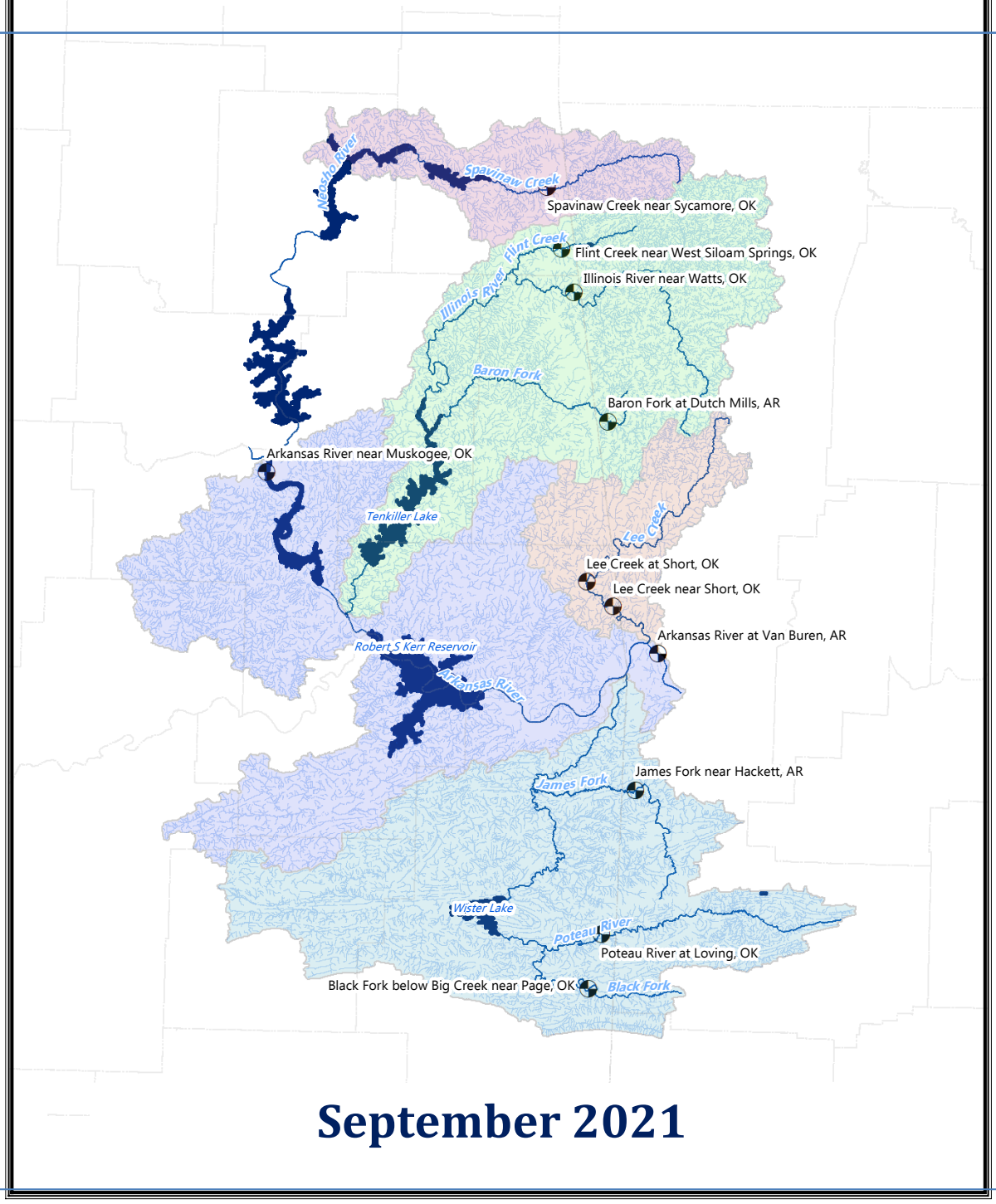
September 23, 2021

The 2022 Proposed Budget covering July 1, 2021 through June 30, 2022.

Beginning Cash Balance – July 1, 2021 Regions Checking Account - $29,900.79 Simmons Bank Certificate of Deposit - $11,189.63	**$ 41,090.42**
PROPOSED BUDGETED RECEIPTS	
Annual Dues – Arkansas and Oklahoma ($3,500/State)	$ 7,000.00
Total Gross Receipts	**$ 7,000.00**
TOTAL FUNDS AVAILABLE	**$ 48,090.42**
PROPOSED BUDGETED EXPENDITURES	
Chairman Hosting Expenses	$ 600.00
Report Printing/Reproduction	$ 2,000.00
Personnel Service & Office Expenses	$ 250.00
Audit	$ 600.00
Meeting Space Rental	$ 900.00
Security Bond/Insurance	$ 550.00
Stream Gage Reimbursement	$ 6,300.00
Total Expenditures	**$ 11,200.00**
TOTAL	**$ 36,890.46**

Arkansas River Basin Compact

Annual Compliance Report



September 2021

Submitted to the Arkansas-Oklahoma Arkansas River Basin Compact Commission

ARKANSAS RIVER BASIN COMPACT

ANNUAL REPORT

The Arkansas River Basin Interstate Compact (Compact) exists to promote interstate comity between the states of Arkansas and Oklahoma and provide for an equitable apportionment of the waters of the Arkansas River between the States of Arkansas and Oklahoma. Provisions in the Compact specify apportionment requirements for the Illinois River, Lee Creek and Spavinaw Creeks, Poteau River, and Arkansas River subbasins based on computation of annual runoff, yield, and depletion/accretions. In an effort to streamline computations and verify Compact compliance, an Excel-based data entry and analyses tool has been developed to standardize computation methods and annual reporting. The new report summary includes compilation of reservoir depletions and subbasin yields in single page, tabular formats. A description of computation methods and procedures is included as Appendix A.

COMPACT COMPLIANCE

For the water year 2020, annual yields in the Illinois River, Lee Creek, Spavinaw Creek, Poteau River, and Arkansas River subbasins exceeded apportionment requirements (no computed deficits). Results from compliance computations are summarized in Tables #1 and #2 on page 2.

Note:

- *Nutrient loading and water quality data for the Illinois River subbasin is reported in a separate publication entitled Water Quality Monitoring Report Illinois River Basin.*

USGS STREAM GAGE CALIBRATION

The following describes United States Geological Survey stream gage calibration as noted in Geological Survey Water-Supply Paper 2175: *Measurement and Computation of Streamflow: Volume 1, Measurement of Stage and Discharge, S. E. Rantz and others.*

> "Each gage will be equipped with data collection platforms that record stage (water-level) at 15-minute intervals and transmit these data to the USGS National Water Information System (NWIS) database and displayed in near real-time on the USGS web page (http://ar.water.usgs.gov). Water-level information from the gages will be used to develop discharge rating curves for calculation of instantaneous and daily discharge in accordance with methods as described by Rantz and others (1982)."

Arkansas River Basin Compact
2020 Computations Summary

Summary of Results for Water Year 2020

Table 1. Annual Depletion by Major Reservoirs in the Compact Area

ANNUAL DEPLETIONS BY MAJOR RESERVOIRS IN ACRE-FEET (AF)

RESERVOIR	CHANGE IN STORAGE	PRECIPITATION (P)	RUNOFF (p)	EVAPORATION (E)	PERMITTED DIVERSIONS (D)	RELEASES (O)	INFLOW (I)	DEPLETIONS (X)
Webber Falls	(13,941)	53,737	9,673	35,512	-	14,267,728	14,245,235	(22,493)
Tenkiller Ferry	(38,491)	125,786	22,641	41,802	25,393	2,678,219	2,603,779	(74,440)
Robert S. Kerr	(69,515)	193,403	34,813	133,957	1,149	42,199,292	42,106,292	(92,999)
Wister	9,463	23,979	4,316	22,762	9,766	1,463,385	1,485,712	22,328
						ANNUAL DEPLETIONS:		(167,605)

Table 2. Annual Yield from Sub-basins in the Compact Area

ANNUAL YIELD FROM SUB-BASINS IN ACRE-FEET (AF)

SUB-BASIN	RUNOFF	DEPLETIONS (+) ACCRETIONS (-)	ANNUAL YIELD[1]	STATE OBLIGATED	FLOW REQUIRED TO DELIVER		ACTUAL FLOW DELIVERED
					Percentage	Amount	
Spavinaw Creek	236,435	1	**236,436**	AR	50	118,218	**236,435**
Illinois River	1,299,748	(1,118,680)	**181,068**	AR	40	72,427	**1,299,748**
Lee Creek	394,410	11,392	**405,802**	AR	0	-	**394,410**
Poteau River	843,752	1,848	**845,600**	AR	40	338,240	**843,752**
Arkansas River	267,048	(194,488)	**72,560**	OK	40	29,024	**267,048**

[1] *Runoff which would occur from any specified area under unaltered conditions*

Arkansas River Basin Compact
2020 Reservoir Summary

WATER BALANCE FOR LARGE RESERVOIRS IN THE COMPACT AREA															
	Normal Storage	Surface Area	Month	Storage	Precipitation (P)		Runoff (p)	Evaporation (E)			Diversions (D)	Releases (O)		Inflow (I)	Depletions (X)
	AF	Acres		AF	in	AF	AF	in	in*	AF	AF	Total (DSF)	Total AF	AF	AF
Webbers Falls	170,100	11,600	Oct	190,227	5.55	5,365		3.68	2.58	2,490		1,578,167	3,130,294		
			Nov		4.09	3,954		1.85	1.29	1,249		1,107,184	2,196,099		
			Dec		1.47	1,421		1.82	1.28	1,234		549,640	1,090,211		
			Jan		5.10	4,930		1.43	1.00	965		1,545,756	3,066,007		
			Feb		3.07	2,968		2.07	1.45	1,403		1,011,746	2,006,798		
			Mar		6.73	6,506		2.96	2.07	2,000		2,340,227	4,641,840		
			Apr		5.21	5,036		4.57	3.20	3,092		1,776,937	3,524,555		
			May		10.68	10,324		5.77	4.04	3,905		2,363,511	4,688,024		
			Jun		1.31	1,266		8.65	6.05	5,852		1,105,403	2,192,567		
			Jul		0.96	928		7.88	5.52	5,332		265,060	525,747		
			Aug		3.65	3,528		7.40	5.18	5,009		480,781	953,629		
			Sep	176,286	7.77	7,511		4.40	3.08	2,980		143,316	284,267		
			TOTAL	(13,941)	55.59	53,737	9,673	52.48	36.74	35,512	-		14,267,728	14,245,235	(22,493)
Tenkiller Ferry	627,467	12,900	Oct	727,790	9.8	10,492		4.19	2.93	3,151		178,971	354,989		
			Nov		4.0	4,246		2.21	1.55	1,662		196,561	389,879		
			Dec		2.0	2,172		2.25	1.57	1,692		109,854	217,895		
			Jan		4.6	4,956		1.95	1.36	1,465		121,403	240,803		
			Feb		2.7	2,892		2.39	1.67	1,796		143,736	285,100		
			Mar		8.0	8,600		3.62	2.53	2,721		122,588	243,153		
			Apr		5.4	5,816		4.94	3.46	3,720		192,470	381,764		
			May		10.9	11,664		6.32	4.42	4,753		97,034	192,467		
			Jun		50.1	53,847		8.84	6.19	6,649		117,089	232,246		
			Jul		4.2	4,526		7.59	5.31	5,711		26,204	51,976		
			Aug		7.0	7,504		6.77	4.74	5,093		29,000	57,522		
			Sep	689,299	8.4	9,073		4.50	3.15	3,389		15,339	30,425		
			TOTAL	(38,491)	117.01	125,786	22,641	55.55	38.89	41,802	25,393		2,678,219	2,603,779	(74,440)
Robert S. Kerr	525,700	41,900	Oct	595,656	7.35	25,664		3.79	2.66	9,273		2,154,369	4,273,191		
			Nov		3.49	12,186		1.96	1.37	4,791		1,891,173	3,751,142		
			Dec		2.03	7,088		1.78	1.25	4,353		940,777	1,866,031		
			Jan		4.62	16,132		1.29	0.90	3,143		2,422,254	4,804,541		
			Feb		3.08	10,754		1.86	1.30	4,534		1,837,213	3,644,112		
			Mar		5.78	20,182		3.02	2.11	7,374		3,273,028	6,492,051		
			Apr		5.30	18,506		4.64	3.25	11,338		2,794,236	5,542,367		
			May		8.66	30,238		6.14	4.30	15,007		3,157,585	6,263,070		
			Jun		0.22	768		9.15	6.41	22,371		1,461,385	2,898,657		
			Jul		3.19	11,138		8.36	5.85	20,421		372,444	738,743		
			Aug		3.90	13,618		8.02	5.61	19,600		635,752	1,261,014		
			Sep	526,141	7.77	27,130		4.81	3.37	11,752		334,950	664,373		
			TOTAL	(69,515)	55.39	193,403	34,813	54.81	38.36	133,957	1,149		42,199,292	42,106,292	(92,999)
Wister	48,850	7,700	Oct	46,493	6.88	4,415		3.38	2.36	1,517		10,093	20,019		
			Nov		2.52	1,617		1.77	1.24	797		34,966	69,355		
			Dec		0.81	520		1.69	1.18	760		46,058	91,356		
			Jan		3.63	2,329		1.42	0.99	638		84,131	166,874		
			Feb		2.25	1,444		1.76	1.23	792		69,534	137,921		
			Mar		5.83	3,741		2.99	2.09	1,343		40,111	79,560		
			Apr		3.01	1,931		4.45	3.12	2,001		144,475	286,566		
			May		6.52	4,184		6.12	4.28	2,748		66,274	131,454		
			Jun		0.78	501		8.33	5.83	3,742		104,964	208,196		
			Jul		1.76	1,129		7.87	5.51	3,537		3,720	7,379		
			Aug		3.38	2,169		6.87	4.81	3,088		6,136	12,171		
			Sep	55,956	-	-		4.01	2.80	1,799		127,317	252,533		
			TOTAL	9,463	37.37	23,979	4,316	50.68	35.47	22,762	9,766		1,463,385	1,485,712	22,328

** A coefficient of 0.7 is applied to convert pan evaporation data to lake evaporation*

Arkansas River Basin Compact
Sub-basin Drainage Areas

Water Year 2020 - Additional Tables (refer to Drainage Areas for adjustment of flows)

USGS 07191220		
Spavinaw Creek near Sycamore, OK		
Drainage area:	133	sq.mi
Measured	130,655	cfs
	259,155	acre-feet
Adjusted to State Line		
Drainage Area:	121.34	sq.mi
Estimated	119,201	cfs
	236,435	**acre-feet**

USGS 07195855		
Flint Creek near West Siloam Springs		
Drainage area:	60	sq.mi
Measured	48,485	cfs
	96,171	acre-feet
Adjusted to StateLine		
Drainage Area:	55	sq.mi
Estimated	44,245	cfs
	87,760	acre-feet

USGS 07195500		
Illinois River near Watts, OK		
Drainage area:	635	sq.mi
Measured	565,373	cfs
	1,121,417	acre-feet
Adjusted to StateLine		
Drainage Area:	630	sq.mi
Estimated	560,529	cfs
	1,111,810	**acre-feet**

USGS 07196900		
Baron Fork at Dutch Mills, AR		
Drainage area:	41	sq.mi
Measured	32,527	cfs
	64,518	acre-feet
Adjusted to StateLine		
Drainage Area:	63	sq.mi
Estimated	50,506	cfs
	100,178	acre-feet

USGS 07249985		
Lee Creek near Short, OK		
Drainage area:	420	sq.mi
Measured	341,436	cfs
	677,238	acre-feet
Adjusted to StateLine		
Drainage Area:	245	sq.mi
Estimated	198,846	cfs
	394,410	acre-feet

USGS 07247015		
Poteau River at Loving, OK		
Drainage area:	269	sq.mi
Measured	274,405	cfs
	544,282	acre-feet
Adjusted to StateLine		
Drainage Area:	262	sq.mi
Estimated	266,856	cfs
	529,309	**acre-feet**

USGS 07247250		
Black Fork below Big Creek nr Page, OK		
Drainage area:	74	sq.mi
Measured	121,949	cfs
	241,886	acre-feet
Adjusted to StateLine		
Drainage Area:	18	sq.mi
Estimated	28,897	cfs
	57,318	**acre-feet**

USGS 07247250		
James Fork near Hackett, AR		
Drainage area:	147	sq.mi
Measured	121,966	cfs
	241,919	acre-feet
Adjusted to StateLine		
Drainage Area:	156	sq.mi
Estimated	129,632	cfs
	257,125	**acre-feet**

USGS 07250550		
AR River at James W Trimble L&D nr Van Buren		
Drainage area:	151,000	sq.mi
Measured	19,142,710	cfs
	37,969,565	acre-feet
Adjusted to StateLine		
Drainage Area:	149,954	sq.mi
Estimated	19,010,141	cfs
	37,706,615	**acre-feet**

USGS 07194500		
Arkansas River near Muskogee, OK		
Drainage area:	84,133	sq.mi
Measured	14,059,160	cfs
	27,886,344	**acre-feet**

USGS 07245000		
Askansas River near Whitefield, OK		
Drainage area:	37,876	sq.mi
Measured	3,536,836	cfs
	7,015,313	**acre-feet**

Arkansas River Basin Compact

Appendix A

Guidelines for the Computation of Annual Yields

This document provides details on the data sources and methods required for computation of the annual yields for the Spavinaw Creek, Illinois River, Lee Creek, Poteau River and Arkansas River Sub-basins of the Oklahoma-Arkansas River Compact.

Computation of Annual Yields

The Oklahoma-Arkansas River Compact states the required determinations for computation of annual yields (Appendix I, page 116), as follows:

1. **Measurement or computation of actual runoff from each Sub-basin**
2. **Computation of total depletions or accretions in each of the respective Sub-basins**
3. Sum of items (1) and (2) to obtain the "annual yield" for each basin
4. Multiply item (3) by 100 minus the percent depletion allowed in Article IV of the Compact
5. Compute deficiency, if any, by comparing item (4) to (1)

Items 1 and 2 are explained in this document, as these involve interpretation of the Compact, data collection and application of appropriate methods for computation of runoff, accretions, and depletions. Items 3 to 5 are not included herein as these are self-explanatory.

1. Measurement or Computation of Actual Runoff from each Sub-basin

- Runoff from the Sub-basins should be computed using the areas defined by the Compact in Article II (page 93), and further comments of the Committee presented in Appendix I, Item 1 (page 117-118). Active USGS streamflow gauges should be used to retrieve measured runoff as available. Since most gauges are not located right on the Oklahoma-Arkansas state border, estimates of runoff should account for the ungauged flows generated in the drainage area above or below the selected gauge.

  In the case of the Spavinaw Creek, Illinois River, Lee Creek and Poteau River Sub-basins, the runoff measured at the gauges needs to be adjusted using simple linear interpolation, as follows:

$$R = R_M * \left[\frac{A_T}{A_G}\right] \qquad \textbf{(Eq. 1)}$$

Where,

***R** = Actual runoff at the OK-ARK state line*

***R_M** = Measured runoff at the gauge*

***A_G** = Contributing area at the gauge*

***A_U** = Area ungauged above or below gauge*

***A_T** = Total area including ungauged portion. Because water from these Sub-basins originates in the state of Arkansas, then:*

- *If gauge is located on the Oklahoma side: $A_T = A_G - A_U$*
- *If gauge is located on Arkansas side: $A_T = A_G + A_U$*

The report should include a brief description of the procedure used to compute actual runoff (R) in these Sub-basins and should also include the measured ungauged drainage areas used for such computation.

In the case of the Arkansas River Sub-basin, the Compact specifies that the following formula be applied (Appendix I, Item 1, page 117):

$$Q_A = Q_V - [Q_M + Q_W + Q_2 + Q_3 + Q_4] \quad \textbf{(Eq. 2)}$$

Where,

Q_A = *Total annual discharge originating from the Arkansas River Sub-basin.*

Q_V = *Total annual discharge of the Arkansas River immediately below the mouth of Lee Creek presently measured at the Van Buren gaging station.*

Q_M = *Total annual discharge of the Arkansas River immediately below the mouth of the Grand Neosho River, presently measured at the Muskogee gaging station.*

Q_W = *Total annual discharge of the Canadian River at Eufaula Dam, presently measured at Whitefield gaging station.*

Q_2 = *Total annual outflow from the Illinois River Sub-basin.*

Q_3 = *Total annual outflow from the Lee Creek Sub-basin.*

Q_4 = *Total annual outflow from the Poteau River Sub-basin.*

Measured runoff should be retrieved from the USGS website (http://waterdata.usgs.gov/nwis) for the following gauges (Figure 1), as available:

Table 1. Current USGS gauges used for Computation of Runoff at Sub-basins in the Compact Area

Sub-basin	USGS Gauges Required	Drainage Area (mi^2)
Spavinaw Creek	07191220 - Spavinaw Creek near Sycamore, OK	133
Illinois River	07195855 - Flint Creek near West Siloam Springs, OK 07195500 - Illinois River near Watts, OK 07196900 - Baron Fork at Dutch Mills, AR	59.8 635 41
Lee Creek	07249985 - Lee Creek near Short OK	420
Poteau River	07247015 - Poteau River at Loving, OK 07247250 - Black Fork below Big Creek nr Page, OK 07247250 – James Fork near Hackett, AR	269[a] 74.4\ 147
Arkansas River	07194500 - Arkansas River near Muskogee, OK 07245000 - Canadian River near Whitefield, OK 07250550 - AR River at J. W. Trimble L&D nr Van Buren, AR	84,133 37,876 151,000[d]

[a] Does not include 25.1 sq. miles of ungauged drainage.

[b] Does not include 13.0 sq. miles of ungauged drainage.

[c] Does not include 35.2 sq. miles of ungauged drainage.

[d] Includes 22,200 sq. miles of drainage area in Kansas that "probably is noncontributing".

Data obtained from the eleven (11) above listed gauges is sufficient to accurately compute actual runoff from the Sub-basins but different gages could be used for the computation of runoff.

- Review of the Poteau River Sub-basin indicates that there are large portions of runoff that originates in Arkansas but is not included in the gaging. Calculations should be completed to estimate the runoff for these areas using the following equation.

$$R_U = R_M * \left[\frac{A_U}{A_G}\right] \quad \textbf{(Eq. 3)}$$

Where,
R_U *= Calculated runoff at the OK-AR state line from ungauged contributing streams*
R_M *= Measured runoff at the gauge*
A_G *= Contributing area at the gauge*
A_U *= Area contributing runoff for ungauged streams*

Actual runoff should be computed on an annual basis, and monthly values should be included as appendices, instead of the daily time series that have been included in previous reports. Units should be consistent; preferably in Acre-feet (AF).Flows originated from outside the Compact area should not be included in the computation of actual runoff, unless specified in the Compact. Article II of the Compact defines the drainage areas for each Sub-basin as waters originating in the Compact area. In previous reports, return flows from the White River Basin have been removed from the flow originating in the Arkansas River Basin since the water is being transferred in from another basin. The return flow data is obtained from the water department/utilities for the Cities of Fayetteville, Rogers, and Springdale, AR.

2. Computation of Total Depletions or Accretions in each of the respective Sub-basins

In Supplement No. 1, Appendix I, Item 2, the Compact states that *"The total annual depletion in each sub-basin will be the sum of the following:* ***(a)*** *Total stream diversions minus return flows.* ***(b)*** *Depletions and/or accretions by major reservoirs.* ***(c)*** *Evaporation losses from other than major reservoirs.* ***(d)*** *Pumpage of ground water alluvium aquifers".* Data sources and procedures suggested for computation of these items are described as follows:

a) Total stream diversions minus return flows

Diversions over the Oklahoma side of the Compact, i.e. the Arkansas Sub-basin and the Oklahoma portion of the Lee Creek Sub-basin, should be estimated using information from the OWRB. Likewise, diversions over the Arkansas side of the Compact should be obtained from ANRC. These agencies manage the surface water rights of their areas, and can provide information on the type of uses, allocated amounts, annual reported use, and estimates of return flows. Values of annual diversions for each sub-basin should be included in the report, along with a brief description of the methods and assumptions used in the calculation of return flows.

Depletions and/or accretions by major reservoirs

The Compact defines depletion as the difference between the inflow and outflow, using the following equation (Appendix I, item 2):

$$I - O = -P + p \pm \Delta S + E + D$$

in which

***I - O** = Depletion in the reservoir.*

***P** = Precipitation on reservoir surface.*

***p** = Runoff that would have occurred from area covered by reservoir, computed by a derived rainfall-runoff factor c times P, or cP.*

***ΔS** = Change in storage volume at beginning and end of period*

***E** = Evaporation from reservoir surface.*

***D** =Direct diversions from reservoir storage, not included in outflow; seepage from reservoir may also be a factor and, if not included in measured outflow as at gaging station below dam, should be estimated.*

Monthly data for the reservoirs of the Compact area should be obtained from the USACE web page, at http://www.swt-wc.usace.army.mil/. Available data includes reservoir contents, as well as evaporation and precipitation measured over the reservoir surface.

- **Precipitation on reservoir surface (P)**

  Monthly values of precipitation data measured over the lakes should be retrieved from the USACE webpage.

- **Runoff (p)**

  This component should be estimated as the product of precipitation (P) and a runoff coefficient as stated in the Compact, also known as the Rational Method. A runoff coefficient of 0.18 has been used since 1974 to determine the runoff quantity. It has been noted that the runoff coefficient value can vary depending on publications and that there is no way to know what existed in the area before the reservoirs were built. For these reasons it is agreed upon by the Engineering Committee to continue the use of 0.18 as the runoff coefficient since this is the value that has been used in all of the previous reports.

- **Change in Storage (ΔS)**

  Change in storage is defined in the compact as the *"Change in the storage volume at the beginning and end of a period",* which for the water year would be computed as the difference between the contents at the end of the period (September 30th) minus the contents at the beginning of the period (September 30th, previous calendar year).

- **Evaporation from reservoir surface (E)**

  Monthly values of evaporation strictly measured over the lakes should be retrieved from the USACE webpage. Pan evaporation is used to estimate the evaporation from lakes. There is a correlation between lake evaporation and pan evaporation. Evaporation from a natural body of water is usually at a lower rate because the body of water does not have metal sides that get hot with the sun, and while light penetration in a pan is essentially uniform, light penetration in natural bodies of water will decrease as depth increases. Pan coefficients can

vary depending on a number of different variables, including ground cover, levels of relative humidity, and 24-hour wind speed. Previous reports have used a pan coefficient of 0.70 for correlation between reservoir evaporation and pan evaporation.

Further discussion as to the coefficient value that should be used is required by the engineering committee.

- **Direct Diversions from reservoir surface (D)**

  Direct diversions from reservoir storage, not included in the outflow, can be computed using information from the OWRB water rights database. Previous reports only used data from the USACE, but did not include description of details such as the type of use, the year of the data, and if any return flows had been included in the computation.

b) Evaporation losses from other than major reservoirs

This item has not been addressed in previous reports. The Compact states that *"Evaporation from small lakes, such as those not designed for water supply, including flood-detentions structures, farm ponds, and recreation lakes, may be estimated on basis of average water surface area and appropriate data from evaporation-pan records"* (Appendix I, Item 2, page 119).

Further discussion about the data sources and feasibility of including this item in the computation of depletions needs to be discussed by the Engineering Committee. Inclusion of this item in the computation of depletions will be determined by the Engineering Committee.

c) Pumpage of ground water from alluvium aquifers

This item has not been included in previous reports. The Compact states that *Pumpage from stream alluviums may cause appreciable depletions in the stream flow. This is not believed to be a factor at the present (1969) time but could conceivably be in the future for some stream reaches"* (Appendix I, Item 2, page 119).

Inclusion of this item in the computation of depletions will be determined by the Engineering Committee.

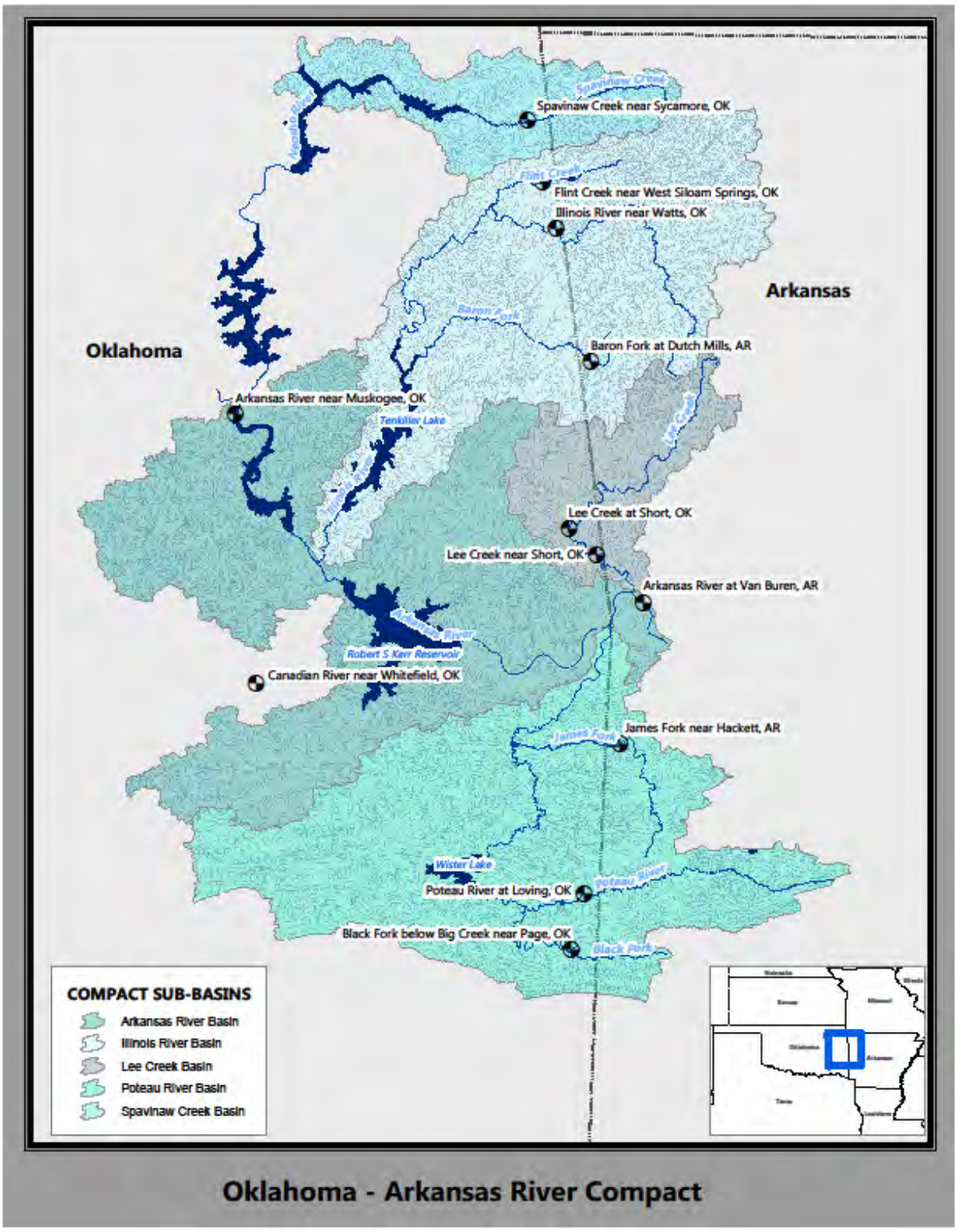
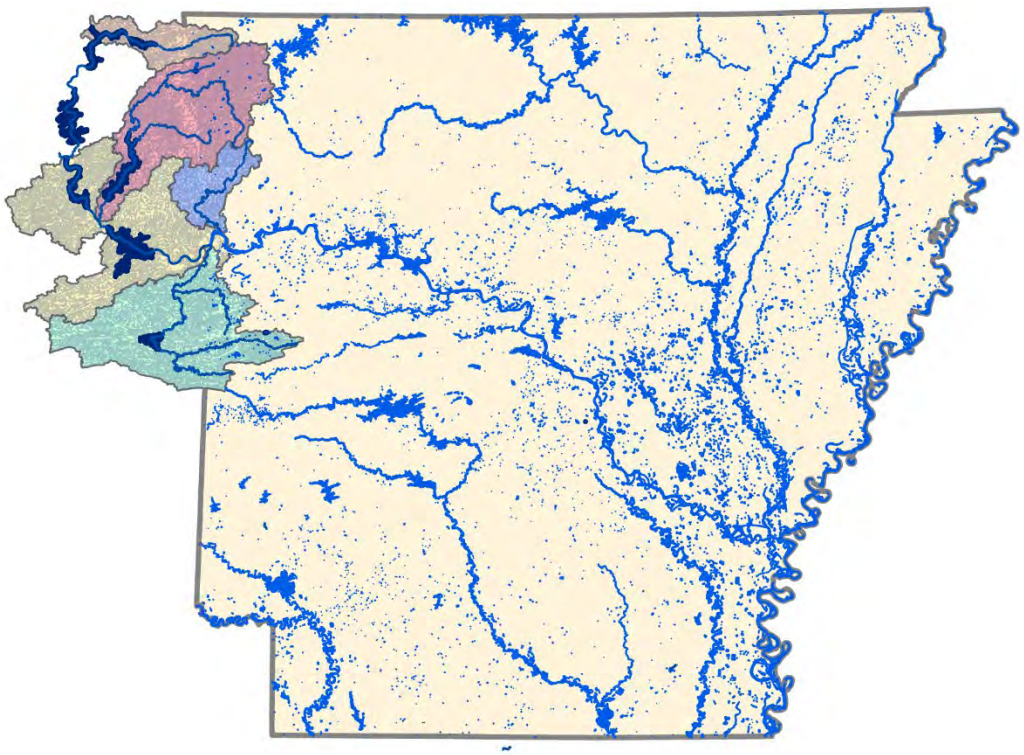


Figure 1. Map of the Oklahoma-Arkansas River Compact Area

Arkansas-Oklahoma
Arkansas River Compact Commission

State of Arkansas
Environmental Committee Report



September 23, 2021

Table of Content

TAB	CONTENT
	2020 CLIMATE SUMMARY ILLINOIS RIVER WATERSHED
	Figure 1 – Illinois River Basin, water quality monitoring stations, and climate recording stations
	Table 1 – 2020 Climate Data
	Figure 2 – 2020 Recorded Monthly High and Low Temperature Versus Historical Monthly High and Low Temperatures
	Figure 3 - 2020 Monthly Precipitation Versus Historical Monthly Precipitation
	Table 2 – 2020 Top Six Daily Flows for Monitored Streams
	Water Quality Monitoring Report Illinois River Basin
	Table 3 – Arkansas 5-Year Rolling Average Total Phosphorus Loadings
	Monitoring Station: Flint Creek Northwest of Siloam Springs, Oklahoma
	Table 4 – Five Year Rolling Average Phosphorus Loading
	Figure 4 - Five-year Average Phosphorus Loading Bar Chart
	Table 5 – Annual Total Phosphorus Loading
	Figure 5 - Total Phosphorus Versus 3-Month Geometric Mean
	Monitoring Station: Sager Creek Near West Siloam Springs, Arkansas
	Table 6 – Arkansas 5-Year Rolling Average Total Phosphorus Loadings
	Figure 6 - Five-year Average Phosphorus Loading Bar Char
	Table 7 – Annual Total Phosphorus Loading
	Figure 7 - Total Phosphorus Versus 3-Month Geometric Mean
	Monitoring Station: Illinois River South of Siloam Springs, Arkansas
	Table 8 – Arkansas 5-Year Rolling Average Total Phosphorus Loadings
	Figure 8 - Five-year Average Phosphorus Loading Bar Char
	Table 9 – Annual Total Phosphorus Loading
	Figure 9 - Total Phosphorus Versus 3-Month Geometric Mean
	Monitoring Station: Baron Fork at Dutch Mills, Arkansas
	Table 10 – Arkansas 5-Year Rolling Average Total Phosphorus Loadings
	Figure 10 - Five-year Average Phosphorus Loading Bar Char
	Table 11 – Annual Total Phosphorus Loading
	Figure 11 - Total Phosphorus Versus 3-Month Geometric Mean
	Arkansas 303 (d) List
	Public Hearing Notice
	Table 12 – 2020 303 (d) Category 5 List (Draft) Illinois River
	Figure 12 – 2020 303 (d) Category 5 List (Draft) Illinois River Watershed
	Table 13 – 2020 303 (d) Category 5 Alternate List (Draft) Illinois River Watershed
	Figure 13 – 2020 303 (d) Category 5 Alternate List (Draft) Illinois River Watershed
	Table 14 – 2020 303 (d) Category 5 List (Draft) Lee Creek Watershed
	Figure 14 –2020 303 (d) Category 5 (Draft) Lee Creek Watershed
	Figure 14 –2020 303 (d) Category 5 (Draft) Lee Creek Watershed

Climatic Summary Illinois River Watershed

Climate data is presented to identify climate factors such as temperature and precipitation which impact monitoring results within the Illinois River Watershed. Drake Field located in Fayetteville, Arkansas, is the monitoring station utilized for records representing climate conditions for the Illinois River watershed. The dataset for station USW00093993, Drake Field, Fayetteville, Arkansas, is available at NOAAs National Centers for Environmental Information – Climate Data Online. The following URL directs do the datasets: https://www.ncdc.noaa.gov/cdo-web/datasets . Figure 1 below illustrates the spatial relationship of the monitoring stations to the watershed.

Figure 1-Illinois River Basin, water quality monitoring stations, and climate recording station



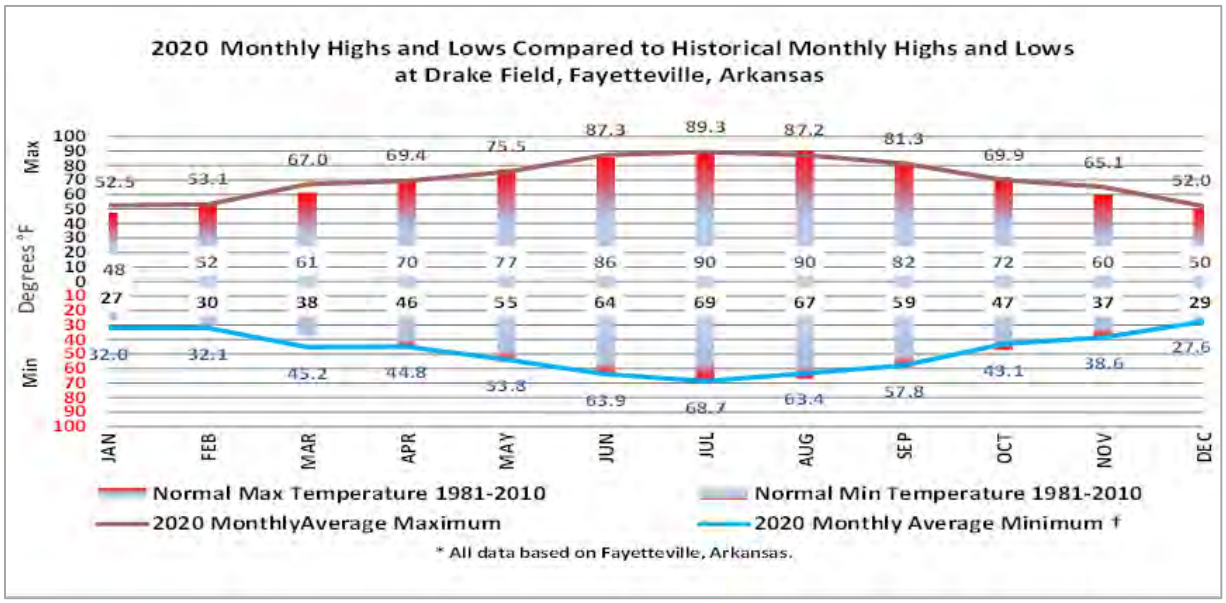
The recorded data for average maximum temperature, average minimum temperature, precipitation, and outliers are in table 1. The average maximum temperature was 2.2° Fahrenheit greater than normal. The average minimum temperature was .08° Fahrenheit greater than normal. The precipitation total for the year was 1.4 inches greater than normal. The historical

normals are derived using data collected during 1980 to 2010. Figure 2 illustrates the monthly average maximum temperature and monthly average minimum temperature compared to the monthly averages.

Table 1 - 2020 Climate Data

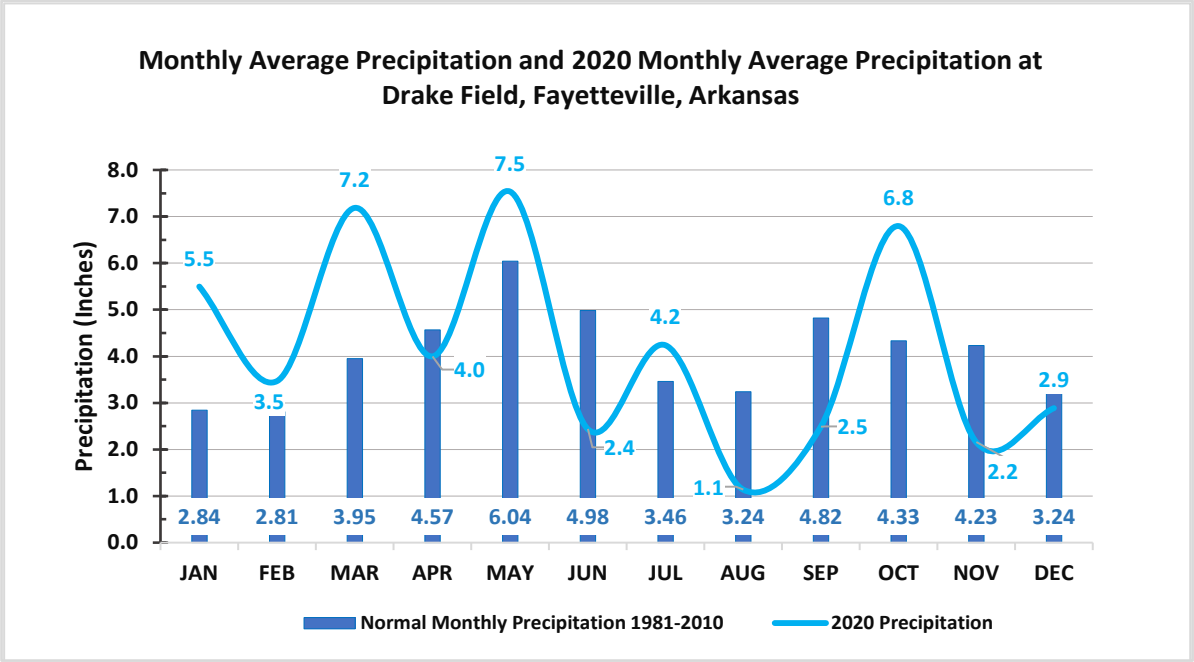
Average Max Temperature 2020 (F°)	70.8 °	Normal	68.6 °	Difference	2.2 °
Average Min Temperature 2020 (F°)	45.0°	Normal	45.8 °	Difference	0.8 °
Total Precipitation (In) 2020	49.9 “	Normal	48.5 “	Difference	1.4“
Extreme Maximum Temp 2020 (F°)	95 °	*Recorded June 6, 2020*			
Extreme Minimum Temp (F°) 2020	13 °	*Recorded December 25, 2020*			
Extreme Precipitation (in) 2020	3.27 “	*24-hour total for January 10, 2020*			

Figure 2 – 2020 Recorded Monthly High and Low Temperatures Versus Historical Monthly High and Low Temperatures



Precipitation for calendar year 2020 registered 1.4 inches greater than normal. Recorded monthly average precipitation compared to historical monthly averages are illustrated in figure 3. January, February, March, May, July, and October were months with above average precipitation. April, June, August, September, November, and December were months with below average precipitation.

Figure 3 - 2020 Monthly Precipitation Versus Historical Monthly Precipitation



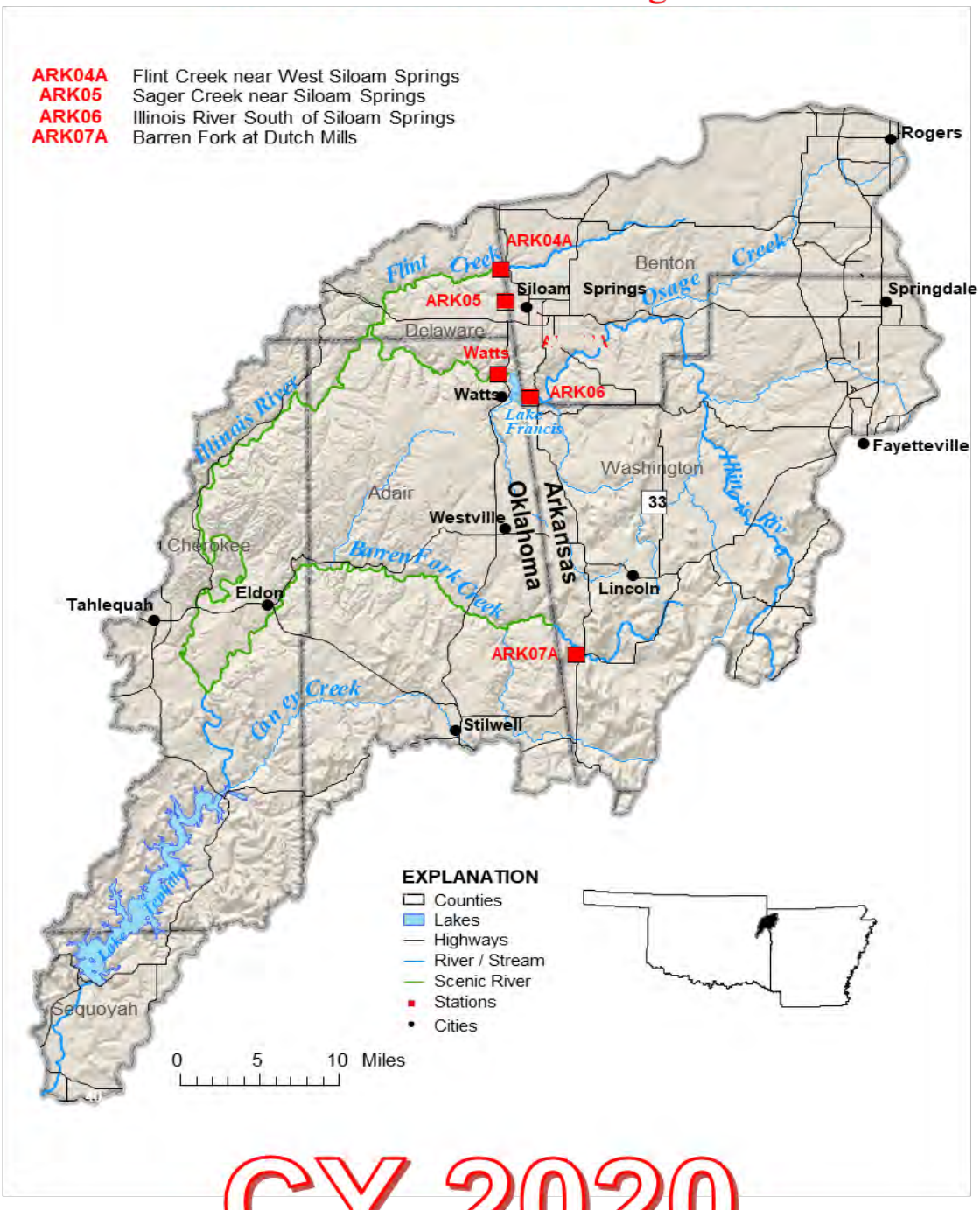
Reviewing precipitation patterns is central to identifying high stream flows and the effects on phosphorus loading. Increased overland flow and streamflow augments higher phosphorus readings. For this reason, the top six highest flows are discounted in the following analysis. The top six flows for each of the four streams monitored by Arkansas are listed below in table 2. While January 10th recorded the greatest precipitation, March 19th effected flows the most across the watershed.

Table 2 – 2020 Top Six Daily Flows for Each Monitored Stream

Flint Creek		Sager Creek		Illinois River		Baron Fork	
Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)
03/19/2020	995	3/19/2020	965	03/20/2020	18,654	03/19/2020	2,567
01/11/2020	909	01/11/2020	536	03/19/2020	11,737	05/26/2020	816
03/20/2020	517	01/10/2020	408	01/11/2020	11,033	01/11/2020	674
01/10/2020	345	03/14/2020	374	05/26/2020	6,600	03/18/2020	634
05/26/2020	334	05/26/2020	365	05/16/2020	6,061	03/20/2020	435
01/12/2020	287	05/16/2020	262	03/15/2020	5,804	02/04/2020	404

Water Quality Monitoring Report
Illinois River Basin
Arkansas-Oklahoma Compact

State Of Arkansas Monitoring Stations



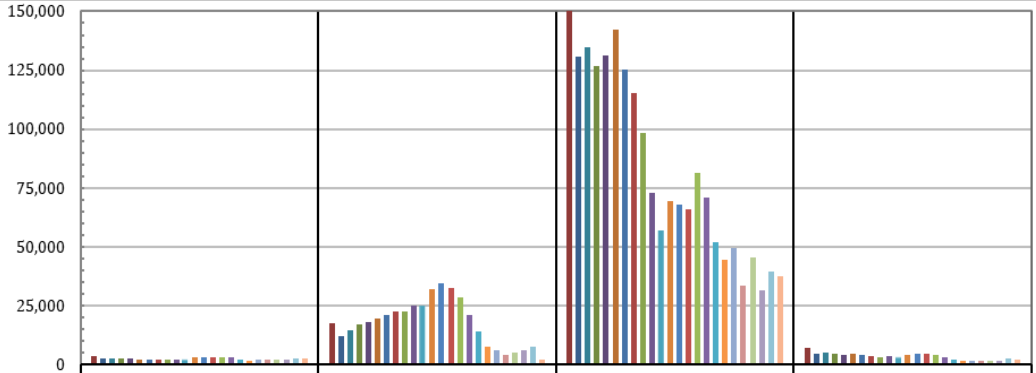
CY 2020

Table 3 - Arkansas 5-Year Rolling Average Total Phosphorus Loading

Arkansas

5-Year Rolling Average Total Phosphorus Loading

(excluding targeted high flows)



	Flint Ck ARK04A	Sager Ck ARK05	Illinois R. ARK06	Baron Fk ARK07A
Total P 80-93	3,267	17,566	190,577	7,160
Total P 94-98	2,488	12,133	130,567	4,519
Total P 95-99	2,555	14,284	134,951	4,874
Total P 96-00	2,187	16,796	126,713	4,571
Total P 97-01	2,213	18,008	131,495	4,002
Total P 98-02	2,043	19,332	142,446	4,354
Total P 99-03	2,019	20,798	125,156	3,792
Total P 00-04	2,106	22,418	115,417	3,661
Total P 01-05	2,049	22,616	98,479	2,777
Total P 02-06	1,855	24,905	72,654	3,274
Total P 03-07	1,707	25,113	56,817	3,062
Total P 04-08	2,848	31,649	69,349	4,145
Total P 05-09	2,723	34,345	67,883	4,237
Total P 06-10	2,762	32,462	65,668	4,267
Total P 07-11	3,102	28,313	81,467	3,678
Total P 08-12	2,919	20,984	70,853	3,156
Total P 09-13	1,794	13,856	51,777	1,898
Total P 10-14	1,551	7,661	44,170	1,347
Total P 11-15	1,825	5,710	49,406	1,559
Total P 12-16	1,761	3,789	33,473	1,276
Total P 13-17	1,946	5,083	45,502	1,193
Total P 14-18	1,901	6,007	31,343	1,483
Total P 15 -19	2,487	7,626	39,200	2,224
Total P16-20	2,462	1,920	37,199	2,004

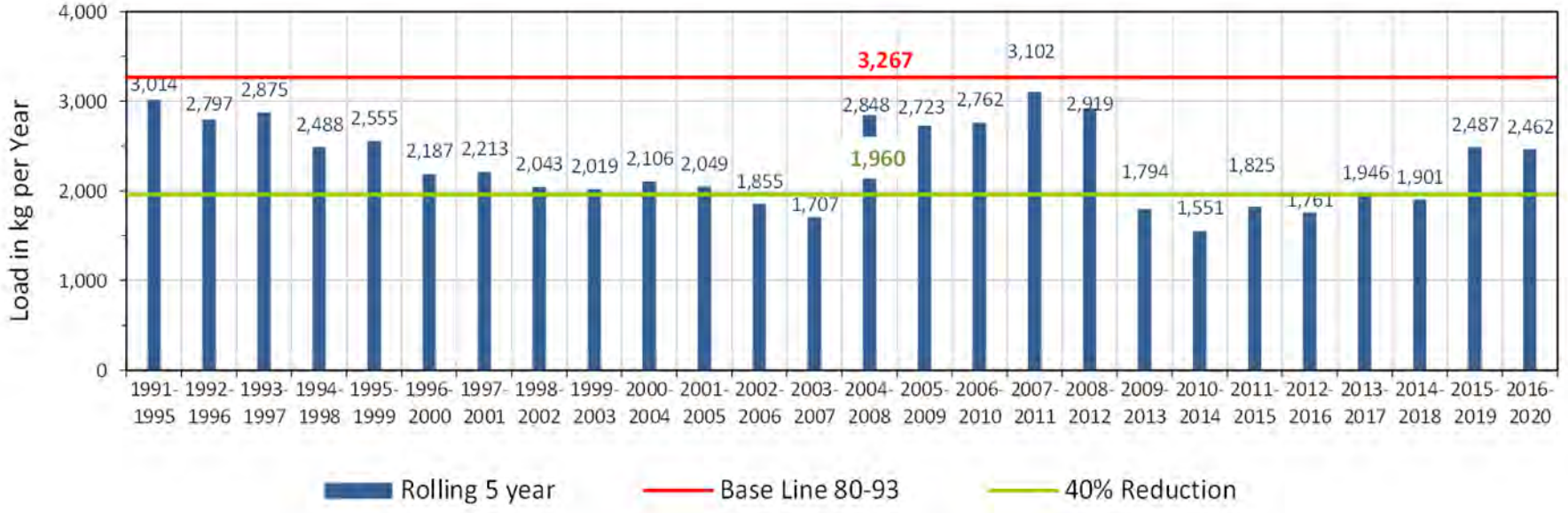
Values represent all available data routinely collected. Targeted high flows excluded beginning 2016.

Monitoring Station: Flint Creek
Northwest of West Siloam Springs, Oklahoma

Table 4 - Five-Year Rolling Average Phosphorus Loading

Year	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19	16-20
Pt (mg/l)	0.054	0.054	0.059	0.061	0.060	0.053	0.052	0.046	0.050	0.052	0.054	0.056	0.058	0.073	0.072	0.073	0.070	0.067	0.047	0.046	0.046	0.048	0.048	0.047	0.047	0.047
Flow (cfs)	62.0	58.4	54.7	45.6	47.7	46.6	47.7	49.2	44.9	45.1	42.6	37.2	32.8	43.9	42.1	42.4	49.5	48.9	42.5	37.6	44.4	41.1	45.3	45.4	59.1	58.4
Pt (kg/yr)	3014	2797	2875	2488	2555	2187	2213	2043	2019	2106	2049	1855	1707	2848	2723	2762	3102	2919	1794	1551	1825	1761	1946	1901	2487	2462
% Decrease	8%	14%	12%	24%	22%	33%	32%	37%	38%	36%	37%	43%	48%	13%	17%	15%	5%	11%	45%	53%	44%	46%	40%	42%	24%	25%

Figure 4 – Five-Year Rolling Average Phosphorus Loading Bar Chart

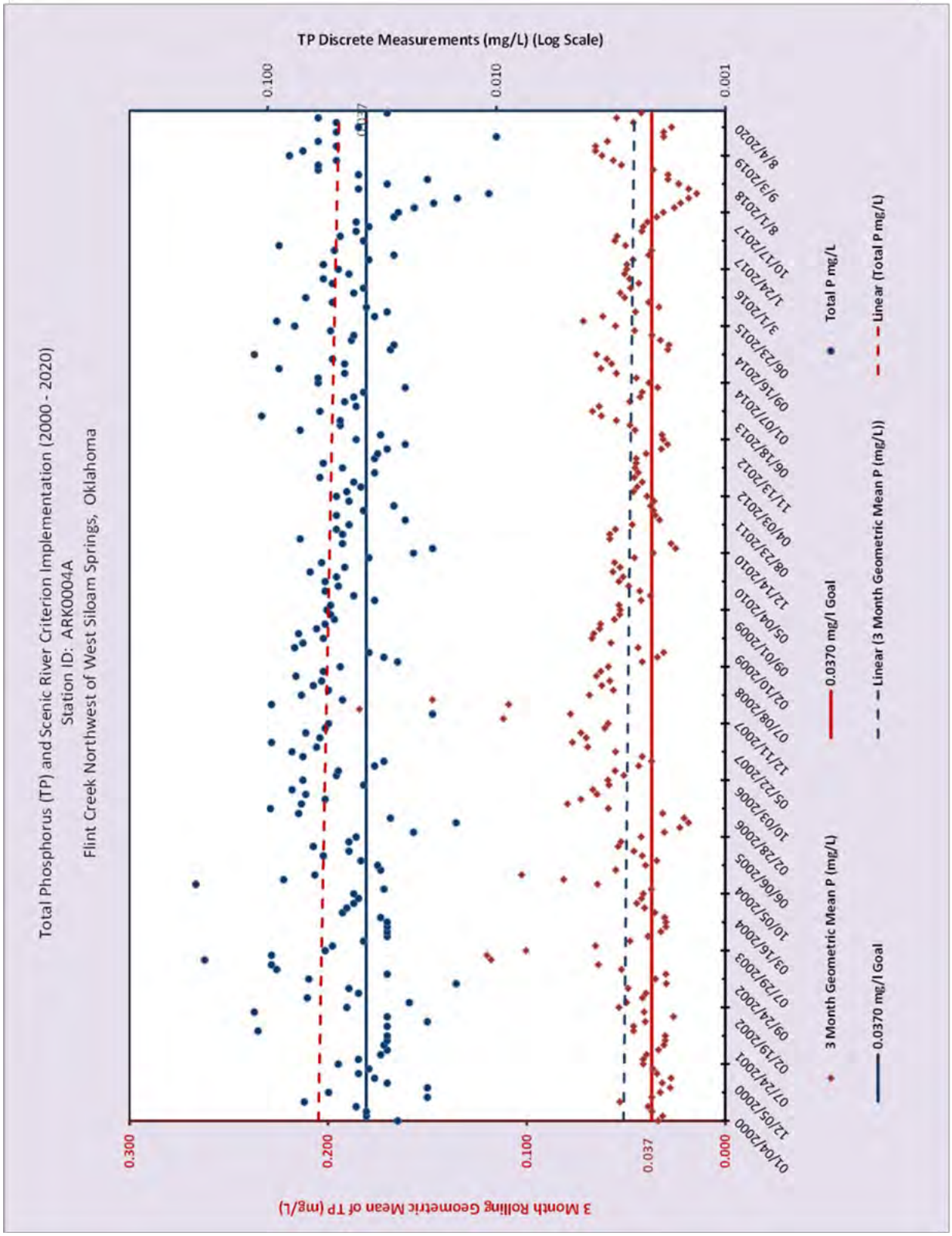


Monitoring Station: Flint Creek
Northwest of West Siloam Springs, Oklahoma

Table 5-Annual Total Phosphorus Loading

ARK04A Year	Flow (cfs)	Total P (mg/L)	Total P (kg/yr)
1981	19.8	0.149	2,635
1982	29.9	0.171	4,566
1983	19.0	0.073	1,239
1984	53.5	0.112	5,351
1985	91.3	0.063	5,137
1986	78.4	0.067	4,691
1987	58.3	0.049	2,551
1988	41.8	0.031	1,157
1989	38.0	0.050	1,697
1990	71.3	0.060	3,821
1991	51.6	0.054	2,489
1992	56.1	0.047	2,355
1993	88.2	0.045	3,545
1994	53.0	0.051	2,414
1995	61.3	0.075	4,106
1996	33.5	0.050	1,496
1997	37.3	0.074	2,448
1998	42.9	0.056	2,142
1999	63.5	0.045	2,578
2000	55.6	0.038	1,893
2001	39.4	0.047	1,636
2002	44.6	0.047	1,850
2003	21.4	0.075	1,438
2004	64.6	0.055	3,173
2005	43.0	0.046	1,772
2006	12.6	0.056	630
2007	22.4	0.059	1,180
2008	76.9	0.147	10,096
2009	55.6	0.054	2,681
2010	44.3	0.049	1,939
2011	48.5	0.042	1,798
2012	19.2	0.043	732
2013	45.1	0.049	1,973
2014	30.7	0.049	1,343
2015	103.8	0.048	4,449
2016	32.2	0.051	1,467
2017	39.9	0.044	1,554
2018	45.6	0.043	1,750
2019	99.3	0.050	4,433
2020	75.1	0.048	3,243
Avg.	50.2	0.062	2,758

Figure 5 - Total Phosphorus Versus 3-Month Geometric Mean

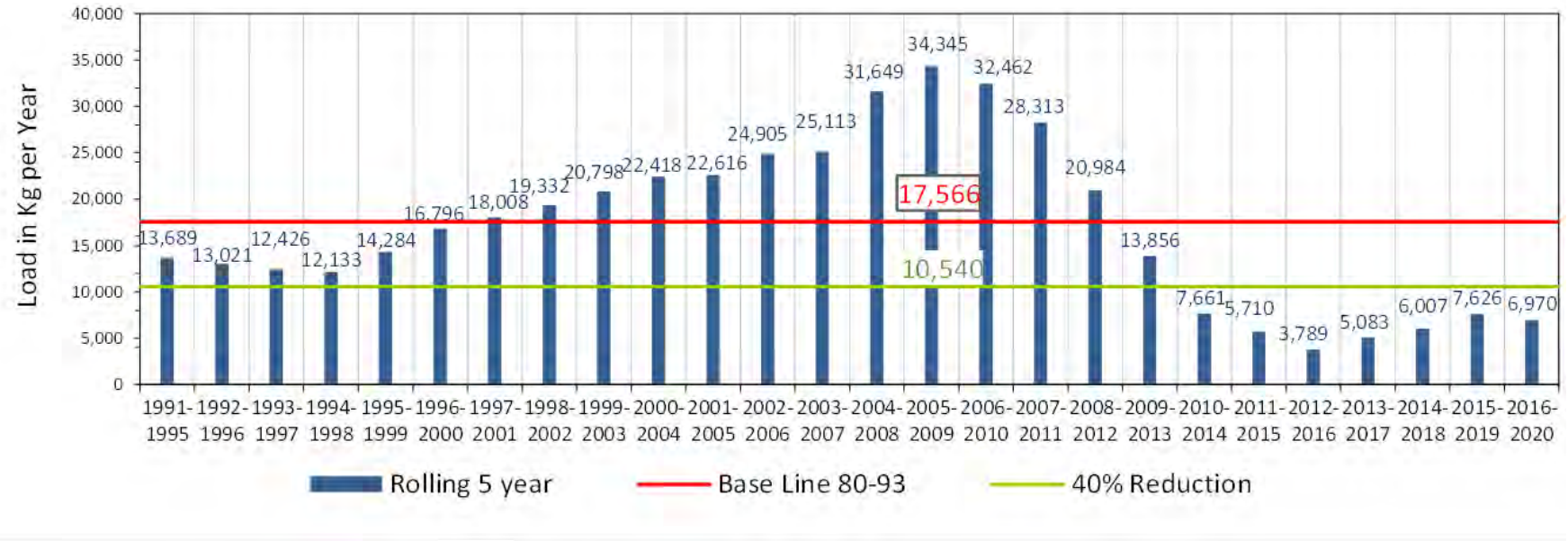


Monitoring Station: Sager Creek
Near West Siloam Springs, Arkansas

Table 6 – Five-Year Rolling Average Phosphorus Loading

Year	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19	16-20
Pt (mg/l)	0.9	0.9	0.8	0.8	0.9	0.9	0.9	0.9	1.1	1.0	1.2	1.4	1.4	1.3	1.4	1.2	1.0	0.8	0.6	0.4	0.3	0.2	0.2	0.3	0.3	0.3
Flow (cfs)	18.0	17.1	17.4	16.1	17.8	20.4	22.5	23.3	22.0	24.0	21.6	20.3	20.1	27.6	28.3	29.2	31.7	29.7	24.0	20.0	23.3	21.0	23.1	23.5	29.1	26.7
Pt (kg/yr)	13689.3	13020.8	12426.1	12132.5	14283.8	16796.3	18008.2	19331.7	20797.6	22418.2	22615.8	24904.7	25112.8	31649.1	34345.2	32462.3	28313.4	20984.1	13855.7	7661.0	5709.5	3788.7	5083.3	6007.0	7625.7	6969.8
% Decrease	22%	26%	29%	31%	19%	4%	-3%	-10%	-18%	-28%	-29%	-42%	-43%	-80%	-96%	-85%	-61%	-19%	21%	56%	67%	78%	71%	66%	57%	60%

Figure 6 – Five–Year Rolling Average Phosphorus Loading Chart

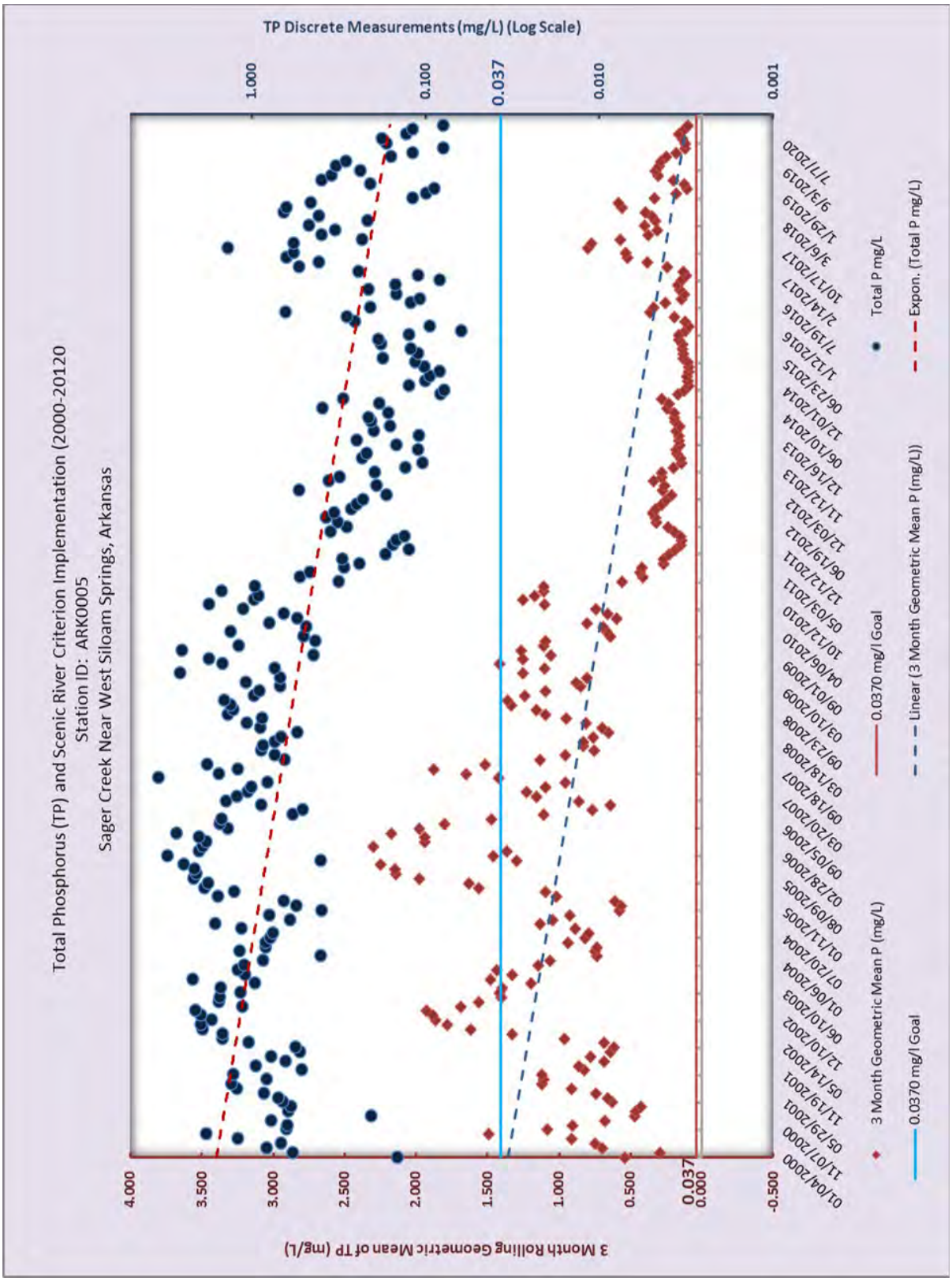


Monitoring Station: Sager Creek
Near West Siloam Springs, Arkansas

Table 7 – Annual Total Phosphorus Loading

ARK05 Year	Flow (cfs)	Total P (mg/L)	Total P (kg/yr)
1981	6.5	2.125	12,336
1982	9.0	2.025	16,277
1983	6.3	1.964	11,050
1984	15.4	0.950	13,066
1985	24.8	1.736	38,450
1986	21.1	0.834	15,716
1987	16.7	0.948	14,136
1988	12.6	1.154	12,986
1989	11.7	1.227	12,821
1990	20.2	0.860	15,515
1991	15.5	0.914	12,653
1992	16.5	1.284	18,921
1993	24.6	0.637	13,995
1994	15.7	0.721	10,110
1995	17.8	0.697	11,080
1996	11.0	0.919	9,028
1997	17.8	1.029	16,354
1998	18.1	0.858	13,876
1999	24.5	0.979	21,429
2000	30.7	0.820	22,469
2001	21.2	0.803	15,201
2002	21.8	1.192	23,231
2003	11.7	1.503	15,700
2004	34.5	0.916	28,224
2005	18.5	1.461	24,200
2006	14.9	1.799	23,940
2007	21.0	1.306	24,494
2008	48.9	0.945	41,271
2009	38.1	1.286	43,759
2010	22.9	0.897	18,335
2011	27.4	0.573	14,027
2012	11.4	0.250	2,540
2013	20.2	0.228	4,105
2014	18.2	0.196	3,193
2015	39.1	0.128	4,470
2016	16.3	0.207	3,013
2017	21.7	0.473	9,179
2018	22.2	0.427	8,454
2019	46.4	0.230	9,531
2020	26.8	0.126	3,010
Avg.	21.0	0.941	17,635

Figure 7 – Sager Creek Total Phosphorus Versus 3-Month Geometric Mean

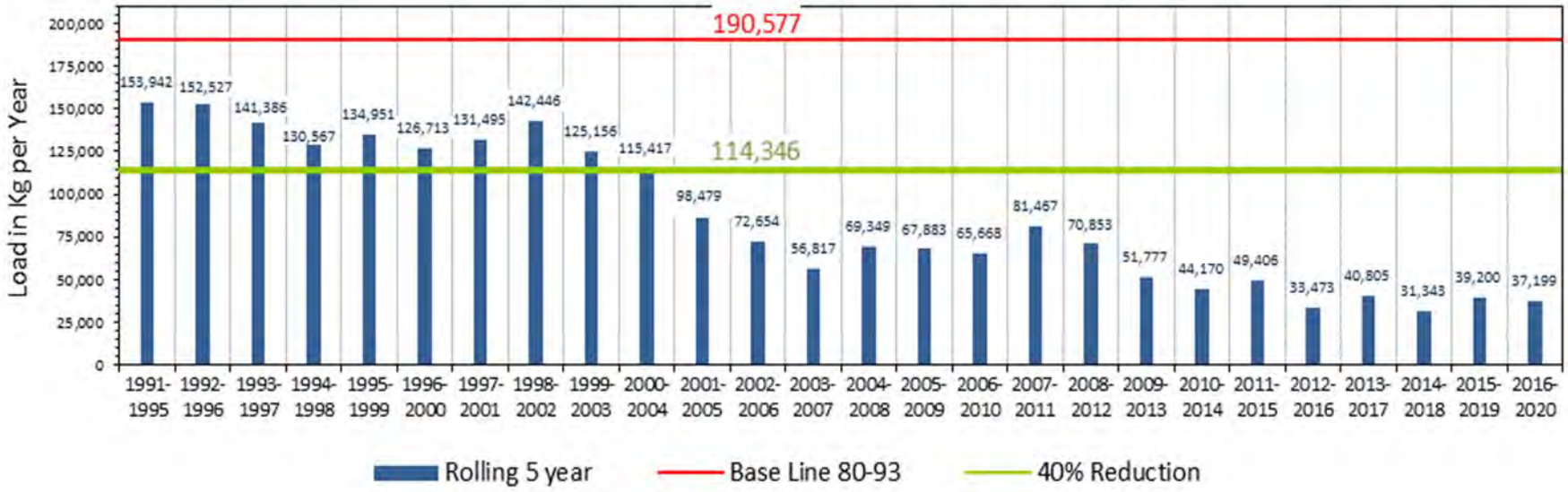


Monitoring Station: Illinois River
South of Siloam Springs, Arkansas

Table 8 - Five-Year Rolling Average Phosphorus Loading

Year	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19	16-20
Pt (mg/l)	0.210	0.211	0.209	0.222	0.225	0.224	0.238	0.252	0.246	0.236	0.214	0.179	0.149	0.136	0.122	0.110	0.110	0.098	0.081	0.080	0.081	0.068	0.077	0.061	0.060	0.058
Flow (cfs)	821	809	757	658	670	633	619	634	569	548	516	455	428	569	624	668	830	811	718	621	686	551	591	579	734	721
Pt (kg/yr)	153,942	152,527	141,386	130,567	134,951	126,713	131,495	142,446	125,156	115,417	98,479	72,654	56,817	69,349	67,883	65,668	81,467	70,853	51,777	44,170	49,406	33,473	40,805	31,343	39,200	37,199
% Decrease	19%	20%	26%	31%	29%	34%	31%	25%	34%	39%	48%	62%	70%	64%	64%	66%	57%	63%	73%	77%	74%	82%	79%	84%	79%	80%

Figure 8 - Five-Year Rolling Average Phosphorus Loading Chart

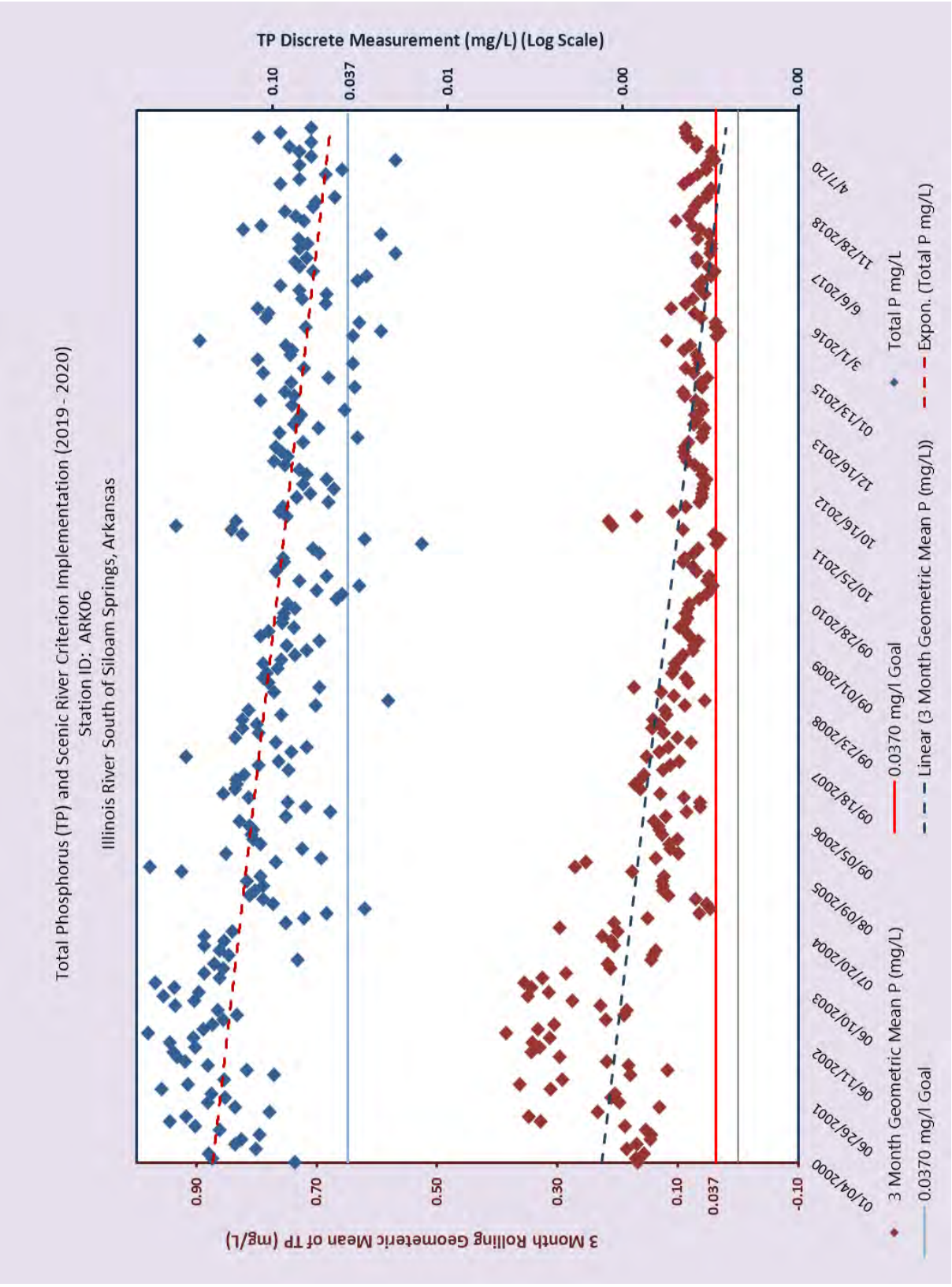


MONITORING STATION: ILLINOIS RIVER
SOUTH OF SILOAM, ARKANSAS

Table 9 - Annual Total Phosphorus Loading

ARK06 Year	Flow (cfs)	Total P (mg/L)	Total P (kg/yr)
1981	197	0.420	73,895
1982	591	0.370	195,294
1983	352	0.386	121,347
1984	706	0.442	278,693
1985	947	0.289	244,426
1986	879	0.305	239,436
1987	815	0.294	213,996
1988	531	0.253	119,982
1989	558	0.291	145,020
1990	1127	0.204	205,331
1991	724	0.220	142,253
1992	760	0.222	150,684
1993	1163	0.181	188,000
1994	674	0.190	114,370
1995	783	0.237	165,733
1996	667	0.225	134,032
1997	497	0.213	94,504
1998	668	0.246	146,960
1999	737	0.206	135,413
2000	597	0.230	122,831
2001	598	0.293	156,581
2002	570	0.282	143,700
2003	344	0.219	67,422
2004	633	0.153	86,496
2005	436	0.120	46,785
2006	290	0.120	31,048
2007	436	0.131	51,022
2008	1051	0.158	148,306
2009	907	0.080	64,782
2010	659	0.061	35,885
2011	1097	0.120	117,154
2012	343	0.070	21,547
2013	583	0.073	37,984
2014	426	0.074	28,014
2015	1334	0.066	78,651
2016	418	0.057	21,264
2017	547	0.043	21,003
2018	521	0.063	29,333
2019	1200	0.070	75,030
2020	917	0.056	45,860
Avg.	673	0.193	116,261

Figure 9 – Illinois River Total Phosphorus Versus 3-Month Geometric Mean

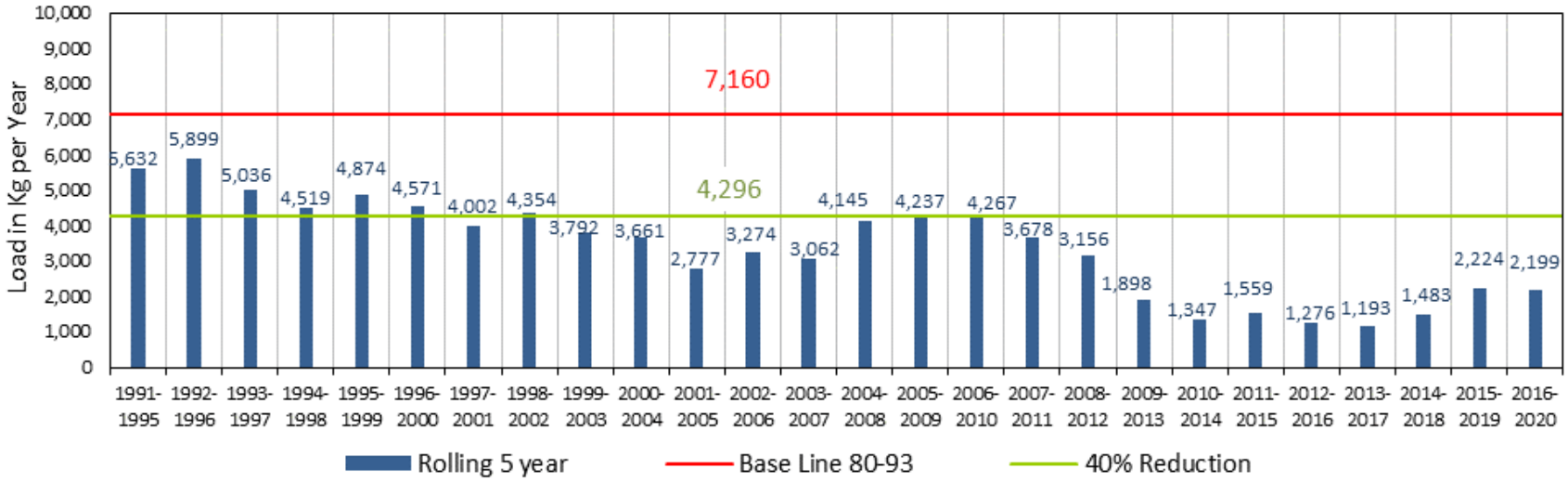


Monitoring Station: Baron Fork
at Dutch Mills, Arkansas

Table 10 - Five-Year Rolling Average Phosphorus Loading

Year	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19	16-20
Pt (mg/l)	0.108	0.107	0.095	0.100	0.104	0.099	0.095	0.102	0.107	0.104	0.091	0.096	0.093	0.093	0.088	0.085	0.080	0.072	0.057	0.053	0.052	0.050	0.048	0.061	0.066	0.072
Flow (cfs)	58.5	61.5	59.1	50.5	52.3	52.0	47.4	47.8	39.6	39.3	34.0	38.1	37.0	50.2	53.7	55.9	51.6	49.1	37.1	28.2	33.4	28.5	27.6	27.0	37.8	34.1
Pt (kg/yr)	5632	5899	5036	4519	4874	4571	4002	4354	3792	3661	2777	3274	3062	4145	4237	4267	3678	3156	1898	1347	1559	1276	1193	1483	2224	2199
% Decrease	21%	18%	30%	37%	32%	36%	44%	39%	47%	49%	61%	54%	57%	42%	41%	40%	49%	56%	73%	81%	78%	82%	83%	79%	69%	69%

Figure 10 - Five-Year Rolling Average Phosphorus Loading Chart

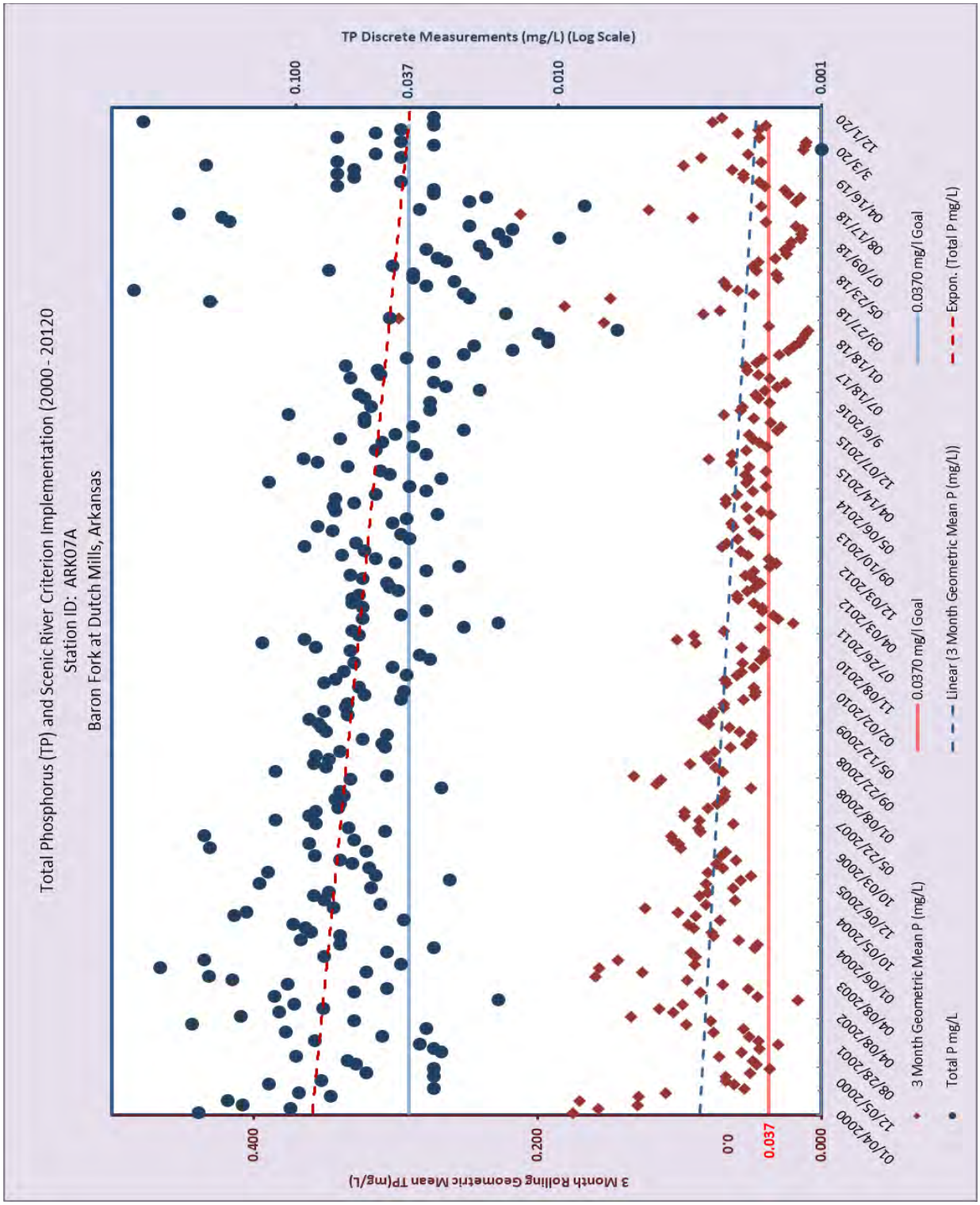


Monitoring Station: Baron Fork at Dutch Mills, Arkansas

Table 11 – Annual Total Phosphorus Loading

ARK07A Year	Flow (cfs)	Total P (mg/L)	Total P (kg/yr)
1981	18.4	0.135	2,218
1982	37.4	0.484	16,167
1983	27.2	0.125	3,037
1984	51.8	0.183	8,466
1985	79.4	0.211	14,962
1986	64.0	0.147	8,402
1987	63.2	0.134	7,563
1988	31.8	0.097	2,755
1989	50.2	0.124	5,559
1990	102.0	0.109	9,929
1991	49.4	0.086	3,794
1992	47.9	0.127	5,433
1993	104.0	0.083	7,709
1994	37.0	0.081	2,677
1995	54.2	0.162	7,842
1996	64.4	0.084	4,831
1997	35.9	0.067	2,151
1998	61.1	0.107	5,822
1999	45.8	0.102	4,176
2000	52.6	0.133	6,230
2001	41.4	0.065	2,387
2002	38.0	0.104	3,536
2003	20.1	0.133	2,386
2004	44.5	0.087	3,458
2005	26.1	0.069	1,595
2006	62.0	0.088	4,873
2007	32.3	0.087	2,510
2008	86.0	0.132	10,138
2009	62.3	0.066	3,672
2010	37.1	0.054	1,789
2011	40.2	0.060	2,161
2012	19.7	0.048	845
2013	26.3	0.058	1,364
2014	17.8	0.049	778
2015	101.8	0.050	4,546
2016	22.1	0.050	987
2017	36.9	0.039	1,290
2018	39.8	0.123	4,374
2019	94.2	0.069	5,804
2020	55.6	0.080	3,969
Avg.	49.5	0.107	4,747

Figure 11 – Baron Fork Total Phosphorus versus 3 Month Geometric Mean



Arkansas 303 (d) List

In keeping with the two-year rotation for producing the 303 (d) list, Arkansas Department of Energy and Environment – Division of Environmental Quality (DEQ), Office of Water Quality, has prepared the draft 2020 303 (d) list. The "2020 Assessment Methodology" is available for review online. Documents and documentation for the program is available at the website listed below https://www.adeq.state.ar.us/water/planning/integrated/303d/list.aspx .

DEQ has entered the public comment timeframe concerning the draft list. The public comment period opened August 1, 2021 and remains open until September 20, 2021. Comments can be submitted throughout the period via email at waterbodycomments@adeq.state.ar.us or via mail to:

Arkansas DEQ
Office of Water Quality-Planning 303(d) Comments
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317

A Public Hearing is scheduled for September 20. 2021, beginning at 1:00 p.m. at the DEQ Headquarters in North Little Rock. A virtual session will be offered through the Zoom virtual platform. This and more information are included in the public notice provided on the following page.

Waters listed in the draft are further detailed after the public notice. Since the compact covers five watersheds, the information reviewed includes waterbodies in the watersheds for Arkansas River, Illinois River, Poteau River, Spavinaw Creek, and Lee Creek. Data for three of the five watersheds is presented and was gathered based on 8-digit hydrologic units (HUC) with 11110103 representing the Illinois River, 11110104 representing Lee Creek, and 11110105 representing the Poteau River. The details are presented following the public notice in the form of a spreadsheet and locator map. Table 12 and Figure 12 include details for the Illinois River, Table 13 and Figure 13 include details for the Illinois River alternate list. Table 14 and Figure 14 include details for Lee Creek. Table 15 and Figure 15 include details for the Poteau River.

NOTICE OF PUBLIC HEARING, COMMENT PERIOD

This is to give notice that the Department of Energy and Environment – Division of Environmental Quality (DEQ), Office of Water Quality, 5301 Northshore Drive, North Little Rock, Arkansas 72118-5317 is opening the public comment period for the 2020 draft 303(d) Impaired Waters List. The 2020 draft 303(d) Impaired Waters List can be found at www.adeq.state.ar.us/water/planning/integrated/303d/list.aspx. Public comments will be accepted from August 1, 2021, to September 20, 2021. Comments can be submitted anytime throughout this period via email at waterbodycomments@adeq.state.ar.us or mail at Arkansas DEQ, Office of Water Quality-Planning 303(d) Comments, 5301 Northshore Drive, North Little Rock, AR 72118-5317.

A public hearing will be held on September 20, 2021, beginning at 1:00 p.m. CDT to accept comments on the 2020 draft 303(d) Impaired Waters List. Due to the ongoing COVID-19 pandemic and in the interest of public health, the public hearing will be held in person at DEQ Headquarters in North Little Rock and remotely through the Zoom virtual meetings platform, which may be utilized via telephone or internet audio. Written and oral statements may be submitted regarding the draft 303(d) Impaired Waters List to the Presiding Officer for consideration at the Public Hearing. If the hearing is postponed and rescheduled, a new legal notice will be published to announce the details of the new hearing date.

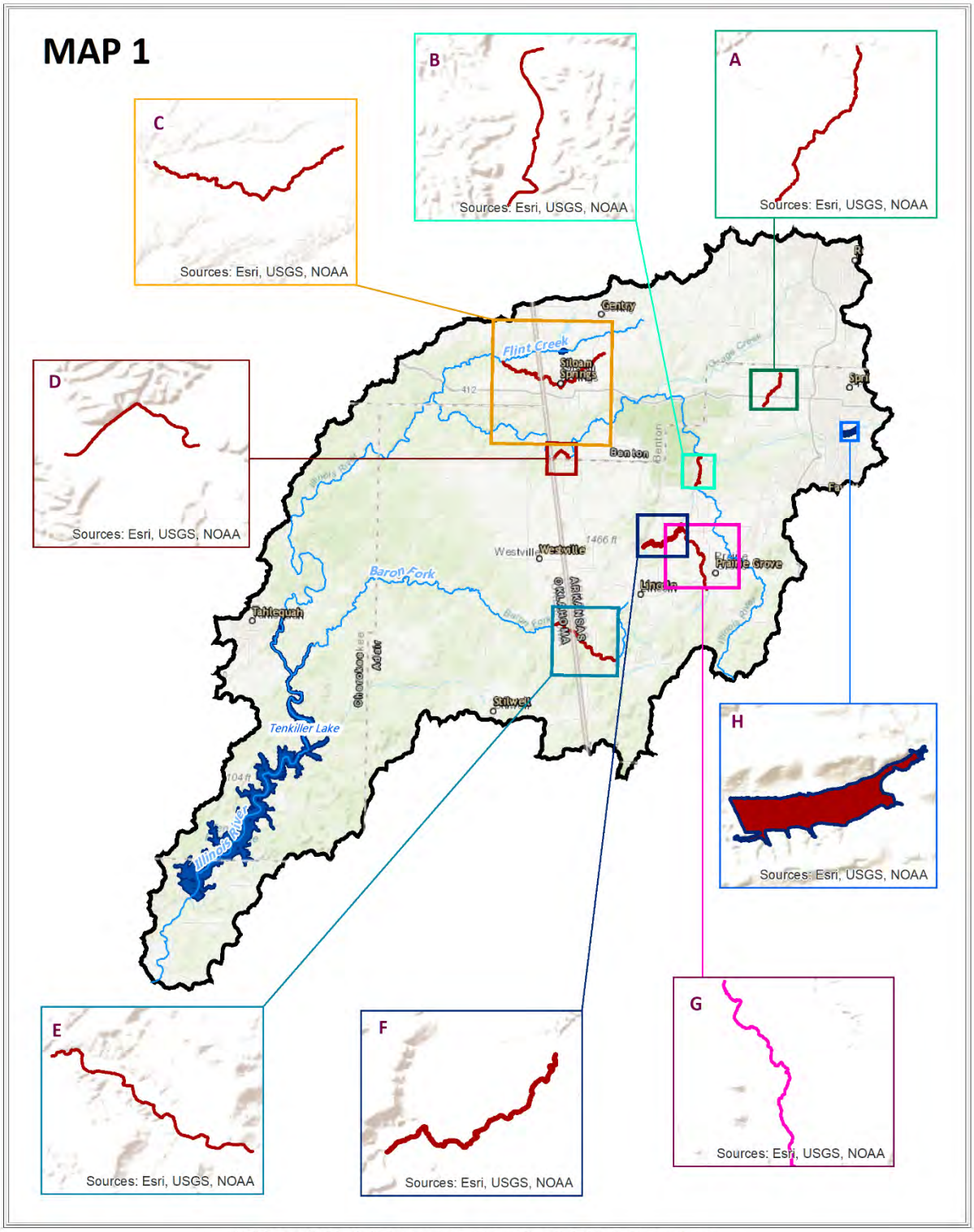
Persons wishing to be recognized to make an oral comment through the Zoom virtual meetings platform during the public hearing must be placed on a "virtual sign-in list" by notifying the Presiding Officer before 4:00 p.m. CDT on the day before the hearing. A request to be included on the list of commenters must include the name and mailing address of the individual requestor or commenter and be submitted by email to the email address above or voicemail to the telephone number 501-682-0947. Written comments may be submitted until 11:59 p.m. CDT on the day of the hearing, and must also include the commenter's name, mailing address, and email address.

Table 12 – 2020 303 (d) Category 5 List (Draft) Illinois River Watershed

Map Reference	Planning Segment	Assessment Unit	Stream Names	Parameter	Descriptor	Miles	Designated Use(s) Not Supported	Source of Contamination	Priority
1 - A	3J	AR_11110103_733	Unnamed Trib. to Brush	Dissolved Oxygen	Primary season	3.5	AL	UN	Medium
1 - E	3J	AR_11110103_813	Baron Fork	Dissolved Oxygen	Critical season	7.3	AL	UN	Low
1 - D	3J	AR_11110103_020	Illinois River	Sulfates	Site specific	1.6	AL	UN	Medium
1 - B	3J	AR_11110103_024	Illinois River	Sulfates	Site specific	2.8	AL	UN	Medium
1 - F	3J	AR_11110103_027	Illinois River	Sulfates		7.1	AL	UN	Medium
1 - G	3J	AR_11110103_026	Moores Creek	Sulfates		4.8	AL	UN	Medium
1 - C	3J	AR_11110103_932	Sager Creek	Ammonia-N	Chronic - Early Life	12.3	AL	UN	Low
1 - H	3J	AR_11110103_4080	Fayetteville	pH	Short-term	171 acres	OU	UN	Medium

KEY	
OU	Other Uses
AL	Aquatic Life
ORW	Outstanding Resource Waterbody
DW	Drinking Water
PC	Primary Contact
A&I	Agriculture and Industry
FC	Fish Consumption*
UN	Unknown
UR	Urban Runoff
IP	Industrial Pollution
AG	Agriculture
MP	Municipal Pollution
SE	Surface Erosion
RE	Resource Extraction
NA	Not available/Not applicable

Figure 12 – 2020 303 (d) Category 5 List (Draft) Illinois River Watershed



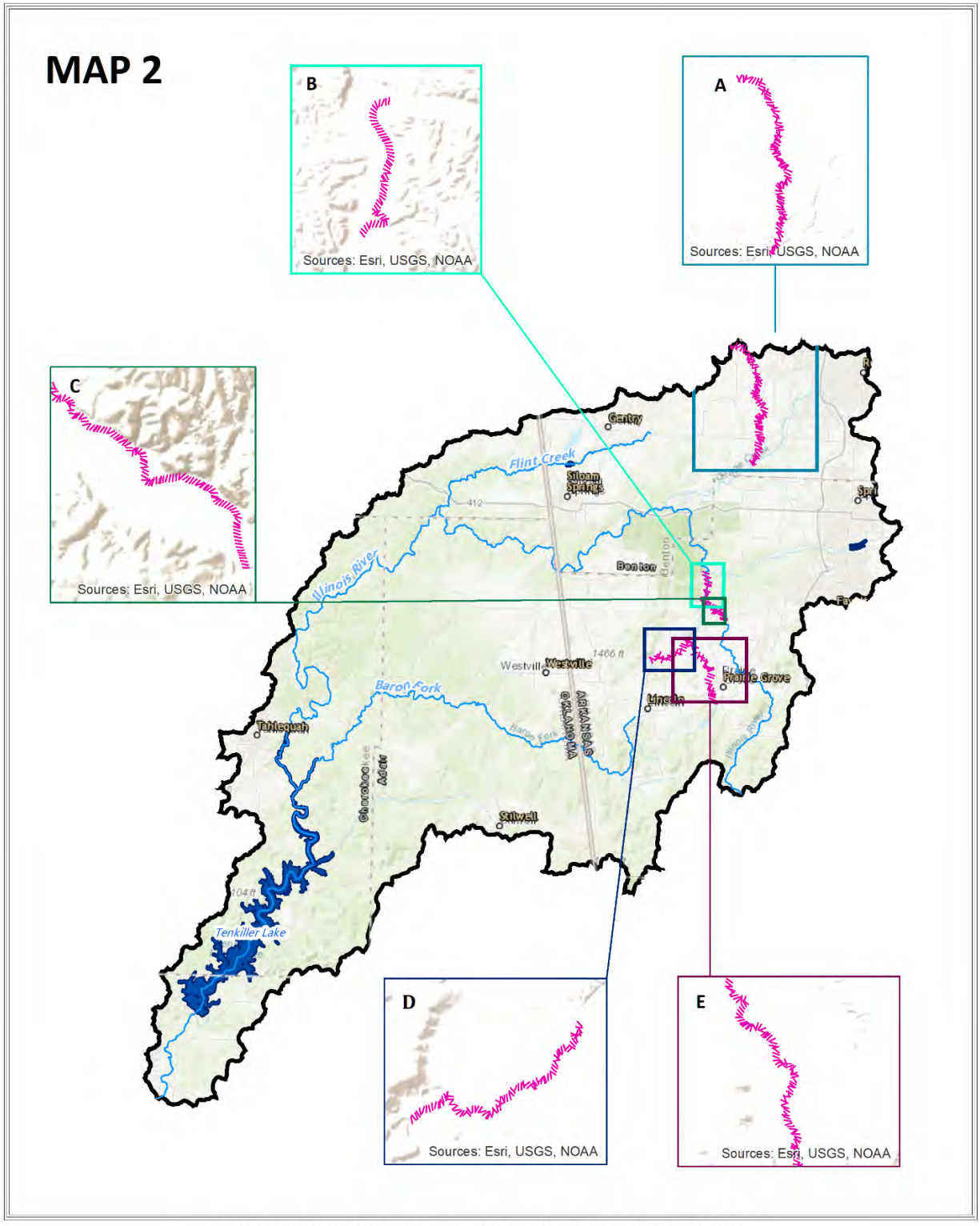
2020 Draft 303(d) Category 5 List - Illinois River Watershed
10 Digit HUC - 11110103

Table 13 – 2020 303 (d) Category 5 Alternate List (Draft) Illinois River Watershed

Map Reference	Assessment Unit	Stream Names	Parameter	Descriptor	Miles	Designated Use(s) Not Supported	Source of Contamination	Priority
2 - C	AR_11110103_024	Illinois River	Turbidity	Base Flows	2.8	OU	UN	Low
2 - C	AR_11110103_028	Illinois River US of Goose Creek	E. coli	Primary Contact	2.9	PC	IP, MP, SE, AG	Low
2 - E	AR_11110103_027	Illinois River, Muddy Fork	E. coli		7.1	PC	IP, MP, SE, AG	Low
2 - A	AR_11110103_933	Little Osage Creek near Healing Springs	E. coli	Primary Contact	4.3	PC	IP, MP, SE, AG	Low
2 - A	AR_11110103_630	Little Osage Creek S of Centerton	E. coli	Primary Contact	7.2	PC	IP, MP, SE, AG	Low
2 - D	AR_11110103_026	Moores Creek	E. coli		4.8	PC	IP, MP, SE, AG	Low

KEY	
OU	Other Uses
AL	Aquatic Life
ORW	Outstanding Resource Waterbody
DW	Drinking Water
PC	Primary Contact
A&I	Agriculture and Industry
FC	Fish Consumption*
UN	Unknown
UR	Urban Runoff
IP	Industrial Pollution
AG	Agriculture
MP	Municipal Pollution
SE	Surface Erosion
RE	Resource Extraction
NA	Not available/Not applicable

Figure 13 – 2020 303 (d) Category 5 Alternate List (Draft) Illinois River Watershed



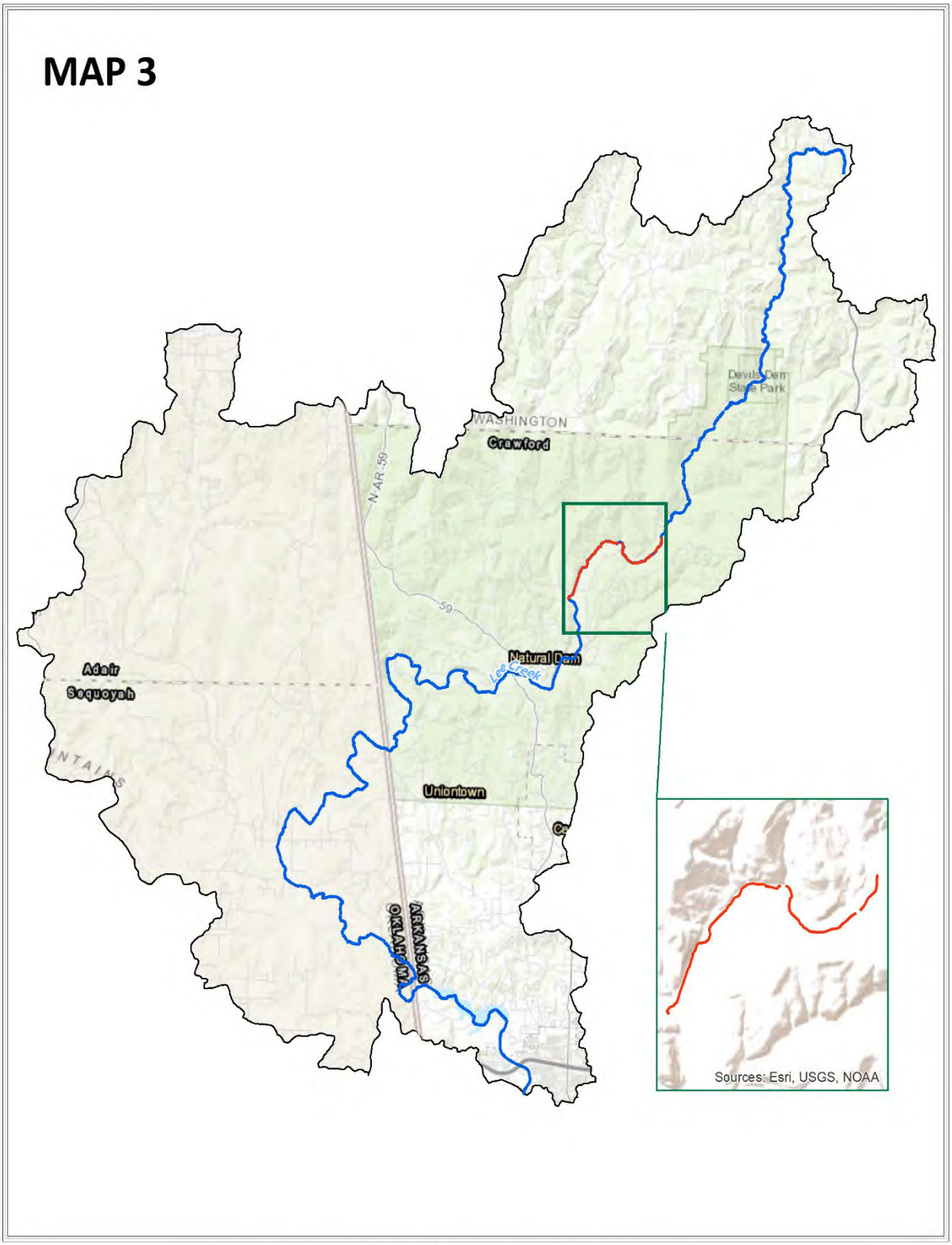
2020 Draft 303(d) List Category 5 Alt.- Illinois River Watershed
10 Digit HUC - 11110103

Table 14 – 2020 303 (d) Category 5 List (Draft) Lee Creek Watershed

Map Reference	Assessment Unit	Stream Names	Parameter	Descriptor	Miles	Designated Use(s) Not Supported	Source of Contamination	Priority
3	AR_11110104_40	Lee Creek	pH		582 acres	OU	UN	Low

KEY	
OU	Other Uses
AL	Aquatic Life
ORW	Outstanding Resource
DW	Drinking Water
PC	Primary Contact
A&I	Agriculture and Industry
FC	Fish Consumption*
UN	Unknown
UR	Urban Runoff
IP	Industrial Pollution
AG	Agriculture
MP	Municipal Pollution
SE	Surface Erosion
RE	Resource Extraction
NA	Not available/Not

Figure 14 –2020 303 (d) Category 5 (Draft) Lee Creek Watershed



2020 Draft 303(d) List Category 5t.- Lee Creek Watershed
10 Digit HUC - 1111010

Table 15 – 2020 303 (d) Category 5 and Category 4a List (Draft) Poteau River Watershed

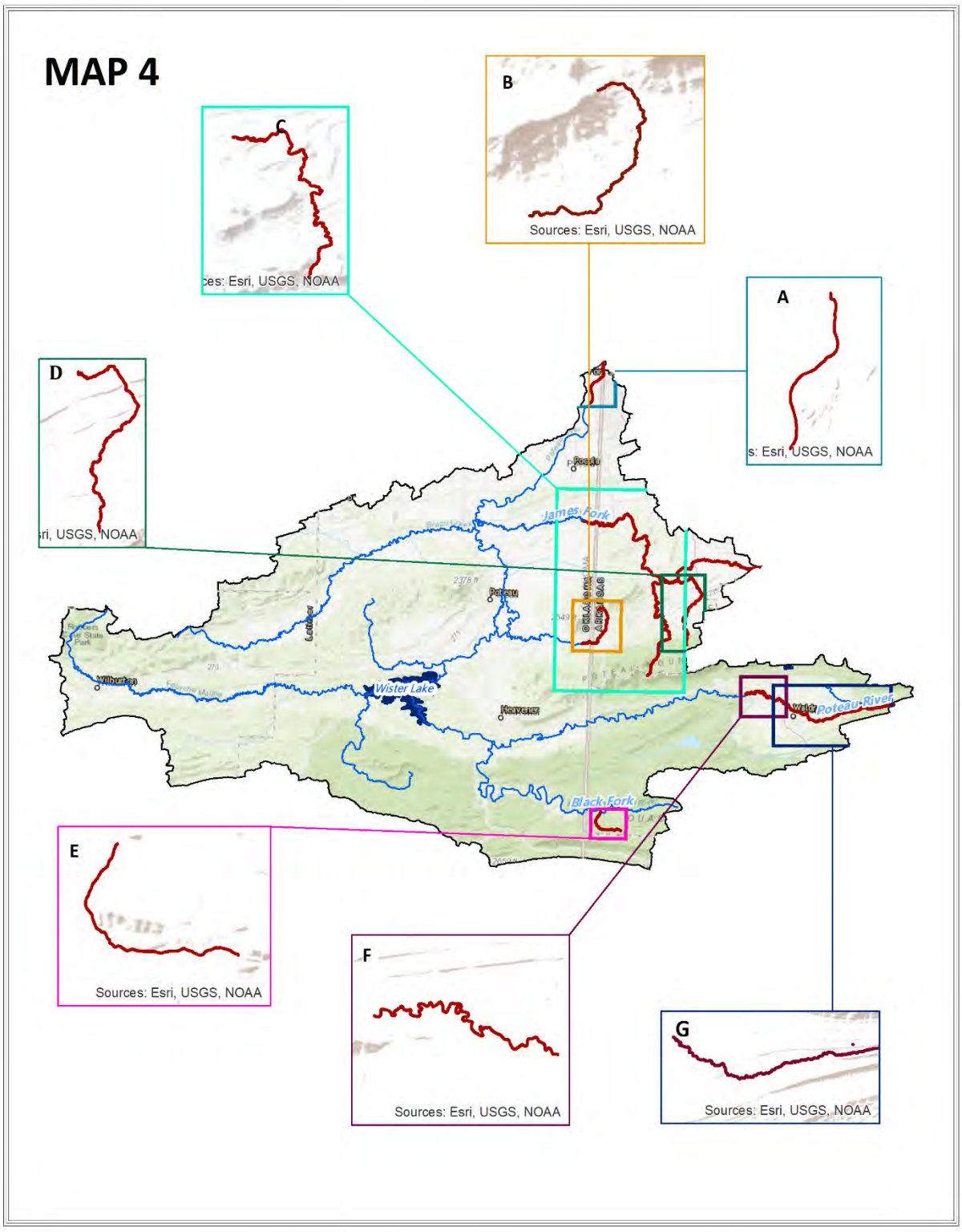
Map Reference	Assessment Unit	Stream Names	Parameter	Descriptor	Miles	Designated Use(s) Not Supported	Source of Contamination	Priority
4 - E	AR_11110105_925	Briery Creek	pH		3.8	OU	UN	Medium
4 - D	AR_11110105_036	Cherokee Creek	Turbidity	Storm Flows	10.6	OU	AG, UN	Low
4 - C	AR_11110105_033	James Fork	Turbidity	Base Flows	28.2	OU	AG, UN	Low
4 - A	AR_11110105_001	Poteau River	Dissolved Oxygen	Critical season	4.9	AL	UN	Medium
4 - F	AR_11110105_731	Poteau River	Turbidity	Base Flows	13.4	OU	IP, MP, SE, AG	Low
4 - G	AR_11110105_031	Poteau River	Sulfates		6.7	AL	IP, MP, SE	Medium
4 - G	AR_11110105_031	Poteau River	Turbidity		6.7	OU	IP, MP, SE	Medium
Not Mapped	AR_11110105_831	Unnamed Tributary to Poteau	Chloride		1.1	AL	UN	Low
Not Mapped	AR_11110105_831	Unnamed Tributary to Poteau	Total Dissolved Solids		1.1	AL	UN	Low
4 - B	AR_11110105_034	Upper Sugar Loaf	Turbidity	Storm Flows	6.9	OU	UN	Low

303(d) 4a

4 - A	AR_11110105_001	Poteau River	Turbidity	Base Flows	4.9	OU	UR	
4 - A	AR_11110105_001	Poteau River	Turbidity	Storm Flows	4.9	OU	UR	
4 - G	AR_11110105_031	Poteau Rv nr Waldron	Total Phosphorus		6.7	AL	IP	

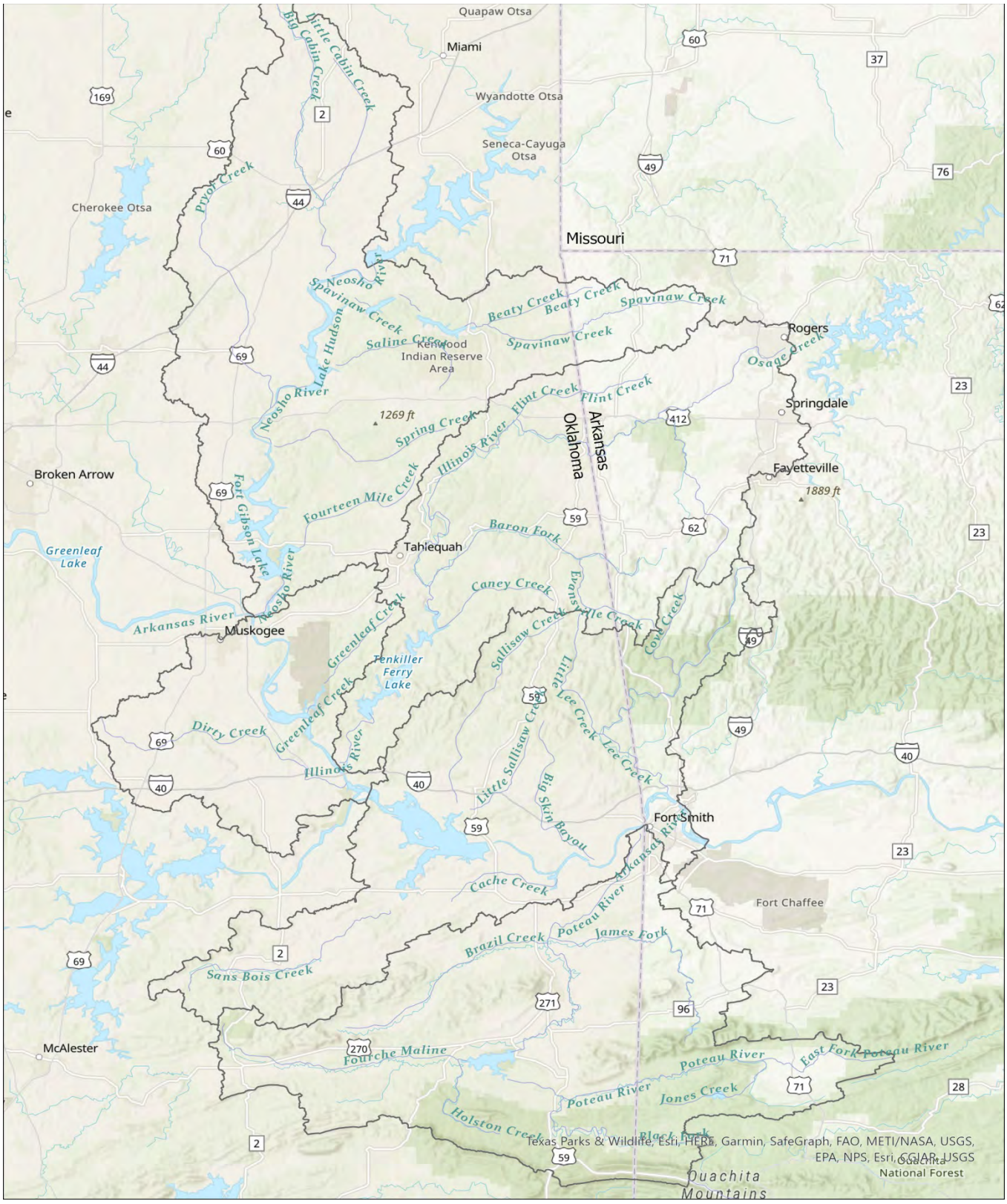
KEY	
OU	Other Uses
AL	Aquatic Life
ORW	Outstanding Resource Waterbody
DW	Drinking Water
PC	Primary Contact
A&I	Agriculture and Industry
FC	Fish Consumption*
UN	Unknown
UR	Urban Runoff
IP	Industrial Pollution
AG	Agriculture
MP	Municipal Pollution
SE	Surface Erosion
RE	Resource Extraction
NA	Not available/Not applicable

Figure 15 –2020 303 (d) Category 5 and Category 4a List (Draft) Poteau River Watershed



2020 Draft 303(d) List Category 4a & 5.- Poteau River Watershed
10 Digit HUC - 11110105

Arkansas-Oklahoma Arkansas River Compact Commission
Environmental Committee Report



September 23, 2021

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 1999-2020[1] and 2016-2020.

Station (see footnotes)	1999-2020 (3-month GM'S)			2016-2020 (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]	348	11	97%	76	2	97%
Illinois River near Tahlequah[2]	349	24	93%	74	6	92%
Flint Creek near Kansas[2]	338	0	100%	74	0	100%
Barren Fork near Eldon[2]	339	195	42%	71	35	51%
Little Lee Creek near Nicut[1]	112	110	2%	34	34	0%
Lee Creek near Short	228	227	0%	34	34	0%
Mountain Fork River near Smithville	199	169	15%	38	34	11%

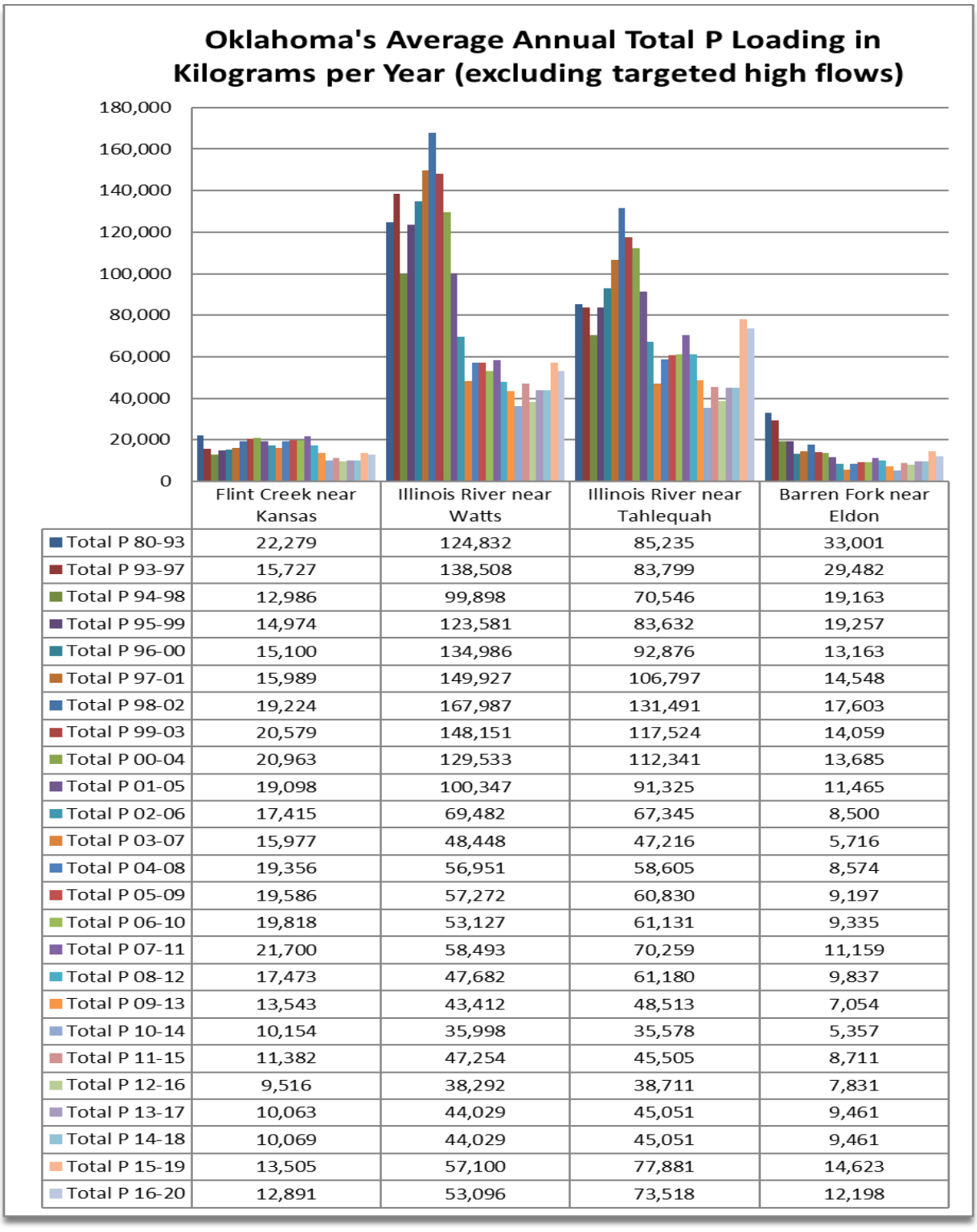
Table 2. Waters Listed on Oklahoma's 2020 303(d) List

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



	Flint Creek near Kansas	Illinois River near Watts	Illinois River near Tahlequah	Barren Fork near Eldon
Total P 80-93	22,279	124,832	85,235	33,001
Total P 93-97	15,727	138,508	83,799	29,482
Total P 94-98	12,986	99,898	70,546	19,163
Total P 95-99	14,974	123,581	83,632	19,257
Total P 96-00	15,100	134,986	92,876	13,163
Total P 97-01	15,989	149,927	106,797	14,548
Total P 98-02	19,224	167,987	131,491	17,603
Total P 99-03	20,579	148,151	117,524	14,059
Total P 00-04	20,963	129,533	112,341	13,685
Total P 01-05	19,098	100,347	91,325	11,465
Total P 02-06	17,415	69,482	67,345	8,500
Total P 03-07	15,977	48,448	47,216	5,716
Total P 04-08	19,356	56,951	58,605	8,574
Total P 05-09	19,586	57,272	60,830	9,197
Total P 06-10	19,818	53,127	61,131	9,335
Total P 07-11	21,700	58,493	70,259	11,159
Total P 08-12	17,473	47,682	61,180	9,837
Total P 09-13	13,543	43,412	48,513	7,054
Total P 10-14	10,154	35,998	35,578	5,357
Total P 11-15	11,382	47,254	45,505	8,711
Total P 12-16	9,516	38,292	38,711	7,831
Total P 13-17	10,063	44,029	45,051	9,461
Total P 14-18	10,069	44,029	45,051	9,461
Total P 15-19	13,505	57,100	77,881	14,623
Total P 16-20	12,891	53,096	73,518	12,198

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 1993-2020 and 1999-2020, total phosphorus concentrations measured at both higher and lower flows from 1999-2020, and use assessment geometric means from 1999-2020. 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 1999-2020 are analyzed, all stations demonstrate a highly significant downward trend, except Barren Fork adjusted data which showed no significant trend.
3. All waterbodies show some significant downward trend when only higher flow total phosphorus concentrations are considered. The Barren Fork River shows no significant trend in unadjusted total phosphorus concentrations at higher flows.
4. When only lower flow data from 1999-2020 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 2020 report, and 2020 results are in superscript.)

Station	All Data (1993-2020)		All Data (1999-2020)		Higher Flow Data (1999-2020)		Lower Flow Data (1999-2020)		Geomtric Mean For Assessment (1999-2020)
	Unadj	Flow Adj	Unadj	Flow Adj	Unadj	Flow Adj	Unadj	Flow Adj	Unadj
Illinois River near Watts	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓$^{(↓↓↓)}$	↓↓↓	↓↓↓	↓↓↓	↓↓↓
Illinois River near Tahlequah	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓
Flint Creek near Kansas	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓	↓↓↓
Barren Fork near Eldon	NT	NT	↓↓↓$^{(↓↓)}$	NT$^{(↓↓↓)}$	NT	↓↓↓$^{(↓↓)}$	NT	NT	↓↓↓

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

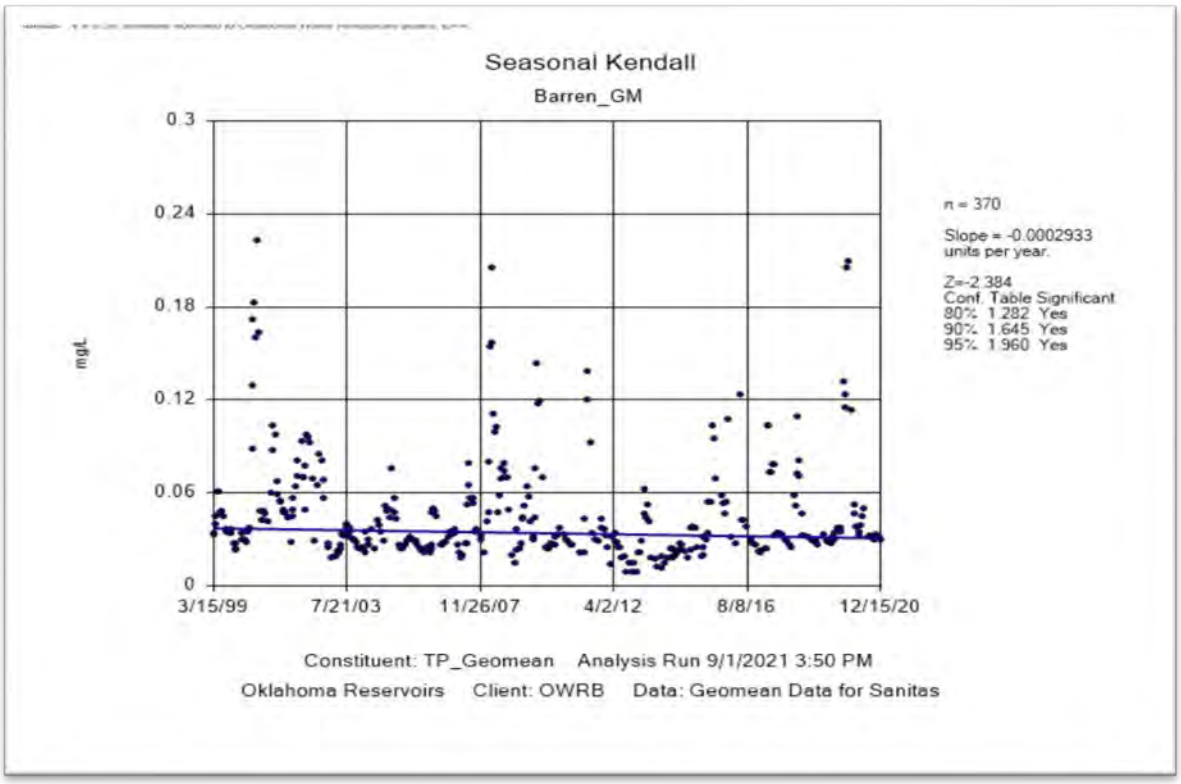


Figure 1. Trend for use assessment geometric means (1999-2020) on the Barren Fork River near Eldon.

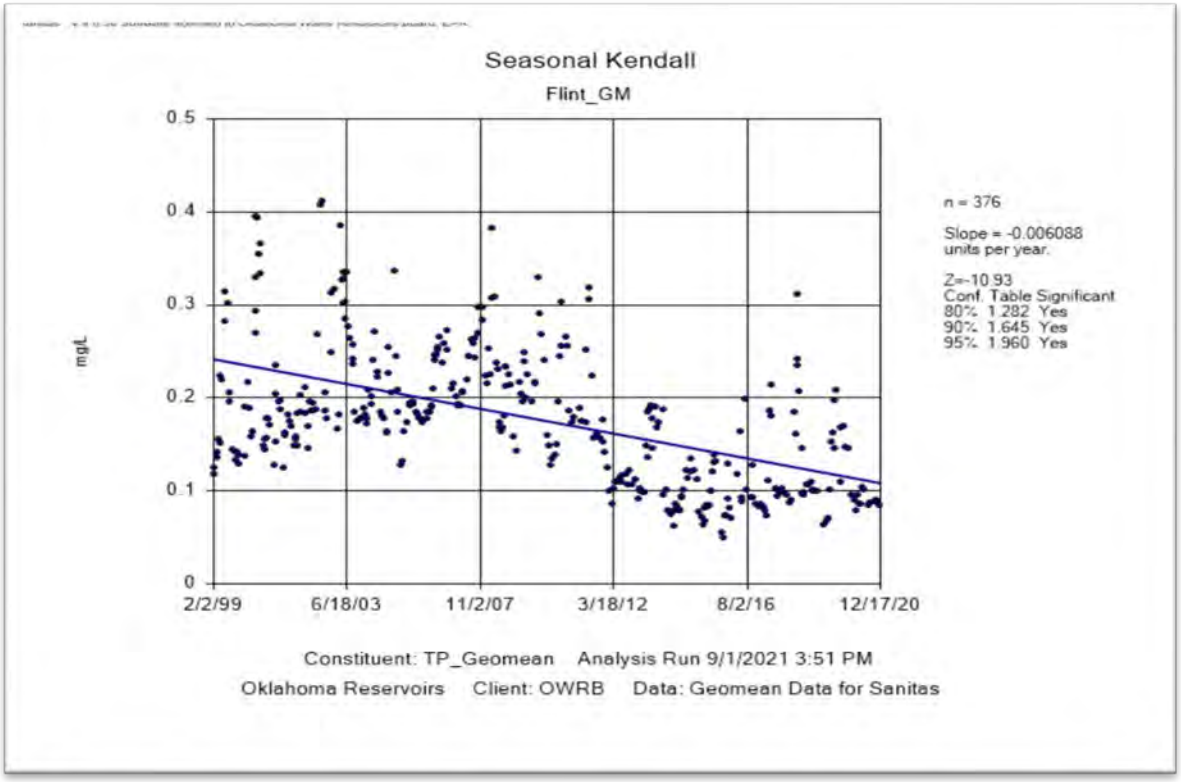


Figure 2. Trend for use assessment geometric means (1999-2020) on Flint Creek near Kansas.

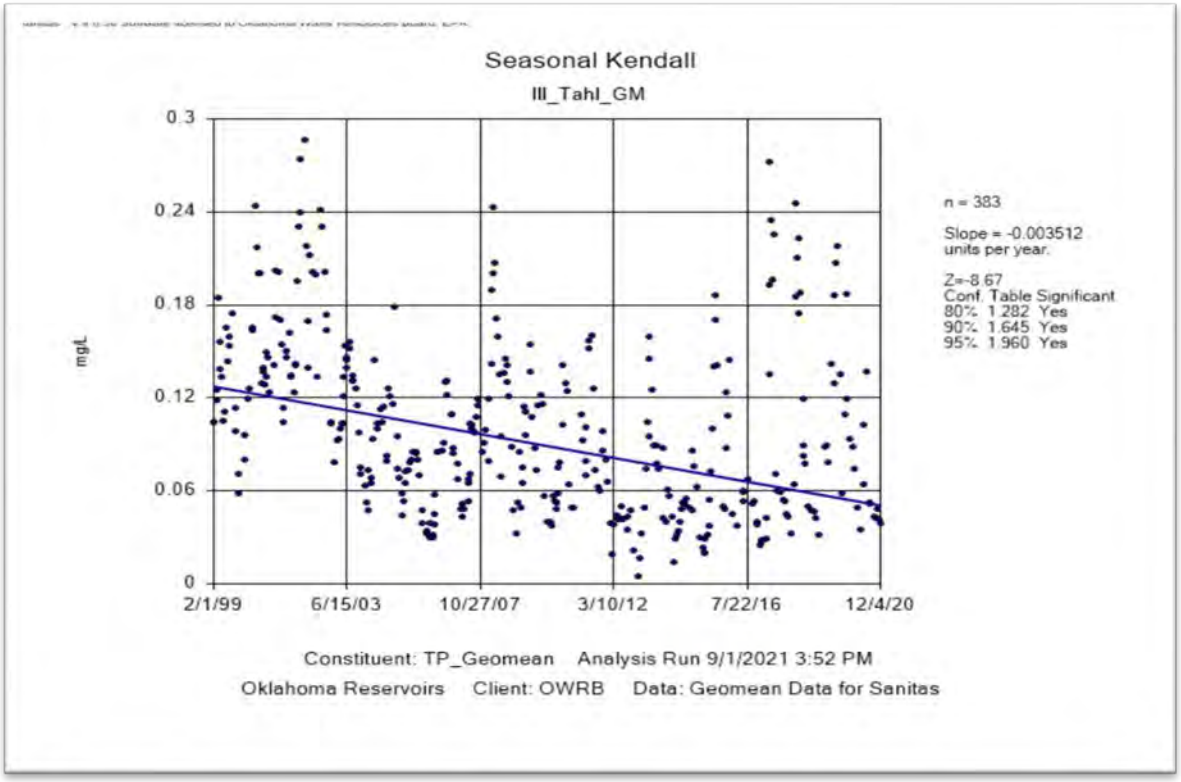


Figure 3. Trend for use assessment geometric means (1999-2020) on Illinois River near Tahlequah.

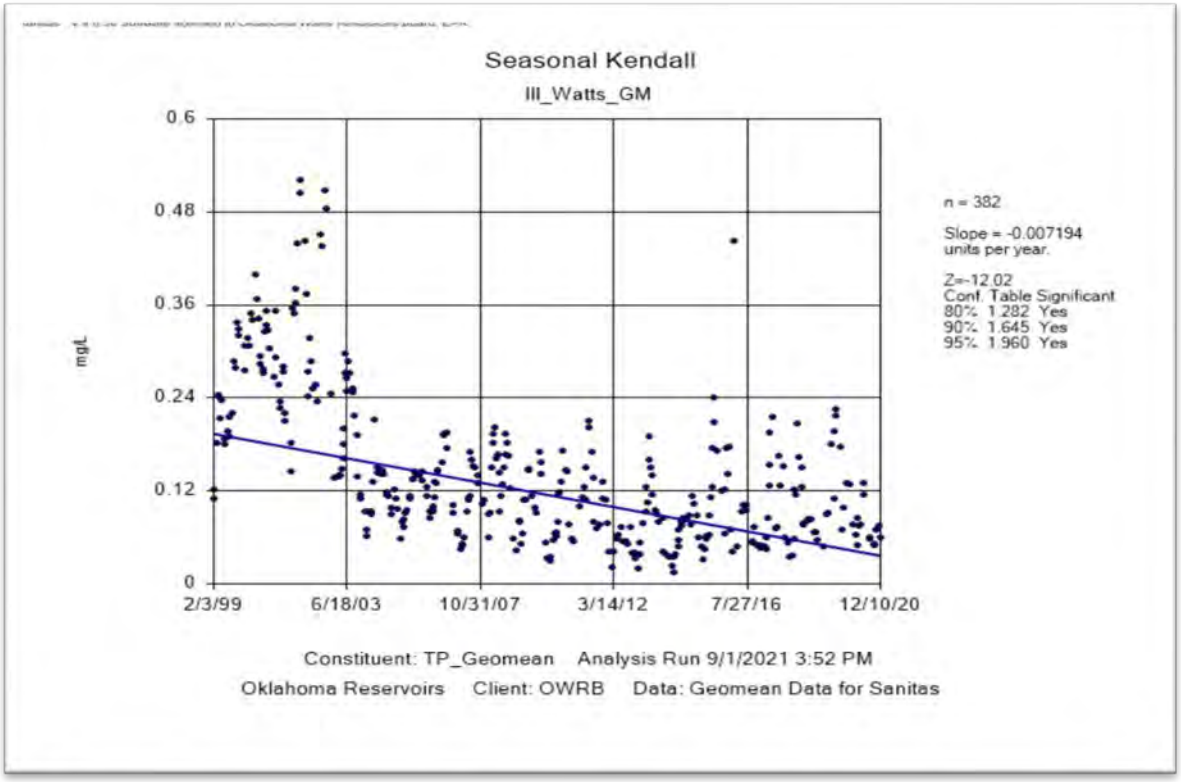


Figure 4. Trend for use assessment geometric means (1999-2020) on Illinois River near Watts.

Arkansas River at Moffett



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

Stream Data

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

Parameters

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

Beneficial Uses

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

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

Notes

U = Assessment yielded undetermined supporting status

Arkansas River at Muskogee

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



Stream Data

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

Parameters

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

Beneficial Uses

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

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

Stream Data

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

Parameters

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

Beneficial Uses

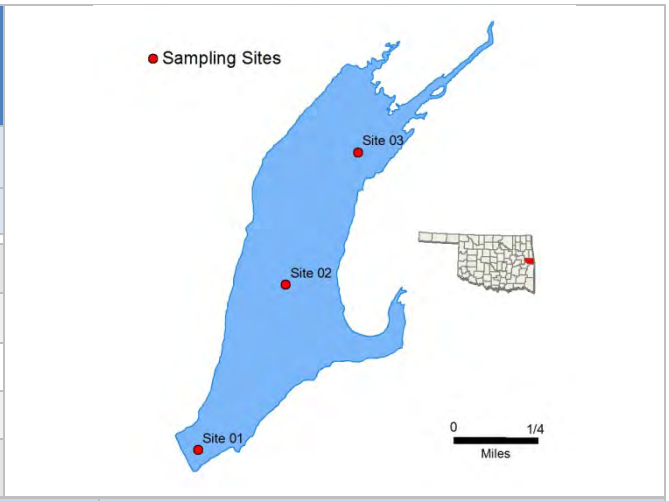
Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chlorides	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment	Total Phosphorus
Fish & Wildlife Propagation	S	S	S	S						S	S	S	
Aesthetics												S	S
Agriculture					S		S	S					
Primary Body Contact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

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



Stream Data

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

Parameters

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

Beneficial Uses

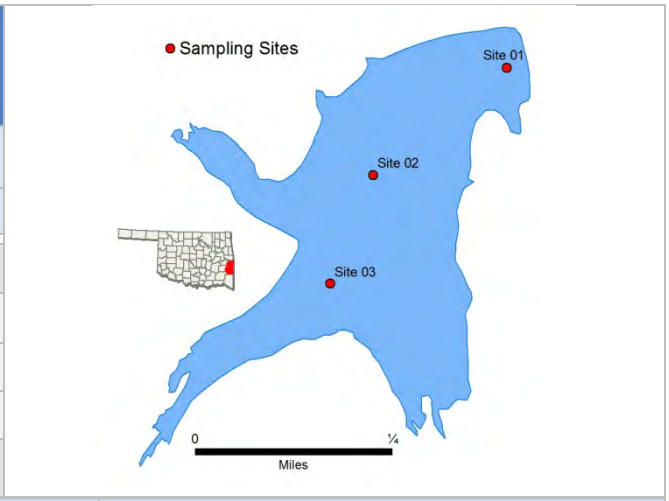
Click to learn more about Beneficial Uses	Turbidity	pH	Dissolved Oxygen	Metals	Sulfates	Nitrates	Chloride	Total Dissolved Solids	Bacteria	Bio. Fish	Bio. BMI	Sediment
Fish & Wildlife Propagation	S	S	S	S						S	NS	S
Aesthetics												S
Agriculture					S		S	S				
Primary Body Contact Recreation				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

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

Notes

Cedar

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



General

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

Parameters

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

Beneficial Uses

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

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

Notes

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

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

Flint Creek at Flint

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



Stream Data

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

Parameters

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

Beneficial Uses

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

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

Notes

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

Fourche-Maline Creek at Red Oak

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



Stream Data

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

Parameters

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

Beneficial Uses

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

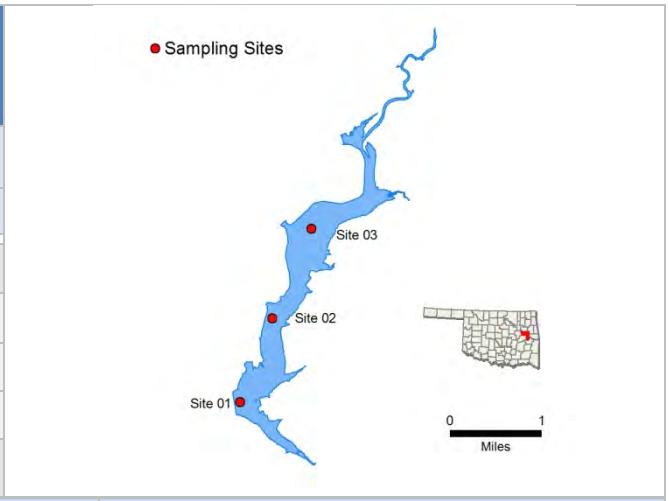
S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

Fish & Wildlife Propagation not supporting for Lead

Greenleaf

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



General

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

Parameters

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

Beneficial Uses

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

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

Notes

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

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

Illinois River at Tahlequah



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

Stream Data

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

Parameters

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

Beneficial Uses

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

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

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

Illinois River at Watts



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

Stream Data

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

Parameters

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

Beneficial Uses

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

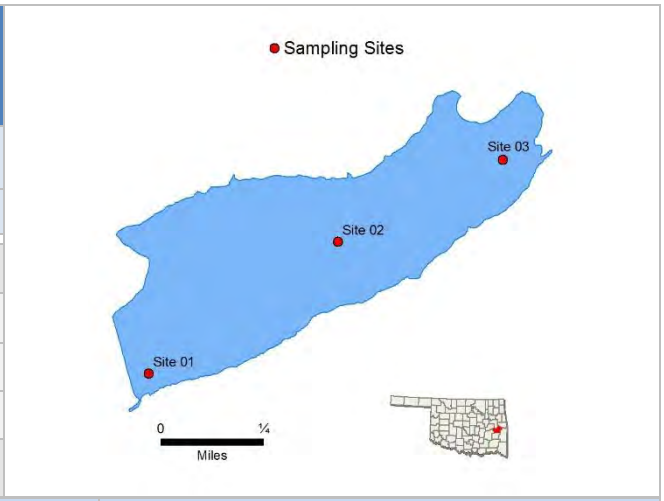
S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

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

John Wells

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



General

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

Parameters

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

Beneficial Uses

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

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

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

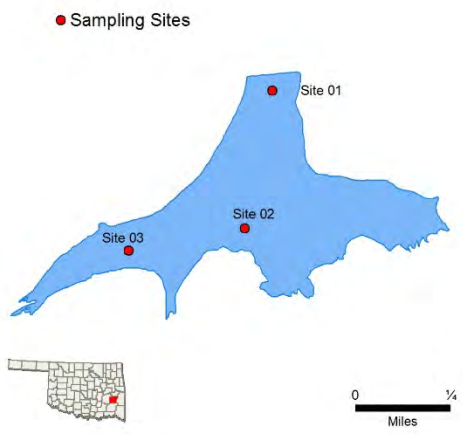
NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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

Lloyd Church (Wilburton)

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



General

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

Parameters

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

Beneficial Uses

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

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

Notes

* Standards revision, true color is for permitting purposes only

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

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

Stream Data

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

Parameters

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

Beneficial Uses

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

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

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

Little Lee Creek at Nicut

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



Stream Data

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

Parameters

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

Beneficial Uses

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

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

Notes

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

New Spiro

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



General

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

Parameters

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

Beneficial Uses

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

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

Notes

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

*Standards revision, true color is for permitting purposes only

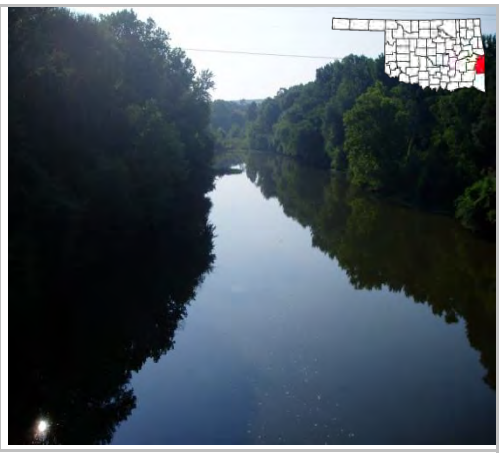
NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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



Stream Data

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

Parameters

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

Beneficial Uses

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

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

Notes

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

Poteau River at Pocola

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



Stream Data

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

Parameters

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

Beneficial Uses

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

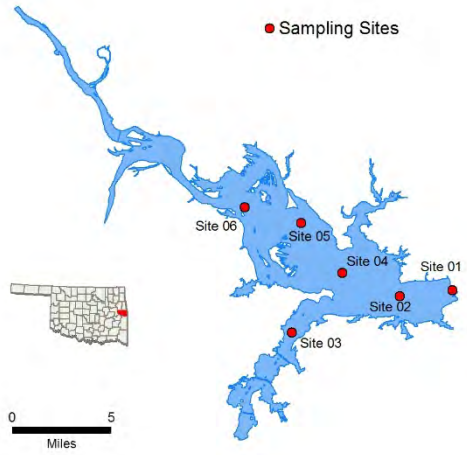
S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

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

Robert S. Kerr

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



General

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

Parameters

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

Beneficial Uses

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

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

Notes

*Standards revision, true color is for permitting purposes only

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

Sager Creek at West Siloam Springs



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

Stream Data

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

Parameters

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

Beneficial Uses

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

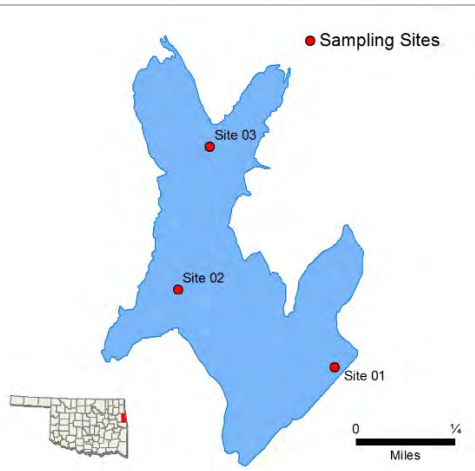
S = Fully Supporting
NS = Not Supporting
NEI = Not Enough Information

Notes

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

Stilwell City

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



General

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

Parameters

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

Beneficial Uses

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

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

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

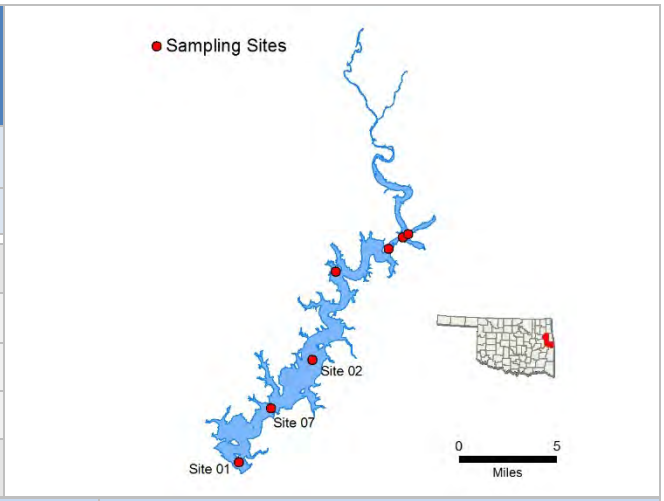
NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
Chlor-a = Chlorophyll-a
mg/L = milligrams per liter
µS/cm = microsiemens/cm
ppt = parts per thousand
En = Enterococci

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

Tenkiller (1,2,7)

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



General

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

Parameters

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

Beneficial Uses

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

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

Notes

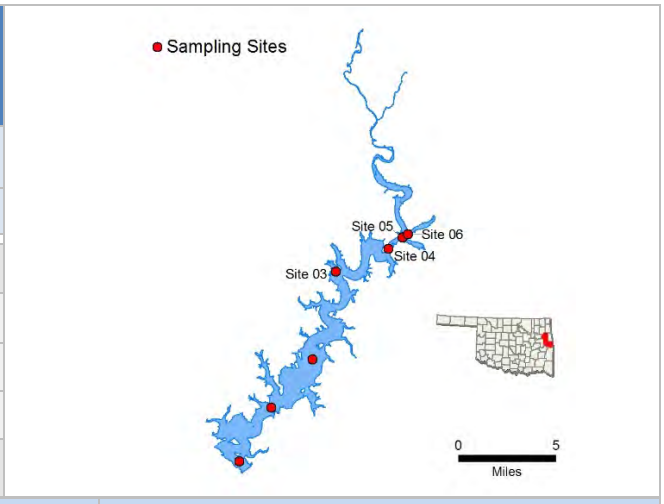
*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.
**N/A – parameters not collected in current sample year.*

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

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, Illinois River Arm (3-6)

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



General

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

Parameters

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

Beneficial Uses

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

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

Notes

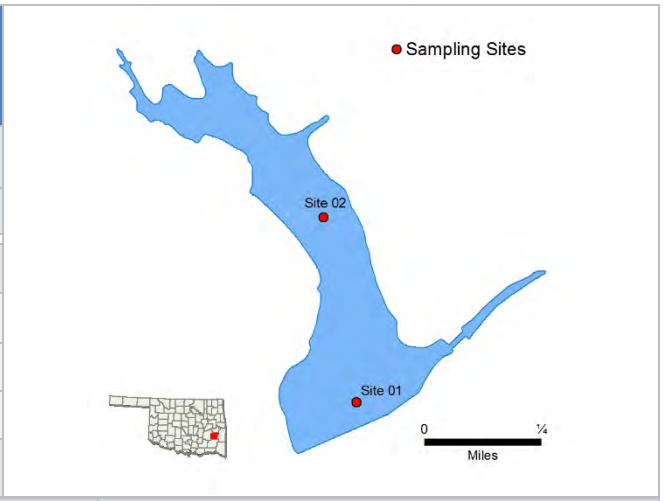
*The lake is listed in the WQS as a NLW indicating that the Aesthetics beneficial use is considered threatened by nutrients until studies can be conducted to confirm non-support status.

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

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

Wayne Wallace

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



General

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

Parameters

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

Beneficial Uses

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

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

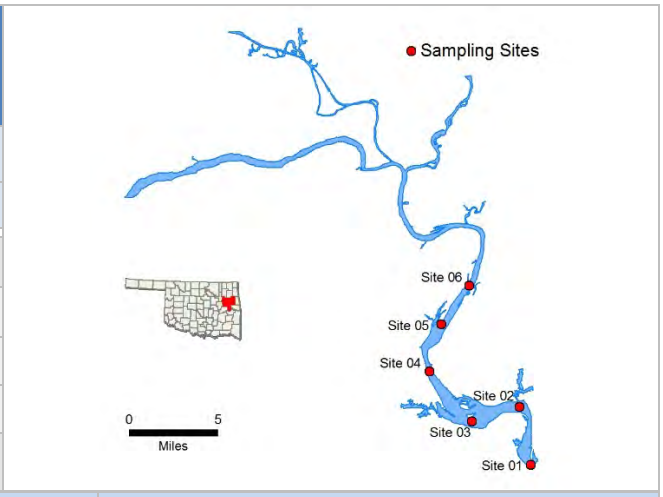
Notes

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

Webbers Falls

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



General

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

Parameters

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

Beneficial Uses

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

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

Notes

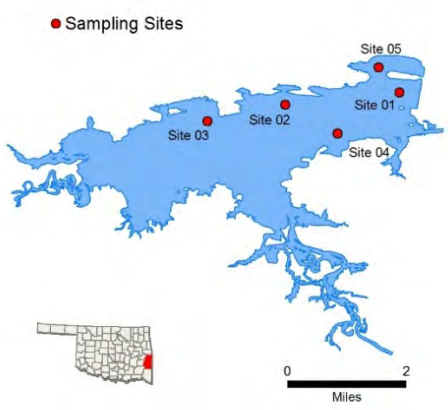
*Standards revision, true color is for permitting purposes only.
**Only one visit in SY19 due to extreme flooding

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

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

Wister

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



General

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

Parameters

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

Beneficial Uses

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

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

Notes

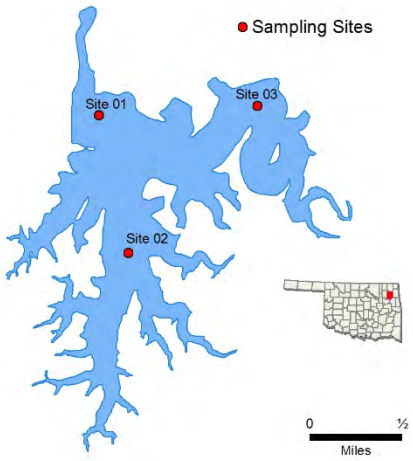
*Standards revision, true color is for permitting purposes only.
*Currently, the lake is listed as a Nutrient Limited Watershed (NLW) in the Oklahoma Water Quality Standards (WQS). This listing means that the lake is considered threatened from nutrients until a more intensive study can confirm the Aesthetics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

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

Sampling and Assessment by the Oklahoma Water Resources Board – 3800 Classen Blvd, Oklahoma City, OK, 73118 – 405.530.8800 – http://www.owrb.ok.gov
Bathy map available: http://www.owrb.ok.gov/maps/PMG/owrbdata_Bathy.html

W.R. Holway

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



General

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

Parameters

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

Beneficial Uses

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

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

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

NTU = nephelometric turbidity units
µS/cm = microsiemens per centimeter
E. coli = Escherichia coli
OWQS = Oklahoma Water Quality Standards
mV = millivolts
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

Oklahoma 2020 Integrated Report
Appendix B

Legend

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

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

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

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

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

2020 Category 5 Waters for the Oklahoma/Arkansas Compact Area

TMDL Development Priority Schedule

TMDL Priority	Proposed Initiation of TMDL Development*
1	2022
2	2023-2025
3	2026-2028
4	2029-2031

*Dates are only estimates and subject to change

Waterbody ID	HUC 8	Waterbody Name	Size	Unit	Cause	TMDL Priority	Unconfirmed Potential Sources
OK120400010070_00	11110102	Webbers Falls Lake	11600	Acres	TURBIDITY	3	140
OK120400010120_00	11110102	Greenleaf Creek	15.31	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	3	140
OK120400010130_00	11110102	Greenleaf Lake	920	Acres	MERCURY, CHLOROPHYLL-A	3	140
OK120400010280_00	11110102	Bayou Manard	14.02	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	3	39, 140
OK120400010425_00	11110102	Arkansas River, Unnamed Trib of	2.23	Miles	FISH BIOASSESSMENTS, BENTHIC	3	140
OK120400020010_00	11110102	Dirty Creek	44.18	Miles	DISSOLVED OXYGEN	4	46, 59, 87, 92, 108, 111, 133, 136, 140
OK120400020030_00	11110102	Dirty Creek, South Fork	15.55	Miles	SULFATE, DISSOLVED OXYGEN, BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	4	39, 46, 49, 62, 85, 87, 92, 108, 111, 133, 136, 140
OK120400020110_00	11110102	Dirty Creek, Georges Fork	10.05	Miles	TURBIDITY, DISSOLVED OXYGEN	4	39, 46, 87, 92, 108, 111, 133, 136, 140
OK120400020160_00	11110102	Butler Creek	10.34	Miles	DISSOLVED OXYGEN	4	46, 59, 87, 92, 108, 111, 133, 136, 140
OK120400020190_00	11110102	Elk Creek	13.96	Miles	SULFATE	4	49, 87, 102, 140
OK120400020240_00	11110102	Shady Grove Creek	10.80	Miles	PH, SULFATE, TOTAL DISSOLVED SOLIDS (TDS),	4	8, 49, 102, 140
OK121600010050_00	11070209	Fort Gibson Lake	12464	Acres	DISSOLVED OXYGEN	1	46, 108, 133, 136, 140
OK121600010060_00	11070209	Ranger Creek	7.94	Miles	PH	3	140
OK121600010080_00	11070209	Pecan Creek	9.19	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	3	140
OK121600010280_00	11070209	Neosho River	14.26	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS,	3	46, 56, 62, 85, 87, 92, 108, 133, 136, 140
OK121600010290_00	11070209	Spring Creek	39.70	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	1	140
OK121600010430_00	11070209	Chouteau Creek	22.25	Miles	AMMONIA, UN-IONIZED, DISSOLVED OXYGEN, PH	3	46, 59, 87, 92, 108, 111, 133, 136, 140
OK121600020020_00	11070209	Hudson Lake, Lower	5802	Acres	DISSOLVED OXYGEN	2	140
OK121600020170_00	11070209	Neosho River	10.89	Miles	LEAD, DISSOLVED OXYGEN	3	46, 56, 62, 82, 85, 87, 92, 108, 133, 136, 140
OK121600030020_00	11070209	Grand Lake O' the Cherokees, Lower	10051	Acres	DISSOLVED OXYGEN, LEAD	2	82, 140
OK121600050020_00	11070209	Spavinaw Lake	1584	Acres	CHLOROPHYLL-A, DISSOLVED OXYGEN	1	4, 46, 59, 92, 108, 133, 136, 140, 146
OK121600050060_00	11070209	Spavinaw Creek	3.96	Miles	DISSOLVED OXYGEN	1	140
OK121600050070_00	11070209	Eucha Lake (Upper Spavinaw)	2860	Acres	CHLOROPHYLL-A, DISSOLVED OXYGEN	1	4, 46, 59, 92, 108, 133, 136, 140, 146
OK121600060060_10	11070209	Big Cabin Creek	4.16	Miles	SULFATE	3	49, 140
OK121600060080_00	11070209	Little Cabin Creek	32.31	Miles	PH, DISSOLVED OXYGEN	4	140
OK121600060200_00	11070209	Bull Creek	10.83	Miles	SULFATE, DISSOLVED OXYGEN, TOTAL DISSOLVED	4	4, 59, 62, 84, 85, 92, 140
OK121600060220_00	11070209	Big Cabin Creek	11.58	Miles	TOTAL DISSOLVED SOLIDS (TDS), SULFATE	4	49, 97, 102, 140
OK121600060240_00	11070209	Pawpaw Creek	18.40	Miles	DISSOLVED OXYGEN	4	46, 59, 87, 92, 108, 111, 133, 136, 140, 156
OK121610000050_10	11070209	Pryor Creek	4.97	Miles	PH, DISSOLVED OXYGEN	4	8, 46, 59, 85, 87, 92, 102, 108, 111, 128, 133, 136, 140
OK121610000090_00	11070209	Pryor Creek	2.35	Miles	DISSOLVED OXYGEN	4	84, 85, 92, 140, 156
OK121610000090_10	11070209	Pryor Creek	12.12	Miles	DISSOLVED OXYGEN, FISH BIOASSESSMENTS	4	46, 49, 59, 87, 92, 102, 108, 111, 136, 140
OK121700010010_00	11110103	Illinois River	9.47	Miles	DISSOLVED OXYGEN	1	140

OK121700010020_00	11110103	Deep Branch	8.71	Miles	DISSOLVED OXYGEN	1	39, 140
OK121700020020_00	11110103	Tenkiller Ferry Lake	8442	Acres	DISSOLVED OXYGEN, PHOSPHORUS, TOTAL	1	140
OK121700020100_00	11110103	Snake Creek	2.66	Miles	DISSOLVED OXYGEN	1	140
OK121700020110_00	11110103	Chicken Creek	3.54	Miles	FISH BIOASSESSMENTS	1	46, 59, 87, 92, 108, 111, 133, 136, 140
OK121700020180_00	11110103	Elk Creek	8.46	Miles	DISSOLVED OXYGEN	1	140
OK121700020220_00	11110103	Tenkiller Ferry Lake, Illinois River Arm	5032	Acres	CHLOROPHYLL-A, PHOSPHORUS, TOTAL	1	4, 59, 108, 136, 140, 146
OK121700020270_00	11110103	Park Hill Branch	6.86	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	3	46, 49, 59, 72, 87, 92, 102, 108, 111, 136, 140
OK121700030010_00	11110103	Illinois River	7.68	Miles	ENTEROCOCCUS, PHOSPHORUS, TOTAL	1	4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700030030_00	11110103	Stick Ross Creek (Ross Branch)	4.54	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	1	140
OK121700030040_00	11110103	Tahlequah Creek (Town Branch)	6.21	Miles	ESCHERICHIA COLI (E. COLI)	1	46, 92, 108, 133, 136, 140
OK121700030080_00	11110103	Illinois River	31.68	Miles	ENTEROCOCCUS, PHOSPHORUS, TOTAL	1	4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700030090_00	11110103	Pumpkin Hollow Creek	9.27	Miles	DISSOLVED OXYGEN	1	140
OK121700030110_00	11110103	Cedar Hollow Creek	3.60	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	1	39, 140
OK121700030280_00	11110103	Illinois River	15.65	Miles	PHOSPHORUS, TOTAL, ESCHERICHIA COLI (E. COLI), TURBIDITY, ENTEROCOCCUS	2	4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700030290_00	11110103	Flint Creek	1.60	Miles	PHOSPHORUS, TOTAL, DISSOLVED OXYGEN	1	4, 46, 59, 92, 108, 133, 136, 140, 146
OK121700030350_00	11110103	Illinois River	5.18	Miles	PHOSPHORUS, TOTAL, ENTEROCOCCUS, ESCHERICHIA COLI (E. COLI)	2	4, 34, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700040010_00	11110103	Caney Creek	20.92	Miles	ESCHERICHIA COLI (E. COLI), ENTEROCOCCUS, BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	3	46, 59, 85, 92, 100, 108, 136, 140
OK121700050010_00	11110103	Illinois River, Baron Fork	25.15	Miles	PHOSPHORUS, TOTAL	2	4, 46, 59, 85, 92, 100, 108, 133, 136, 140, 146
OK121700050070_00	11110103	Walltrip Branch	6.90	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	2	140
OK121700050090_00	11110103	Tyner Creek	15.92	Miles	DISSOLVED OXYGEN	2	140
OK121700060010_00	11110103	Flint Creek	7.75	Miles	PHOSPHORUS, TOTAL	1	4, 46, 59, 85, 92, 100, 108, 140, 146
OK121700060080_00	11110103	Sager Creek	4.15	Miles	SEDIMENTATION/SILTATION, BENTHIC MACROINVERTEBRATES BIOASSESSMENTS,	1	4, 46, 59, 85, 92, 108, 133, 136, 140, 146
OK220100010010_00	11110105	Poteau River	23.89	Miles	ENTEROCOCCUS	3	46, 59, 85, 92, 100, 108, 136, 140
OK220100010010_10	11110105	Poteau River	1.55	Miles	ENTEROCOCCUS	4	46, 59, 85, 92, 100, 108, 136, 140
OK220100010010_40	11110105	Poteau River	21.35	Miles	LEAD, SELENIUM, COPPER, SILVER, CADMIUM	3	140
OK220100010050_00	11110105	New Spiro Lake	254	Acres	DISSOLVED OXYGEN, CHLOROPHYLL-A, PH	3	46, 92, 108, 133, 136, 140
OK220100010160_00	11110105	Sugarloaf Creek	15.00	Miles	DISSOLVED OXYGEN, PH	3	140
OK220100010180_00	11110105	Caston Creek	14.43	Miles	SULFATE	4	46, 49, 59, 87, 92, 102, 108, 111, 136, 140
OK220100010265_00	11110105	Rock Creek Tributary!	2.01	Miles	FISH BIOASSESSMENTS	4	46, 49, 59, 87, 92, 102, 108, 111, 136, 140
OK220100020010_10	11110105	Poteau River	27.04	Miles	ENTEROCOCCUS, ESCHERICHIA COLI (E. COLI)	3	46, 59, 85, 92, 100, 108, 136, 140
OK220100020020_00	11110105	Wister Lake	7333	Acres	PHOSPHORUS, TOTAL, TURBIDITY, MERCURY, PH,	2	140
OK220100020030_00	11110105	Poteau River, Black Fork	1.96	Miles	PH	1	140
OK220100020040_00	11110105	Poteau River, Black Fork	28.60	Miles	PH	1	140
OK220100020060_00	11110105	Cedar Lake	78	Acres	PH, DISSOLVED OXYGEN, MERCURY	1	46, 92, 108, 133, 136, 140
OK220100020080_00	11110105	Big Creek	12.57	Miles	PH, BENTHIC MACROINVERTEBRATES BIOASSESSMENTS	1	39, 46, 62, 69, 85, 87, 92, 108, 111, 133, 136, 140
OK220100040020_00	11110105	Fourche Maline Creek	36.94	Miles	DISSOLVED OXYGEN	2	46, 62, 69, 85, 87, 92, 108, 111, 133, 136, 140
OK220100040030_00	11110105	Holson Creek	17.38	Miles	PH	4	140
OK220100040050_00	11110105	Red Oak Creek	10.95	Miles	PH, DISSOLVED OXYGEN	2	46, 85, 92, 108, 133, 136, 140
OK220100040080_00	11110105	Bandy Creek	12.44	Miles	FISH BIOASSESSMENTS	2	46, 49, 59, 87, 92, 102, 108, 111, 136, 140
OK220100040100_00	11110105	Lloyd Church Lake (Wilburton City)	160	Acres	PH, MERCURY, TURBIDITY	2	140

OK220100040140_00	11110105	Carlton Lake	52	Acres	MERCURY	2	140
OK220100040150_00	11110105	Wayne Wallace Lake	94	Acres	MERCURY, DISSOLVED OXYGEN, PH	2	46, 92, 108, 133, 136, 140
OK220200010010_00	11110104	Arkansas River	20.59	Miles	BENTHIC MACROINVERTEBRATES BIOASSESSMENTS,	4	46, 59, 92, 108, 136, 140
OK220200020020_00	11110104	Robert S. Kerr Lake	43380	Acres	TURBIDITY	1	140
OK220200020130_10	11110104	Vian Creek	21.42	Miles	DISSOLVED OXYGEN	4	39, 140
OK220200030040_00	11110104	Brushy Creek Lake	358	Acres	TURBIDITY, CHLOROPHYLL-A, PH	1	140
OK220200030120_00	11110104	Stilwell City Lake	188	Acres	DISSOLVED OXYGEN, TURBIDITY, MERCURY	1	46, 108, 133, 136, 140
OK220200040010_10	11110104	Sans Bois Creek	10.76	Miles	SULFATE	4	140
OK220200050010_00	11110104	Lee Creek	1.87	Miles	LEAD, ENTEROCOCCUS	3	46, 92, 108, 133, 136, 140, 146

OKLAHOMA WATER RESOURCES BOARD

WATER QUALITY STANDARDS UPDATE

September 23, 2021

Water quality standards (WQS) define the goals for a waterbody and work to safeguard human health and aquatic life by establishing provisions to limit pollution to lakes and rivers. The Oklahoma Water Resources Board (OWRB) is the state agency responsible for developing and promulgating WQS to ensure water quality protection across the State of Oklahoma. OWRB staff, in cooperation with all stakeholders, work to develop and/or revise WQS as necessary. The bullets below summarize program highlights from the 2020-2021 rulemaking.

- At the February 16, 2021 meeting of the OWRB, the board adopted revisions to the Oklahoma Scenic River total phosphorus criterion for Illinois River, Barren Fork Creek, and Flint Creek. These revisions were subsequently approved by the Oklahoma Legislature and the Governor signed the resolution in June 2021. OWRB staff worked in cooperation with Oklahoma partner environmental agencies, Cherokee Nation, and ADEQ staff on the revised total phosphorus criterion and the adopted revisions were an outgrowth of recommendations from the Arkansas Oklahoma Joint Study Committee.

- The adopted criterion applicable to the Illinois River, Barren Fork Creek, and Flint Creek is (Title 785, Chapter 45):

  > *The total phosphorus six month rolling average of 0.037 mg/L shall not be exceeded more than once in a one-year period and not more than three times in a five-year period.*

- Associated implementation provisions outlining the calculation of the six-month rolling average and water quality assessment requirements were also adopted into Implementation of Oklahoma's Water Quality Standards (Title 785, Chapter 46).

Additional information on the revised total phosphorus criterion is available on the OWRB website at https://www.owrb.ok.gov/rules/wqs/revisions/totalphosphorous.php and https://www.owrb.ok.gov/rules/wqs/index.php. Questions or information requests can also be directed to Monty Porter at monty.porter@owrb.ok.gov or Rebecca Veiga Nascimento at rebecca.veiga@owrb.ok.gov.

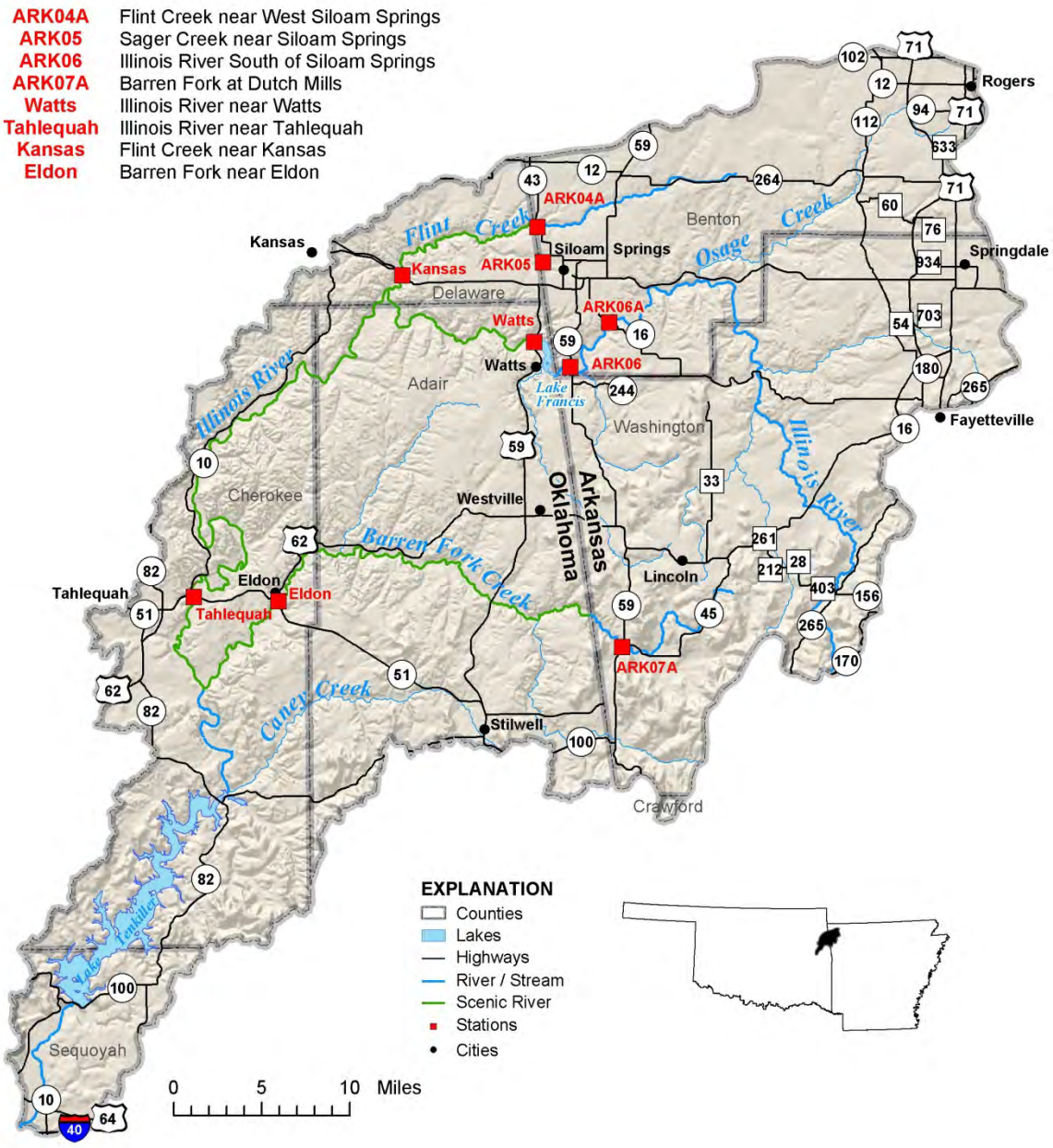
Completed TMDL's
In the Arkansas-Oklahoma Compact Area:
Provided by the Oklahoma Department of Environmental Quality

Waterbody ID	HUC8	Waterbody Name	Cause	TMDL ID	TMDL Completion Date
OK121600010010_00	11070209	Neosho River	Enterococcus	42581	9/27/2012
OK121600010060_00	11070209	Ranger Creek	Enterococcus	34847	7/28/2008
OK121600010100_00	11070209	Fourteenmile Creek	Enterococcus	34848	7/28/2008
OK121600010430_00	11070209	Chouteau Creek	Enterococcus	42582	9/27/2012
OK121600010430_00	11070209	Chouteau Creek	Escherichia coli	42582	9/27/2012
OK121600010440_00	11070209	Crutchfield Branch	Escherichia coli	34849	7/28/2008
OK121600010440_00	11070209	Crutchfield Branch	Enterococcus	34849	7/28/2008
OK121600020030_10	11070209	Saline Creek	Enterococcus	58701	5/13/2014
OK121600020070_00	11070209	Little Saline Creek	Enterococcus	58702	5/13/2014
OK121600050020_00	11070209	Spavinaw Lake	Phosphorus	38670	6/9/2010
OK121600050070_00	11070209	Eucha Lake	Phosphorus	38667	6/9/2010
OK121600050150_00	11070209	Spavinaw Creek	Enterococcus	58705	5/13/2014
OK121600050160_00	11070209	Beaty Creek	Enterococcus	58707	5/13/2014
OK121600050180_00	11070209	Cloud Creek	Enterococcus	58708	5/13/2014
OK121600060080_00	11070209	Little Cabin Creek	Escherichia coli	50980	10/1/2012
OK121600060080_00	11070209	Little Cabin Creek	Enterococcus	50980	10/1/2012
OK121610000050_10	11070209	Pryor Creek	Escherichia coli	58709	5/13/2014
OK121610000050_10	11070209	Pryor Creek	Enterococcus	58709	5/13/2014
OK121610000090_00	11070209	Pryor Creek	Turbidity	58709	5/13/2014
OK120400010260_00	11110102	Arkansas River	Enterococcus	42530	9/27/2012
OK120400010400_00	11110102	Coody Creek	Enterococcus	42532	9/27/2012
OK120400010400_00	11110102	Coody Creek	Escherichia coli	42532	9/27/2012
OK120400020010_00	11110102	Dirty Creek	Enterococcus	42533	9/27/2012
OK120400020010_00	11110102	Dirty Creek	Turbidity	42533	9/27/2012
OK120400020030_00	11110102	Dirty Creek, South Fork	Enterococcus	42535	9/27/2012
OK120400020110_00	11110102	Dirty Creek, Georges Fork	Enterococcus	42536	9/27/2012
OK120400020160_00	11110102	Butler Creek	Turbidity	42538	9/27/2012
OK120400020160_00	11110102	Butler Creek	Escherichia coli	42538	9/27/2012
OK120400020160_00	11110102	Butler Creek	Enterococcus	42538	9/27/2012
OK120400020190_00	11110102	Elk Creek	Enterococcus	42537	9/27/2012
OK120400020240_00	11110102	Shady Grove Creek	Enterococcus	42539	9/27/2012
OK220200030010_20	11110104	Sallisaw Creek	Enterococcus	58780	5/13/2014
OK220200040010_10	11110104	Sans Bois Creek	Enterococcus	58782	5/13/2014
OK220200040010_40	11110104	Sans Bois Creek	Enterococcus	35635	10/20/2008
OK220200040010_40	11110104	Sans Bois Creek	Escherichia coli	35635	10/20/2008
OK220200040050_00	11110104	Sans Bois Creek, Mountain Fork	Escherichia coli	35626	10/20/2008
OK220100010010_00	11110105	Poteau River	Turbidity	58800	5/13/2014
OK220100010010_40	11110105	Poteau River	Turbidity	58820	5/13/2014
OK220100030010_00	11110105	Brazil Creek	Enterococcus	58760	5/13/2014
OK220100040020_00	11110105	Fourche Maline Creek	Enterococcus	35634	10/28/2008

Water Quality Monitoring Report for the Illinois River Basin

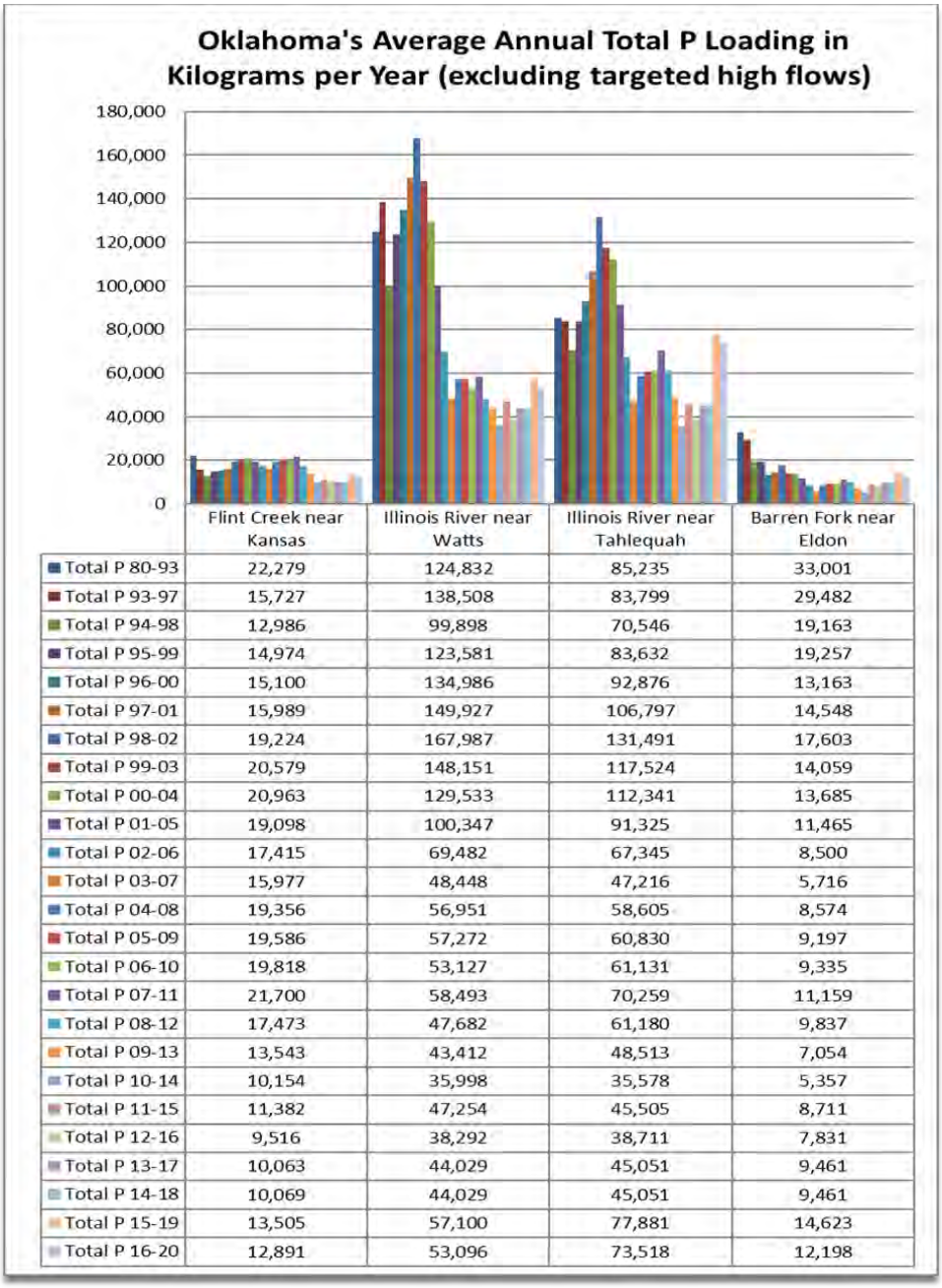
Illinois River Basin

Arkansas – Oklahoma Compact



CY 2020





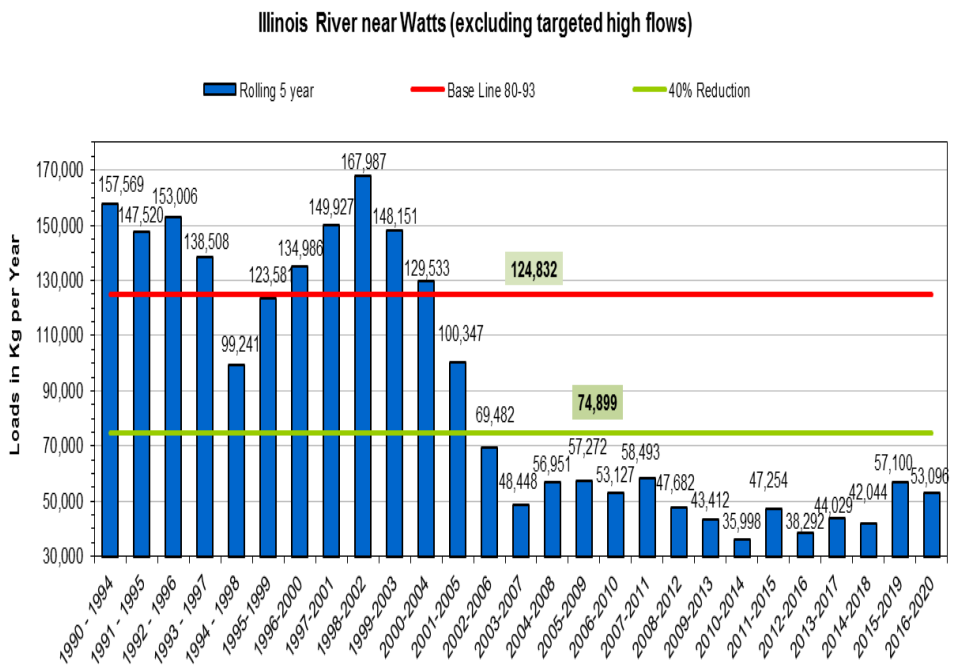
	Flint Creek near Kansas	Illinois River near Watts	Illinois River near Tahlequah	Barren Fork near Eldon
Total P 80-93	22,279	124,832	85,235	33,001
Total P 93-97	15,727	138,508	83,799	29,482
Total P 94-98	12,986	99,898	70,546	19,163
Total P 95-99	14,974	123,581	83,632	19,257
Total P 96-00	15,100	134,986	92,876	13,163
Total P 97-01	15,989	149,927	106,797	14,548
Total P 98-02	19,224	167,987	131,491	17,603
Total P 99-03	20,579	148,151	117,524	14,059
Total P 00-04	20,963	129,533	112,341	13,685
Total P 01-05	19,098	100,347	91,325	11,465
Total P 02-06	17,415	69,482	67,345	8,500
Total P 03-07	15,977	48,448	47,216	5,716
Total P 04-08	19,356	56,951	58,605	8,574
Total P 05-09	19,586	57,272	60,830	9,197
Total P 06-10	19,818	53,127	61,131	9,335
Total P 07-11	21,700	58,493	70,259	11,159
Total P 08-12	17,473	47,682	61,180	9,837
Total P 09-13	13,543	43,412	48,513	7,054
Total P 10-14	10,154	35,998	35,578	5,357
Total P 11-15	11,382	47,254	45,505	8,711
Total P 12-16	9,516	38,292	38,711	7,831
Total P 13-17	10,063	44,029	45,051	9,461
Total P 14-18	10,069	44,029	45,051	9,461
Total P 15-19	13,505	57,100	77,881	14,623
Total P 16-20	12,891	53,096	73,518	12,198

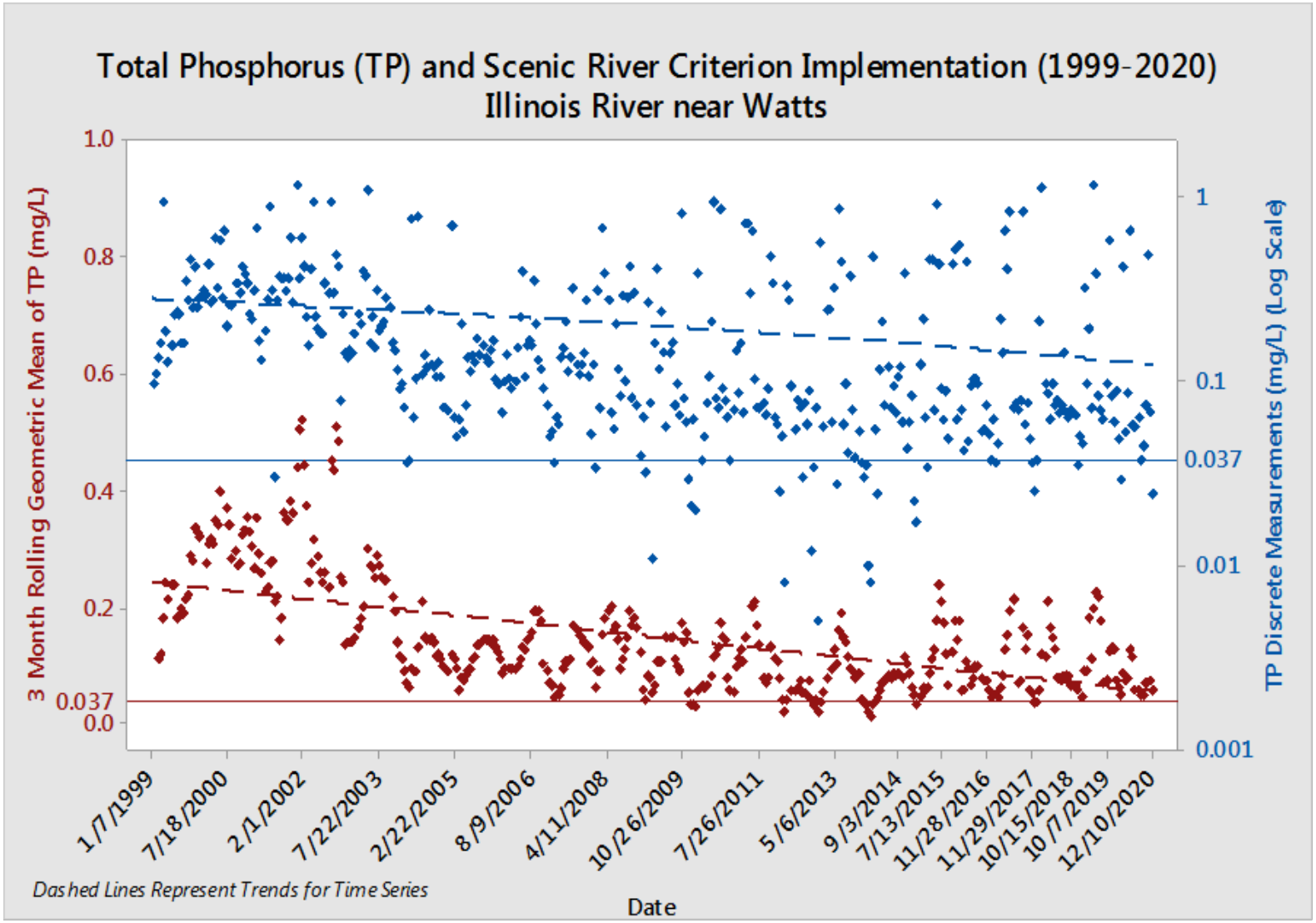
Values represent all available data, which is routinely collected and excludes targeted high flow events.

Illinois River near Watts

Illinois River near Watts			Loadings
Year	Flow (cfs)	Total P (mg/L)	Total P kg/year
1980	173	0.423	65,279
1981	260	0.190	44,119
1982	591		
1983	352		
1984	706		
1985	947		
1986	879		
1987	815		
1988	531		
1989	558	0.210	104,653
1990	1,127	0.181	182,432
1991	724	0.162	104,534
1992	760	0.161	109,571
1993	1,163	0.277	287,317
1994	674	0.168	101,127
1995	783	0.143	100,233
1996	693	0.188	116,542
1997	573	0.163	83,415
1998	713	0.138	87,876
1999	793	0.250	177,057
2000	648	0.309	178,827
2001	649	0.346	200,549
2002	619	0.316	174,694
2003	347	0.155	48,035
2004	688	0.104	63,903
2005	459	0.106	43,453
2006	349	0.116	36,156
2007	464	0.106	43,926
2008	1177	0.068	71,480
2009	915	0.069	56,386
2010	587	0.057	29,882
2011	1101	0.081	79,648
2012	336	0.052	15,594
2013	642	0.082	46,994
2014	448	0.056	22,412
2015	1364	0.061	74,303
2016	434	0.065	25,189
2017	918	0.064	52,481
2018	715	0.066	42,126
2019	1511	0.071	95,806
2020	1116	0.050	49,832
Average	715	0.149	94,878

Year	80-93	90-94	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19	16-20
Pt (mg/l)	0.204	0.198	0.201	0.210	0.200	0.162	0.195	0.221	0.249	0.275	0.271	0.246	0.203	0.158	0.118	0.102	0.095	0.085	0.077	0.065	0.068	0.066	0.068	0.062	0.065	0.061	0.065	0.063
Flow (cfs)	685	890	821	815	777	687	711	684	675	684	611	590	552	492	461	627	673	698	849	823	716	746	778	690	761	776	988	939
Pt (kg/yr)	124,832	157,569	147,520	153,006	138,508	99,241	123,581	134,986	149,927	167,987	148,151	129,533	100,347	69,482	48,448	56,951	57,272	53,127	58,493	47,682	43,412	36,806	47,254	38,287	44,029	42,044	57,100	53,096
Decrease	0.0%	-26.2%	-18.2%	-22.6%	-11.0%	20.5%	1.0%	-8.1%	-20.1%	-34.6%	-18.7%	-3.8%	19.6%	44.3%	61.2%	54.4%	54.1%	57.4%	53.1%	61.8%	65.2%	70.5%	62.1%	69.3%	64.7%	66.3%	54.3%	57.5%

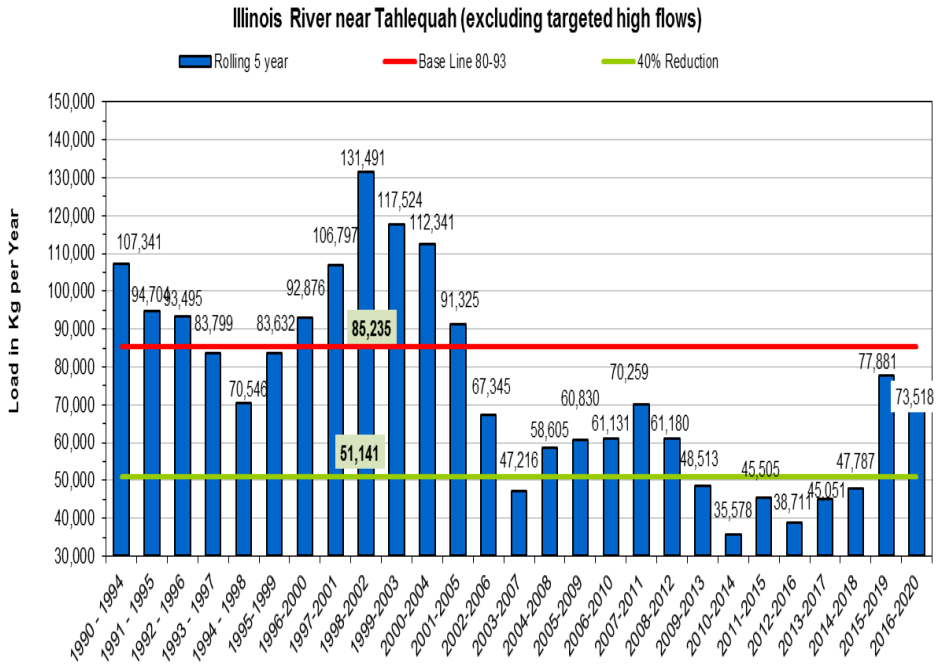


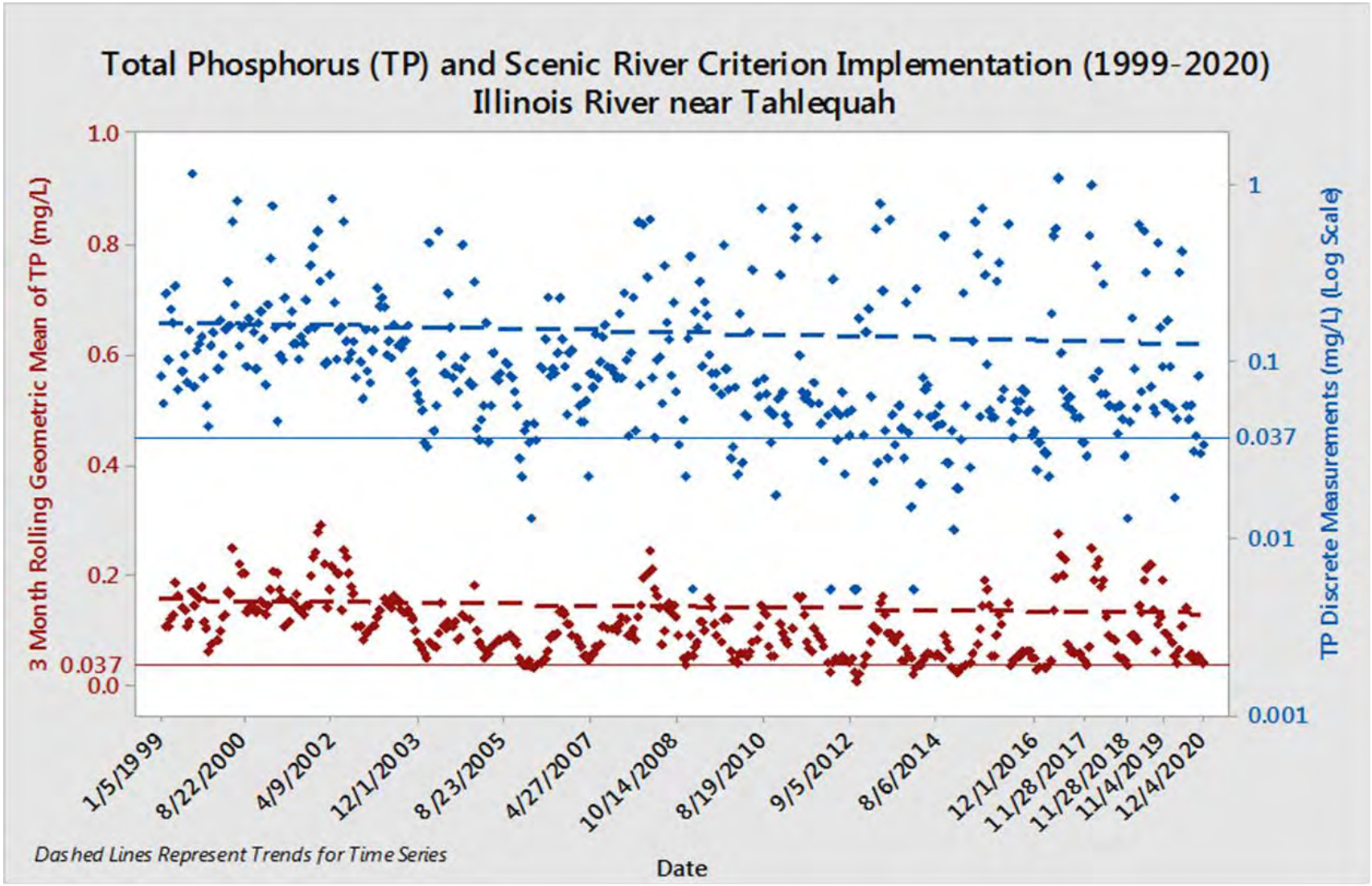

Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2020)
Illinois River near Watts
3 Month Rolling Geometric Mean of TP (mg/L)
1.0
0.8
0.6
0.4
0.2
0.037
0.0
TP Discrete Measurements (mg/L) (Log Scale)
1
0.1
0.037
0.01
0.001
1/7/1999
7/18/2000
2/1/2002
7/22/2003
2/22/2005
8/9/2006
4/11/2008
10/26/2009
7/26/2011
5/6/2013
9/3/2014
7/13/2015
11/28/2016
11/29/2017
10/15/2018
10/7/2019
12/10/2020
Dashed Lines Represent Trends for Time Series
Date

Illinois River near Tahlequah

Illinois River Near Tahlequah			Loadings
Year	Flow (cfs)	Total P (mg/L)	Total P kg/year
1980	249		
1981	384		
1982	812		
1983	537		
1984	1,157		
1985	1,651		
1986	1,452		
1987	1,218		
1988	820		
1989	808		
1990	1,695	0.098	147,579
1991	1,094	0.079	76,796
1992	1,207	0.080	86,205
1993	1,751	0.099	154,647
1994	1,071	0.084	80,223
1995	1,123	0.080	80,229
1996	938	0.085	71,207
1997	812	0.069	49,797
1998	1,044	0.081	75,524
1999	1,143	0.121	123,518
2000	1,083	0.136	131,543
2001	1,033	0.158	145,766
2002	851	0.211	160,366
2003	478	0.100	42,690
2004	1,157	0.075	77,499
2005	712	0.060	38,148
2006	426	0.074	28,154
2007	736	0.066	43,383
2008	1,839	0.062	101,829
2009	1,407	0.072	90,475
2010	819.8	0.050	36,608
2011	1,540.8	0.058	79,813
2012	491.8	0.038	16,689
2013	946.1	0.043	36,331
2014	659.4	0.038	22,378
2015	2,174.6	0.041	79,628
2016	700.6	0.050	31,286
2017	1,219.7	0.050	54,465
2018	987.2	0.054	47,610
2019	2,308.0	0.100	206,129
2020	1,670.3	0.047	70,112
Average	1,078	0.079	76,337

Year	80-93	90-94	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19	16-20
Pt (mg/l)	0.090	0.088	0.085	0.086	0.082	0.079	0.093	0.104	0.117	0.143	0.143	0.137	0.121	0.104	0.075	0.067	0.067	0.065	0.062	0.056	0.052	0.046	0.045	0.042	0.044	0.047	0.059	0.060
Flow (cfs)	1060	1364	1249	1218	1139	998	1012	1004	1023	1031	918	920	846	725	702	974	1024	1046	1269	1220	1041	892	1163	994	1140	1148	1510	1377
Pt (kg/yr)	85,235	107,341	94,704	93,495	83,799	70,546	83,632	92,876	106,797	131,491	117,524	112,341	91,323	67,345	47,216	58,605	60,830	61,131	70,259	61,180	48,513	35,578	45,505	37,303	45,051	47,787	77,881	73,518
Decrease	0.0%	-25.9%	-11.1%	-9.7%	1.7%	17.2%	1.9%	-9.0%	-25.3%	-54.3%	-37.9%	-31.8%	-7.1%	21.0%	44.6%	31.2%	28.6%	28.3%	17.6%	28.2%	43.1%	58.3%	46.6%	56.2%	47.1%	43.9%	8.6%	13.7%

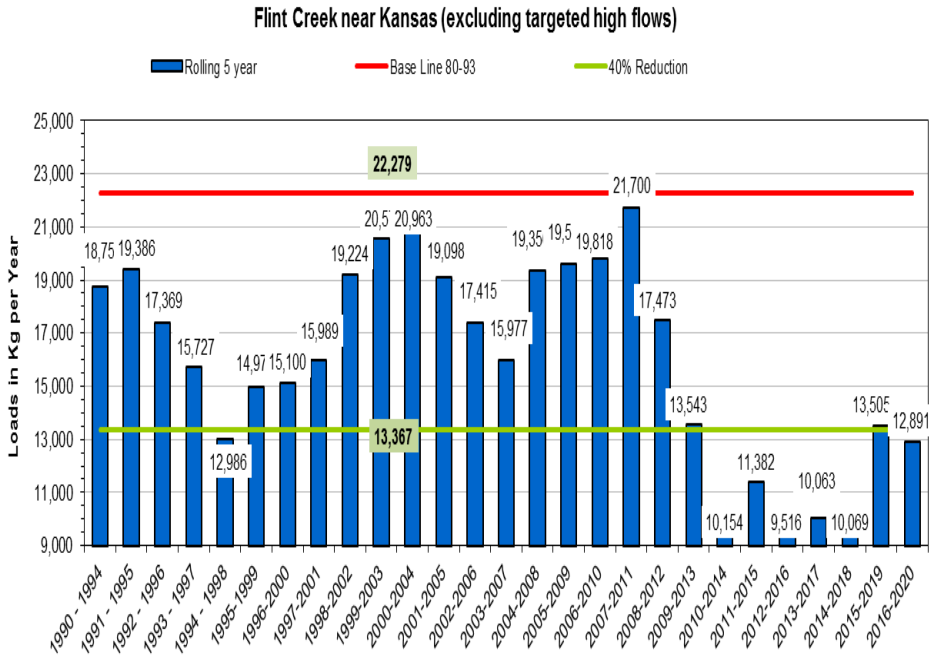


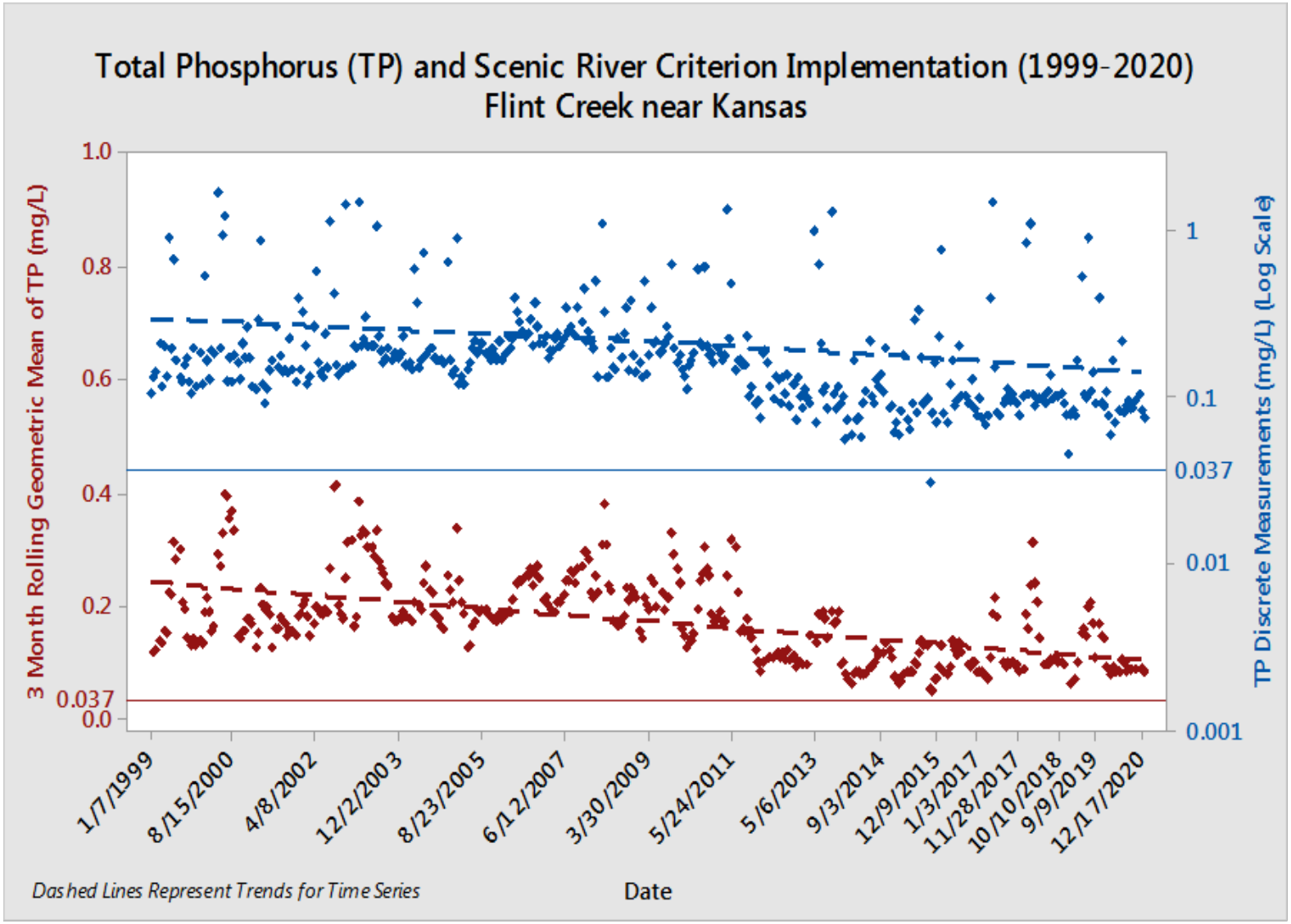

Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2020)
Illinois River near Tahlequah
3 Month Rolling Geometric Mean of TP (mg/L)
1.0
0.8
0.6
0.4
0.2
0.037
0.0
TP Discrete Measurements (mg/L) (Log Scale)
1
0.1
0.037
0.01
0.001
1/5/1999
8/22/2000
4/9/2002
12/1/2003
8/23/2005
4/27/2007
10/14/2008
8/19/2010
9/5/2012
8/6/2014
12/1/2016
11/28/2017
11/28/2018
11/4/2019
12/4/2020
Dashed Lines Represent Trends for Time Series
Date

Flint Creek near Kansas

Flint Creek Near Kansas			Loadings
Year	Flow (cfs)	Total P (mg/L)	Total P kg/year
1980	32	0.189	5,454
1981	57	0.178	9,077
1982	69	0.186	11,537
1983	49	0.284	12,415
1984	143	0.240	30,532
1985	237	0.224	47,591
1986	183	0.223	36,430
1987	141	0.157	19,840
1988	97	0.265	22,946
1989	90	0.557	44,981
1990		0.114	
1991		0.120	
1992		0.118	
1993	182	0.156	25,359
1994	136	0.127	15,418
1995	140	0.185	23,207
1996	76	0.152	10,294
1997	95.7	0.117	9,964
1998	96.5	0.127	10,945
1999	137	0.186	22,758
2000	132	0.178	20,984
2001	101	0.164	14,793
2002	82	0.310	22,675
2003	49.8	0.316	14,055
2004	149.0	0.165	21,957
2005	91.8	0.168	13,774
2006	36.8	0.226	7,428
2007	70.3	0.240	15,068
2008	218.0	0.157	30,567
2009	141.6	0.187	23,649
2010	91.7	0.171	14,004
2011	137.8	0.152	18,707
2012	48.1	0.107	4,598
2013	121.2	0.093	10,070
2014	72.4	0.096	6,206
2015	253.8	0.070	15,864
2016	82.7	0.092	6,796
2017	130.1	0.085	9,877
2018	115.2	0.097	9,978
2019	289.9	0.090	23,299
2020	190.7	0.082	13,962
Average	120	0.174	18,727

Year	80-93	90-94	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19	16-20
Pt (mg/l)	0.214	0.132	0.142	0.146	0.140	0.133	0.154	0.157	0.159	0.196	0.230	0.228	0.226	0.238	0.225	0.191	0.196	0.199	0.184	0.154	0.140	0.121	0.101	0.090	0.085	0.086	0.087	0.089
Flow (cfs)	117	159	153	134	126	109	109	107	112	110	101	103	95	82	80	113	112	112	132	127	108	94	127	118	132	131	174	162
Pt (kg/yr)	22,279	18,758	19,386	17,369	15,727	12,986	14,974	15,100	15,989	19,224	20,579	20,963	19,098	17,415	15,977	19,356	19,586	19,818	21,700	17,473	13,543	10,154	11,382	9,513	10,063	10,069	13,505	12,891
Decrease	0.0%	15.8%	13.0%	22.0%	29.4%	41.7%	32.8%	32.2%	28.2%	13.7%	7.6%	5.9%	14.3%	21.8%	28.3%	13.1%	12.1%	11.0%	2.6%	21.6%	39.2%	54.4%	48.9%	57.3%	54.8%	54.8%	39.4%	42.1%

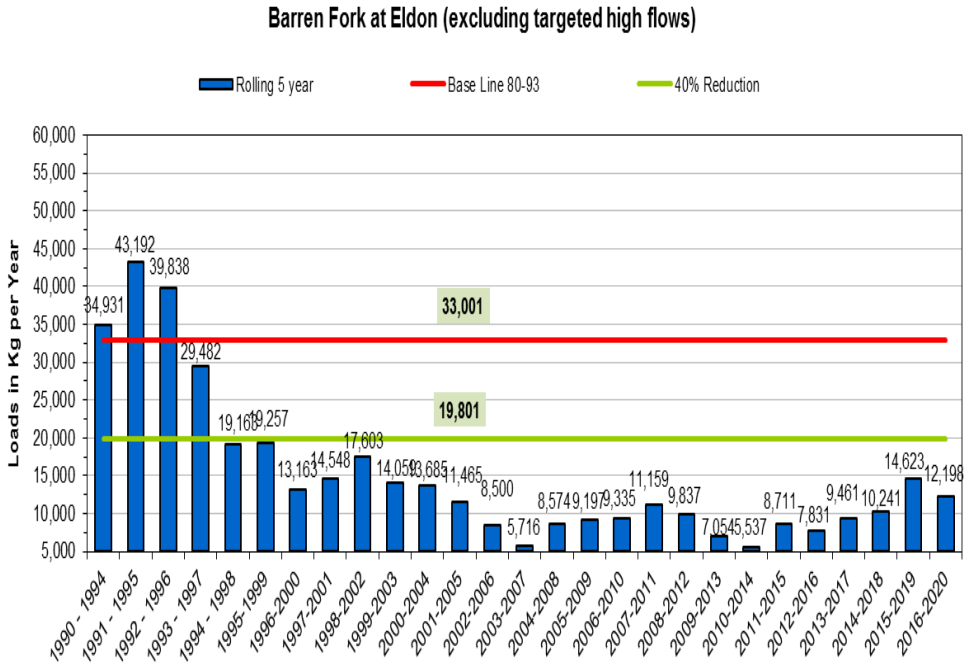


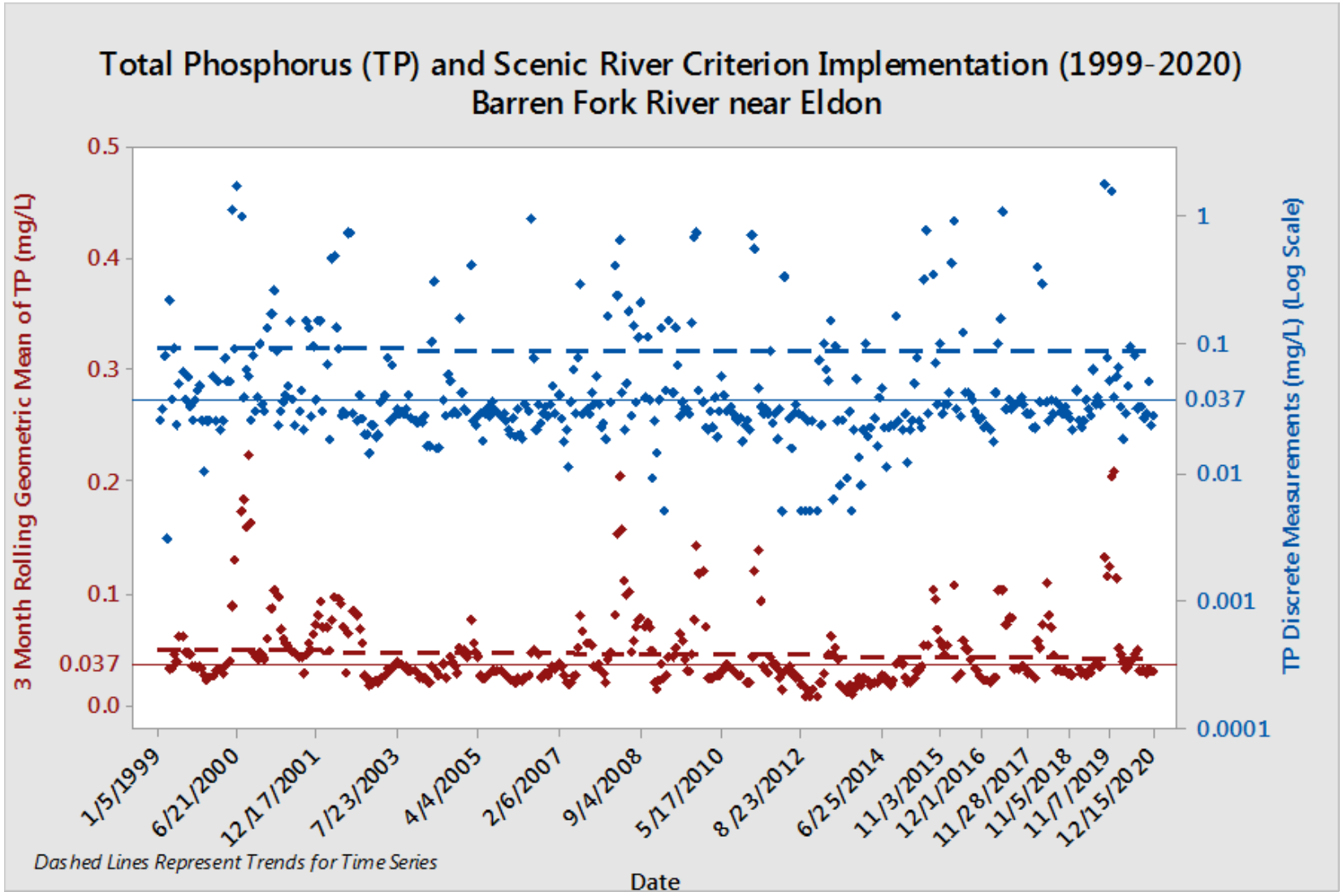

Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2020)
Flint Creek near Kansas
3 Month Rolling Geometric Mean of TP (mg/L)
1.0
0.8
0.6
0.4
0.2
0.037
0.0
TP Discrete Measurements (mg/L) (Log Scale)
1
0.1
0.037
0.01
0.001
1/7/1999
8/15/2000
4/8/2002
12/2/2003
8/23/2005
6/12/2007
3/30/2009
5/24/2011
5/6/2013
9/3/2014
12/9/2015
1/3/2017
11/28/2017
10/10/2018
9/9/2019
12/17/2020
Dashed Lines Represent Trends for Time Series
Date

Barren Fork at Eldon

Barren Fork at Eldon			Loadings
Year	Flow (cfs)	Total Phos. (mg/L)	Total P kg/year
1980	77		
1981	201		
1982	296		
1983	184		
1984	364		
1985	593		
1986	536		
1987	491		
1988	269		
1989	320		
1990	666		
1991	451	0.060	24,145
1992	440	0.095	37,315
1993	700	0.108	67,234
1994	328	0.037	10,878
1995	422	0.263	98,819
1996	432	0.025	9,645
1997	332	0.023	6,671
1998	409	0.033	12,054
1999	361	0.048	15,476
2000	376	0.043	14,440
2001	343	0.064	19,605
2002	262	0.088	20,591
2003	145	0.025	3,237
2004	403	0.029	10,438
2005	228	0.027	5,498
2006	169	0.027	4,075
2007	254	0.026	5,898
2008	559	0.045	22,466
2009	460	0.033	13,557
2010	225	0.027	5,426
2011	471	0.028	11,783
2012	130	0.019	2,201
2013	219	0.026	5,083
2014	184	0.024	3,938
2015	872	0.040	31,154
2016	214	0.033	6,309
2017	320	0.028	8,013
2018	318	0.029	8,225
2019	761	0.038	25,816
2020	549	0.031	15,194
Average	374	0.047	15,817

Year	80-93	90-94	91-95	92-96	93-97	94-98	95-99	96-00	97-01	98-02	99-03	00-04	01-05	02-06	03-07	04-08	05-09	06-10	07-11	08-12	09-13	10-14	11-15	12-16	13-17	14-18	15-19	16-20
Pt (mg/l)	0.093	0.076	0.103	0.096	0.075	0.056	0.055	0.039	0.045	0.056	0.053	0.050	0.046	0.039	0.027	0.030	0.031	0.031	0.032	0.030	0.026	0.024	0.026	0.027	0.029	0.030	0.033	0.032
Flow (cfs)	399	517	468	464	443	384	391	382	364	350	297	306	276	241	24	323	334	333	394	369	301	246	375	323	362	382	497	432
Pt (kg/yr)	33,001	34,931	43,192	39,838	29,482	19,163	19,257	13,163	14,548	17,603	14,059	13,685	11,465	8,500	5,716	8,574	9,197	9,335	11,159	9,837	7,054	5,357	8,711	7,831	9,461	10,241	14,623	12,198
Decrease	0.0%	-5.8%	-30.9%	-20.7%	10.7%	41.9%	41.6%	60.1%	55.9%	46.7%	57.4%	58.5%	65.3%	74.2%	82.7%	74.0%	72.1%	71.7%	66.2%	70.2%	78.6%	83.8%	73.6%	76.3%	71.3%	69.0%	55.7%	63.0%




Total Phosphorus (TP) and Scenic River Criterion Implementation (1999-2020)
Barren Fork River near Eldon
3 Month Rolling Geometric Mean of TP (mg/L)
TP Discrete Measurements (mg/L) (Log Scale)
0.5
0.4
0.3
0.2
0.1
0.037
0.0
1
0.1
0.037
0.01
0.001
0.0001
1/5/1999
6/21/2000
12/17/2001
7/23/2003
4/4/2005
2/6/2007
9/4/2008
5/17/2010
8/23/2012
6/25/2014
11/3/2015
12/1/2016
11/28/2017
11/5/2018
11/7/2019
12/15/2020
Dashed Lines Represent Trends for Time Series
Date

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

Loan/Grant #	Community	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-06-0015-R	Adair County RWS & SWMD #2	Adair	$99,999.00	3/11/2008	REAP
FAP-85-0155-G	Adair County RWS & SWMD #2	Adair	$100,000.00	6/11/1985	Emergency
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
ORF-98-0010-CW	Stilwell Area Development Authority	Adair	$4,000,000.00	8/10/1999	CWSRF
FAP-93-0073-L	Stilwell Area Development Authority	Adair	$1,000,000.00	12/12/1995	FA Loan
FAP-99-0080-R	Watts Public Works Authority	Adair	$99,800.00	11/16/1999	REAP
FAP-97-0125-R	Watts Public Works Authority	Adair	$149,750.00	2/10/1998	REAP
FAP-88-0053-G	Watts Public Works Authority	Adair	$85,000.00	7/16/1990	Emergency
FAP-85-0129-G	Watts Public Works Authority	Adair	$10,000.00	2/12/1985	Emergency
FAP-18-0027-R	Westville Utility Authority	Adair	$0.00	8/18/2020	REAP
ORF-21-0005-CW	Westville Utility Authority	Adair	$109,395.26	8/18/2020	CWSRF
ORF-20-0013-CW	Westville Utility Authority	Adair	$37,575.00	8/20/2019	CWSRF
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-05-0013-G	Westville Utility Authority	Adair	$100,000.00	10/11/2005	Emergency
FAP-03-0019-R	Westville Utility Authority	Adair	$99,969.00	6/14/2005	REAP
ORF-99-0020-CW	Westville Utility Authority	Adair	$430,400.00	12/11/2001	CWSRF
FAP-98-0011-R	Burnt Cabin Rural Water District Incorporated	Cherokee	$65,427.00	6/9/1998	REAP
FAP-83-0019-G	Burnt Cabin Rural Water District Incorporated	Cherokee	$24,000.00	11/2/1983	Emergency
ORF-21-0021-DW	Cherokee County Rural Water District #1	Cherokee	$100,000.00	6/15/2021	DWSRF
FAP-98-0029-L	Cherokee County Rural Water District #1	Cherokee	$380,000.00	12/12/2000	FA Loan
FAP-97-0110-R	Cherokee County Rural Water District #1	Cherokee	$100,000.00	12/14/1999	REAP
FAP-90-0055-G	Cherokee County Rural Water District #10	Cherokee	$27,000.00	3/12/1991	Emergency
ORF-19-0002-DW	Cherokee County Rural Water District #11	Cherokee	$1,575,000.00	2/16/2021	DWSRF
ORF-19-0002-DW	Cherokee County Rural Water District #11	Cherokee	$1,575,000.00	2/16/2021	DWSRF
FAP-08-0005-R	Cherokee County Rural Water District #12	Cherokee	$70,000.00	6/9/2009	REAP
FAP-21-0008-G	Cherokee County Rural Water District #13	Cherokee	$0.00	4/20/2021	Emergency
FAP-12-0010-L	Cherokee County Rural Water District #13	Cherokee	$1,600,000.00	3/13/2012	FA Loan
FAP-02-0026-R	Cherokee County Rural Water District	Cherokee	$135,000.00	6/8/2004	REAP

	#13				
FAP-00-0007-L	Cherokee County Rural Water District #13	Cherokee	$1,810,000.00	6/11/2002	FA Loan
FAP-97-0098-R	Cherokee County Rural Water District #13	Cherokee	$80,000.00	3/14/2000	REAP
FAP-95-0060-G	Cherokee County Rural Water District #13	Cherokee	$100,000.00	1/9/1996	Emergency
FAP-95-0031-L	Cherokee County Rural Water District #13	Cherokee	$170,000.00	1/9/1996	FA Loan
FAP-98-0081-R	Cherokee County Rural Water District #14	Cherokee	$54,000.00	2/10/1999	REAP
FAP-02-0004-L	Cherokee County Rural Water District #2	Cherokee	$645,000.00	8/13/2002	FA Loan
FAP-12-0002-D	Cherokee County Rural Water District #3	Cherokee	$26,870.00	9/18/2012	Drought
ORF-11-0002-DW	Cherokee County Rural Water District #3	Cherokee	$3,110,000.00	7/12/2011	DWSRF
FAP-98-0052-G	Cherokee County Rural Water District #3	Cherokee	$45,000.00	2/10/1999	Emergency
FAP-21-0017-R	Cherokee County Rural Water District #7	Cherokee	$0.00	2/16/2021	REAP
FAP-08-0033-R	Cherokee County Rural Water District #7	Cherokee	$39,069.00	12/9/2008	REAP
FAP-91-0057-G	Cherokee County Rural Water District #7	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-06-0011-R	Cherokee County Rural Water District #8 -- Briggs	Cherokee	$99,999.00	6/12/2007	REAP
FAP-02-0001-L	Cherokee County Rural Water District #8 -- Briggs	Cherokee	$285,000.00	6/11/2002	FA Loan
FAP-91-0058-G	Cherokee County Rural Water District #8 -- Briggs	Cherokee	$23,180.00	9/10/1991	Emergency
FAP-83-0021-G	Cherokee County Rural Water District #8 -- Briggs	Cherokee	$53,000.00	1/10/1984	Emergency
FAP-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-09-0011-G	Hulbert Public Works Authority	Cherokee	$75,000.00	11/10/2009	Emergency
FAP-01-0066-R	Hulbert Public Works Authority	Cherokee	$99,000.00	7/9/2002	REAP
FAP-99-0082-R	Hulbert Public Works Authority	Cherokee	$79,350.00	11/16/1999	REAP
FAP-91-0120-G	Hulbert Public Works Authority	Cherokee	$25,000.00	9/15/1992	Emergency
ORF-19-0014-CW	Tahlequah Public Works Authority	Cherokee	$6,750,000.00	12/5/2019	CWSRF
ORF-18-0017-DW	Tahlequah Public Works Authority	Cherokee	$8,200,000.00	12/6/2018	DWSRF
ORF-11-0010-DW	Tahlequah Public Works Authority	Cherokee	$1,680,000.00	12/13/2011	DWSRF
ORF-09-0040-DW	Tahlequah Public Works Authority	Cherokee	$16,320,000.00	12/8/2009	DWSRF
FAP-83-0044-G	Town of Hulbert	Cherokee	$100,000.00	1/10/1984	Emergency
ORF-21-0030-CW	Bristow Municipal Authority	Creek	$9,100,000.00	10/20/2020	CWSRF
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-08-0004-DW	Creek County Rural Water District #7	Creek	$3,230,000.00	8/12/2008	DWSRF
ORF-99-0002-DW	Creek County Rural Water District #7	Creek	$615,000.00	2/8/2000	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-16-0003-G	Depew Public Works Authority	Creek	$0.00	9/20/2016	Emergency
FAP-11-0015-R	Depew Public Works Authority	Creek	$0.00	7/16/2013	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-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
ORF-14-0006-CW	Kiefer Public Works Authority	Creek	$320,000.00	12/17/2013	CWSRF
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
FAP-90-0057-G	Kiefer Public Works Authority	Creek	$11,000.00	8/14/1990	Emergency
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
ORF-18-0020-CW	Sapulpa Municipal Authority	Creek	$7,850,000.00	5/15/2018	CWSRF
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-96-0132-R	Town of Depew	Creek	$59,000.00	1/14/1997	REAP
FAP-85-0131-G	Town of Drumright	Creek	$76,000.00	5/14/1985	Emergency
FAP-83-0027-G	Town of Drumright	Creek	$100,000.00	1/10/1984	Emergency
FAP-96-0186-R	Town of Mounds	Creek	$55,200.00	4/8/1997	REAP
FAP-09-0013-R	Town of Oilton	Creek	$78,400.00	7/13/2010	REAP
FAP-83-0075-G	Town of Oilton	Creek	$28,420.00	4/10/1984	Emergency
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-13-0014-R	Colcord Public Works Authority	Delaware	$0.00	7/15/2014	REAP
FAP-97-0107-R	Colcord Public Works Authority	Delaware	$94,800.00	1/12/1999	REAP
ORF-11-0007-DW	Delaware County Rural Water District #1	Delaware	$260,000.00	10/17/2011	DWSRF
FAP-97-0047-R	Delaware County Rural Water District #1	Delaware	$50,000.00	11/13/2001	REAP
FAP-96-0020-G	Delaware County Rural Water District #1	Delaware	$85,000.00	7/8/1997	Emergency
FAP-97-0008-L	Delaware County Rural Water District #1	Delaware	$360,000.00	7/8/1997	FA Loan
FAP-85-0229-G	Delaware County Rural Water District #1	Delaware	$63,000.00	9/8/1987	Emergency
FAP-17-0006-L	Delaware County Rural Water District #3	Delaware	$1,040,000.00	1/17/2017	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-09-0013-G	Delaware County RWSG & SWMD #10	Delaware	$19,125.00	1/12/2010	Emergency
FAP-07-0034-R	Delaware County RWSG & SWMD #10	Delaware	$98,653.20	5/14/2008	REAP

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-97-0068-R	Delaware County RWSG & SWMD #9	Delaware	$10,000.00	5/13/1997	REAP
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
ORF-17-0007-DW	Grand Lake Public Works Authority	Delaware	$700,000.00	2/20/2018	DWSRF
FAP-18-0003-L	Grand Lake Public Works Authority	Delaware	$1,390,000.00	11/1/2017	FA Loan
ORF-17-0018-CW	Grand Lake Public Works Authority	Delaware	$1,825,182.60	6/20/2017	CWSRF
FAP-12-0016-L	Grand Lake Public Works Authority	Delaware	$1,000,000.00	7/17/2012	FA Loan
ORF-11-0003-DW	Grand Lake Public Works Authority	Delaware	$5,500,000.00	7/17/2012	DWSRF
ORF-09-0004-CW	Grand Lake Public Works Authority	Delaware	$992,500.00	9/8/2009	CWSRF
FAP-09-0001-L	Grand Lake Public Works Authority	Delaware	$1,990,000.00	9/8/2009	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
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-99-0005-R	Grand Lake Public Works Authority	Delaware	$94,000.00	4/13/1999	REAP
FAP-97-0044-L	Grand Lake Public Works Authority	Delaware	$655,000.00	12/9/1997	FA Loan
ORF-21-0027-CW	Grove Municipal Services Authority	Delaware	$5,350,000.00	9/15/2020	CWSRF
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-18-0007-DW	Jay Utilities Authority	Delaware	$1,031,000.00	5/15/2018	DWSRF
ORF-07-0004-DW	Jay Utilities Authority	Delaware	$2,470,000.00	2/12/2008	DWSRF
ORF-99-0011-CW	Jay Utilities Authority	Delaware	$3,766,000.00	8/8/2000	CWSRF
FAP-02-0003-R	Kansas Public Works Authority	Delaware	$67,000.00	11/12/2002	REAP
FAP-97-0097-R	Kansas Public Works Authority	Delaware	$109,500.00	11/16/1999	REAP
FAP-97-0040-R	Kansas Public Works Authority	Delaware	$139,270.00	3/10/1998	REAP
FAP-86-0002-G	Kansas Public Works Authority	Delaware	$65,000.00	1/12/1988	Emergency
FAP-98-0017-G	Moseley School District 34	Delaware	$46,750.00	6/9/1998	Emergency
FAP-08-0004-R	Oaks Public Works Authority	Delaware	$0.00	6/18/2013	REAP
ORF-16-0004-DW	South Delaware County Regional Water Authority	Delaware	$3,000,000.00	4/18/2017	DWSRF
FAP-84-0015-G	Town of Colcord	Delaware	$95,816.00	4/10/1984	Emergency
FAP-83-0012-G	Town of Kansas	Delaware	$92,516.00	3/13/1984	Emergency
FAP-98-0044-R	West Siloam Springs	Delaware	$96,350.00	3/14/2000	REAP
FAP-94-0013-G	West Siloam Springs	Delaware	$18,315.00	7/12/1994	Emergency
FAP-84-0059-G	West Siloam Springs	Delaware	$100,000.00	6/10/1986	Emergency
FAP-01-0008-L	West Siloam Springs Municipal	Delaware	$275,000.00	11/13/2001	FA Loan

	Authority				
FAP-21-0002-G	Boynton Public Works Authority	Muskogee	$0.00	10/20/2020	Emergency
FAP-00-0032-G	Boynton Public Works Authority	Muskogee	$81,591.00	1/9/2001	Emergency
FAP-91-0047-G	Boynton Public Works Authority	Muskogee	$50,000.00	2/8/1994	Emergency
FAP-90-0100-G	Braggs Public Works Authority	Muskogee	$70,000.00	2/12/1991	Emergency
ORF-21-0016-CW	East Central Oklahoma Water Authority	Muskogee	$439,500.00	5/18/2021	CWSRF
ORF-21-0016-CW	East Central Oklahoma Water Authority	Muskogee	$439,500.00	5/18/2021	CWSRF
FAP-21-0001-G	East Central Oklahoma Water Authority	Muskogee	$0.00	9/15/2020	Emergency
ORF-20-0011-CW	East Central Oklahoma Water Authority	Muskogee	$36,130.00	12/5/2019	CWSRF
FAP-19-0009-G	East Central Oklahoma Water Authority	Muskogee	$0.00	8/20/2019	Emergency
ORF-20-0015-DW	East Central Oklahoma Water Authority	Muskogee	$1,000,000.00	8/20/2019	DWSRF
ORF-20-0015-DW	East Central Oklahoma Water Authority	Muskogee	$1,000,000.00	8/20/2019	DWSRF
FAP-17-0047-R	East Central Oklahoma Water Authority	Muskogee	$0.00	8/21/2018	REAP
FAP-96-0045-G	East Central Oklahoma Water Authority	Muskogee	$97,750.00	4/14/1998	Emergency
FAP-97-0021-R	East Central Oklahoma Water Authority	Muskogee	$59,700.00	3/11/1997	REAP
ORF-11-0004-CW	Fort Gibson Utilities Authority	Muskogee	$980,000.00	4/12/2011	CWSRF
ORF-99-0017-CW	Fort Gibson Utilities Authority	Muskogee	$710,000.00	3/14/2000	CWSRF
ORF-97-0011-CW	Fort Gibson Utilities Authority	Muskogee	$445,100.00	5/12/1998	CWSRF
FAP-93-0005-L	Fort Gibson Utilities Authority	Muskogee	$820,000.00	3/9/1993	FA Loan
ORF-99-0015-CW	Haskell Public Works Authority	Muskogee	$320,000.00	12/14/1999	CWSRF
FAP-95-0064-L	Muskogee County Rural Water District #1	Muskogee	$430,000.00	8/12/1997	FA Loan
FAP-02-0058-R	Muskogee County Rural Water District #10	Muskogee	$99,999.00	4/8/2003	REAP
FAP-00-0060-R	Muskogee County Rural Water District #11	Muskogee	$150,000.00	12/12/2000	REAP
FAP-01-0075-R	Muskogee County Rural Water District #14	Muskogee	$150,000.00	8/31/2001	REAP
FAP-17-0008-L	Muskogee County Rural Water District #3	Muskogee	$1,595,000.00	6/16/2021	Interest Earning
FAP-17-0008-L	Muskogee County Rural Water District #3	Muskogee	$1,595,000.00	5/16/2017	FA Loan
FAP-05-0023-R	Muskogee County Rural Water District #3	Muskogee	$99,999.00	6/8/2010	REAP
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-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-02-0011-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
ORF-18-0012-DW	Muskogee Municipal Authority	Muskogee	$17,640,000.00	10/16/2018	DWSRF
ORF-18-0012-DW	Muskogee Municipal Authority	Muskogee	$17,640,000.00	10/16/2018	DWSRF
ORF-17-0019-CW	Muskogee Municipal Authority	Muskogee	$27,360,000.00	4/18/2017	CWSRF
ORF-17-0014-CW	Muskogee Municipal Authority	Muskogee	$110,000.00	2/21/2017	CWSRF
ORF-14-0012-CW	Muskogee Municipal Authority	Muskogee	$7,300,000.00	12/17/2013	CWSRF
ORF-11-0008-CW	Muskogee Municipal Authority	Muskogee	$12,775,000.00	8/9/2011	CWSRF
ORF-09-0020-CW	Muskogee Municipal Authority	Muskogee	$1,435,000.00	8/11/2009	CWSRF
ORF-08-0007-DW	Muskogee Municipal Authority	Muskogee	$30,410,000.00	7/8/2008	DWSRF
FAP-03-0005-L	Muskogee Municipal Authority	Muskogee	$4,575,000.00	6/10/2003	FA Loan
ORF-99-0007-CW	Muskogee Municipal Authority	Muskogee	$1,970,765.66	6/8/1999	CWSRF
ORF-99-0007-L	Muskogee Municipal Authority	Muskogee	$3,335,000.00	6/8/1999	FA Loan
ORF-98-0004-L	Muskogee Municipal Authority	Muskogee	$5,850,000.00	6/9/1998	FA Loan
ORF-98-0004-CW	Muskogee Municipal Authority	Muskogee	$3,480,000.00	6/9/1998	CWSRF
ORF-96-0017-CW	Muskogee Municipal Authority	Muskogee	$14,112,000.00	2/11/1997	CWSRF
ORF-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-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-90-0004-CW	Muskogee Municipal Authority	Muskogee	$11,553,000.00	2/11/1992	CWSRF
FAP-90-0019-G	Oktaha Public Works Authority	Muskogee	$19,700.00	4/10/1990	Emergency
FAP-19-0012-R	Porum Public Works Authority	Muskogee	$0.00	6/18/2019	REAP
ORF-18-0016-CW	Porum Public Works Authority	Muskogee	$496,117.00	11/1/2017	CWSRF
ORF-18-0016-CW	Porum Public Works Authority	Muskogee	$496,117.00	11/1/2017	CWSRF
ORF-17-0008-CW	Porum Public Works Authority	Muskogee	$780,000.00	9/20/2016	CWSRF
FAP-14-0012-R	Porum Public Works Authority	Muskogee	$0.00	12/16/2014	REAP
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-10-0001-G	Town of Boynton	Muskogee	$13,607.53	3/9/2010	Emergency
FAP-83-0003-G	Town of Boynton	Muskogee	$27,695.00	8/12/1983	Emergency
FAP-96-0077-R	Town of Braggs	Muskogee	$36,995.00	1/14/1997	REAP
FAP-98-0049-G	Town of Council Hill	Muskogee	$100,000.00	3/9/1999	Emergency
FAP-04-0064-R	Town of Taft	Muskogee	$99,557.68	1/11/2005	REAP
FAP-83-0091-G	Town of Taft	Muskogee	$86,620.00	1/10/1984	Emergency
FAP-84-0020-G	Town of Warner	Muskogee	$100,000.00	5/8/1984	Emergency

FAP-00-0006-G	Warner Utilities Authority	Muskogee	$45,000.00	6/13/2000	Emergency
ORF-96-0022-CW	Warner Utilities Authority	Muskogee	$258,000.00	8/10/1999	CWSRF
FAP-96-0051-L	Warner Utilities Authority	Muskogee	$435,000.00	4/8/1997	FA Loan
FAP-89-0016-L	Warner Utilities Authority	Muskogee	$240,000.00	2/13/1990	FA Loan
ORF-16-0003-DW	Gore Public Works Authority	Sequoyah	$885,000.00	10/12/2016	DWSRF
FAP-01-0005-R	Gore Public Works Authority	Sequoyah	$60,000.00	11/13/2001	REAP
ORF-11-0007-CW	Muldrow Public Works Authority	Sequoyah	$3,705,000.00	9/13/2011	CWSRF
ORF-20-0021-DW	Roland Utility Authority	Sequoyah	$2,359,000.00	1/21/2020	DWSRF
ORF-20-0019-CW	Roland Utility Authority	Sequoyah	$740,000.00	10/15/2019	CWSRF
FAP-12-0001-L	Roland Utility Authority	Sequoyah	$3,360,000.00	2/13/2012	FA Loan
ORF-08-0003-CW	Roland Utility Authority	Sequoyah	$3,855,000.00	6/10/2008	CWSRF
FAP-95-0053-L	Roland Utility Authority	Sequoyah	$4,890,000.00	4/8/1997	FA Loan
FAP-95-0001-G	Roland Utility Authority	Sequoyah	$75,000.00	5/14/1996	Emergency
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-01-0067-R	Sequoyah County Rural Water District #5	Sequoyah	$80,000.00	7/12/2011	REAP
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-86-0050-G	Sequoyah County Rural Water District #5	Sequoyah	$75,000.00	5/8/1990	Emergency
FAP-99-0083-R	Sequoyah County Rural Water District #8	Sequoyah	$138,500.00	2/8/2000	REAP
FAP-03-0003-R	Sequoyah County RWS & SWMD #4	Sequoyah	$99,950.00	3/13/2012	REAP
FAP-83-0024-G	Sequoyah County RWS & SWMD #4	Sequoyah	$86,000.00	1/10/1984	Emergency
FAP-91-0069-G	Sequoyah County RWSG & SWMD #7	Sequoyah	$30,000.00	12/8/1992	Emergency
FAP-02-0064-R	Town of Gans	Sequoyah	$110,000.00	4/16/2006	REAP
FAP-84-0090-G	Town of Gans	Sequoyah	$100,000.00	5/14/1985	Emergency
FAP-83-0008-G	Town of Marble City	Sequoyah	$100,000.00	2/14/1984	Emergency
FAP-84-0043-G	Town of Muldrow	Sequoyah	$77,200.00	4/10/1984	Emergency
FAP-89-0071-G	Utility Service Authority	Sequoyah	$20,097.00	1/9/1990	Emergency
FAP-99-0081-R	Vian	Sequoyah	$59,500.00	11/16/1999	REAP
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
FAP-07-0006-G	Vian Public Works Authority	Sequoyah	$75,000.00	1/8/2008	Emergency
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

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

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

OKLAHOMA CONSERVATION COMMISSION
Program Activities in the Arkansas/Oklahoma Compact Commission Area for the period of October 2020 through September 2021

For over thirty years the Oklahoma Conservation Commission (OCC) has monitored water quality, implemented best management practices, and provided water quality education in the Arkansas/Oklahoma Compact Commission area. Resource protection in the area continues to be a priority which challenges the OCC and partners to bring funding, partnerships and solutions to the area. Some of the OCC ongoing activities are summarized below.

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) To support the CREP program and enroll landowners who weren't CREP eligible, the OCC created long term easements with landowners to exclude their riparian property from production, further lessening the amount of pollution entering the river. Beginning in 2007, OCC began enrolling landowners in ten to fifteen year agreements and ultimately enrolled 51 landowners and 2,182 acres. Some of those agreements have since been closed, either by reaching the agreement end date or through enrollment in additional easement programs. Currently 33 participants have enrolled 1,524.9 acres that are protected at an annual cost of $90,335.40.

c) With EPA funding, OCC contracted a study in the Tyner Creek area 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. OCC originally partnered with the Oklahoma Scenic Rivers Commission (OSRC) in 2007 when OSRC, now part of the Grand River Dam Authority (GRDA), enrolled 414.59 acres in 30 year riparian protection easements. Many of these landowners were ineligible for CREP because they had previously enrolled in 3 to 5 year riparian protection agreements with local conservation districts as part of a 2000-2005 OCC project. For the 2007 program, OSRC utilized EPA 319 funding from OCC plus funding from the poultry industry to fund these $665,916.70 worth of agreements, the majority of which will be in place until 2037. In partnership with the GRDA the OCC has made an additional $3,100,000 available for long-term riparian easement protection along the Illinois River and in the Grand Lake Watershed. These riparian exclusions are funded primarily with U.S. EPA §319 dollars. GRDA also received support from the Oklahoma Office of Secretary of Environment for an additional $584,183 to add to this program. Currently, 1,590.17 acres are enrolled in this program in the Illinois River watershed, with an additional 236.86 acres enrolled in the Grand Lake Watershed. This is an increase from last year's enrollment of 563.91 acres in the Illinois River watershed and 236.86 acres in the Grand Lake Watershed. GRDA is currently enrolling $500,000 worth of agreements in these areas. Between the two programs, Oklahoma currently has 3,351.93 acres enrolled in long-term riparian protection agreements (Figure 1).

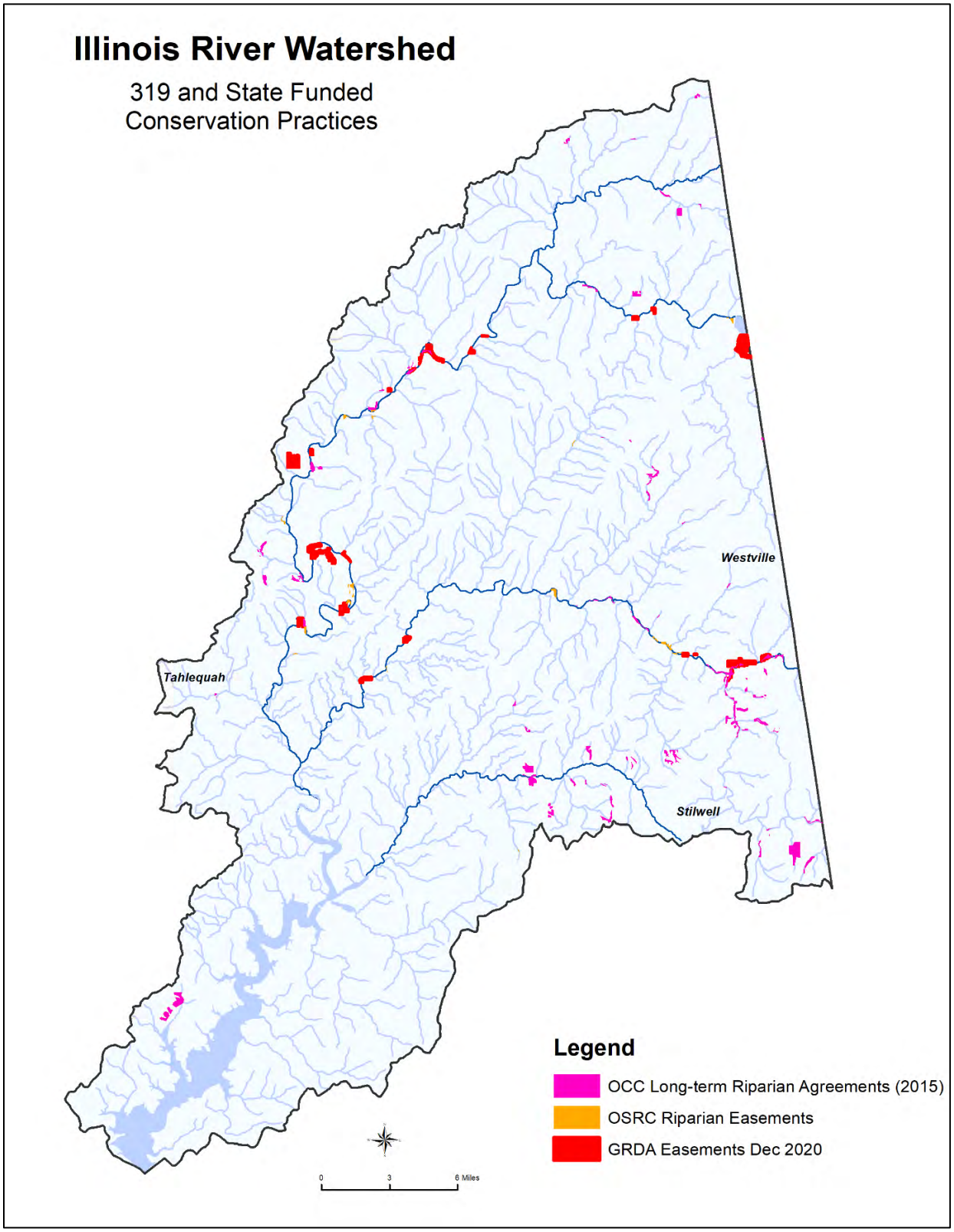
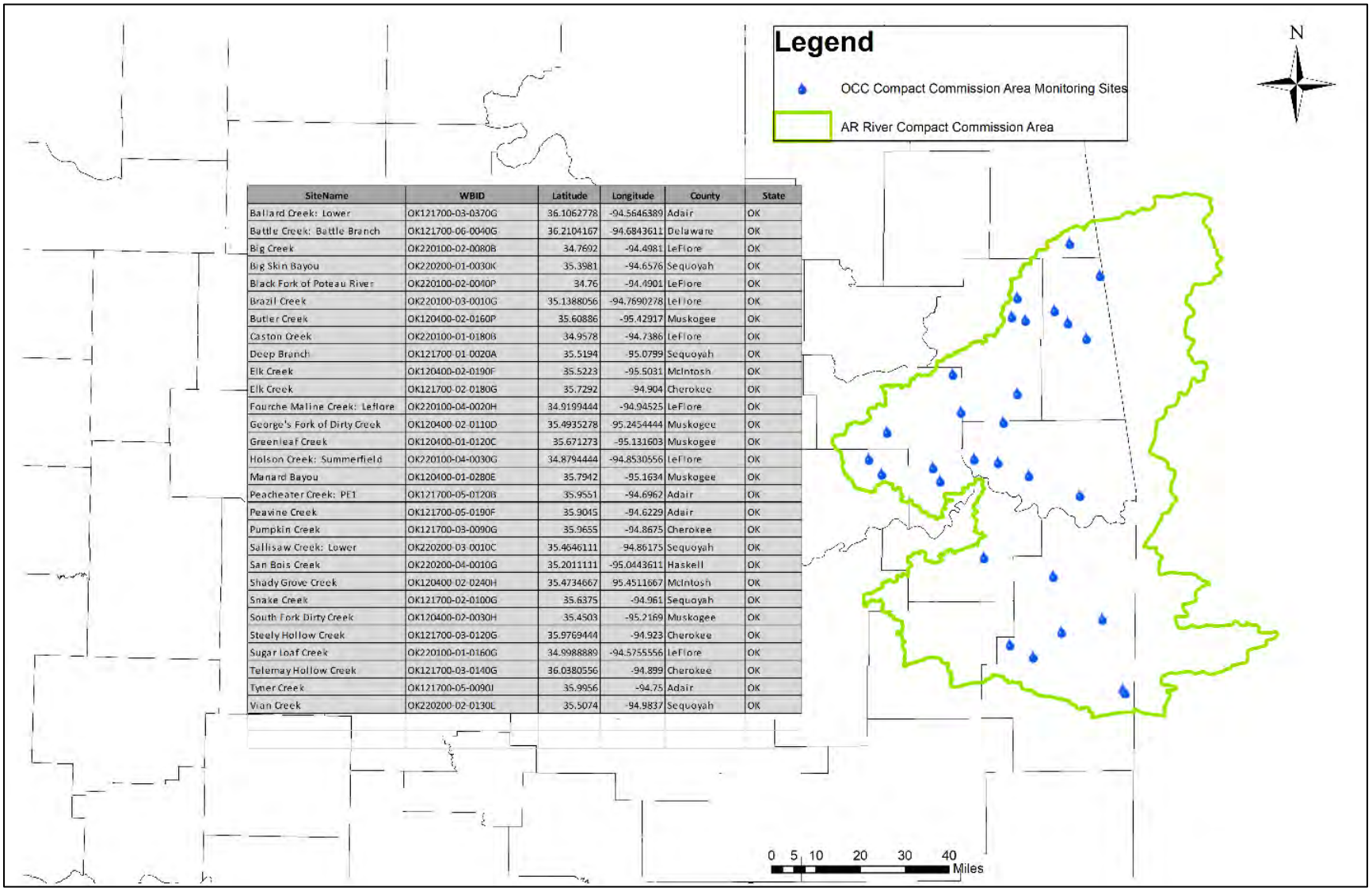


Figure 1. Long-term riparian easements in the Illinois River Watershed.

2) Rotating Basin Monitoring Program

OCC monitors 30 sites in the compact commission area through its Rotating Basin Monitoring Program (RBMP) including eleven sites in the Illinois River watershed, seven sites in the Poteau River Watershed, four sites in the Robert S. Kerr Watershed, and seven in the Dirty/Greenleaf Creeks Watershed (Figure 2). Through the RBMP, fish community assessments were completed in the summer of 2018. Macroinvertebrate collections were made at all sites in the summer of 2018, winter of 2019 and summer of 2019, and the winter of 2020. Water quality monitoring occurred on a five week intervals beginning in May 2018 through March 2020. Monitoring was paused due to the COVID-19 pandemic with the two last episodes completed in August and September 2020. Monitoring has paused for a period and will resume in 2023. These sites were selected to represent Hydrologic Units within the Illinois River watershed to characterize water quality conditions and relate those conditions to manageable land units. Assessment results for this report are currently undergoing the final stages of review at EPA; once completed, they will be posted on the OCC website and can be seen at: https://conservation.ok.gov/wq-statewide-rotating-basin-monitoring-program/ under Group 3. Summaries of these monitoring stations from previous monitoring cycles are included in this report following Figure 2. OCC will continue to evaluate monitoring results and needs in the Illinois River Watershed and adjust monitoring efforts accordingly.



SiteName	WBID	Latitude	Longitude	County	State
Ballard Creek: Lower	OK121700-03-0370G	36.1062778	-94.5646389	Adair	OK
Battle Creek: Battle Branch	OK121700-06-0040G	36.2104167	-94.6843611	Delaware	OK
Big Creek	OK220100-02-0080B	34.7692	-94.4981	LeFlore	OK
Big Skin Bayou	OK220200-01-0030K	35.3981	-94.6576	Sequoyah	OK
Black Fork of Poteau River	OK220100-02-0040P	34.76	-94.4901	LeFlore	OK
Brazil Creek	OK220100-03-0010G	35.1388056	-94.7690278	LeFlore	OK
Butler Creek	OK120400-02-0160P	35.60886	-95.42917	Muskogee	OK
Caston Creek	OK220100-01-0180B	34.9578	-94.7386	LeFlore	OK
Deep Branch	OK121700-01-0020A	35.5194	-95.0799	Sequoyah	OK
Elk Creek	OK120400-02-0190F	35.5223	-95.5031	McIntosh	OK
Elk Creek	OK121700-02-0180G	35.7292	-94.904	Cherokee	OK
Fourche Maline Creek: LeFlore	OK220100-04-0020H	34.9199444	-94.94525	LeFlore	OK
George's Fork of Dirty Creek	OK120400-02-0110D	35.4935278	-95.2454444	Muskogee	OK
Greenleaf Creek	OK120400-01-0120C	35.671273	-95.131603	Muskogee	OK
Holson Creek: Summerfield	OK220100-04-0030G	34.8794444	-94.8530556	LeFlore	OK
Menard Bayou	OK120400-01-0280E	35.7942	-95.1634	Muskogee	OK
Peacheater Creek: PE1	OK121700-05-0120B	35.9551	-94.6962	Adair	OK
Peavine Creek	OK121700-05-0190F	35.9045	-94.6229	Adair	OK
Pumpkin Creek	OK121700-03-0090G	35.9655	-94.8675	Cherokee	OK
Sallisaw Creek: Lower	OK220200-03-0010C	35.4646111	-94.86175	Sequoyah	OK
San Bois Creek	OK220200-04-0010G	35.2011111	-95.0443611	Haskell	OK
Shady Grove Creek	OK120400-02-0240H	35.4734667	95.4511667	McIntosh	OK
Snake Creek	OK121700-02-0100G	35.6375	-94.961	Sequoyah	OK
South Fork Dirty Creek	OK120400-02-0030H	35.4503	-95.2169	Muskogee	OK
Steely Hollow Creek	OK121700-03-0120G	35.9769444	-94.923	Cherokee	OK
Sugar Loaf Creek	OK220100-01-0160G	34.9988889	-94.5755556	LeFlore	OK
Telemay Hollow Creek	OK121700-03-0140G	36.0380556	-94.899	Cherokee	OK
Tyner Creek	OK121700-05-0090I	35.9956	-94.75	Adair	OK
Vian Creek	OK220200-02-0130L	35.5074	-94.9837	Sequoyah	OK

Figure 2. OCC Rotating Basin Monitoring Program Sites in the Compact Commission Area.

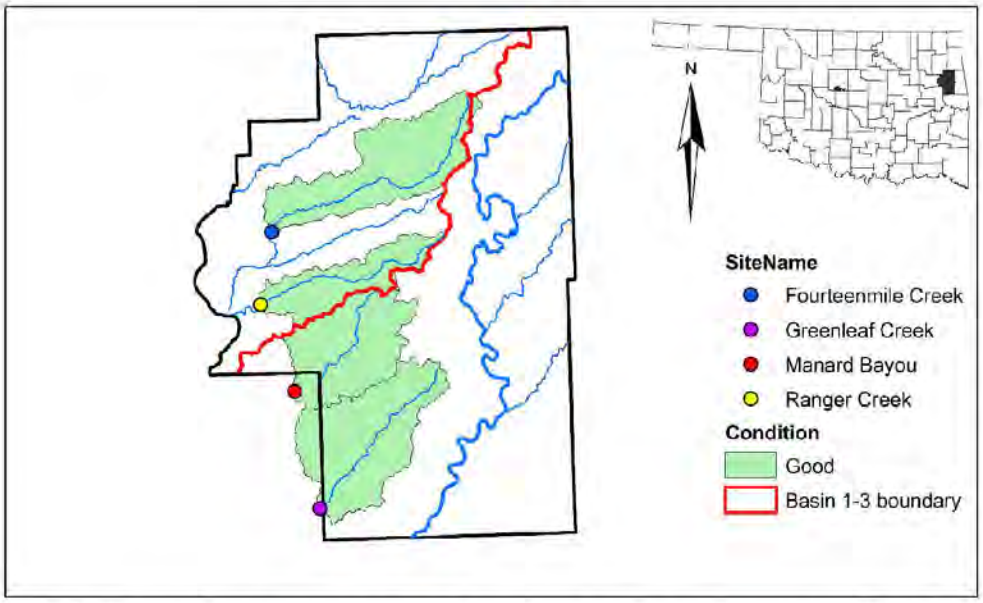
OKLAHOMA CONSERVATION COMMISSION

Know Your Stream: Rotating Basin Site Summary

Cherokee County Conservation District

The Oklahoma Conservation Commission (OCC) has the statutory responsibility to monitor streams across the state and determine the effects of non-point source (NPS) pollution. Unlike point source pollution that is discharged from a specific source, NPS in streams is a result of land-use activities within the watershed. OCC seeks to work voluntarily with landowners to address NPS affected watersheds. The OCC's "Rotating Basin Monitoring Program" not only allows the identification of NPS affected waters, but provides the tools to select best-management practices (BMP) necessary for improvement and for the documentation of water quality improvement following voluntary BMPs.

This leaflet provides an overview of the assessment results for the third cycle of monitoring the streams in the Cherokee County Conservation District. The full report can be accessed online: https://conservation.ok.gov/wp-content/uploads/2021/07/R.B.-Group-3.3-Final-Report.pdfor by calling (405) 534-6997 and requesting a copy of the "Rotating Basin Group 3, Cycle 3 Final Report" or "Rotating Basin Group 1, Cycle 4 Final Report."



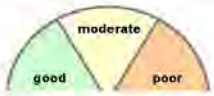
OCC Rotating Basin monitoring sites within Cherokee County Conservation District

Four streams in the Cherokee County Conservation District were sampled approximately every five weeks from June 2013 – May 2015 (south of boundary) or June 2016 – May 2018 (north of boundary). Eighteen water quality parameters were measured at each site visit. Additionally, one fish and habitat assessment, up to four macroinvertebrate (bugs) assessments, and at least 10 *E. coli* bacteria assessments were conducted at each site. Streams within the conservation district were then compared to reference streams in the region that received high scores in each stream metric. Streams were scored by several metrics to create the indices of stream health on the following page.

Summary of stream health (scale of 1-5, 5 being best) as determined by comparison to high quality streams in the same ecoregions (Ozark Highlands or Boston Mountains ecoregion) and Oklahoma State Water Quality Standards.

Site	P	N	NH_3	DO	pH	Turb.	Salt	Fish	Bugs	Habitat	E.coli	Total
Fourteen mile	5	5	5	5	5	3	5	5	3	5	5	**51**
Greenleaf	5	5	5	5	5	5	5	5	3	5	5	**53**
Manard	5	5	5	5	5	5	5	5	3	5	5	**53**
Ranger	5	5	5	5	5	3	5	5	3	5	5	**51**

Key: 1 = Significantly different than high quality sites
3 = Not as good as high quality sites, but not impaired
5 = Equal to or better than high quality sites
-5 = Impaired by state standards



Good: 45+ AND no 303(d) listings; **Moderate**: 30-44 AND ≤2 303(d) listings; **Poor**: <30 OR ≥3 303(d) listings

Fourteenmile and Ranger creeks received good ratings and were similar to the high quality reference sites in the Ozark Highlands for all except turbidity and bug metrics. Although the streams were more turbid and scored lower in bug metrics than high quality reference sites, the difference was not significant.

Greenleaf Creek and Manard Bayou received good ratings and were similar to the high quality reference sites in the Boston Mountains for all except the bug metrics. The streams scored lower in bug metrics than high quality reference sites, but the difference was not significant.

† The use of Oklahoma Water Quality Standards to assess and the 2016 results are described in the DEQ's 2016 integrated report accessible at: http://deq.state.ok.us/WQDnew/305b_303d/index.html

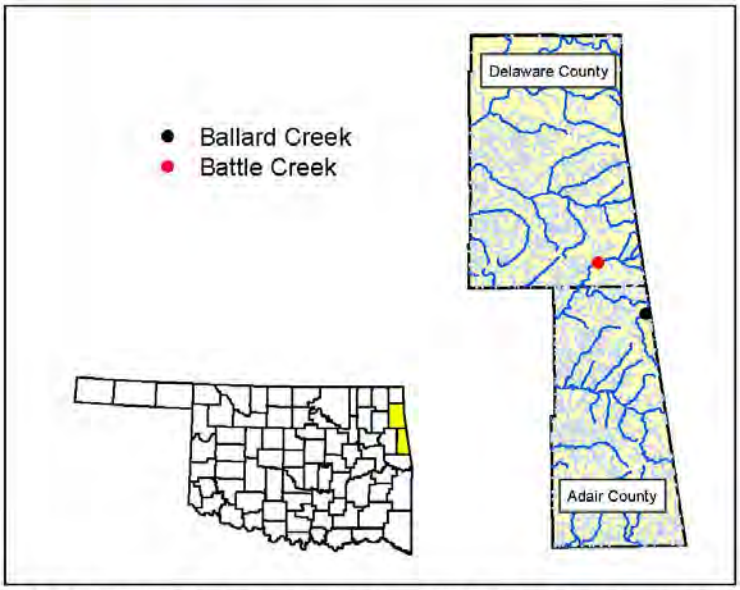
OKLAHOMA CONSERVATION COMMISSION

Know Your Stream: Rotating Basin Site Summary

Adair & Delaware Counties, Ozark Highlands Level 3 Ecoregion

The Oklahoma Conservation Commission (OCC) has the statutory responsibility of monitoring streams across the state in order to identify healthy streams as well as those which may be impacted by non-point source (NPS) pollution. NPS pollution is pollution which runs off the land from diffuse sources rather than being discharged from a specific source. If a stream is found to be impaired by NPS pollution, the OCC may be able to implement a voluntary cost-share program to address the identified problems; however, streams must be monitored in order to select best management practices necessary for improvement. The OCC's "Rotating Basin Monitoring Program" provides the tools to assess and then restore water quality in Oklahoma.

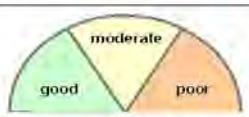
This leaflet gives a brief summary of the assessment results for the third 2-year cycle of the monitoring program for streams in Adair & Delaware Counties. The full report can be accessed online under the Water Quality Division, Reports tab at: http://www.conservation.ok.gov or by calling (405) 522-4500 and requesting a copy of the "Rotating Basin Group 3, Cycle 3 Final Report."



OCC Rotating Basin monitoring sites within Adair & Delaware Counties.

Through the Rotating Basin Program, two streams in Adair & Delaware Counties were sampled approximately every five weeks from June 2013-May 2015. Eighteen water quality parameters were measured or analyzed at each site visit. In addition, OCC staff conducted one fish and habitat assessment and up to four macroinvertebrate collections. Summer samples were also analyzed for *E. coli* bacteria. Each site was compared to "high quality" streams in the ecoregion, streams known to have high quality fish populations, benthic macroinvertebrate populations, instream and riparian habitat, and water quality. All of the data collected has been distilled into a few key components in order to produce an index score of general, overall stream health, shown on the next page.

Summary of general stream health as determined by comparison to high quality streams in the Ozark Highlands ecoregion and by assessment using Oklahoma State Water Quality Standards†.

	*Good*	*Moderate*
	Battle Creek	**Ballard Creek**
Overall Stream Health	**55**	**41**
Phosphorus	5	5
Nitrogen	5	5
Ammonia	5	5
Dissolved Oxygen	5	-5
pH	5	5
Turbidity	5	3
Salts (chloride, sulfate, TDS)	5	5
Fish	5	5
Macroinvertebrates	5	3
Instream/Riparian Habitat	5	5
Bacteria	5	5
	Scale of 1-5 (5 being the best)	

KEY: 1 = Significantly different than high quality sites;
3 = Not as good as high quality sites, but not impaired
5 = Equal to or better than high quality sites
-5 = Impaired by state standards

Battle Creek (OK121700-06-0040G): This stream is comparable to high quality streams within the ecoregion. This is an outstanding stream.

Ballard Creek (OK121700-03-0370G): This stream is listed as impaired by state standards for dissolved oxygen. All other values were comparable to high quality streams within the ecoregion except for slightly elevated turbidity and slightly lower quality macroinvertebrate community.

† The use of Oklahoma Water Quality Standards to assess streams and the 2016 results are described in the DEQ's 2016 Integrated Report, accessible online at: http://www.deq.state.ok.us/wqdnew/305b_303d/index.html

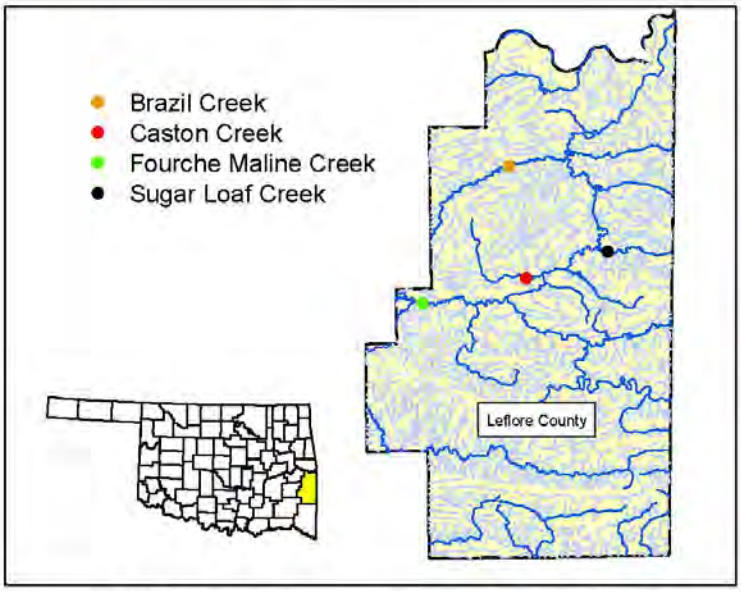
OKLAHOMA CONSERVATION COMMISSION

Know Your Stream: Rotating Basin Site Summary

Leflore County, Arkansas Valley Level 3 Ecoregion

The Oklahoma Conservation Commission (OCC) has the statutory responsibility of monitoring streams across the state in order to identify healthy streams as well as those which may be impacted by non-point source (NPS) pollution. NPS pollution is pollution which runs off the land from diffuse sources rather than being discharged from a specific source. If a stream is found to be impaired by NPS pollution, the OCC may be able to implement a voluntary cost-share program to address the identified problems; however, streams must be monitored in order to select best management practices necessary for improvement. The OCC's "Rotating Basin Monitoring Program" provides the tools to assess and then restore water quality in Oklahoma.

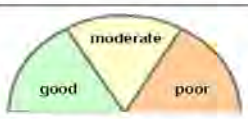
This leaflet gives a brief summary of the assessment results for the third 2-year cycle of the monitoring program for streams in Leflore County. The full report can be accessed online under the Water Quality Division, Reports tab at: http://www.conservation.ok.gov or by calling (405) 522-4500 and requesting a copy of the "Rotating Basin Group 3, Cycle 3 Final Report."



OCC Rotating Basin monitoring sites within Leflore County.

Through the Rotating Basin Program, four streams in Leflore County were sampled approximately every five weeks from June 2013-May 2015. Eighteen water quality parameters were measured or analyzed at each site visit. In addition, OCC staff conducted one fish and habitat assessment and up to four macroinvertebrate collections. Summer samples were also analyzed for *E. coli* bacteria. Each site was compared to "high quality" streams in the ecoregion, streams known to have high quality fish populations, benthic macroinvertebrate populations, instream and riparian habitat, and water quality. All of the data collected has been distilled into a few key components in order to produce an index score of general, overall stream health, shown on the next page.

Summary of general stream health as determined by comparison to high quality streams in the Arkansas Valley ecoregion and by assessment using Oklahoma State Water Quality Standards†.

	*Good*		*Moderate*	
	Fourche Maline Creek	**Brazil Creek**	**Caston Creek**	**Sugarloaf Creek**
Overall Stream Health	**53**	**51**	**43**	**31**
Phosphorus	5	5	5	5
Nitrogen	5	3	3	5
Ammonia	5	5	5	5
Dissolved Oxygen	5	5	5	-5
pH	5	5	5	-5
Turbidity	5	5	5	5
Salts (chloride, sulfate, TDS)	5	5	-5	5
Fish	5	5	5	5
Macroinvertebrates	3	3	5	1
Instream/Riparian Habitat	5	5	5	5
Bacteria	5	5	5	5
	Scale of 1-5 (5 being the best)			

KEY: 1 = Significantly different than high quality sites;
3 = Not as good as high quality sites, but not impaired
5 = Equal to or better than high quality sites
-5 = Impaired by state standards

Fourche Maline Creek (OK220100-04-0020H): This stream is comparable to high quality streams within the ecoregion for all parameters except a slightly lower quality macroinvertebrate community.

Brazil Creek (OK220100-03-0010G): This stream is comparable to high quality streams for all parameters within the ecoregion except for slightly elevated nitrogen levels and slightly lower quality macroinvertebrate community.

Caston Creek (OK220100-01-0180B): This stream is listed as impaired by state standards for salts (sulfates specifically). All other parameters were comparable to high quality streams within the ecoregion except for slightly elevated nitrogen levels.

Sugarloaf Creek (OK220100-01-0160G): This stream is listed as impaired by state standards for dissolved oxygen and pH. All other parameters were comparable to high quality streams within the ecoregion except for significantly lower quality macroinvertebrate community.

† The use of Oklahoma Water Quality Standards to assess streams and the 2016 results are described in the DEQ's 2016 Integrated Report, accessible online at: http://www.deq.state.ok.us/wqdnew/305b_303d/index.html

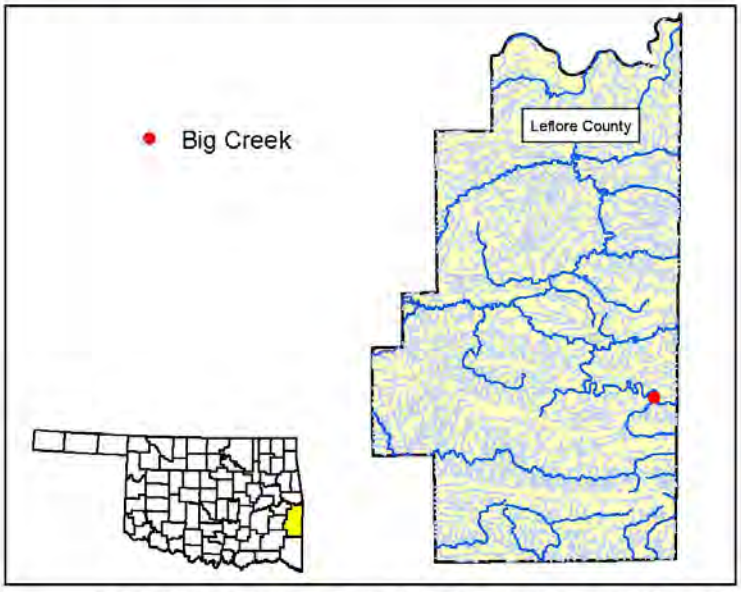
OKLAHOMA CONSERVATION COMMISSION

Know Your Stream: Rotating Basin Site Summary

Leflore County, Ouachita Mountains Level 3 Ecoregion

The Oklahoma Conservation Commission (OCC) has the statutory responsibility of monitoring streams across the state in order to identify healthy streams as well as those which may be impacted by non-point source (NPS) pollution. NPS pollution is pollution which runs off the land from diffuse sources rather than being discharged from a specific source. If a stream is found to be impaired by NPS pollution, the OCC may be able to implement a voluntary cost-share program to address the identified problems; however, streams must be monitored in order to select best management practices necessary for improvement. The OCC's "Rotating Basin Monitoring Program" provides the tools to assess and then restore water quality in Oklahoma.

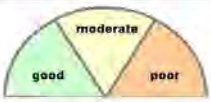
This leaflet gives a brief summary of the assessment results for the third 2-year cycle of the monitoring program for streams in Leflore County. The full report can be accessed online under the Water Quality Division, Reports tab at: http://www.conservation.ok.gov or by calling (405) 522-4500 and requesting a copy of the "Rotating Basin Group 3, Cycle 3 Final Report."



OCC Rotating Basin monitoring sites within Leflore County.

Through the Rotating Basin Program, one stream in Leflore County was sampled approximately every five weeks from June 2013-May 2015. Eighteen water quality parameters were measured or analyzed at each site visit. In addition, OCC staff conducted one fish and habitat assessment and up to four macroinvertebrate collections. Summer samples were also analyzed for *E. coli* bacteria. Each site was compared to "high quality" streams in the ecoregion, streams known to have high quality fish populations, benthic macroinvertebrate populations, instream and riparian habitat, and water quality. All of the data collected has been distilled into a few key components in order to produce an index score of general, overall stream health, shown on the next page.

Summary of general stream health as determined by comparison to high quality streams in the Ouachita Mountains ecoregion and by assessment using Oklahoma State Water Quality Standards†.

	*Moderate*
	Big Creek
Overall Stream Health	**45**
Phosphorus	5
Nitrogen	5
Ammonia	5
Dissolved Oxygen	5
pH	-5
Turbidity	5
Salts (chloride, sulfate, TDS)	5
Fish	5
Macroinvertebrates	5
Instream/Riparian Habitat	5
Bacteria	5
	Scale of 1-5 with 5 being the best
KEY: 1=significantly worse than high quality sites 3=not as good as high quality sites but not impaired 5=equal to or better than high quality sites -5=impaired by state standards	

Big Creek (OK220100-02-0080B): This stream is listed as impaired by state standards for pH. All other parameters were comparable to high quality streams within the ecoregion.

† The use of Oklahoma Water Quality Standards to assess streams and the 2016 results are described in the DEQ's 2016 Integrated Report, accessible online at: http://www.deq.state.ok.us/wqdnew/305b_303d/index.html

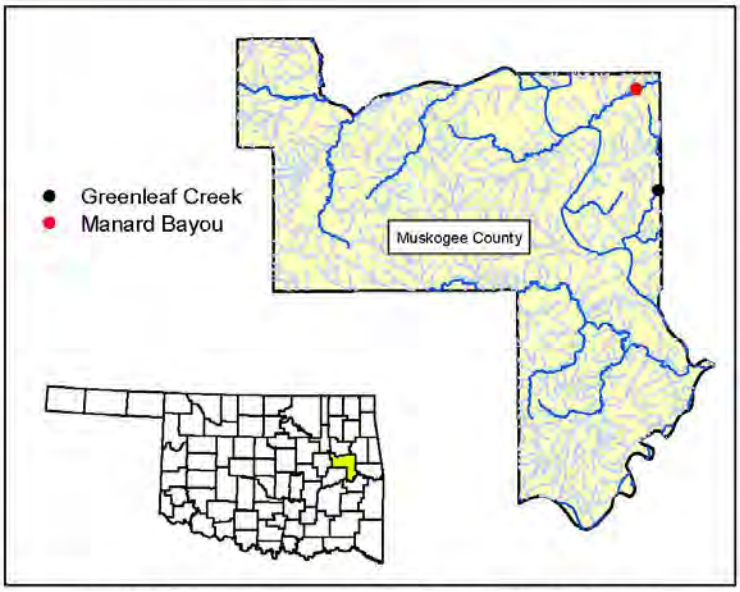
OKLAHOMA CONSERVATION COMMISSION

Know Your Stream: Rotating Basin Site Summary

Muskogee County, Boston Mountains Level 3 Ecoregion

The Oklahoma Conservation Commission (OCC) has the statutory responsibility of monitoring streams across the state in order to identify healthy streams as well as those which may be impacted by non-point source (NPS) pollution. NPS pollution is pollution which runs off the land from diffuse sources rather than being discharged from a specific source. If a stream is found to be impaired by NPS pollution, the OCC may be able to implement a voluntary cost-share program to address the identified problems; however, streams must be monitored in order to select best management practices necessary for improvement. The OCC's "Rotating Basin Monitoring Program" provides the tools to assess and then restore water quality in Oklahoma.

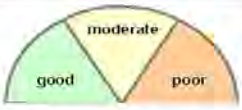
This leaflet gives a brief summary of the assessment results for the third 2-year cycle of the monitoring program for streams in Muskogee County. The full report can be accessed online under the Water Quality Division, Reports tab at: http://www.conservation.ok.gov or by calling (405) 522-4500 and requesting a copy of the "Rotating Basin Group 3, Cycle 3 Final Report."



OCC Rotating Basin monitoring sites within Muskogee County.

Through the Rotating Basin Program, two streams in Muskogee County were sampled approximately every five weeks from June 2013-May 2015. Eighteen water quality parameters were measured or analyzed at each site visit. In addition, OCC staff conducted one fish and habitat assessment and up to four macroinvertebrate collections. Summer samples were also analyzed for *E. coli* bacteria. Each site was compared to "high quality" streams in the ecoregion, streams known to have high quality fish populations, benthic macroinvertebrate populations, instream and riparian habitat, and water quality. All of the data collected has been distilled into a few key components in order to produce an index score of general, overall stream health, shown on the next page.

Summary of general stream health as determined by comparison to high quality streams in the Boston Mountains ecoregion and by assessment using Oklahoma State Water Quality Standards†.

	*Good*	
	Greenleaf Creek	**Manard Bayou Creek**
Overall Stream Health	**53**	**53**
Phosphorus	5	5
Nitrogen	5	5
Ammonia	5	5
Dissolved Oxygen	5	5
pH	5	5
Turbidity	5	5
Salts (chloride, sulfate, TDS)	5	5
Fish	5	5
Macroinvertebrates	3	3
Instream/Riparian Habitat	5	5
Bacteria	5	5
	Scale of 1-5 (5 being the best)	

KEY: 1 = Significantly different than high quality sites;
3 = Not as good as high quality sites, but not impaired
5 = Equal to or better than high quality sites
-5 = Impaired by state standards

Greenleaf Creek (OK120400-01-0120C): This stream is comparable to high quality streams within the ecoregion for all parameters except for slightly lower quality macroinvertebrate community.

Manard Bayou Creek (OK120400-01-0280E): This stream is comparable to high quality streams within the ecoregion for all parameters except for slightly lower quality macroinvertebrate community.

† The use of Oklahoma Water Quality Standards to assess streams and the 2016 results are described in the DEQ's 2016 Integrated Report, accessible online at: http://www.deq.state.ok.us/wqdnew/305b_303d/index.html

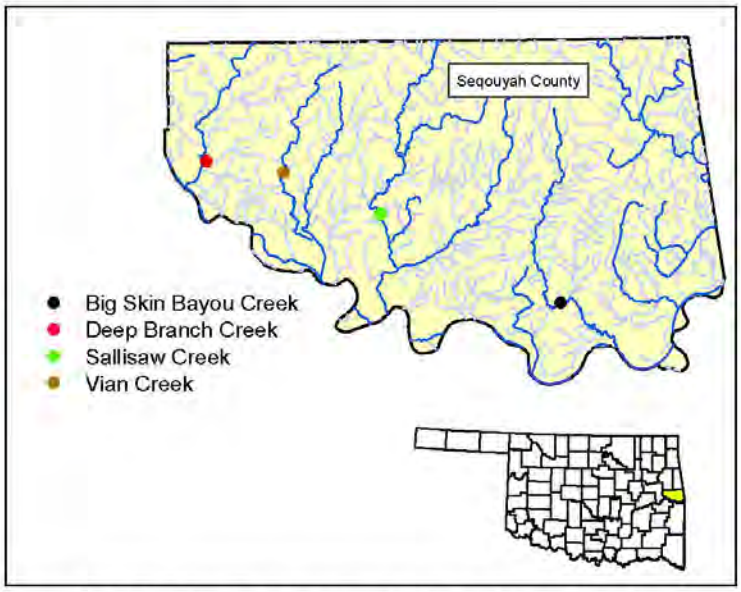
OKLAHOMA CONSERVATION COMMISSION

Know Your Stream: Rotating Basin Site Summary

Sequoyah County, Boston Mountains Level 3 Ecoregion

The Oklahoma Conservation Commission (OCC) has the statutory responsibility of monitoring streams across the state in order to identify healthy streams as well as those which may be impacted by non-point source (NPS) pollution. NPS pollution is pollution which runs off the land from diffuse sources rather than being discharged from a specific source. If a stream is found to be impaired by NPS pollution, the OCC may be able to implement a voluntary cost-share program to address the identified problems; however, streams must be monitored in order to select best management practices necessary for improvement. The OCC's "Rotating Basin Monitoring Program" provides the tools to assess and then restore water quality in Oklahoma.

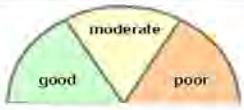
This leaflet gives a brief summary of the assessment results for the third 2-year cycle of the monitoring program for streams in Sequoyah County. The full report can be accessed online under the Water Quality Division, Reports tab at: http://www.conservation.ok.gov or by calling (405) 522-4500 and requesting a copy of the "Rotating Basin Group 3, Cycle 3 Final Report."



OCC Rotating Basin monitoring sites within Sequoyah County.

Through the Rotating Basin Program, four streams in Sequoyah County were sampled approximately every five weeks from June 2013-May 2015. Eighteen water quality parameters were measured or analyzed at each site visit. In addition, OCC staff conducted one fish and habitat assessment and up to four macroinvertebrate collections. Summer samples were also analyzed for *E. coli* bacteria. Each site was compared to "high quality" streams in the ecoregion, streams known to have high quality fish populations, benthic macroinvertebrate populations, instream and riparian habitat, and water quality. All of the data collected has been distilled into a few key components in order to produce an index score of general, overall stream health, shown on the next page.

Summary of general stream health as determined by comparison to high quality streams in the Boston Mountains ecoregion and by assessment using Oklahoma State Water Quality Standards†.

	*Moderate*			
	Big Skin Bayou Creek	**Vian Creek**	**Deep Branch Creek**	**Sallisaw Creek**
Overall Stream Health	**41**	**33**	**33**	**33**
Phosphorus	5	5	5	5
Nitrogen	5	5	5	5
Ammonia	5	5	5	5
Dissolved Oxygen	5	-5	-5	-5
pH	-5	-5	-5	5
Turbidity	1	5	5	5
Salts (chloride, sulfate, TDS)	5	5	5	5
Fish	5	5	3	5
Macroinvertebrates	5	3	5	3
Instream/Riparian Habitat	5	5	5	5
Bacteria	5	5	5	5
	Scale of 1-5 (5 being the best)			

KEY: 1 = Significantly different than high quality sites;
3 = Not as good as high quality sites, but not impaired
5 = Equal to or better than high quality sites
-5 = Impaired by state standards

Big Skin Bayou Creek (OK220200-01-0030H): This stream is listed as impaired by state standards for pH. All other values were comparable to high quality streams within the ecoregion except for significantly elevated turbidity levels.

Vian Creek (OK220200-02-0130E): This stream is listed as impaired by state standards for dissolved oxygen and pH. All other values were comparable to high quality streams within the ecoregion except for slightly lower quality macroinvertebrate community.

Deep Branch Creek (OK121700-01-0020A): This stream is listed as impaired by state standards for pH and turbidity. All other values were comparable to high quality streams within the ecoregion except for slightly lower quality fish community.

Sallisaw Creek (OK220200-03-0010C): This stream is listed as impaired by state standards for dissolved oxygen. All other values were comparable to high quality streams within the ecoregion except for slightly lower quality macroinvertebrate community.

† The use of Oklahoma Water Quality Standards to assess streams and the 2016 results are described in the DEQ's 2016 Integrated Report, accessible online at: http://www.deq.state.ok.us/wqdnew/305b_303d/index.html

3) Blue Thumb Monitoring and Education

The OCC's Blue Thumb (BT) program supports citizen scientists who monitor multiple stream sites in the compact commission area including two stream sites in the Illinois River watershed, five sites in the Poteau River Watershed, and one site in the Dirty/Greenleaf Creeks Watershed. Volunteers collect observational and chemical data approximately monthly. Macroinvertebrate collections are completed twice a year. Habitat assessments and fish collections are completed once every four to five years. The biological data (macroinvertebrates and fish) are submitted to the State of Oklahoma Integrated Report. The chemical data are used for education and screening purposes. Summaries of data reports written by volunteers about sites in the compact commission area can be found by clicking on monitoring sites on the interactive map at https://www.bluethumbok.com/volunteer-written-data-interpretations.html.

For several years, Blue Thumb has partnered with the Grand River Dam Authority (GRDA) to offer Riverology 101, a workshop for teachers focusing on the Illinois River and Grand Lake watersheds, and Journey to the Bottom of the Creek, a day camp for children in the Tahlequah area. Although we planned to support both events in 2020, both were cancelled out of concern for COVID-19. Camps resumed in 2021 with a Riverology program for 14 teachers in July and a Journey to the Bottom of the Creek camp in Tahlequah for 14 kids.

Early in 2020, Blue Thumb began a partnership with the Illinois River Watershed Partnership (IRWP) to support monitoring and facilitate educational events in the Oklahoma portion of the Illinois River watershed. The sampling locations include 12 sites on tributaries to the Illinois River that were selected by the IRWP to be analogous to monitoring stations previously sampled on the Arkansas side of the state line. At each site, BT and IRWP staff completed a macroinvertebrate collection with onsite identification to order, water quality sampling and a rapid habitat assessment. Although early 2020 sampling required Blue Thumb to analyze water quality samples due to the response to COVID-19, by the November 2020 sampling runs, GRDA was able to complete analysis of water quality samples. Sites are monitored three times a year in alternate years.

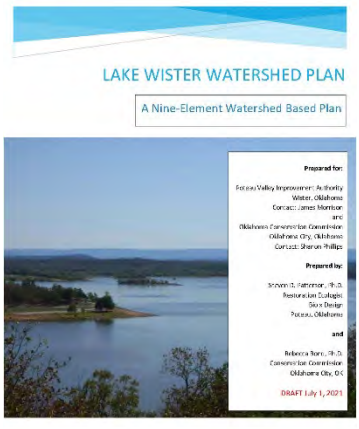
This partnership continued with sampling in November 2020 and in April and August of 2021. Volunteers were able to join the effort on a limited basis in November of 2020 and continued to assist with this effort in 2021.



IRWP Director, Nicole Hardiman, and a Blue Thumb volunteer sort a macroinvertebrate sample (April 2021)



Rebecca and two Blue Thumb volunteers collect macroinvertebrate samples (April 2021)



Blue Thumb has also been assisting the Poteau Valley Improvement Authority (PVIA) with the development of a watershed based plan (WBP) for Lake Wister. This WBP uses information gathered from a

Lake Wister modeling effort to support an update to the Lake Wister TMDL, as well as watershed-wide HUC 12 basin monitoring completed by the University of Arkansas in cooperation with Arkansas Department of Agriculture, Division of Natural Resources, PVIA, and OCC to plan and prioritize a strategy to address water quality impairments in the watershed. PVIA, OCC, and the Oklahoma Department of Environmental Quality plan to hold a public meeting in the late summer/early fall of 2021 to introduce the watershed plan and updated TMDL and accept public input.

Finally, in partnership with the Oklahoma Association of Conservation Districts and Friends of Blue Thumb, and the OCC Soil Health Program, Blue Thumb is supporting conservation districts in supporting sustainable landscaping in suburban and urban areas. The Yard by Yard Program, has expanded in 2021 from just Oklahoma and Tulsa counties to include Delaware and Muskogee Counties, with hopes to expand beyond that later in 2021 and 2022. More information about Yard by Yard can be found at: https://www.okconservation.org/yardbyyard and https://youtu.be/kuGgIS03GoI.

4) Oklahoma/Arkansas Memorandum of Agreement

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

An important component of this agreement is to cooperate with Arkansas and the Cherokee Nation to develop a watershed implementation plan (WIP) for the watershed. One component of this WIP is for the states to update their NPS WBPs for the watershed. To support this update, Oklahoma has contracted with Texas A&M University, developers of the Soil and Water Assessment Tool (SWAT) model, to develop a SWAT model for the watershed. This SWAT model will be housed in the Hydrologic and Water Quality System (HAWQs) online water quality system to support updates, transparency, data sharing, and use of the ultimate tool. Texas A&M will complete a hydrologically and chemically calibrated SWAT model for the Illinois River which utilizes the same sub-basin and calibration points utilized in the EPA Hydrological Simulation Program- Fortran (HSPF) model. The WIP subcommittee have agreed to a timeline to follow up model development in Arkansas and Oklahoma with public meetings in spring of 2022 to finalize updates to the WBPs.

5. Hydrologic and Water Quality Systems (HAWQS) Modeling for Oklahoma

HAWQS is a web-based, interactive water quantity and quality model that was originally developed for EPA by Texas A&M. HAWQS is currently available nationwide,

calibrated to the HUC 8 watershed level (https://www.epa.gov/waterdata/hawqs-hydrologic-and-water-quality-system and https://hawqs.tamu.edu/#/). However, since many efforts in watershed and project planning are done at the smaller HUC 12 watershed scale, Texas A&M has been working with partnering states to further develop HAWQS to that finer topographic scale. Therefore, also in partnership with OSU and Texas A&M, the OCC is developing a statewide HAWQS model for Oklahoma, calibrated hydrologically and chemically to the HUC12 level, statewide. Therefore, in addition to the Illinois River Watershed SWAT model, baseline SWAT models will be available for all HUC 12 watersheds in the compact commission area. Anticipated completion for this product is December 2022.

In the compact commission area and in addition to the baseline SWAT model for the Illinois River described earlier which will tie into the EPA model, this effort will also produce a baseline SWAT model for the Wister watershed that will tie into a lake model developed for the Poteau Valley Improvement Authority. These efforts will assist with further developments of the Wister Lake Watershed Based Plan.

The OK HAWQS system will be updated to include simplified simulations of conservation practice installation scenarios. This automation should help insure that the use of SWAT to predict load reductions resulting from theoretical conservation practice installations will be standardized.

The added benefit of the HAWQs system is that the model is stored in the cloud and freely accessible online. Updated climate, soils, land use, and even water quality data is automatically linked to the baseline models developed through the system. These data updates, sharing and online storage will make it much simpler to update and re-use historically developed watershed models to evaluate changes over time in watersheds and will support additional watershed plan development statewide.

6) Neighborhood Solutions to Natural Resource Concerns Regional Conservation Partnership Program (RCPP): Neighbors Helping Neighbors Project

The OCC, GRDA, Cherokee Nation, and poultry integrators are partnering with the Natural Resources Conservation Service (NRCS) to help address some challenges created by the recent evolutions of the poultry industry in eastern Oklahoma. OCC and GRDA received an RCPP grant from NRCS to work with poultry growers and their neighbors to design and install conservation practice systems and other solutions to noise, dust, odor, and water quality concerns voiced by neighbors of poultry producers. This program is active along the entire eastern border of Oklahoma (Figure 3) and includes the majority of the compact commission area in Oklahoma. This program is supported by at least $2,010,000 in funding from the NRCS, OCC (state and EPA CWA §319 funding), GRDA, the Cherokee Nation, and poultry integrators (Simmons, Tysons, and Okay Foods). The intent of the program is to convene small working groups of growers and their neighbors to identify, clarify, and prioritize challenges of living next door to a large animal production operation. Experts from NRCS, OCC, GRDA, Cooperative Extension, the Oklahoma Water Resources Board,

Oklahoma Department of Agriculture, Food and Forestry, county commissioners, and other available specialties and programs will then consider the challenges and recommend potential solutions to be funded using a combination of available state and federal resources. Initial meetings at least one such neighborhood group for the upper, middle, and lower project areas are planned for fall of 2021.

7) <u>Poultry Litter Transfer Program</u>

The OCC will also renew a poultry litter transfer program in fall of 2021 to support litter transfer from poultry producing watersheds along the eastern Oklahoma border into non-nutrient limited watersheds further west in Oklahoma. This program will focus at least $300,000 in state funding to reduce water quality impacts in high priority watersheds in eastern Oklahoma including portions of the compact commission area.

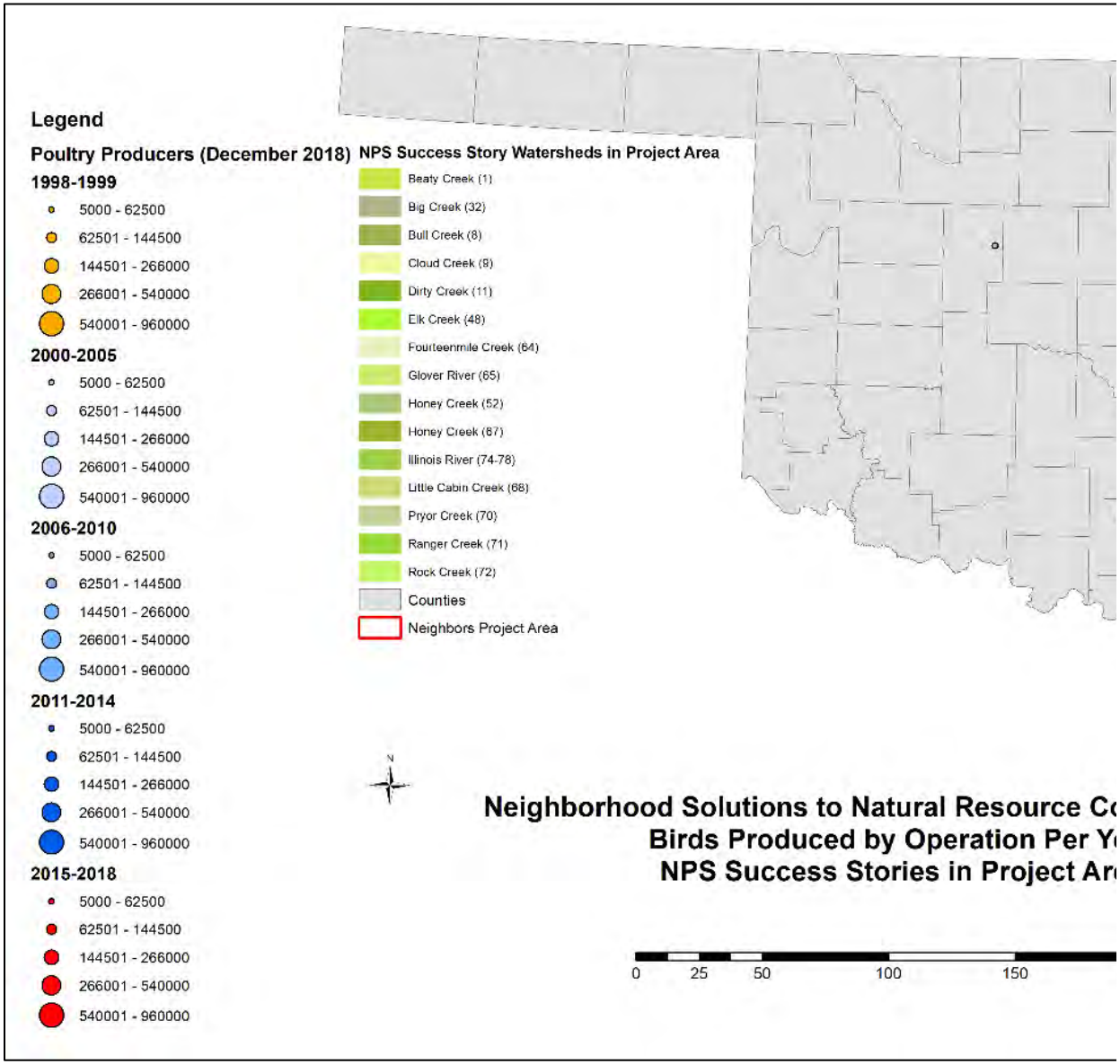


Figure 2. Neighbors Helping Neighbors Project Area.

8) Unpaved Roads in the New Spiro Watershed

OCC has been supporting the town of Spiro since at least 2015 with water quality monitoring of the New Spiro Lake and watershed. The intent of this monitoring is to support long-term efforts to improve and protect water quality in the lake. In addition to developing a WBP for the watershed, the OCC plans to complete a prioritization assessment of unpaved roads in the watershed along with a demonstration project to address a significant long-term erosive site on the lakeside road. This work is planned for the coming year.

9) Soil Health Education Program

The OCC partners with NRCS, the Nature Conservancy, the Oklahoma Association of Conservation Districts, the Noble Research Institute, tribes, state and federal agencies, universities, and others to encourage landowners to adopt management strategies to improve soil health. These include programs, such as field days and seminars on grazing management, plant ID, cover crops, and water infiltration, soil health monitoring and assessments associated with various management strategies using a mobile application (WORMS), conservation planning and mentoring to support landowners adopting soil health practices, and conservation practice installation to support soil health.

Covid-related limitations greatly affected the program's ability to hold in person trainings; however, they did complete some individual landowner consultations in the New Spiro and Illinois River watersheds to include conservation planning and soil health assessments. Activities planned for later in 2021 and 2022 include regenerative grazing workshop(s) in the Poteau River Watershed and increased soil health assessments in the compact commission area.

10) Locally-Led Cost-Share Program

Since 1998, the OCC has supported conservation districts and local landowners efforts to restore, conserve and protect natural resources through the Locally-Led Cost-Share Program (LLCP). The program provides an annual allocation to the nine conservation districts in the compact commission area to support conservation practice installation. Eligible producers are enrolled in the program based on priorities and conservation practice focuses established by the local conservation district. Conservation planning is generally designed and completed by the NRCS, and once practices have been complete and certified as complying with NRCS or other appropriate standards, the conservation district reimburses the cooperator for a portion of the cost of installation (generally between 50 – 75% of actual costs). Conservation Districts, the OCC, and landowners have installed at least $3,190,459 worth of conservation practices since 1998. Of which, $1,528,327 was funded by county conservation districts and the OCC and $1,662,132 was funded by landowners. These conservation practices include brush management, cover crops, fencing, grade

stabilization structures, grassed waterways, heavy use protection, herbaceous weed control, nutrient management, channel obstruction removal, pasture and hayland planting, pest management, livestock watering pipeline, ponds and pond cleanouts, livestock watering facilities and livestock wells.

Because the LLCP has not been previously summarized for the compact commission, OCC summarized the most recently completed program years, representing a window slightly extended beyond the intended compact commission report program year. In 2019 and 2020, landowners installed $354,301 worth of conservation practices funded with $203,811 of OCC/district funds and $150,492 landowner funds. These installations included 1,372 acres of brush management, 15,517 linear feet of fencing, 3,137 square feet of heavy use area, 2,061.7 acres of herbaceous weed control, 1,012.6 acres of nutrient management, 165.7 acres of pasture and hayland planting, 2,925 linear feet of livestock pipeline, 32 ponds, and three livestock watering facilities (Figure 4).



Figure 3. Examples of conservation practices installed in the compact commission area in 2019-2020 include cross fencing (upper left), pond (upper right), livestock watering and heavy use area (lower left), and brush control (lower right).

11) Upstream Flood Control Structure Program

The OCC partners with conservation districts, NRCS, and others to maintain 2,107 upstream flood control dams constructed across Oklahoma through the USDA NRCS Watershed and Flood Prevention Operations Program. This program saves an estimated $96 million in damages associated with flooding by protecting 2,756 county and highway bridges, flood reduction for 41,744 farms and ranches, trapping 19 million tons of sediment, and creating or enhancing 90,979 acres of wetlands each year. Forty-two of these structures were constructed as multipurpose structures, which provide municipal and rural waters supplies and recreation areas.

Fifty-five of these structures are in the compact commission area, including seven high hazard, five significant hazard, and 43 low hazard structures constructed along Sallisaw, Fourche Maline, Caston, and Scraper Hollow creeks (Figure 5). OCC provided assistance to the Adair, Sequoyah, Latimer, and LeFlore county conservation districts throughout 2020 and 2021 with administrative, technical and land rights issues for both rehabilitation and operation and maintenance. Six structures in the compact commission area (Sallisaw 33 and Sequoyah 36, Fourche Maline 7, Caston Mountain 1 and 2, and Scraper Hollow 2 are currently in the planning phases for rehabilitation projects. In addition to routine operation and maintenance, the Latimer County

conservation district was awarded $11,780 to support aerial spraying to protect the dams at multiple sites in their area.

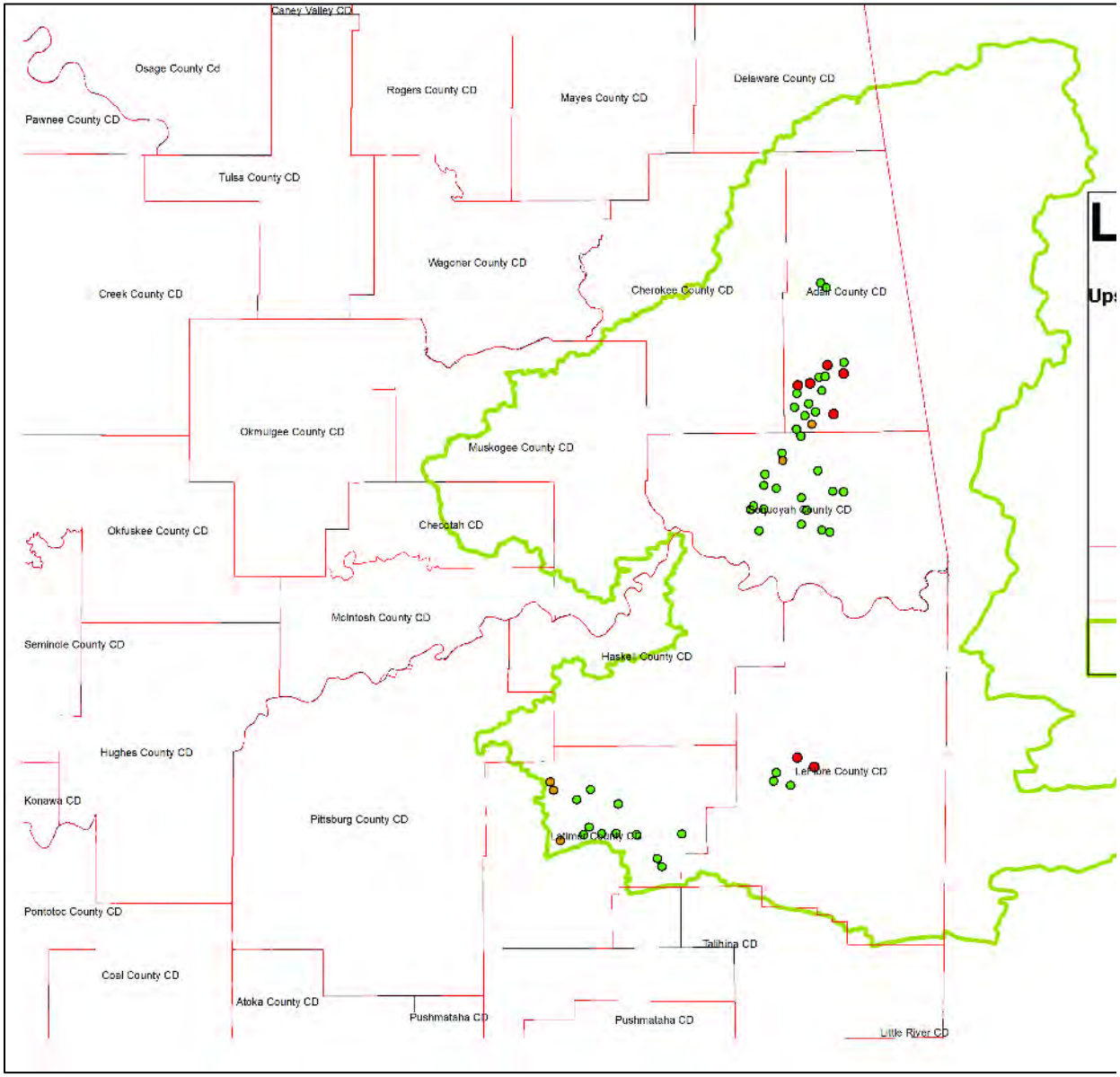


Figure 4. OCC/Conservation District Maintained Upstream Flood Control Structures in Compact Commission Area.

12) OCC Abandoned Mine Land Program

The OCC Abandoned Mine Land (AML) Program reclaims abandoned mine land to preserve public health and safety. Projects are selected for restoration based on the potential dangers that they pose. The AML Program also responds to emergencies that occur when historically coal-mined areas exhibit some immediate threat to public safety, generally related to subsidence or sink hole formation that occurs when structures in historical mines fail or give way. Overall, the program has reclaimed 186 historical coal mining sites including 5,497.2 acres of land, 319,808 of dangerous high wall removal, 257 hazardous waterbodies reclaimed, 223 subsidence sites removed, 22 structures removed, 397 mine openings closed, and 16 miles of clean streams reclaimed.

At least 51,660 acres of these AML areas are included with the compact commission area (Figure 6). In 2020-2021, the AML program administered, completed, and or managed long-term vegetative management for restoration projects on five sites in the compact commission area. This included work on sites in Haskell, Muskogee, and LeFlore counties. Two project restorations were completed at a cost of $463,879.32, restoring 51 acres of land by removing 1,433 feet of dangerous high wall, two hazardous waterbodies, and 42.7 acres of spoil. These sites were also revegetated to restore habitat and protect against erosion. In addition, the AML program completed survey work to prepare for project planning on one site at a cost of $17,148. Finally, the program oversaw vegetation maintenance and monitoring on two restoration sites completed in 2019.

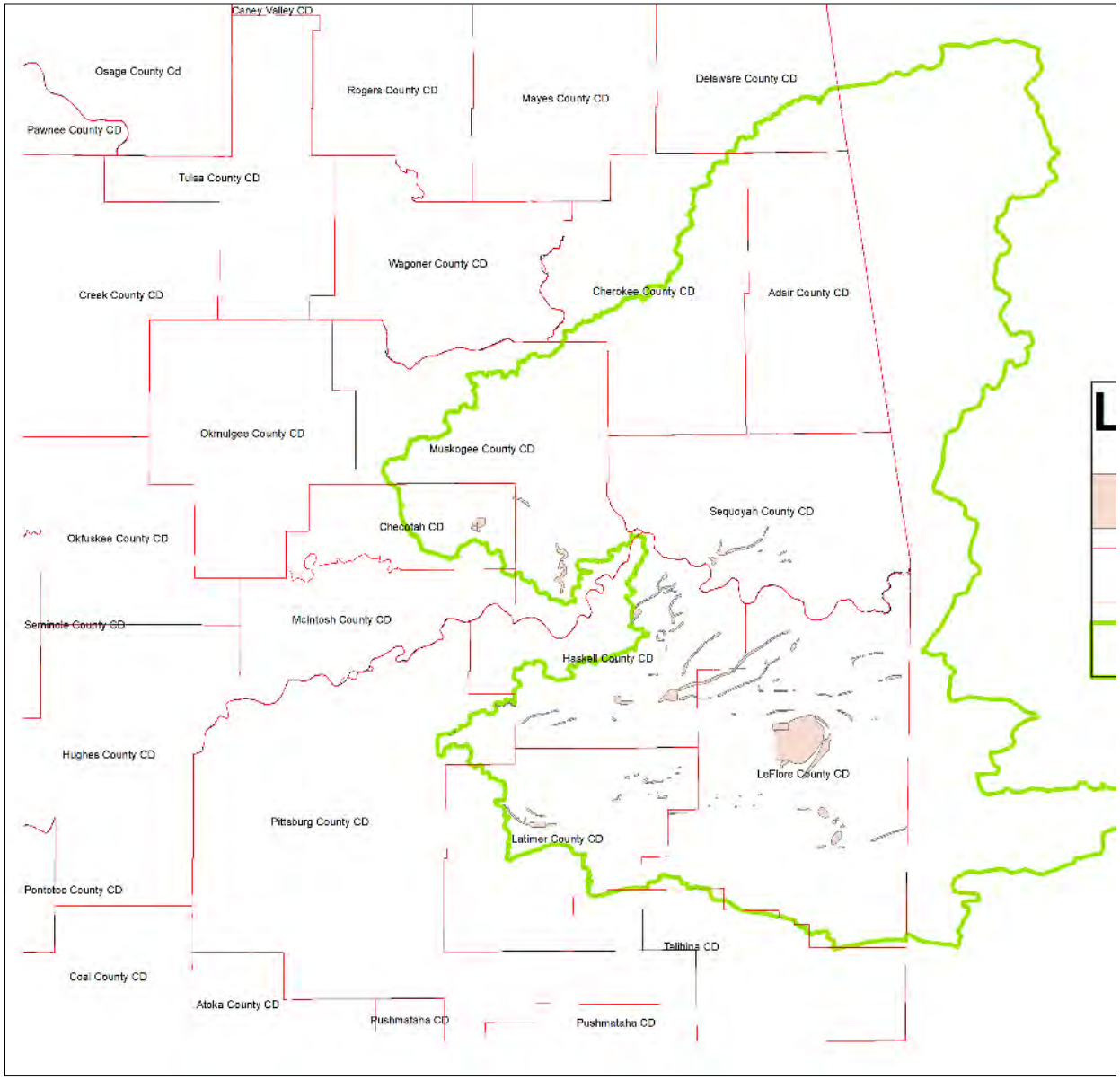


Figure 5. AML Impacted Areas within Compact Commission Area.



IRWP 2021 UPDATE

TRAVIS CHANEY, RESTORATION SPECIALIST



OUR MISSION

IRWP works to improve the integrity of the Illinois River through public **education,** community **outreach**, and implementation of **conservation** and **restoration** practices throughout the watershed.

ILLINOIS River
WATERSHED PARTNERSHIP

A Changing Watershed: Rapid Growth Rate

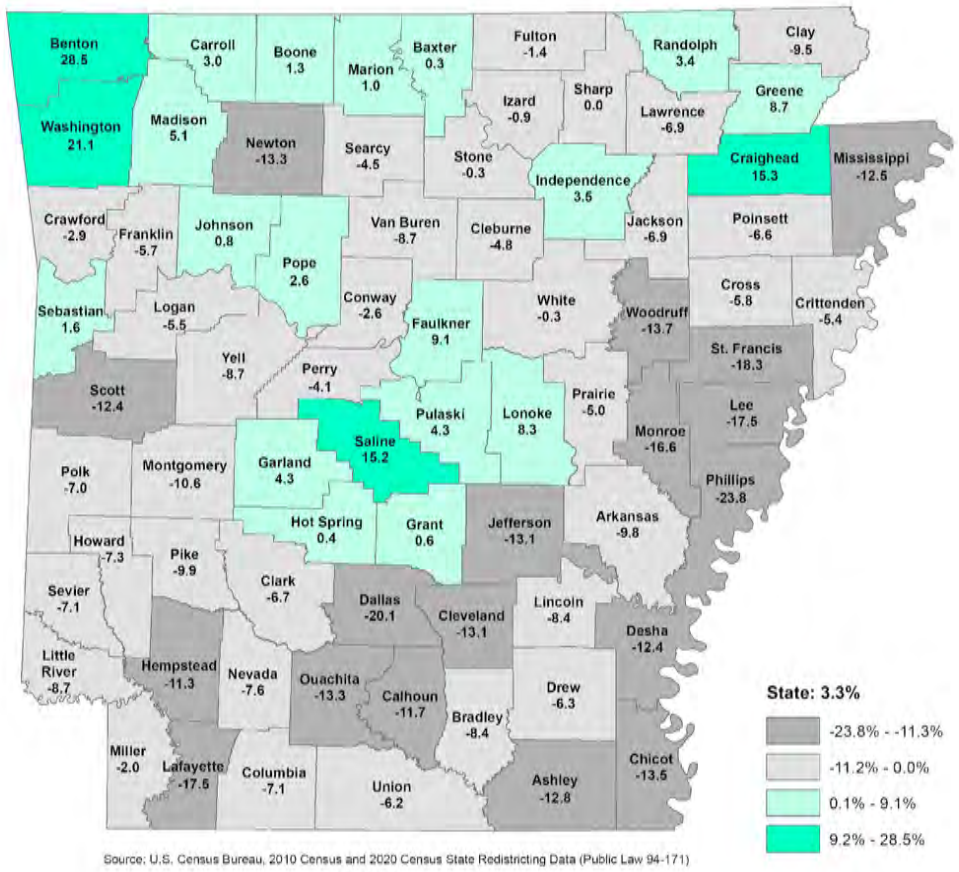
Two-County (Benton and Washington) Population Increase + 105,800

Jurisdiction	2010 Census	2020 Census	Numeric Change 2010 to 2020	Percent Change 2010 to 2020	Annual Average Growth Rate
Benton County	**221,339**	**284,333**	62,994	28.46%	2.54%
Washington County	**203,065**	**245,871**	42,806	21.08%	1.93%

Arkansas 3,011,524 (2020)
Arkansas 2,915,918 (2010)
95,606 Population Increase

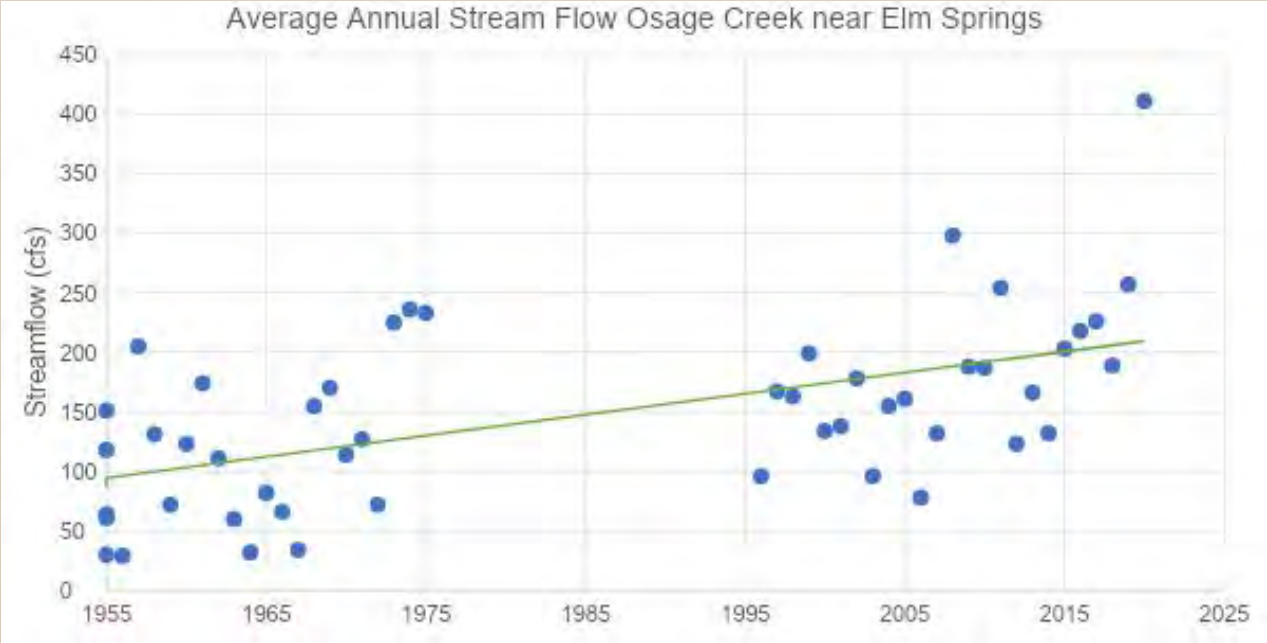
https://arstatedatacenter.youraedi.com/census-2020/
Compiled by Northwest Arkansas Regional Planning

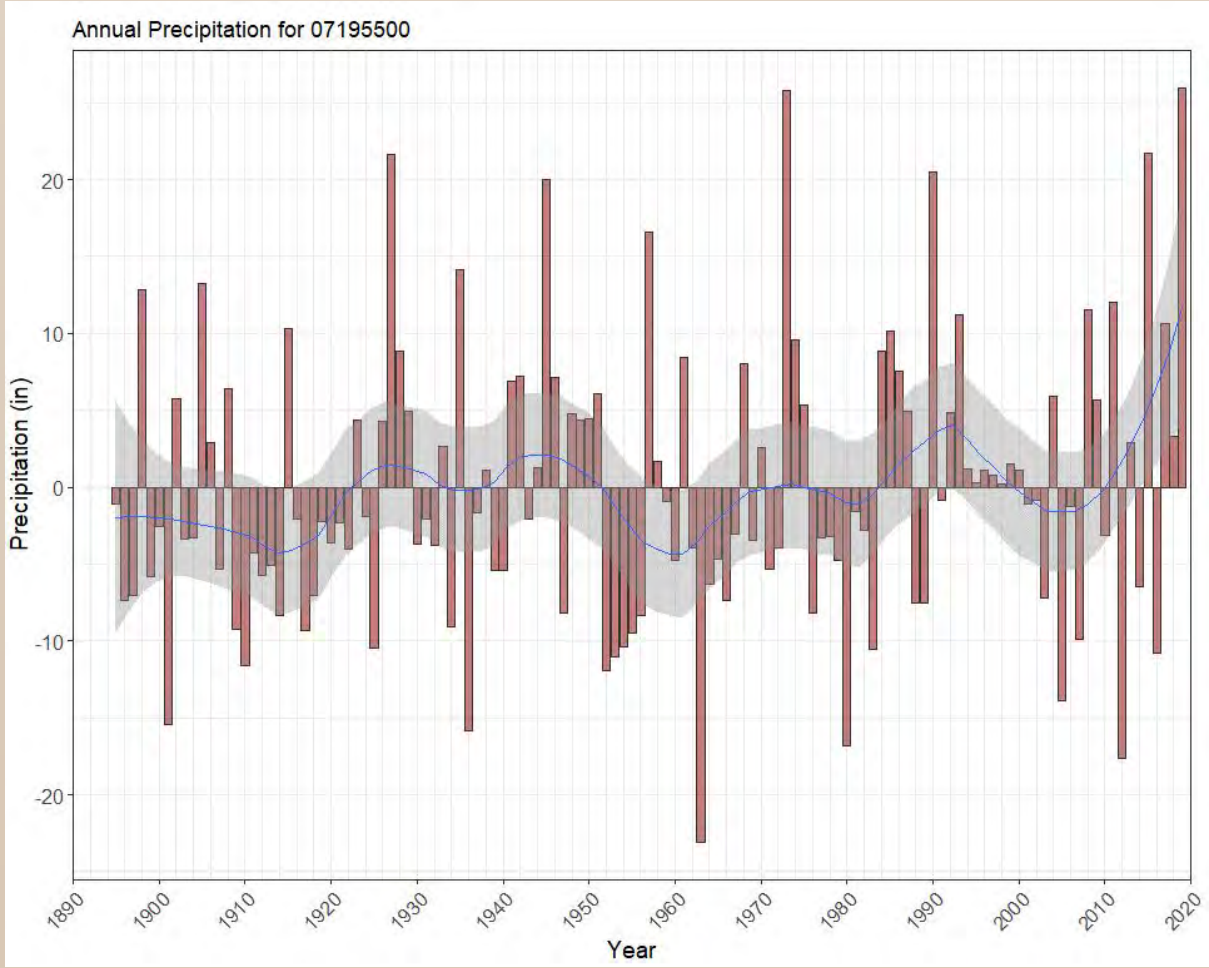
Percent Change in Total Population;
Arkansas by County: 2010 - 2020



ILLINOIS River WATERSHED PARTNERSHIP

A Changing Watershed: Precipitation and Flow

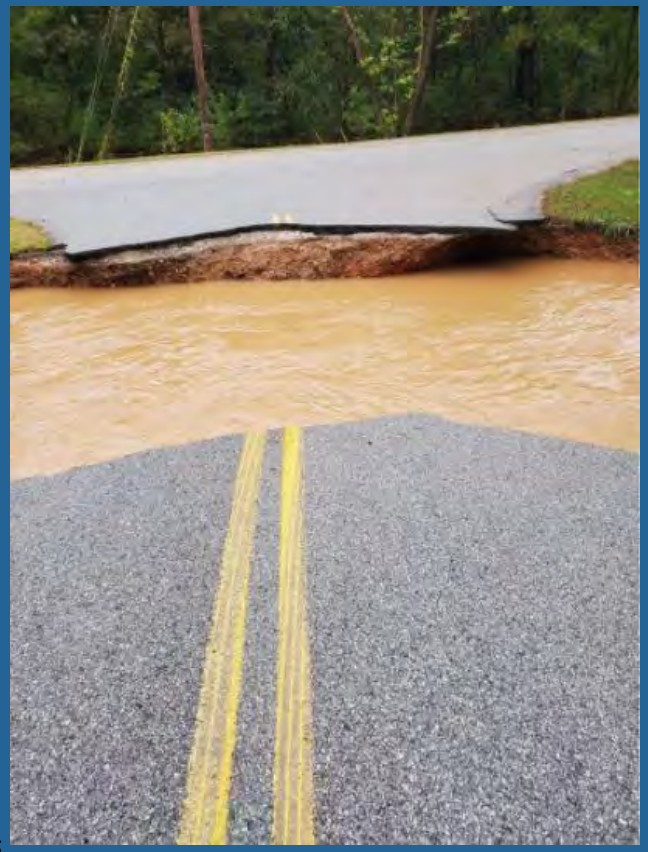




US Army Corps of Engineers ®

ILLINOIS River WATERSHED PARTNERSHIP

Record Flooding: April 28, 2021











A Changing Watershed: 2017 - 2020 Streambank Erosion Assessment

- Goal of understanding erosion rates year-over-year and the modeled potential for erosion in the future
- Prioritized list of streams from no erosion to extreme erosion - 15 sites representing 5% of the watershed
- Average erosion rate of 6.6 feet/year
  - As high as 32 feet/year
- Sediment loading of study area: 37,500 tons/year
- Phosphorus loading of study area (5% of watershed): 56,250 lbs/year



2017-2020 Cross section graph and 2019/2020 data collection photograph overlay at survey site 2 (Muddy Fork).

- P Loading of five WWTF's in watershed: 24,196 lbs/year

ILLINOIS River WATERSHED PARTNERSHIP

OUR MESSAGE

- Proactively conserving and restoring our natural areas reduces risk, improves water quality, and preserves our heritage.
- Offer a “toolbox” of voluntary water quality management solutions to landowners.
- Connect urban and rural landowners to organizations that provide these tools.
- Find solutions that fit the short-term and long-term needs of the landowner



ILLINOIS River WATERSHED PARTNERSHIP

STAKEHOLDER EDUCATION EVENTS



Riparian Buffer Field Tour



Grazing School



NWA LID Conference



Streambank Erosion and Restoration

Residential Low Impact Development LID Tour



Land Conservation Field Tour



Commercial LID Field Tour



ILLINOIS River WATERSHED PARTNERSHIP

RIPARIAN RESTORATION PROGRAM

- $2.8 million cost-share program
- Focused on Impaired Subwatersheds
- Focused on proven, low-cost, water quality BMP's
  - Riparian Revegetation
  - Constructed Wetlands
  - Off-stream watering facilities
  - Livestock Exclusion Fencing
  - Rotational Grazing

- PROGRAM DELIVERABLES
  - 20 Miles of Riparian Area Protected/Restored
  - 2 sq. miles pasture serviced by alternative watering facilities
  - over 43,000 linear feet of fence.



ILLINOIS River WATERSHED PARTNERSHIP

RIPARIAN RESTORATION PROGRAM

What practices can we fund?

Riparian Reforestation



ILLINOIS River WATERSHED PARTNERSHIP

RIPARIAN RESTORATION PROGRAM

What practices can we fund?

Streambank Stabilization



RIPARIAN RESTORATION PROGRAM

What practices can we fund?

Forest Stand Improvement









RIPARIAN RESTORATION PROGRAM

What practices can we fund?

Constructed Wetlands





ILLINOIS River WATERSHED PARTNERSHIP

EXAMPLE PROJECTS







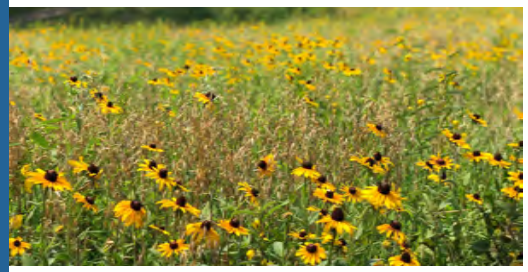
ILLINOIS River WATERSHED PARTNERSHIP

EXAMPLE PROJECTS

JOHNSON LIFT STATION

- 46-acre Native Warm Season Grass and Wildflower establishment
- Proposed City Nature park in middle of rapidly urbanizing area
- 7,500 feet of streams on property
- 2 acre beaver dam wetland
- Springdale Water Utilities is funding creation of Restoration Master Plan that will be taken to EPA for 319 Funding









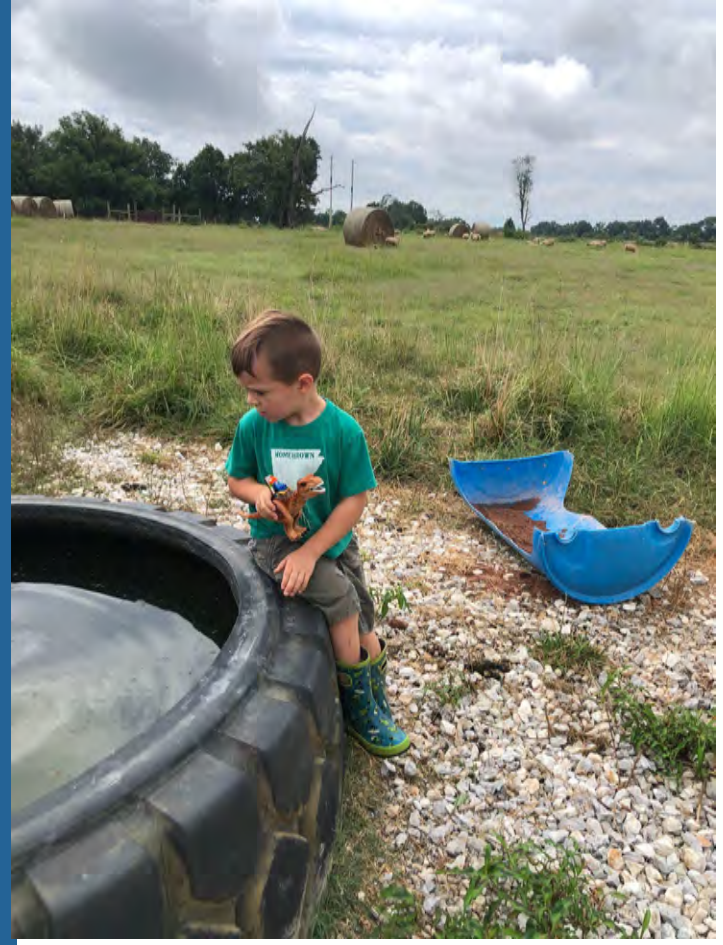




ILLINOIS River
WATERSHED PARTNERSHIP

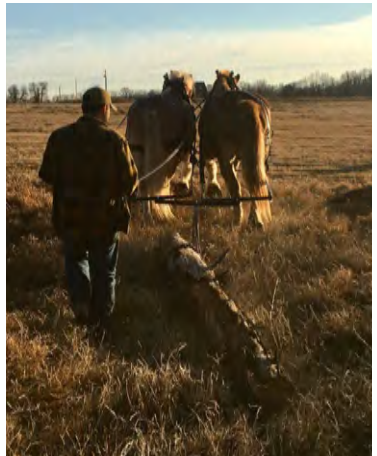
EXAMPLE PROJECTS













EXAMPLE PROJECTS

















ONGOING PROJECTS

JOHN BROWN UNIVERSITY

- Restoring a 7.5 acre, remnant prairie on the edge of campus.
- Theo Witsell of ANHC described this remnant as "*one of only three upland prairies known to survive in Benton County. This site supports at least two species of state conservation concern*
- This Fall, Big Bluestem seed will be harvested by Arkansas Audubon to supply regional ecotype seed to their NATIVE project that sets up farmers to grow native seed for conservation programs.



ONGOING PROJECTS

THE COURSE AT SAGER'S CROSSING

- Construction finished. Came in under budget and were able to pay for multiple years of maintenance.
- 4,000LF of streambank restored/revegetated.
- 10,000 plugs planted
- 7.5 acres of riparian, wetland, and upland prairie habitats.
- Took Siloam Springs Board of Directors on tour. Hoping to get approval for Dogwood Springs Trail Project this Fall.





June 2019



March 2021



March 2021



April 2021



August 2021



August 2021

PROJECT PHOTOS



Hyrdoseeding in early May 2021



July 2021



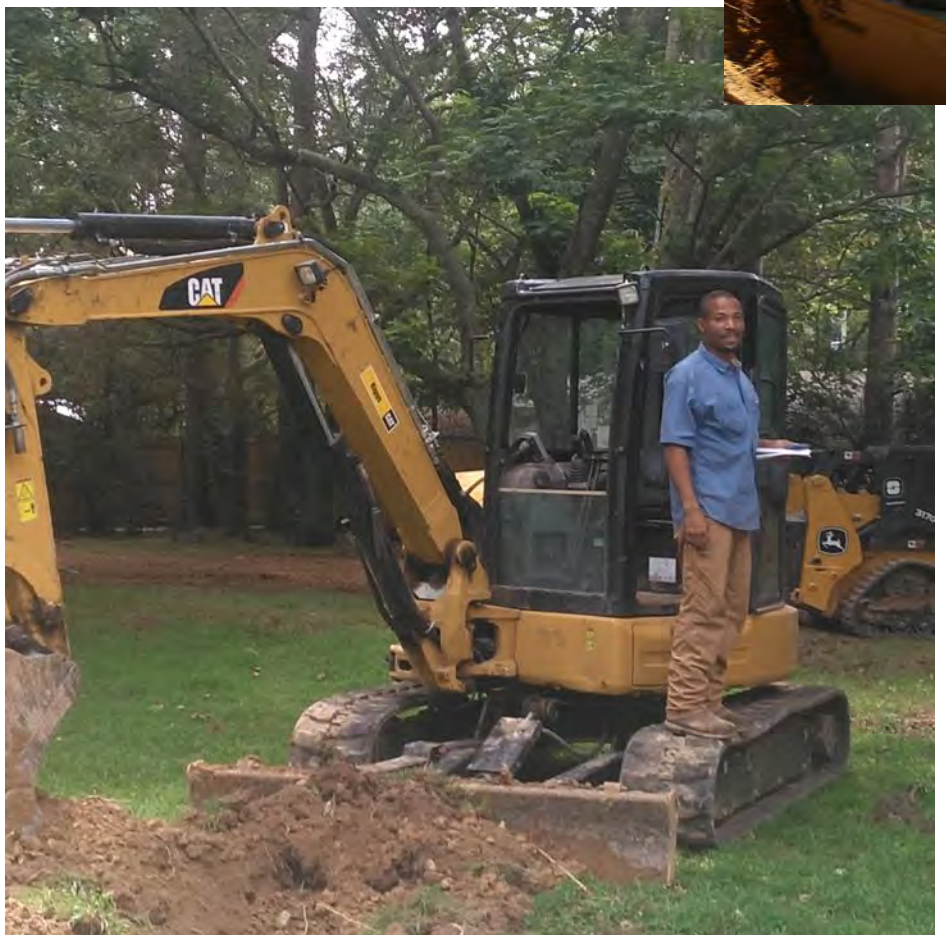
ILLINOIS River
WATERSHED PARTNERSHIP

SEPTIC TANK REMEDIATION PROGRAM

OVERVIEW

- CWSRF grant awarded by ANRD Launched March, 2021
- $1M over three years.
- Purpose: Improve and protect water quality by Assisting Residents in remediating their failing onsite septic systems.
- Eligibility Requirements
  - Property located in a priority WS
  - ADH reports the system as failing







ILLINOIS River WATERSHED PARTNERSHIP

BACKGROUND

- Over 55,000 active permitted septic systems in Benton & Washington counties
- ADH rough estimate of 5% in failure
- Water quality concerns: pathogen indicator bacteria, sulfates, chlorides and nutrients
- Topography and soil types in NWA present risks for failure





ILLINOIS River WATERSHED PARTNERSHIP

How the Program Works

- Qualification Process
- **Zero-interest loan** payable over up to 10 years for up to $30,000 to repair and/or replace a failing septic system.
- Many homeowners also qualify for **grant** funding based on household income. The grant is **free** money that does not require repayment.
- 44 projects in process, 4 completed

ANNUAL INCOME LEVEL	GRANT (no repayment)	0% INTEREST LOAN
less than $20,828	90%	10%
$20,829 - $31,242	70%	30%
$31,243 - $41,657	50%	50%
$41,658 - $62,485	30%	70%
$62,486 - $83,314	10%	90%
more than $83,314	0%	100%

IMPORTANT

Health Depts and IRWP works with program applicants before any construction has begun.

This program does **not** fund septic installation for new construction.

ILLINOIS River WATERSHED PARTNERSHIP

UNPAVED ROADS DEMONSTRATION PROJECTS

Project Goals:

- Install three water quality-improving practices on Benton County unpaved roads
- Provide training for Roads Dept. personnel and landowners
- Measure changes in maintenance and repair







ILLINOIS River WATERSHED PARTNERSHIP

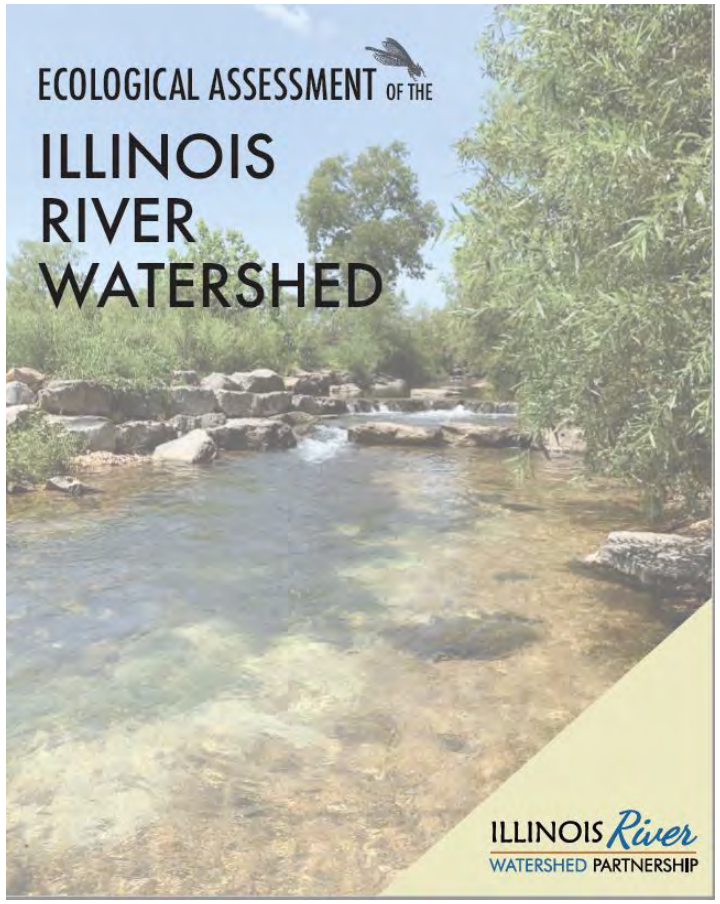
Ecological Assessment of Priority Subwatersheds











- Habitat Assessment, Macroinvertebrate Diversity, Water Chemistry, & Land Use Assessment – parameters for trend analysis
- Four years of data at 21 Arkansas sites (even years), 12 in Oklahoma (odd years)

ILLINOIS River
WATERSHED PARTNERSHIP

BLUE CITIES



PROGRAM GOALS:

1) Targeted outreach to city and county elected officials, planning commissions, and relevant staff

2) Short-term goal: drive awareness among these audiences regarding the Illinois River, impacts to it, and tools available to improve water quality

3) Long-term goal: increase implementation of best management practices for water quality improvement by major cities and counties

Expected Outcomes: City councils, planning commissions, & staff use stormwater management toolkits, participate in LID educational field tours, attend vegetation management trainings

BLUE NEIGHBORHOODS

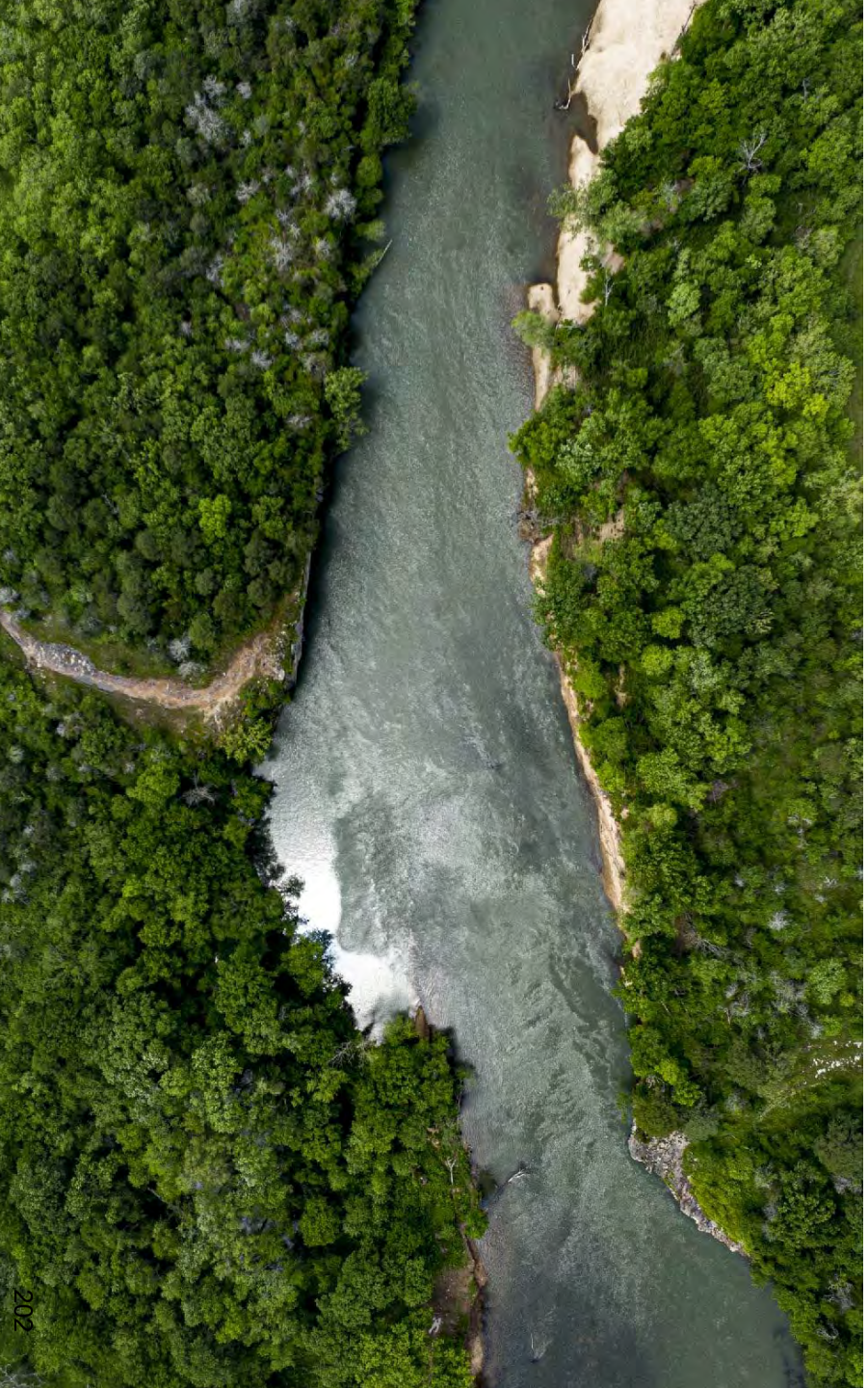


Goals:

1) Identification of high-impact neighborhoods
2) Targeted outreach plans with those residents to advance concepts of sustainably managed stormwater
3) Create plans for low impact development practice implementation

Expected Outcomes: Identify high priority neighborhoods, develop LID Master Plans, implement at least 15 LID BMPs

ILLINOIS River WATERSHED PARTNERSHIP



THANK YOU

ILLINOIS River
WATERSHED PARTNERSHIP

LEIF KINDBERG
Executive Director
(479) 422-5676
director@irwp.org
irwp.org | Cave Springs, AR

contact@irwp.org

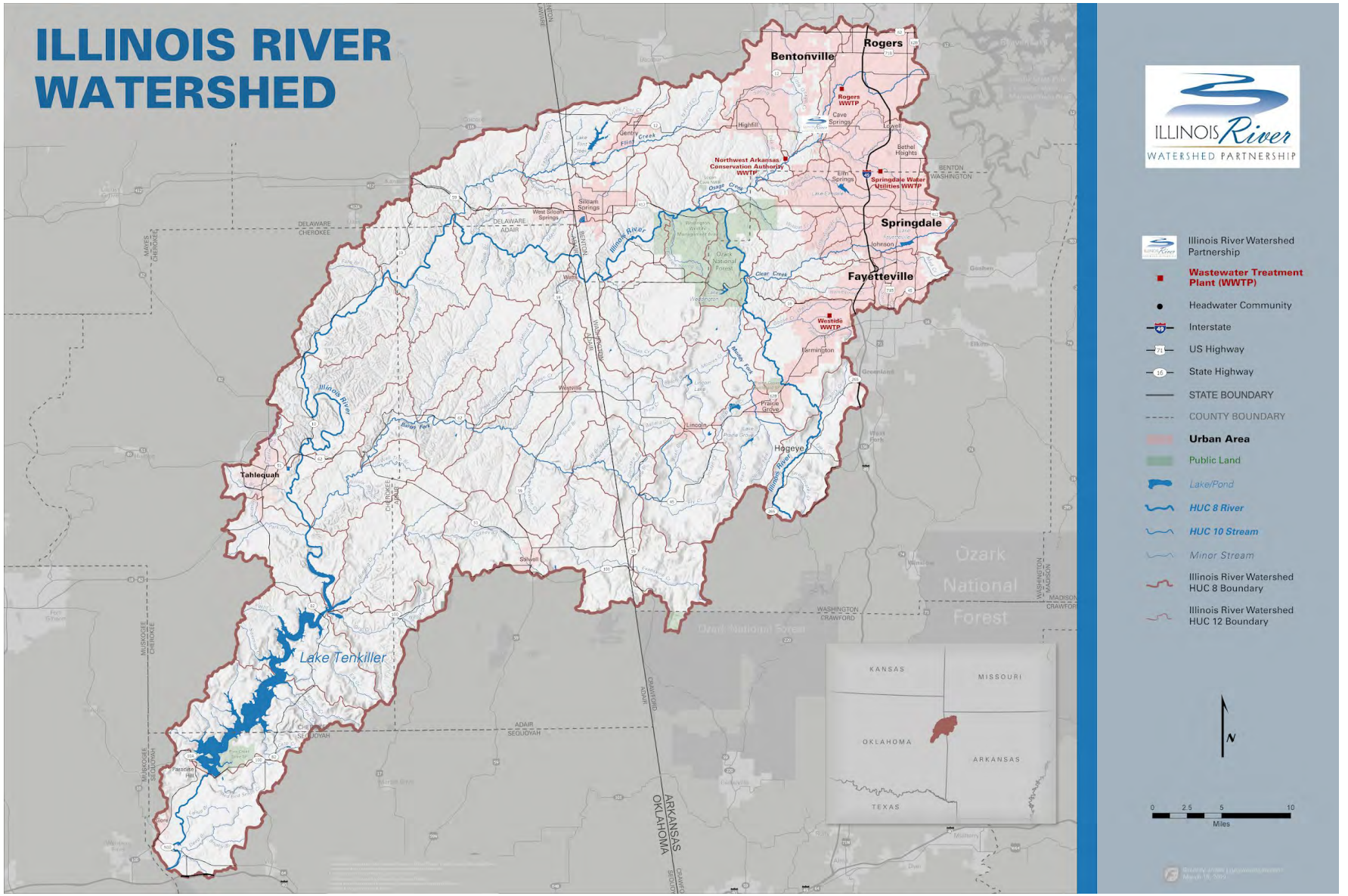
irwp.org

Illinois River Watershed Partnership

ILLINOIS River
WATERSHED PARTNERSHIP

A COMPLEX WATERSHED

- Two states, one tribal nation
- Twenty-two cities
- Four counties
- Rapidly urbanizing, but mostly agricultural
- Many different ecosystems



WATER QUALITY CONCERNS

Species of Conservation Concern

Ozark Blind Cavefish

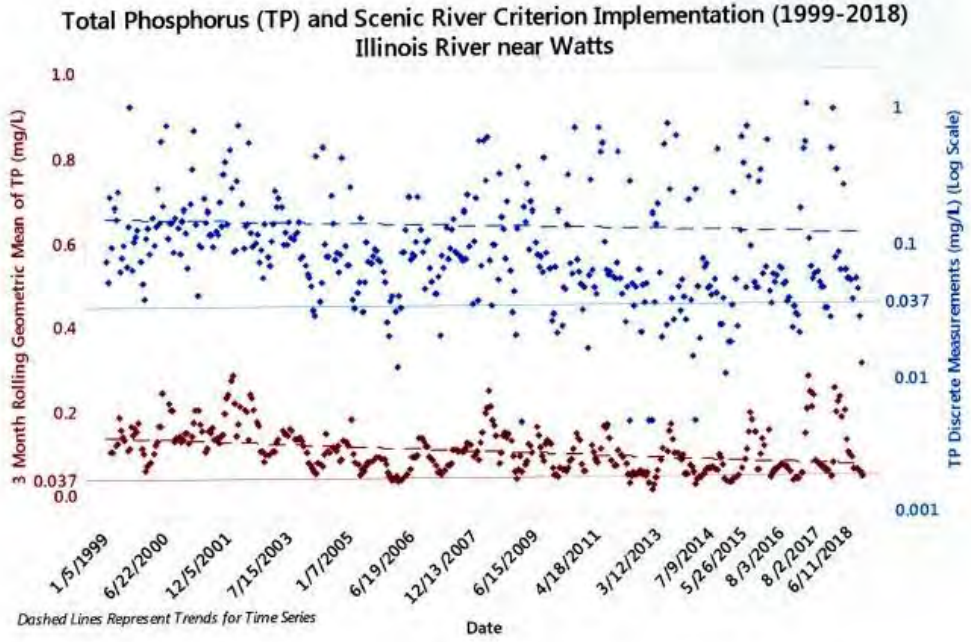




Benton County Cave Crayfish

Gray Bat





Phosphorus Concentrations

ADEQ's DRAFT Impairment Listing (2020)

Subwatershed	Impairment	Source of Contamination
Little Osage Creek	E. coli	IP, MP, SE, AG
Moore's Creek	E. coli	IP, MP, SE, AG
Lower Muddy Fork	E. coli	IP, MP, SE, AG
Illinois River (three segments)	E. coli, Turbidity, sulphates	IP, MP, SE, AG
Baron Fork	Dissolved Oxygen	Unknown
Sager Creek	Ammonia-N	Unknown
Trib. to Brush Creek	Ammonia-N	Unknown
Lake Fayetteville	pH	Unknown

Local Stakeholders

Lead to consensus-based solutions



Business

- Arvest Bank
- Tyson
- Simmons

Agriculture

- Local farmer
- AR Farm Bureau
- OK Farm Bureau

Conservation

- TNC
- AGFC
- ANRC

Construction

- Burns-McDonnell
- Baldwin-Shell
- Crafton-Tull

Tech., Res. & Ed

- AR Water Resources Center
- NWAMN
- OK Conservation Commission

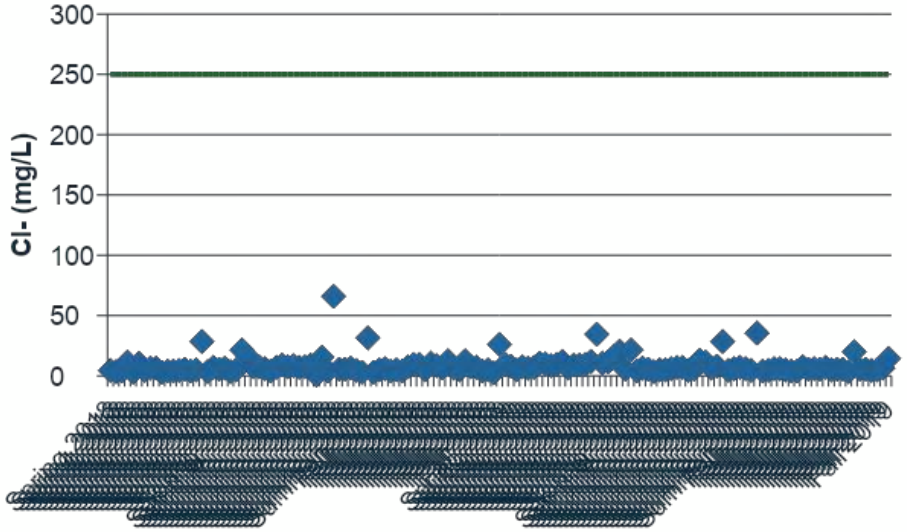
Government

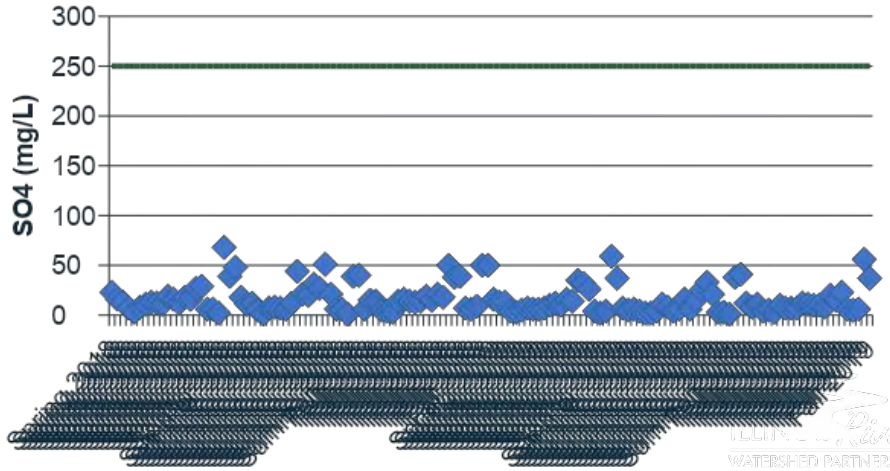
- Springdale Water Utilities
- Cherokee Nation
- GRDA

ILLINOIS River WATERSHED PARTNERSHIP

Water Quality Monitoring with AWRC and RPC

- Initiated following Eco-Assessment
- Partners:
  - EPA/ADEQ: Grantor
  - NWARPC: Grantee
  - IRWP: Sample Collection
  - AWRC: Sample Analysis
- Five impaired sites sampled eight times (two sites in 2020/21)
- Parameters of Concern:
  - Sulfate
  - Chloride
  - E. coli





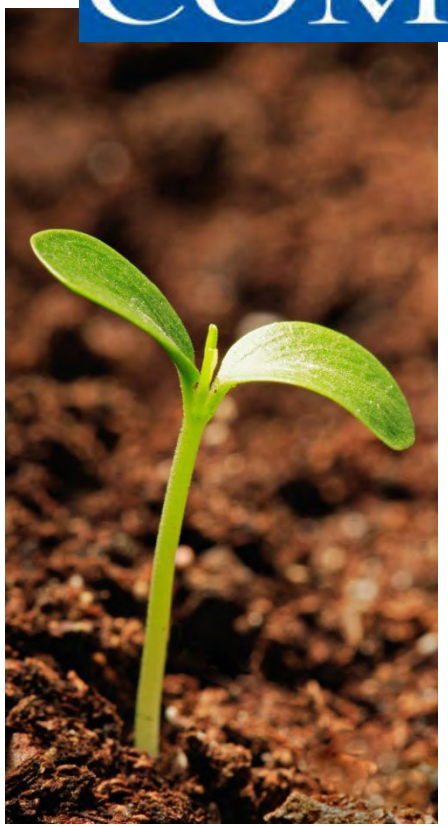
Our Goal:
De-Listing???!!!

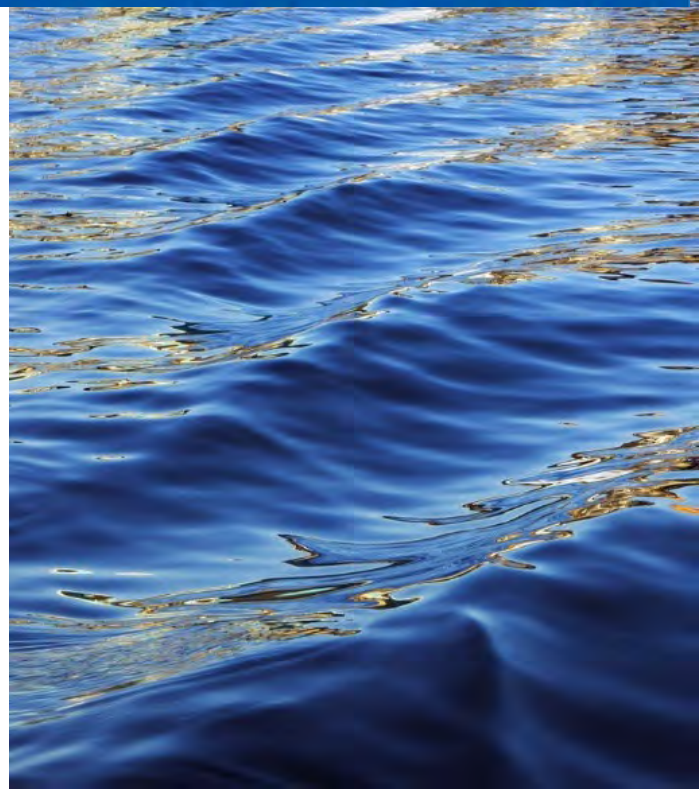
ILLINOIS River WATERSHED PARTNERSHIP

Oklahoma Conservation Commission Programs In Arkansas/Oklahoma Compact Commission Area- 10/20 – 9/21

2021 Compact Commission Meeting
Queen Wilhemina Lodge, Mena, AR
September 23, 2021
Shanon Phillips- OCC WQ Div. Dir.

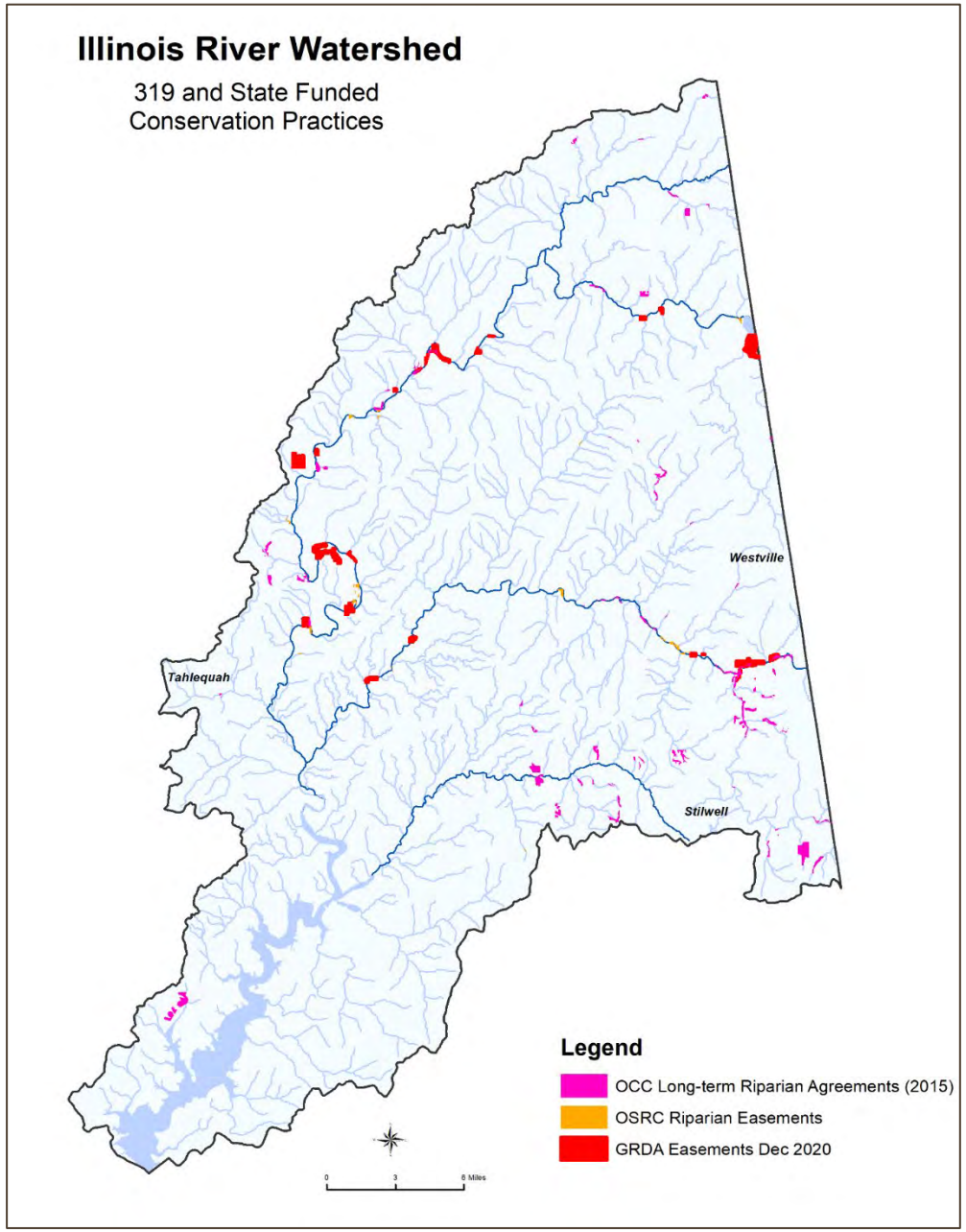






Long-term Riparian Protection

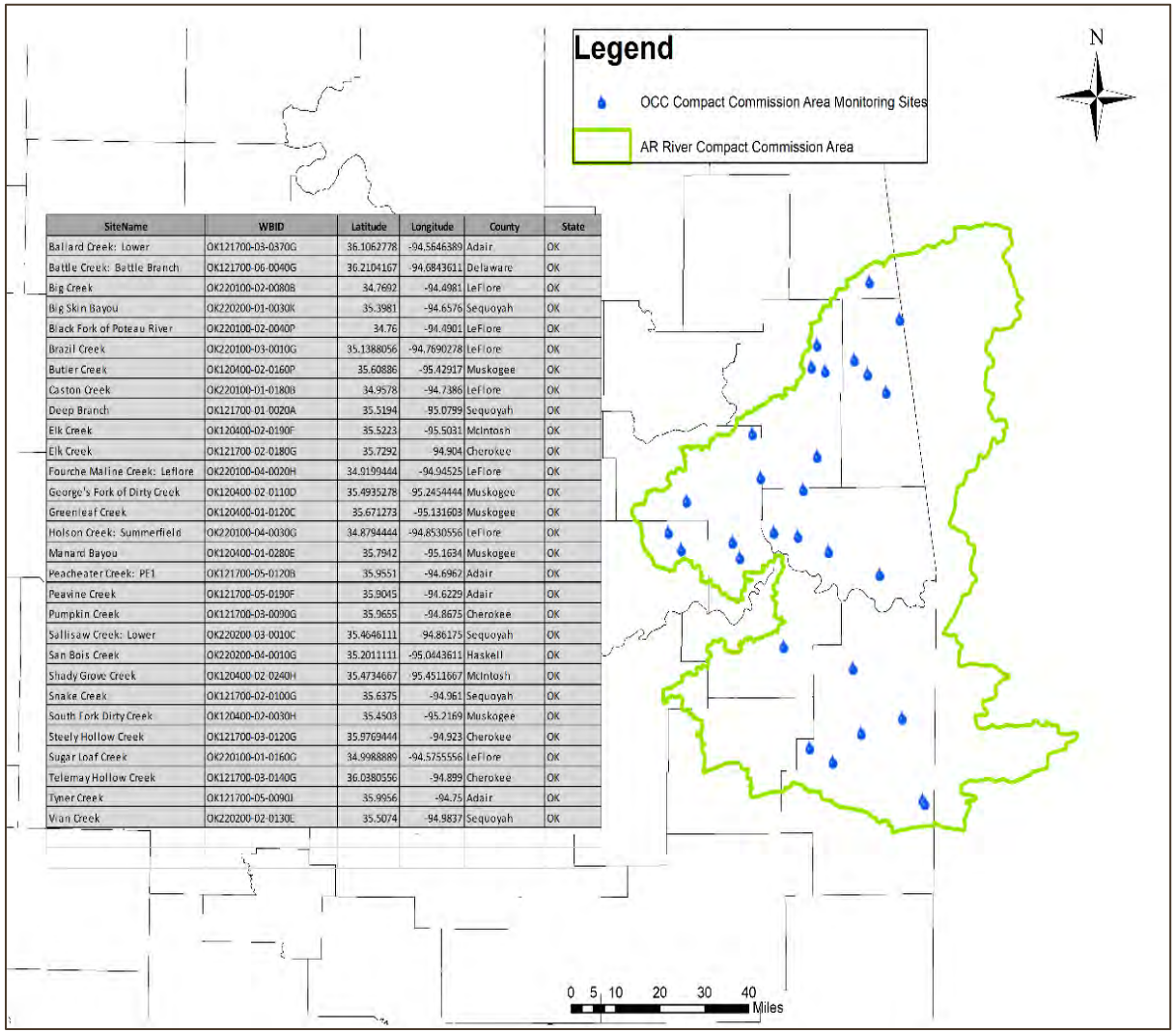
- Partnership with Conservation Districts, Landowners, GRDA, others
- **Added 563.91 acres in 30+ year easements in the Illinois River Watershed (IRW)**
- Currently maintaining in the IRW
  - 1,524.9 acres of 10-15 year easements in partnership with conservation districts and 33 landowners
  - 3,588.09 acres in 46 different 30+ year easements in partnership with GRDA and 41 landowners
  - Total of 5,113 acres currently enrolled



OKLAHOMA CONSERVATION COMMISSION

OCC Water Quality Monitoring- Rotating Basin Monitoring Program

- OCC monitors at least 30 sites in the compact commission area for two out of every 5 years
- Latest round was schedule from May 2018 – June 2020; however COVID challenges meant that sampling was suspended in April and May and resumed for these sites in August and September, 2020.
- Reporting in Basin group 3 is undergoing final review by EPA and will be published on OCC's website when approved. https://conservation.ok.gov/wq-statewide-rotating-basin-monitoring-program/



SiteName	WBID	Latitude	Longitude	County	State
Ballard Creek: Lower	OK121700-03-0370G	36.1062778	-94.5646389	Adair	OK
Battle Creek: Battle Branch	OK121700-06-0040G	36.2104167	-94.6843611	Delaware	OK
Big Creek	OK220100-02-0080B	34.7692	-94.4981	LeFlore	OK
Big Skin Bayou	OK220200-01-0030K	35.3981	-94.6576	Sequoyah	OK
Black Fork of Poteau River	OK220100-02-0040P	34.76	-94.4901	LeFlore	OK
Brazil Creek	OK220100-03-0010G	35.1388056	-94.7690278	LeFlore	OK
Butler Creek	OK120400-02-0160P	35.60886	-95.42917	Muskogee	OK
Caston Creek	OK220100-01-0180B	34.9578	-94.7386	LeFlore	OK
Deep Branch	OK121700-01-0020A	35.5194	-95.0799	Sequoyah	OK
Elk Creek	OK120400-02-0190F	35.5223	-95.5031	McIntosh	OK
Elk Creek	OK121700-02-0180G	35.7292	-94.904	Cherokee	OK
Fourche Maline Creek: LeFlore	OK220100-04-0020H	34.9199444	-94.94525	LeFlore	OK
George's Fork of Dirty Creek	OK120400-02-0110D	35.4935278	-95.2454444	Muskogee	OK
Greenleaf Creek	OK120400-01-0120C	35.671273	-95.131603	Muskogee	OK
Holson Creek: Summerfield	OK220100-04-0030G	34.8794444	-94.8530556	LeFlore	OK
Manard Bayou	OK120400-01-0280E	35.7942	-95.1634	Muskogee	OK
Peacheater Creek: PE1	OK121700-05-0120B	35.9551	-94.6967	Adair	OK
Peavine Creek	OK121700-05-0190F	35.9045	-94.6229	Adair	OK
Pumpkin Creek	OK121700-03-0090G	35.9655	-94.8675	Cherokee	OK
Sallisaw Creek: Lower	OK220200-03-0010C	35.4646111	-94.86175	Sequoyah	OK
San Bois Creek	OK220200-04-0010G	35.2011111	-95.0443611	Haskell	OK
Shady Grove Creek	OK120400-02-0240H	35.4734667	-95.4511667	McIntosh	OK
Snake Creek	OK121700-02-0100G	35.6375	-94.961	Sequoyah	OK
South Fork Dirty Creek	OK120400-02-0030H	35.4503	-95.2169	Muskogee	OK
Steely Hollow Creek	OK121700-03-0120G	35.9769444	-94.923	Cherokee	OK
Sugar Loaf Creek	OK220100-01-0160G	34.9988889	-94.5755556	LeFlore	OK
Tellemay Hollow Creek	OK121700-03-0140G	36.0380556	-94.899	Cherokee	OK
Tyner Creek	OK121700-05-0090I	35.9956	-94.75	Adair	OK
Vian Creek	OK220200-02-0130E	35.5074	-94.9837	Sequoyah	OK

Example Stream Summaries

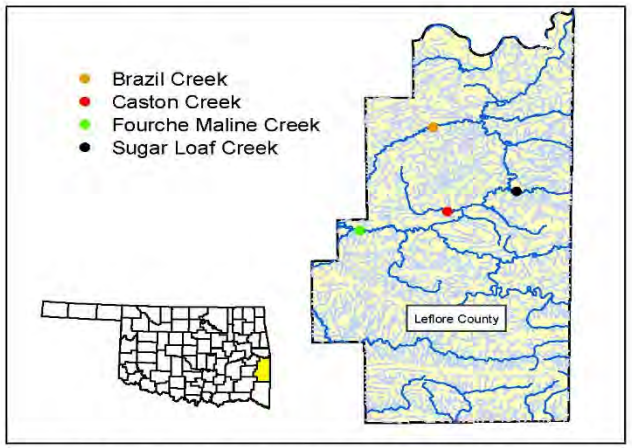
OKLAHOMA CONSERVATION COMMISSION

Know Your Stream: Rotating Basin Site Summary

Leflore County, Arkansas Valley Level 3 Ecoregion

The Oklahoma Conservation Commission (OCC) has the statutory responsibility of monitoring streams across the state in order to identify healthy streams as well as those which may be impacted by non-point source (NPS) pollution. NPS pollution is pollution which runs off the land from diffuse sources rather than being discharged from a specific source. If a stream is found to be impaired by NPS pollution, the OCC may be able to implement a voluntary cost-share program to address the identified problems; however, streams must be monitored in order to select best management practices necessary for improvement. The OCC's "Rotating Basin Monitoring Program" provides the tools to assess and then restore water quality in Oklahoma.

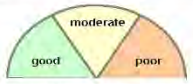
This leaflet gives a brief summary of the assessment results for the third 2-year cycle of the monitoring program for streams in Leflore County. The full report can be accessed online under the Water Quality Division, Reports tab at: http://www.conservation.ok.gov or by calling (405) 522-4500 and requesting a copy of the "Rotating Basin Group 3, Cycle 3 Final Report."



OCC Rotating Basin monitoring sites within Leflore County.

Through the Rotating Basin Program, four streams in Leflore County were sampled approximately every five weeks from June 2013-May 2015. Eighteen water quality parameters were measured or analyzed at each site visit. In addition, OCC staff conducted one fish and habitat assessment and up to four macroinvertebrate collections. Summer samples were also analyzed for *E. coli* bacteria. Each site was compared to "high quality" streams in the ecoregion, streams known to have high quality fish populations, benthic macroinvertebrate populations, instream and riparian habitat, and water quality. All of the data collected has been distilled into a few key components in order to produce an index score of general, overall stream health, shown on the next page.

Summary of general stream health as determined by comparison to high quality streams in the Arkansas Valley ecoregion and by assessment using Oklahoma State Water Quality Standards†.

	*Good*		*Moderate*	
	Fourche Maline Creek	**Brazil Creek**	**Caston Creek**	**Sugarloaf Creek**
Overall Stream Health	**53**	**51**	**43**	**31**
Phosphorus	5	5	5	5
Nitrogen	5	3	3	5
Ammonia	5	5	5	5
Dissolved Oxygen	5	5	5	-5
pH	5	5	5	-5
Turbidity	5	5	5	5
Salts (chloride, sulfate, TDS)	5	5	-5	5
Fish	5	5	5	5
Macroinvertebrates	3	3	5	1
Instream/Riparian Habitat	5	5	5	5
Bacteria	5	5	5	5
	Scale of 1-5 (5 being the best)			

KEY: 1 = Significantly different than high quality sites;
3 = Not as good as high quality sites, but not impaired
5 = Equal to or better than high quality sites
-5 = Impaired by state standards

Fourche Maline Creek (OK220100-04-0020H): This stream is comparable to high quality streams within the ecoregion for all parameters except a slightly lower quality macroinvertebrate community.

Brazil Creek (OK220100-03-0010G): This stream is comparable to high quality streams for all parameters within the ecoregion except for slightly elevated nitrogen levels and slightly lower quality macroinvertebrate community.

Caston Creek (OK220100-01-0180B): This stream is listed as impaired by state standards for salts (sulfates specifically). All other parameters were comparable to high quality streams within the ecoregion except for slightly elevated nitrogen levels.

Sugarloaf Creek (OK220100-01-0160G): This stream is listed as impaired by state standards for dissolved oxygen and pH. All other parameters were comparable to high quality streams within the ecoregion except for significantly lower quality macroinvertebrate community.

† The use of Oklahoma Water Quality Standards to assess streams and the 2016 results are described in the DEQ's 2016 Integrated Report, accessible online at: http://www.deq.state.ok.us/wqdnew/305b_303d/index.html

Blue Thumb Monitoring and Education

- Volunteer Monitored Stream sites:
  - 4 in Illinois River Basin
  - 5 in Poteau River Basin
  - 1 in Dirty/Greenleaf Creek Basin
  - Data summaries written by volunteers available at: https://www.bluethumbok.com/volunteer-written-data-interpretations.html
- Educational Camps in Partnership with GRDA-
  - Returned in 2021 with a Riverology camp for 14 teachers and Journey to the Bottom of the Creek camp for 14 kids









OKLAHOMA CONSERVATION COMMISSION

Blue Thumb Education Continued

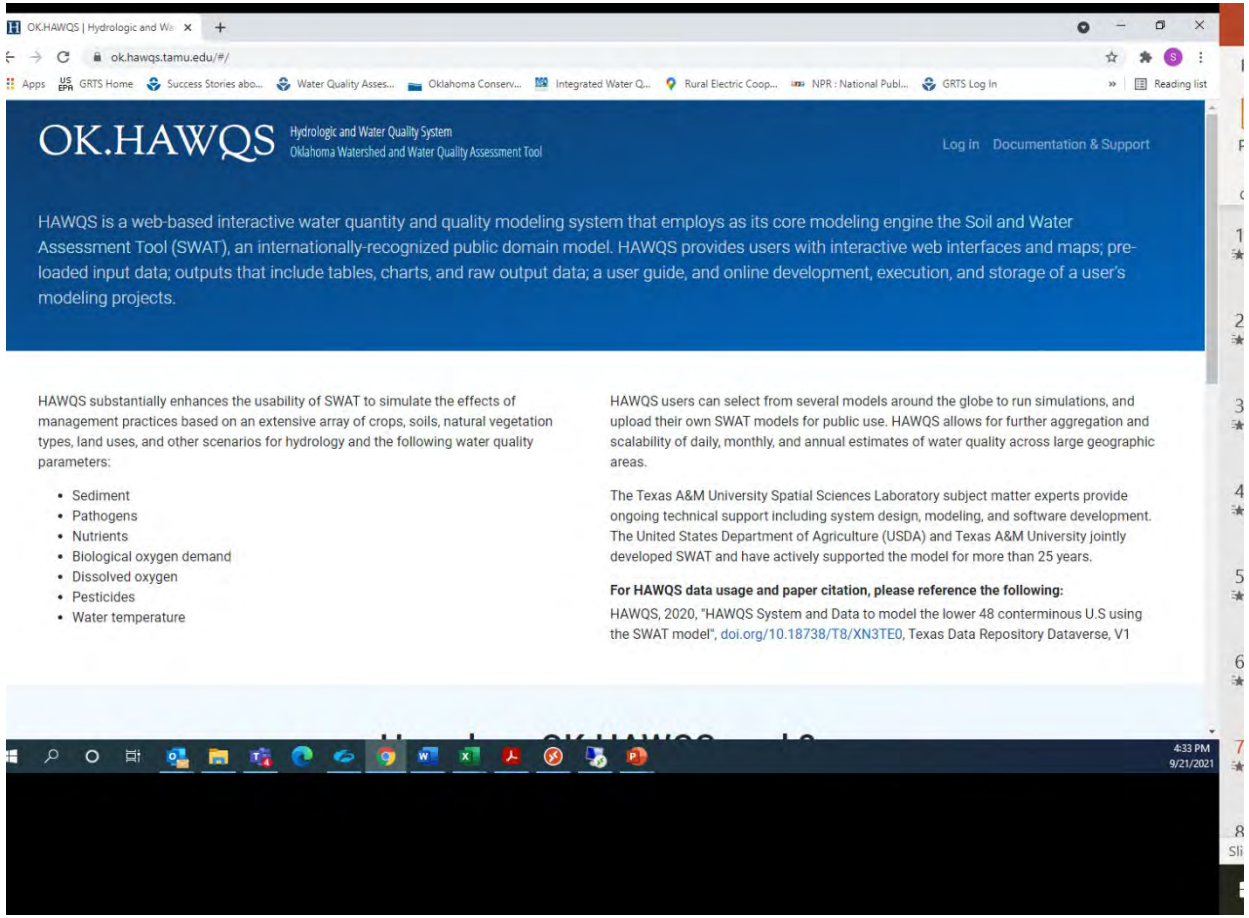
- Sampling with IRWP
  - November 2020, April and August 2021
- Wister Lake Watershed Based Plan in partnership with Poteau Valley Improvement Authority
- Yard by Yard Program- Delaware, Muskogee, and Cherokee Counties participating in the Program
  - https://www.okconservation.org/yardbyyard
  - https://youtu.be/kuGgISo3GoI
  - https://www.publicradiotulsa.org/post/yard-yard-community-resiliency-project#stream/0





Oklahoma/Arkansas Memorandum of Agreement

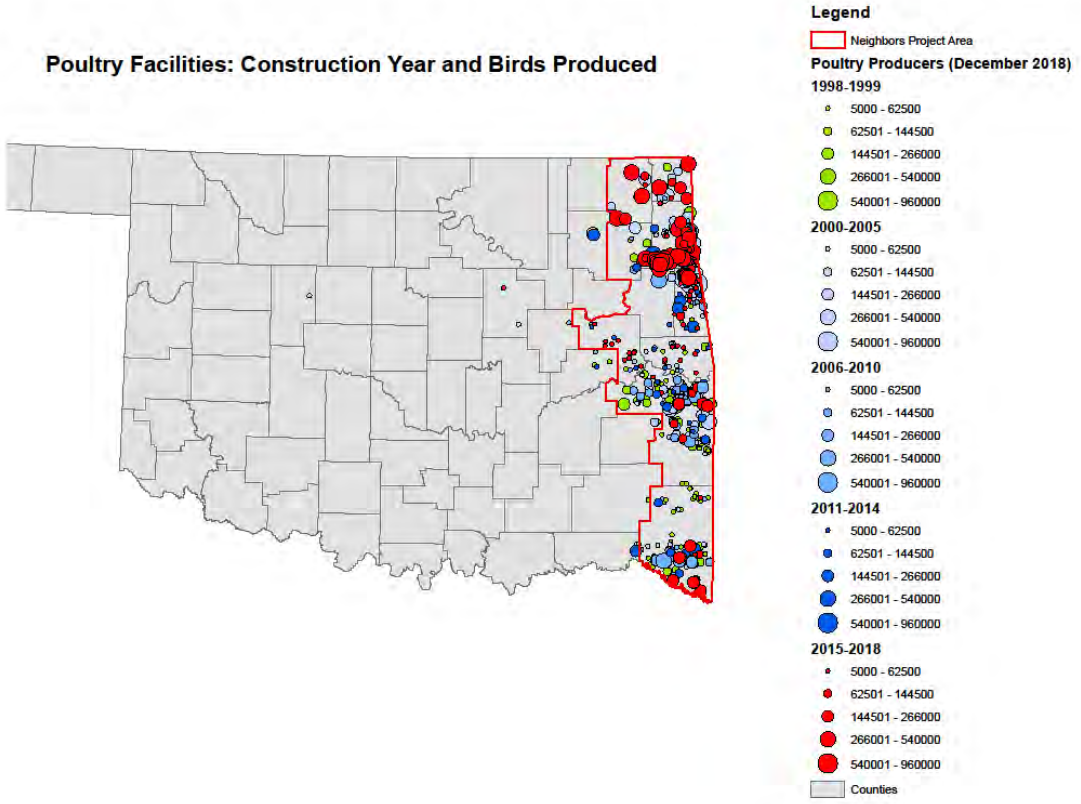
- In support of Watershed Planning, OK has contracted with Texas A&M to develop OK Hydrologic and Water Quality Systems (HAWQS) Modeling for Oklahoma
  - Open sourced
  - Continually updated
  - HUC-12 foundation SWAT modeling for all of OK
  - Held preliminary training on Beta version on September 16,2021
  - In 2021-2022 will also
    - Specifically develop a SWAT model for the IRW set with the same sub-basin and calibration point parameterization as the EPA HSPF model to be used in the cooperative NPS watershed planning development process with Arkansas partners and Cherokee Nation
    - Develop SWAT model for Wister Lake Watershed



OKLAHOMA CONSERVATION COMMISSION

Neighbors Helping Neighbors: 2021 RCPP Project

- $2,010,000 in funding from NRCS, OCC, GRDA, Cherokee Nation, poultry integrators
- Focus on growers and close neighbors
- Conservation practices to address concerns related to living nearby large animal production area
  - Dust
  - Noise
  - Water quality
  - Odors
  - Others?
- Education



OKLAHOMA CONSERVATION COMMISSION







OKLAHOMA CONSERVATION COMMISSION

Poultry Litter Transfer

215

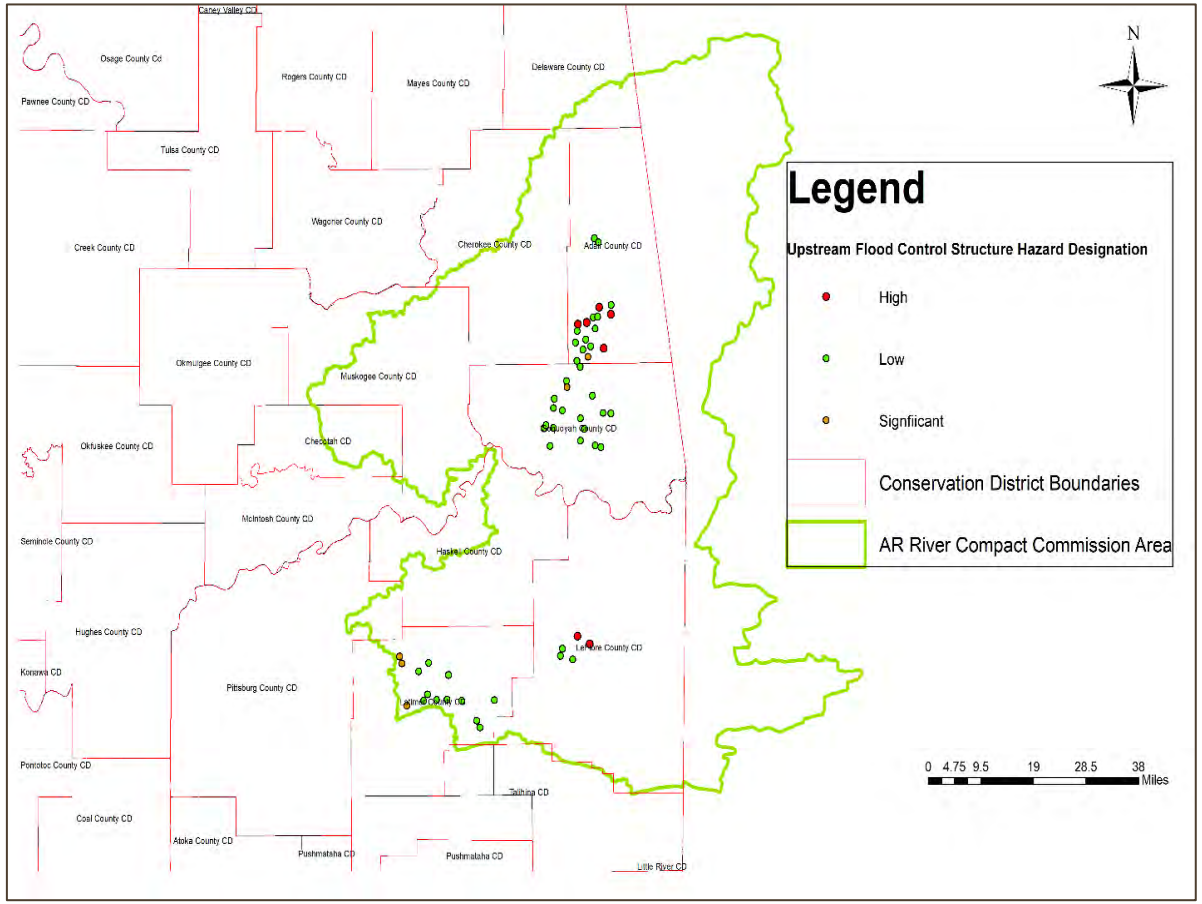
Locally-Led Cost Share Program

- Funding from OK legislature and receipts from oil and gas production tax
- Within the Compact Commission Area, the program has installed at least $3,190,459 in conservation practices (CPs) since 1998- $1,662,132 of which funded by landowners
- Recent program year installed $3354,310 in CPs including- brush management, fencing, heavy use areas, herbaceous weed control, nutrient management pasture planting, livestock pipeline, ponds, and watering facilities



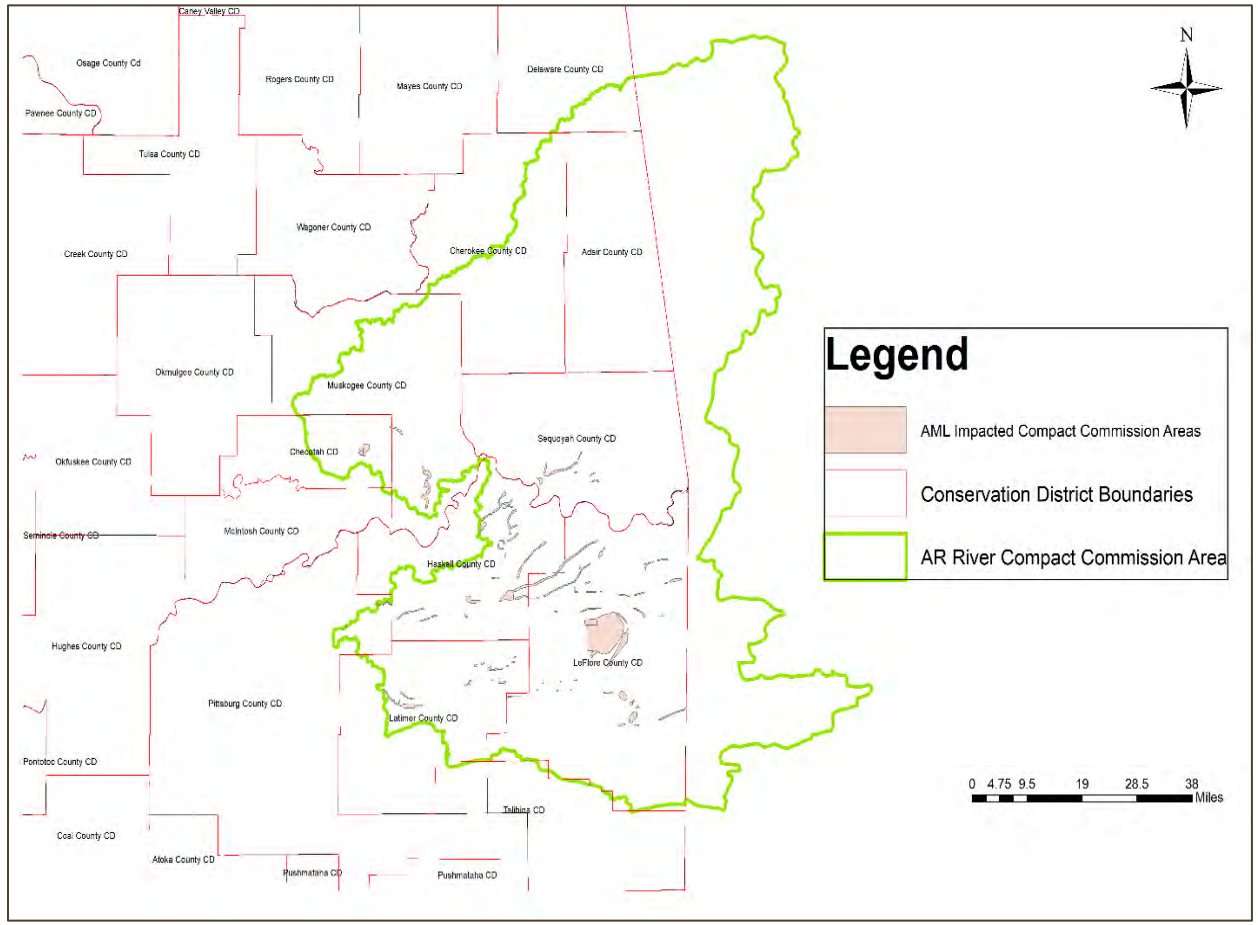
Upstream Flood Control Structure Program

- Conservation Districts, NRCS, OCC, and other partners work to maintain a system of 2,107 dams across OK that save $96 million, trap 19 million tons of sediment, protect 41,744 farms and ranches each year and create 90,979 acres of wetland
- 55 of these structures are within the compact commission area
  - Districts, NRCS, and OCC are completing operation and maintenance
  - Partners also planning rehabilitation on 6 of these structures



Abandoned Mine Lands Program

- Reclamation of abandoned coal mine sites to preserve public health and safety
- To date has reclaimed 186 historical mine sites including 5,497 acres of land, 319,808 feet of dangerous highwall removal, 257 hazardous waterbodies reclaimed, 223 subsidence sites and 22 structures removed, 397 mine openings closed, and 16 miles of clean streams reclaimed.
- Compact commission area contains at least 51,660 acres of these areas
- In 2020-2021, the program administered, completed or managed long-term vegetative management on five sites.
  - Two project restorations completed: $463,879
  - Restored 51 acres of land, removed 1,433 feet highwall, 2 hazardous waterbodies and 42.7 acres of spoil



Questions?



- Shanon Phillips
- Oklahoma Conservation Commission
- 405-522-4728
- Shanon.Phillips@conservation.ok.gov

OKLAHOMA CONSERVATION COMMISSION

ARKANSAS RIVER BASIN COMPACT

ARKANSAS-OKLAHOMA, 1972, WITH

SUPPLEMENTAL INTERPRETIVE

COMMENTS

SUPPLEMENT NO, 1

ARKANSAS RIVER COMPACT COMMISSION

MARCH 16, 1970
REVISED MARCH 3, 1972

ARKANSAS RIVER BASIN COMPACT ARKANSAS-OKLAHOMA, 1972, WITH SUPPLEMENTAL INTERPRETIVE COMMENTS

SUPPLEMENT NO. 1

Approved by the

ARKANSAS RIVER COMPACT COMMITTEE

FOR ARKANSAS:

S. Keith Jackson
Committee Member

John Luce
Committee Member
(alternate)

FOR OKLAHOMA:

Glade R. Kirkpatrick
Committee Member

Milton Craig
Committee Member
(alternate)

FOR UNITED STATES OF AMERICA:

Trigg Twichell
Federal Representative and Chairman of Committee

March 16, 1970
Revised March 3, 1972

Office of Representative, United States 300 E. 8th St., Austin, Tex. 78701

PREFACE

In 1955, the Congress of the United States by Public Law 97, 84th Congress, 1st Session, granted consent to the States of Arkansas and Oklahoma to negotiate and enter into a Compact for the apportionment of the waters of the Arkansas River and its tributaries between the two States. With this authorization and the appointment of a Federal Representative to act as Chairman, the States created the Arkansas-Oklahoma Arkansas River Compact Committee on March 14, 1956, for the purpose of drafting a proposed Compact for the apportionment of the waters of the Arkansas River and its tributaries as they affect those States.

From the beginning the Committee was deliberate in its operations. Two important subcommittees: engineering and legal, were appointed early for the purpose of assembling, analyzing, and interpreting essential engineering and legal data needed by the Compact Committee.

The engineering subcommittee made hydrologic studies which were utilized in determining that portion of the Arkansas River Basin that should be covered by the interstate Compact, analyzed the quantity, quality, and mode of occurrence of the water resources of the area in question and made long-range estimates of the quantities of water that would be needed by the States in future years, recognizing existing water rights and water uses.

The legal committee researched existing Interstate Water Compacts and continuously advised the Compact Committee on legal matters that related to Compact negotiations.

The work of these subcommittees and their reports were invaluable to the Compact committee in reaching its unanimous agreement of the proposed Compact.

The Federal Representative employed a consulting engineer in the field of interstate compacts, and received legal counsel from the U.S. Department of Justice on matters that were of concern to the Federal agencies.

The Arkansas River Compact Committee approved its first formal interstate Compact draft March 16, 1970.

The State of Arkansas ratified this Compact draft through its Act No. 16, 1971, as passed by the Arkansas General Assembly and signed by Governor Dale Bumpers, January 26, 1971.

The State of Oklahoma ratified the interstate Compact draft through H. B. No. 1326, as passed by the Oklahoma Legislature and signed by Governor David Hall, April 24, 1971. This ratification, however, carried the following amendment:

> "SECTION 2. This ratification is subject to the State of Oklahoma and the State of Arkansas, acting through their duly authorized compact representatives, amending said 'Arkansas River Basin Compact' in the particulars as set forth hereinafter, and further, that ratification of said amendment of said compact by the Legislature of the State of Arkansas. Said amendment being expressed as follows:
>
> "The following language shall be added to Article VI, Section A of said compact, to-wit: 'Provided however that nothing contained in this compact or its ratification by Arkansas or Oklahoma shall be interpreted as granting either State or the parties hereto the right or power of eminent domain in any manner whatsoever outside the borders of its own state.'"

The Arkansas River Compact Committee unanimously approved the Oklahoma amendment as an appropriate clarification statement in the Compact. The Federal member of the Committee was formally advised that the Federal agencies had no objections to this amendment.

The State of Arkansas adopted the State of Oklahoma's amendment to the Arkansas River Compact draft through Act No. 40, as passed by the Arkansas General Assembly and signed by Governor Dale Bumpers, February 17, 1972.

The Arkansas River Basin Compact, Arkansas-Oklahoma, 1972, as revised March 3, 1972, contains the amendment as approved by both States and corrections of typographical errors found in the March 16, 1970 draft.

ARKANSAS RIVER BASIN COMPACT
ARKANSAS-OKLAHOMA, 1972

with

SUPPLEMENTAL INTERPRETIVE COMMENTS
Prepared by the Compact Committee

Compact

> The State of Arkansas and the State of Oklahoma, acting through their duly authorized Compact representatives, S. Keith Jackson of Arkansas and Glade R. Kirkpatrick of Oklahoma, after negotiations participated in by Trigg Twichell, appointed by the President as the representative of the United States of America, pursuant to and in accordance with the consent to such negotations granted by an Act of Congress of the United States of America (Public Law 97, 84th Congress, 1st session), approved June 28, 1955, have agreed as follows respecting the waters of the Arkansas River and its tributaries:

Comment

On November 25, 1969, the authorized representatives of the States of Arkansas and Oklahoma approved the language of a draft of a Compact relating to the apportionment of the waters of the Arkansas River Basin originating in the two States between Muskogee, Oklahoma, and Van Buren, Arkansas; including Spavinaw Creek, a tributary to the Grand River upstream from Muskogee; and except the Canadian River above Eufaula Dam, a tributary to the Arkansas River between Muskogee and Van Buren.

The Compact is the result of negotiations between the parties over a period of years. The Compact Committee had the cooperation and advice of all interested Federal agencies, including the counsel of representatives of the United States Department of Justice. Its activities were supported by the water resources agencies of the States. In addition, extensive studies were conducted for the benefit of the Committee by the engineering departments of the University of Arkansas and Oklahoma State University under the federal Water Resources Research program.

These interpretive comments on the approved draft of November 25, 1969, have been prepared so that members of the respective legislatures, congressional committees, Federal agencies, and subsequent Compact administrators might be fully appraised of the intent of the Compact negotiating Committee with regard to each Article of the Compact.

ARTICLE I

Compact

The major purposes of this Compact are:

A. To promote interstate comity between the States of Arkansas and Oklahoma;

B. To provide for an equitable apportionment of the waters of the Arkansas River between the States of Arkansas and Oklahoma and to promote the orderly development thereof;

C. To provide an agency for administering the water apportionment agreed to herein;

D. To encourage the maintenance of an active pollution abatement program in each of the two States and to seek the further reduction of both natural and man-made pollution in the waters of the Arkansas River Basin; and

E. To facilitate the cooperation of the water administration agencies of the States of Arkansas and Oklahoma in the total development and management of the water resources of the Arkansas River Basin.

Comment

Article I is self-explanatory.

ARTICLE II

Compact

As used in this Compact:

A. The term "State" means either State signatory hereto and shall be construed to include any person or

persons, entity or agency of either State who, by reason of official responsibility or by designation of the Governor of that State, is acting as an official representative of that State.

B. The term "Arkansas-Oklahoma Arkansas River Compact Commission," or the term "Commission" means the agency created by this Compact for the administration thereof.

C. The term "Arkansas River Basin" means all of the drainage basin of the Arkansas River and its tributaries from a point immediately below the confluence of the Grand-Neosho River with the Arkansas River near Muskogee, Oklahoma, to a point immediately below the confluence of Lee Creek with the Arkansas River near Van Buren, Arkansas, together with the drainage basin of Spavinaw Creek in Arkansas, but excluding that portion of the drainage basin of the Canadian River above Eufaula Dam.

D. The term "Spavinaw Creek Sub-basin" means the drainage area of Spavinaw Creek in the State of Arkansas.

E. The term "Illinois River Sub-basin" means the drainage area of Illinois River in the State of Arkansas.

F. The term "Lee Creek Sub-basin" means the drainage area of Lee Creek in the State of Arkansas and the State of Oklahoma.

G. The term "Poteau River Sub-basin" means the drainage area of Poteau River in the State of Arkansas.

H. The term "Arkansas River Sub-basin" means all areas of the Arkansas River Basin except the four sub-basins described above.

I. The term "water year" means a twelve-month period beginning on October 1, and ending September 30.

J. The term "annual yield" means the computed annual gross runoff from any specified sub-basin which would have passed any certain point on a stream and would have originated within any specified area under natural conditions, without any man-made depletion or accretion during the water year.

K. The term "pollution" means contaimination or other alterations of the physical, chemical, biological or radiological properties of water or the discharge of any liquid, gaseous, or solid substances into any waters which creates, or is likely to result in a nuisance, or which renders or

is likely to render the waters into which it is discharged harmful, detrimental or injurious to public health, safety, or welfare, or which is harmful, detrimental or injurious to beneficial uses of the water.

Comment

This is the Article of specific definition of terms as they apply to this Compact.

Subsections A and B are self-explanatory.

Subsection C defines the "Arkansas River Basin" as it pertains to this Compact. (See figure 1). It isolates that portion of the overall Arkansas River drainage basin in which the States of Arkansas and Oklahoma are primarily and mutually concerned. All of the area above the gaging station on the main stem of the Arkansas River near Muskogee, Oklahoma, and the Eufaula Dam in the Canadian River except the Spavinaw Creek Basin in the State of Arkansas, has been excluded from consideration.

The intent of the Committee has been to deal with the water originating within the area delineated by this definition and no attempt has been made to define the rights, if any, of either State in waters originating outside the defined area which might flow into and through the area in the main stem of the Arkansas River or the Canadian River.

Waters of the Arkansas River Basin originating above Muskogee and Eufaula Dam have been allocated in part by Compacts between the States of Kansas and Oklahoma, and in the upper reaches of the basin between the States of Colorado and Kansas. The State of Arkansas was not a party to either of those Compacts, and the State of Oklahoma was not a party to the Colorado-Kansas Compact. Waters originating above

Eufaula Dam have been allocated in part by Compact between the States of New Mexico, Oklahoma and Texas; and the State of Arkansas was not a party to that Compact.

Both States recognize that storage has been constructed in the State of Oklahoma above Muskogee for the impounding and release of water to aid navigation in both the States of Oklahoma and Arkansas; and that such waters will in whole or in part flow through the Compact area. It is recognized also that power releases from reservoirs upstream of Muskogee will flow through the Compact area in the main stem of the Arkansas River, and may be subject to diversions and/or impoundment and use in either State. Flood control releases from upstream reservoirs will fall in the same category as power releases.

The drainage area in the State of Arkansas of Spavinaw Creek, a tributary of the Neosho River, has been included in this Compact area. The portion of Spavinaw Creek Basin lying in the State of Oklahoma was included in the physical delineation of the Grand-Neosho River Basin in the Kansas-Oklahoma Arkansas River Basin Compact. In the Kansas-Oklahoma Compact, Spavinaw Creek was excluded from the conservation storage limitation provisions which were the basis of that Compact.

The Spavinaw Creek Sub-basin has been included in this Compact, even though it is not directly tributary to the rest of the Compact area, because (1) the headwaters are in the State of Arkansas and the stream flows into the State of Oklahoma as is the case with all the other tributaries under consideration; (2) the rights of the State of Arkansas were not considered in the Kansas-Oklahoma Compact; and (3) the State of Oklahoma already has substantial development and interest in water supply of the stream.

The lower cutoff point of the Compact area has been placed immediately below the confluence of Lee Creek with the Arkansas River near Van Buren, Arkansas. Lee Creek is the farthest downstream tributary having headwaters in the State of Arkansas and flowing into the State of Oklahoma. It re-enters the State of Arkansas and flows into the Arkansas River in that State. There is interest in the Van Buren-Fort Smith area in Lee Creek as a source of municipal water supply.

Subsections D through H define the various sub-basins which, for purposes of this Compact, have been designated on Spavinaw Creek, Illinois River, Lee Creek and Poteau River, as well as for the Arkansas River main stem. These sub-basins differ from the sub-basins outlined in the Report of the Engineering Advisory Committee, dated January 1969, except for Lee Creek Sub-basin which remains consistent with the original report. It also differs from the Engineering Committee's original recommendations to the Compact Committee concerning the delineation of sub-basins. (See figure 1).

Subsection I is self-explanatory.

Subsection J defines "annual yield," which is a term basic to the allocations of this Compact. It refers to the runoff originating within any area and which would occur under unaltered natural conditions, i.e., where there would be no artificial man-made depletions of, or additions to, the original supply and no regulation of that supply.

The only time this could be measured absolutely would be before any facilities to utilize, import or impound water were constructed. After the first such facility is introduced, the measurement becomes something of an approximation relative to how accurately depletions can be computed

and their ratio to water yield. An excellent opportunity exists in this Compact area to establish relationship of "annual yield" and run-off at key points or with precipitation, or a combination of runoff and precipitation. This is true since depletions are small in relation to the average yield of this basin.

Subsection K is self-explanatory.

ARTICLE III

Compact

A. The physical and other conditions peculiar to the Arkansas River Basin constitute the basis of this Compact, and neither of the States hereby, nor the Congress of the United States by its consent hereto, concedes that this Compact establishes any general principle with respect to any other interstate stream.

B. By this Compact, neither State signatory hereto is relinquishing any interest or right it may have with respect to any waters flowing between them which do not originate in the Arkansas River Basin as defined by this Compact.

Comment

Subsection A confirms the principle that each Compact area has its own special problems and solutions thereto, and cannot provide per se the solutions for other compacting areas.

Subsection B is an affirmation of the principle of equitable apportionment between States of the water of interstate streams (Kansas v. Colorado, 206 U.S. 46; Colorado v. Kansas, 320 U.S. 383).

ARTICLE IV

Compact

The States of Arkansas and Oklahoma hereby agree upon the following apportionment of the waters of the Arkansas River Basin:

A. The State of Arkansas shall have the right to develop and use the waters of the Spavinaw Creek Sub-basin subject to the limitation that the annual yield shall not be depleted by more than fifty percent (50%).

B. The State of Arkansas shall have the right to develop and use the waters of the Illinois River Sub-basin subject to the limitation that the annual yield shall not be depleted by more than sixty percent (60%).

C. The State of Arkansas shall have the right to develop and use all waters originating within the Lee Creek Sub-basin in the State of Arkansas, or the equivalent thereof.

D. The State of Oklahoma shall have the right to develop and use all waters originating within the Lee Creek Sub-basin in the State of Oklahoma, or the equivalent thereof.

E. The State of Arkansas shall have the right to develop and use the waters of the Poteau River Sub-basin subject to the limitation that the annual yield shall not be depleted by more than sixty percent (60%).

F. The State of Oklahoma shall have the right to develop and use the waters of the Arkansas River Sub-basin subject to the limitation that the annual yield shall not be depleted by more than sixty percent (60%).

Comment

This Article apportions the available water resources of the Basin between the two States. Although large quantities of good quality water are available in the Basin, flows fluctuate widely, and provisions for storage will be essential to any substantial development of water use.

The record of Compact negotiations will show that early consideration was given to the possibility of writing a compact based on allocation of conservation storage. Near the end of negotiations and after careful deliberation and study, the consideration of conservation storage allocations was dropped and it was agreed to make allocations on the basis of percentages of annual yield.

It is realized that problems of deficient low flows presently exist and will no doubt continue in the future. Base flows of tributary streams in the Basin are generally low and most streams recede to no flow during dry periods. It is anticipated that future developments of storage facilities will provide for low flow augmentation but it is considered infeasible to specify minimum flows for any stream system. Release of flows from the system of major reservoirs presently constructed and planned for flood control, hydroelectric power and navigation should assure the maintenance of adequate flows throughout the main stem of the Arkansas River in the Compact area.

The percentages of annual flows apportioned between the States are based on the assumptions that the "upstream" State should generally have first call on available waters. Engineering studies have shown it is generally infeasible to develop over sixty percent (60%) of the long-term yield of any Basin in this area.

The division of water is on the basis that forty percent (40%) of the annual yield would be delivered from the upstream State. Exceptions to this have been made in the cases of Spavinaw and Lee Creek Basins.

The City of Tulsa has developed 96,000 acre-feet of conservation storage on lower Spavinaw Creek in the State of Oklahoma for municipal water supply. These reservoirs collect flows from 386 square miles, of which 120 square miles are in the State of Arkansas. In recognition of these existing developments, it was agreed to limit the State of Arkansas allocation to fifty percent (50%) of the annual yield from the area in that State.

The Lee Creek Basin roughly parallels the Arkansas-Oklahoma stateline. The drainage area is approximately sixty percent (60%) in the State of Arkansas and forty percent (40%) in the State of Oklahoma. The main stem rises in the State of Arkansas, but some small tributaries in the upper reaches rise in the State of Oklahoma and flow into the State of Arkansas. The main stem first crosses the Arkansas-Oklahoma stateline at mile 24.6, and then flows back into the State of Arkansas at mile 9.0, crossing and recrossing the stateline until entering the State of Arkansas for the last time at mile 7.6. This watershed is an excellent source of water for the Fort Smith metropolitan area, including nearby areas in the State of Oklahoma, and for which there is a large potential need for future water supplies. In order to permit the full development of this Basin, it was agreed that waters of this Basin be allocated on the basis of origin. This will permit either State to fully develop, use and consume a quantity of water equal to the total annual yield of the Lee Creek Basin in each State.

Each State recognizes that waters are now being transported from one basin to another and that these transbasin diversions could increase in the future. It is also recognized that such transbasin diversion of water is a charge against the apportionment to the respective States.

ARTICLE V

Compact

A. On or before December 31 of each year, following the effective date of this Compact, the Commission shall determine the stateline yields of the Arkansas River Basin for the previous water year.

B. Any depletion of annual yield in excess of that allowed by the provisions of this Compact shall, subject to the control of the Commission, be delivered to the downstream State, and said delivery shall consist of not less than sixty percent (60%) of the current runoff of the basin.

C. Methods for determining the annual yield of each of the sub-basins shall be those developed and approved by the Commission.

Comments

Subsection A provides for the computation of "annual yield" before the end of the calendar year, while the computation itself is based on data available for the water year ending September 30 of that same calendar year. This means that necessary hydrologic data (such as stream flow, water quality, precipitation, etc.) will be required in less than three months after the end of the water year.

Subsection B provides for adjustment of annual depletions so that a depletion in excess of the allocation to either State during the previous water year shall be delivered (restored to the downstream State) as soon as practicable consistent with proper water management.

It is anticipated that each State should control its water management so that consumptive-use depletions will not exceed its allocation. Excess stream-flow depletions, which would be a withholding of water by any means (consumptive uses or storage) could possibly occur in low yield years, but could be made up in subsequent periods of high runoff.

No provisions are made in this Compact for credits for over-deliveries nor for continuing debits for under-deliveries. As a practical manner the water resources of the area are of such a magnitude, and the physical conditions limiting storage facilities are such that complete utilization of the allocated quantities might never be reached.

The allocations are of such magnitude in relation to these factors that the States essentially will be unrestricted in the control and use of the water resources of the Compact area. The Compact does, however, protect against the possibility of either State encroaching upon the rights of the other at some future time when maximum utilization could be approached. (There is a distinct possibility in this area that such a condition might never occur). Or, in a period of extreme drought, it would provide an equitable distribution of a limited water supply.

Subsection C is intended as a directive for determining annual yield. Appendix I attached to these comments outlines procedures for this purpose. Present depletions are small in relation to the original yield and an opportunity exists to establish correlations of yield at agreed-to points in both States. As developments occur in the future, it may be necessary to refine procedures and make arrangements for the collection of additional basic data. It is anticipated that a technical advisory group will be available to the Commission and will develop adequate procedures and make recommendations for the collection of necessary basic data as required for the proper administration of the Compact.

ARTICLE VI

Compact

A. Each State may construct, own and operate for its needs water storage reservoirs in the other State; provided, however, that nothing contained in this Compact or its ratification by Arkansas or Oklahoma shall be interpreted as granting either State or the parties hereto the right or power of eminent domain in any manner whatsoever outside the borders of its own State.

B. Depletion in annual yield of any sub-basin of the Arkansas River Basin caused by the operation of any water storage reservoir either heretofore or hereafter constructed by the United States or any of its agencies, instrumentalities or wards, or by a State, political sub-division thereof, or any person or persons shall be charged against the State in which the yield therefrom is utilized.

C. Each State shall have the free and unrestricted right to utilize the natural channel of any stream within the Arkansas River Basin for conveyance through the other State of waters released from any water storage reservoir for an intended downstream point of diversion or use without loss of ownership of such waters; provided, however, that a reduction shall be made in the amount of water which can be withdrawn at point of removal, equal to the transmission losses.

Comment

This Article recognizes the possibilities of special problems arising and sets forth general provisions for handling some of these problems.

In Subsection A, the Committee recognizes that storage capacity may be constructed by one State in the other and that the Compact creates no bar to such construction. Each State, either individually or the two States jointly, may construct, own and operate for their needs water storage reservoirs in either State.

Subsection B makes it quite clear that depletions resulting from storage constructed at any point in the Basin by the United States, the States or individuals shall be charged against the State in which the benefits of the depletion are realized. Although the Compact is silent as to what part the Commission might take in the event that storage is constructed in one State for the benefit of the other State, it is the view of the Committee that such matters would be worked out at State level so long as the provisions of the Compact are complied with.

Subsection C allows either State to use the channel as a conveyor to transport water from a structure in one State to a point in the other State where it can be used. The only restriction is that a carriage or transmission loss will be charged against the State utilizing the natural channel in the other State. The amount of such transmission loss will be determined by the Compact Commission whenever the need arises.

ARTICLE VII

Compact

The States of Arkansas and Oklahoma mutually agree to:

A. The principle of individual State effort to abate man-made pollution within each State's respective borders, and the continuing support of both States in an active pollution abatement program;

B. The cooperation of the appropriate State agencies in the States of Arkansas and Oklahoma to investigate and abate sources of alleged interstate pollution within the Arkansas River Basin;

C. Enter into joint programs for the identification and control of sources of pollution of the waters of the Arkansas River and its tributaries which are of interstate significance;

D. The principle that neither State may require the other to provide water for the purpose of water quality control as a substitute for adequate waste treatment;

E. Utilize the provisions of all Federal and State water pollution laws and to recognize such water quality standards as may be now or hereafter established under the Federal Water Pollution Control Act in the resolution of any pollution problems affecting the waters of the Arkansas River Basin.

Comment

The States recognize that there is no serious interstate pollution problem in the Basin at present; and that the States are obligated to maintain adequate water quality in the Arkansas River Basin through

whatever means is available to them. An important provision is that neither State may require the other to provide water for the purpose of water quality control as a substitute for adequate waste treatment.

Through active pollution abatement programs the States hope to avoid the conflict over future problems, but have provided that, if necessary, they may utilize the provisions of the Federal Water Pollution Control Act in cases which cannot be resolved within the provisions of the Compact.

ARTICLE VIII

Compact

A. There is hereby created an interstate administrative agency to be known as the "Arkansas-Oklahoma Arkansas River Compact Commission." The Commission shall be composed of three Commissioners representing the State of Arkansas and three Commissioners representing the State of Oklahoma, selected as provided below; and, if designated by the President or an authorized Federal agency, one Commissioner representing the United States. The President, or the Federal agency authorized to make such appointments, is hereby requested to designate a Commissioner and an alternate representing the United States. The Federal Commissioner, if one be designated, shall be the Chairman and presiding officer of the Commission, but shall not have the right to vote in any of the deliberations of the Commission.

B. One Arkansas Commissioner shall be the Director of the Arkansas Soil and Water Conservation Commission, or such other agency as may be hereafter responsible for administering water law in the State. The other two Commissioners shall reside in the Arkansas River drainage area in the State of Arkansas and shall be appointed by the Governor, by and with the advice and consent of the Senate, to four-year staggered terms with the first two Commissioners being appointed simultaneously to terms of two (2) and four (4) years, respectively.

C. One Oklahoma Commissioner shall be the Director of the Oklahoma Water Resources Board, or such other agency as may be hereafter responsible for administering water law in the State. The other two Commissioners shall reside within the Arkansas River drainage area in the State of Oklahoma and shall be appointed by the Governor, by and with the advice and consent of the Senate, to four-year staggered terms, with the first two Commissioners being appointed simultaneously to terms of two (2) and four (4) years, respectively.

D. A majority of the Commissioners of each State and the Commissioner or his alternate representing the United States, if they are so designated, must be present to constitute a quorum. In taking any Commission action, each signatory State shall have a single vote representing the majority opinion of the Commissioners of that State.

E. In the case of a tie vote on any of the Commission's determinations, orders, or other actions, a majority of the Commissioners of either State may, upon written request to the Chairman, submit the question to arbitration. Arbitration shall not be compulsory, but on the event of arbitration, there shall be three arbitrators:

(1) One named by resolution duly adopted by the Arkansas Soil and Water Conservation Commission, or such other State agency as may be hereafter responsible for administering water law in the State of Arkansas; and

(2) One named by resolution duly adopted by the Oklahoma Water Resources Board, or such other State agency as may be hereafter responsible for administering water law in the State of Oklahoma; and

(3) The third chosen by the two arbitrators who are selected as provided above.

If the arbitrators fail to select a third within sixty (60) days following their selection, then he shall be chosen by the Chairman of the Commission.

F. The salaries and personal expenses of each Commissioner shall be paid by the Government which he represents. All other expenses which are incurred by the Commission incident to the administration of this Compact shall be borne equally by the two States and shall be paid by the

Commission out of the "Arkansas-Oklahoma Arkansas River Compact Fund," initiated and maintained as provided in Article IX(B)(5) below. The States hereby mutually agree to appropriate sums sufficient to cover its share of the expenses incurred in the administration of this Compact, to be paid into said fund. Disbursements shall be made from said fund in such manner as may be authorized by the Commission. Such funds shall not be subject to the audit and accounting procedures of the States; however, all receipts and disbursements of funds handled by the Commission shall be audited by a qualified independent public accountant at regular intervals, and the report of such audit shall be included in and become a part of the annual report of the Commission, provided by Article IX(B)(6) below. The Commission shall not pledge the credit of either State and shall not incur any obligations prior to the availability of funds adequate to meet the same.

Comment

This Article creates the administrative agency which will administer the terms of this Compact after it becomes effective through ratification by the States and approval by the Congress. The provisions are similar to those adopted in a number of other interstate stream compacts.

The Article provides for three members for each of the signatory States as Commission members and staggers the terms of those members in order to insure some degree of continuity in its membership.

Subsection D defines a quorum and provides that each State shall have only one vote which represents the majority decision of each State in conducting the business affairs of the Commission.

Subsection E sets forth arbitration procedures for the Commission in the event of a tie vote on important matters. Arbitration is not to be compulsory but is provided in the event that some matter of extreme concern to one of the States requires such action.

Subsection F sets forth the procedure for paying the salaries and expenses of the Commissioners and costs incurred by the Commission in the administration of the Compact. This subsection together with Article IX(B)(5) creates a Compact fund which is essential to flexibility of operation. It also provides for auditing procedures and the report of such audit.

ARTICLE IX

Compact

A. The Commission shall have the power to:

(1) Employ such engineering, legal, clerical and other personnel as in its judgment may be necessary for the performance of its functions under this Compact;

(2) Enter into contracts with appropriate State or Federal agencies for the collection, correlation, and presentation of factual data, for the maintenance of records and for the preparation of reports;

(3) Establish and maintain an office for the conduct of its affairs;

(4) Adopt and procure a seal for its official use;

(5) Adopt rules and regulations governing its operations. The procedures employed for the administration of this Compact shall not be subject to any Administrative Procedures Act of either State, but shall be subject to the provisions hereof and to the rules and regulations of the Commission; provided, however, all rules and regulations of the Commission shall be filed with the Secretary of State of the signatory States;

(6) Cooperate with Federal and State agencies and political subdivisions of the signatory States in developing principles, consistent with the provisions of this Compact and with Federal and State policy, for the storage and release of

water from reservoirs, both existing and future within the Arkansas River Basin, for the purpose of assuring their operation in the best interests of the States and the United States;

(7) Hold hearings and compel the attendance of witnesses for the purpose of taking testimony and receiving other appropriate and proper evidence and issuing such appropriate orders as it deems necessary for the proper administration of this Compact, which orders shall be enforceable upon the request by the Commission or any other interested party in any court of competent jurisdiction within the county wherein the subject matter to which the order relates is in existence, subject to the right of review through the appellate courts of the State of situs. Any hearing held for the promulgation and issuance of orders shall be in the county and State of the subject matter of said hearing;

(8) Make and file official certified copies of any of its findings, recommendations or reports with such officers or agencies of either State, or the United States, as may have any interest in or jurisdiction over the subject matter. Findings of fact made by the Commission shall be admissible in evidence and shall constitute prima facie evidence of such fact in any court or before any agency of competent jurisdiction. The making of findings, recommendations, or reports by the Commission shall not be a condition precedent to instituting or maintaining any action or proceeding of any kind by a signatory State in any court, or before any tribunal, agency or officer, for the protection of any right under this Compact or for the enforcement of any of its provisions;

(9) Secure from the head of any department or agency of the Federal or State government such information, suggestions, estimates and statistics as it may need or believe to be useful for carrying out its functions and as may be available to or procurable by the department or agency to which the request is addressed;

(10) Print or otherwise reproduce and distribute all of its proceedings and reports; and

(11) Accept, for the purposes of this Compact, any and all private donations and gifts and Federal grants of money.

B. The Commission shall:

(1) Cause to be established, maintained and operated such stream, reservoir or other gaging stations as may be necessary for the proper administration of this Compact;

(2) Collect, analyze and report on data as to stream flows, water quality, annual yields and such other information as is necessary for the proper administration of this Compact;

(3) Continue research for developing methods of determining total basin yields;

(4) Perform all other functions required of it by the Compact and do all things necessary, proper or convenient in the performance of its duties thereunder;

(5) Establish and maintain the "Arkansas-Oklahoma Arkansas River Compact Fund," consisting of any and all funds received by the Commission under the authority of this Compact and deposited in one or more banks qualifying for the deposit of public funds of the signatory States;

(6) Prepare and submit an annual report to the Governor of each signatory State and to the President of the United States covering the activities of the Commission for the preceding fiscal year, together with an accounting of all funds received and expended by it in the conduct of its work;

(7) Prepare and submit to the Governor of each of the States of Arkansas and Oklahoma an annual budget covering the anticipated expenses of the Commission for the following fiscal year; and

(8) Make available to the Governor or any State agency of either State or to any authorized representative of the United States, upon request, any information within its possession.

Comment

Article IX sets forth the powers and duties of the administrative Commission. It provides the Commission with the necessary latitude and flexibility for carrying out the provisions and purposes of the Compact.

Subsection A enumerates the powers of the Commission while Subsection B sets out certain specific duties of the Commission. Other duties not specifically stated in Subsection B are implied in the inherent powers granted in Subsection A.

Subsection A(2) enables the Commission to obtain data which is important to the Commission's work and findings. Most of the data useful to the Commission will be gathered by other agencies. However, there could be times when necessary engineering or other data is not gathered by any other agency, and it might be desirable for the Commission to collect the data.

Subsection A(6) gives the Commission the power to cooperate directly and closely with Federal agencies in its administrative activities as they relate to interstate phases of project operation. This subsection deals with all types of storage and release of water whether it is under Federal or State control. Essentially it gives the Commission the power to manage the water resources of the Basin in the best possible manner.

In Subsection A(9) "secure" means that the Commission may obtain information, of whatever nature, by request or purchase if necessary, and is not intended to infer that the Commission will have the power to obtain such information by adverse means from any agency or such information as any agency is prevented by law from releasing. It is not the intent of the subsection that the Commission shall compete with other data collecting agencies of either State or Federal government, but rather that the Commission will utilize these available sources to the extent possible. It is necessary this Commission be given authority to do such work when it is not able to obtain needed information from other agencies due to budget or personnel limitations.

Subsections B(6) and (7) provide for annual reports and annual budgets to be submitted to the respective Governors of the signatory States and to the President of the United States, but sets no date for the submission of these reports. Therefore, it is incumbent upon the Compact Commission to set such a date in the rules and regulations of the Commission. This provides some flexibility in the preparation of the annual report permitting the date to be changed if and when it should become necessary.

All other subsections are self-explanatory.

ARTICLE X

Compact

A. The provisions hereof shall remain in full force and effect until changed or amended by unanimous action of the States acting through their Commissioners and until such changes are ratified by the legislatures of the respective States and consented to by the Congress of the United States in the same manner as this Compact is required to be ratified to become effective.

B. This Compact may be terminated at any time by the appropriate action of the legislature of both signatory States.

C. In the event of amendment or termination of the Compact, all rights established under the Compact shall continue unimpaired.

Comment

This Article affirms the rather obvious fact that no action can be taken to modify the provisions of the Compact without unanimous action of the States and until the changes are ratified by the legislatures and the Congress. It also recognizes the right to terminate by the appropriate action of the States, and the protection of vested rights in the case of such an event.

ARTICLE XI

Compact

Nothing in this Compact shall be deemed:

A. To impair or affect the powers, rights or obligations of the United States, or those claiming under its authority in, over and to the waters of the Arkansas River Basin;

B. To interfere with or impair the right or power of either signatory State to regulate within its boundaries the appropriation, use and control of waters within that State not inconsistent with its obligations under this Compact.

Comment

This Article is a general declaration whereby the States disclaim any intention of impairing or affecting the powers, rights, or obligations of the United States, as they apply to the Arkansas River Basin.

It clearly states that the Compact is not intended to interfere with or impair the rights or powers of either signatory State to regulate the waters within its own boundaries.

ARTICLE XII

Compact

If any part or application of this Compact should be declared invalid by a court of competent jurisdiction, all other provisions and applications of this Compact shall remain in full force and effect.

Comment

This Article is self-explanatory.

ARTICLE XIII

Compact

A. This Compact shall become binding and obligatory when it shall have been ratified by the legislature of each

State and consented to by the Congress of the United States, and when the Congressional Act consenting to this Compact includes the consent of Congress to name and join the United States as a party in any litigation in the United States Supreme Court, if the United States is an indispensable party, and if the litigation arises out of this Compact or its application, and if a signatory State is a party thereto.

B. The States of Arkansas and Oklahoma mutually agree and consent to be sued in the United States District Court under the provisions of Public Law 87-830 as enacted October 15, 1962, or as may be thereafter amended.

C. Notice of ratification by the legislature of each State shall be given by the Governor of that State to the Governor of the other State, and to the President of the United States, and the President is hereby requested to give notice to the Governor of each State of consent by the Congress of the United States.

IN WITNESS WHEREOF, the authorized representatives have executed three counterparts hereof each of which shall be and constitute an original, one of which shall be deposited with the Administrator of General Services of the United States, and one of which shall be forwarded to the Governor of each State.

DONE at the City of Tulsa, State of Oklahoma, this 3rd day of March, A.D., 19 72.

Comment

The Committee wishes to stress the importance of this Article. The utilization of the water resources of this Basin is in large part dependent upon storage facilities. Regulatory works are needed to control and to put the water to use. This area is a single unit within a larger area, the Arkansas-Red-White River Basins in which the pattern of development has been well established. It is now being and must in the future be achieved largely with the assistance and cooperation of the United States government. It is the hope of this Committee that there will be no need to exercise the consent authority which is sought in this Article. As a practical matter, however, should interstate litigation arise out of

the Compact or its application in which the United States is an indispensable party, no satisfactory solution can be reached unless the United States is made a party thereto.

The members of the Arkansas-Oklahoma Arkansas River Compact Committee agree March 3, 1972, that the foregoing statement expresses the intent of the Committee with regard to the draft of the Arkansas-Oklahoma Arkansas River Basin Compact dated November 25, 1969.

FOR ARKANSAS:

S. Keith Jackson
Committee Member

John Luce
Committee Member
(Alternate)

FOR OKLAHOMA:

Glade R. Kirkpatrick
Committee Member

Milton Craig
Committee Member
(Alternate)

Approved: Trigg Twichell
Trigg Twichell, Representative
United States of America

Attest: Willard B. Mills
Willard B. Mills, Secretary

ARKANSAS RIVER BASIN COMPACT

ARKANSAS-OKLAHOMA

APPENDIX I

Computation of Annual Yield

Article II J of the Arkansas River Compact - Arkansas-Oklahoma described "annual yield," which is a term basic to the allocations of this Compact. It refers to the runoff which would occur from any specified area under unaltered natural conditions - i.e., where there would be no artificial man-made depletions of or additions to the original supply and no regulation of that supply.

The only time this could be measured absolutely would be before any facilities to utilize, import or impound water were constructed; and before any of man's activities altered rainfall-runoff relations. Land management practices, while possibly significant for some areas, are difficult to evaluate and will be disregarded, at this time, in the computations to meet the requirements for the administration of this Compact. The accuracy of annual yield determinations will be dependent upon how accurately depletions, and their ratio to total water yield, can be computed. Fortunately, present depletions for most of the compact area are small in relation to the original yield and, until such time that additional developments are made, only reasonable estimates will suffice to assure that terms of the Compact are being met.

Basically, the determinations that are required are as follows: (1) the measurement or computation of the actual runoff from each of the several "sub-basins" as defined by the Compact for each water

year; (2) the computation of the corresponding total depletions and/or accretions in each of the respective sub-basins; (3) the sum of items (1) and (2) to obtain the "annual yield" for each basin; and (4) multiply item (3) by 100 minus the percent depletion allowed in Article IV of the Compact; and (5) compute deficiency, if any, by comparing item (4) with item (1). The following outlines procedures for computing each of these items:

Item 1. Reliable estimates to meet this requirement can be readily made for the several sub-basins on the basis of the existing (1970) stream-gaging stations. (See figure 1 for location of stations). All of the larger streams draining from the State of Arkansas into the State of Oklahoma are gaged in or near the stateline, and acceptable estimates for the total outflow from each sub-basin can be made on the basis of these records plus estimated flows from ungaged areas.

The computation of actual runoff from the Arkansas River Sub-basin will need to take into account both the inflow and outflow from the area. This computation can be made by application of the following equation:

$$Q_A = Q_V - \left[Q_M + Q_W + Q_2 + Q_3 + Q_4\right]$$

in which

Q_A = Total annual discharge originating from the Arkansas River Sub-Basin.

Q_V = Total annual discharge of the Arkansas River immediately below the mouth of Lee Creek presently measured at Van Buren gaging station.

Q_M = Total annual discharge of the Arkansas River immediately below the mouth of the Grand Neosho River, presently measured at the Muskogee gaging station.

Q_W = Total annual discharge of the Canadian River at Eufaula Dam, presently measured at Whitefield gaging station.

Q_2 = Total annual outflow from the Illinois River Sub-basin.

Q_3 = Total annual outflow from the Lee Creek Sub-basin.

Q_4 = Total annual outflow from the Poteau River Sub-basin.

Item 2. The total annual depletion in each sub-basin will be the sum of the following:

(a) Total stream diversions minus return flows.
(b) Depletions and/or accretions by major reservoirs.
(c) Evaporation losses from other than major reservoirs.
(d) Pumpage of ground water from alluvium aquifers.

The following comments relate to each of the above:

(a) Reliable data on this item are not generally available at this time but will need to be firmed up as development of the area's resources progresses. The principal items will be diversions for irrigation and for municipal and industrial water supplies. In the case of small irrigation uses, satisfactory estimates of consumption can be made on basis of acres and types of crops irrigated. Withdrawals for municipal and industrial uses are generally available but estimates of return flows may be necessary. So long as these diversions are small in relation to total runoff no high degree of accuracy will be required.

(b) Depletions caused by major reservoirs will probably be most significant. The depletion from such reservoirs for a given period will be the difference between inflow and outflow and can be determined from the following (all terms expressed in acre-feet):

The inflow, I, at damsite that would have occurred if reservoir had not been in place, can be computed by the following:

$$I = O \pm \Delta S + E + D - P + p,$$

in which

O = Outflow as measured at gaging station below dam, or from gate and spillway ratings.

ΔS = Change in storage volume at beginning and end of period.

P = Precipitation on reservoir surface.

p = Runoff that would have occurred from area covered by reservoir, computed by a derived rainfall-runoff factor, c times P, or cP.

E = Evaporation from reservoir surface.

D = Direct diversions from reservoir storage, not included in outflow; seepage from reservoir may also be a factor and, if not included in measured outflow as at gaging station below dam, should be estimated.

As the depletion is inflow minus outflow, this can be written:

$$I - O = -P + p \pm \Delta S + E + D.$$

(c) Evaporation from small lakes, such as those not designed for water supply, including flood-detention structures, farm ponds, and recreation lakes, may be estimated on basis of average water surface area and appropriate data from evaporation-pan records.

(d) Pumpage from stream alluviums may cause appreciable depletions in stream flow. This is not believed to be a factor at the present (1969) time, but could conceivably be in the future for some stream reaches.

CONCLUSION

The Arkansas River Compact Commission, with the assistance of a Technical Advisory Group, should include, as part of their annual

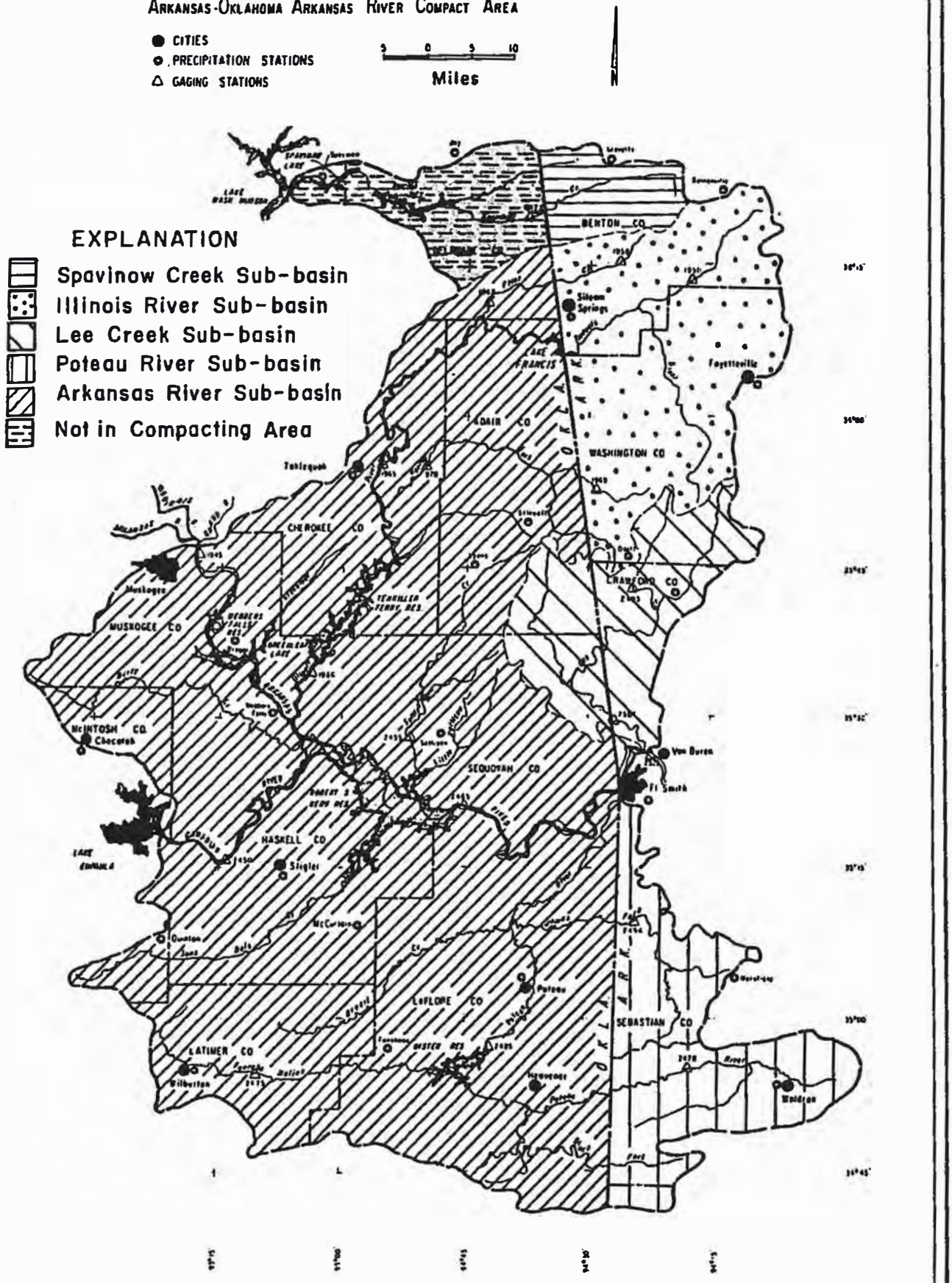
report, information on basin yields and depletions. Until such time as available data reveal that allocations between the States for any of the several sub-basins is in prospect of not being met, only generalized information will be adequate. As additional developments occur, the Commission should take steps to assure that the collection of basic data will be adequate to meet the needs of administration. As a minimum, the Commission should require the installation of instrumentation at such new reservoirs as will permit accurate determination of sub-basin inflow-outflow records.

Although allocations are to be based on annual yields, to be determined by December 31 of each year, current records will be required in the event provisions of Article V(B) need to be met, i.e., the delivery of sixty percent of current runoff to make up a deficiency.

The Commission should make continuing studies of the hydrology of the Basin for improvements or expansions in the collection of basic data as are needed to meet the changing needs for the administration of the Compact.

FIGURE 1

ARKANSAS-OKLAHOMA ARKANSAS RIVER COMPACT AREA



Revised March 3, 1972
NOVEMBER 25, 1969

ARKANSAS-OKLAHOMA
ARKANSAS RIVER COMPACT COMMISSION

RULES, REGULATIONS AND MODES OF PROCEDURE

(As Amended September 25, 1985, September 25, 1991, September 24, 1993, September 27, 2012, and September 24, 2015)

ARTICLE I
THE COMMISSION

1.1 The "Commission" is the "Arkansas-Oklahoma Arkansas River Compact Commission" referred to in Article VIII of the Arkansas River Basin Compact, Arkansas-Oklahoma.

1.2 The credentials of each Commissioner shall be filed with both the Chairman and the Secretary of the Commission. When the credentials of a new Commissioner are received, the Secretary shall promptly notify all other Commissioners of the name and address of the new Commissioner.

1.3 Each Commissioner shall advise the Commission in writing of the address to which all official notices and other Commission communications shall be sent for their receipt and shall further promptly advise in writing the office of the Commission of any changes in address.

ARTICLE II
COMMISSION OFFICERS

2.1 The officers of the Commission shall be a Chairman, a Secretary and a Treasurer.

2.2 The Commissioner (or "alternate") representing the United States shall be the Chairman of the Commission. The Chairman shall preside at meetings of the Commission. His duties shall be those usually imposed upon such officers and as may be assigned by these rules or by the Commission from time to time.

2.3 The Secretary shall be selected by the Commission. The Secretary shall serve for the term, and shall perform the duties, as the Commission shall direct. In case of a vacancy in the office of the Secretary, the Commission shall select a new Secretary as expeditiously as possible.

2.4 The Treasurer shall be selected by the Commission. The Treasurer shall receive, hold and disperse all funds of the Commission which shall come into his hands, and shall furnish a fidelity bond in an amount satisfactory to the Commission. The cost of the bond shall be paid by the Commission.

2.5 As the Commission may determine and direct, the various Commission officer positions may be joined and simultaneously held by the same person.

ARTICLE III
PRINCIPAL OFFICE

3.1 The principal office of the Commission shall be the office of the Chairman or the Secretary, as the Commission shall direct.

3.2 All official files, books and records of the Commission shall be kept and maintained in the principal office of the Commission. All such files, books and records shall be open to inspection by the public at the principal office of the Commission.

ARTICLE IV
COMMISSION MEETINGS

4.1 The annual meeting of the Commission shall be held on the fourth Thursday in September of each year. By prior agreement of all Commissioners, the Commission may select and designate a different date for holding the annual meeting.

4.2 Special meetings of the Commission may be called by the Chairman at any time. Upon written request of a majority of the Commissioners of either of the signatory states setting forth the matters to be considered at a special meeting, it shall be the duty of the Chairman to call a special meeting. Notice of all special meetings shall be sent by the Secretary to all members of the Commission by ordinary mail at least ten days in advance of the meeting and such notice shall state the purpose thereof.

4.3 Emergency meetings of the Commission may be called by the Chairman at any time upon request of either signatory state. For purposes of this rule, an "emergency" situation, for which an emergency meeting may be called, is understood to mean a situation involving an imminent threat of injury to persons or injury and damage to public or personal property or threat of imminent financial loss when time requirements make prior notice procedures impractical and, if adhered to, would increase the likelihood of injury, damage or financial loss.

4.4 Except as otherwise provided herein, prior notice of all Commission meetings shall be given by the Secretary to all Commissioners. Such notice shall advise of the date, time and place of the meeting and shall include an agenda for the meeting or, as may be applicable, a statement of the purpose of or matters to be considered at the meeting. Upon receipt of such notice, it shall be the responsibility of the signatory state to, in-turn, furnish notice to the public in its state such as may be required or provided under the laws of that state. Except as may be otherwise required under the laws of a signatory state, no advance public notice shall be required for the calling and conducting of emergency meetings. At the earliest possible time following any emergency meeting, the public will be notified of any Commission action taken at the meeting.

4.5 Meetings of the Commission shall be held at such places as shall be agreed upon by the Commissioners.

4.6 Minutes of Commission meetings shall be made and preserved in a suitable manner. Until approved by the Commission, minutes shall not be official and shall be furnished only to members of the Commission, its employees and committees.

4.7 A majority of the Commissioners of each state, and the Commissioner (or alternate) representing the United States, must be present to constitute a quorum.

4.8 In taking any Commission action, each signatory state shall have a single vote representing the majority opinion of the Commissioners of that State. The Commissioner (or alternate) representing the United States shall not have the right to vote in any of the deliberations or actions of the Commission.

4.9 In the case of a tie vote on any of the Commission's determinations, orders, or other actions, a majority of the Commissioners of either state may, upon written request to the Chairman, submit the question to arbitration. Arbitration shall not be compulsory, but, in the event of arbitration, there shall be three arbitrators chosen as follows:

(1) One named by resolution duly adopted by the Arkansas Soil and Water Conservation Commission, or such other State agency as may be hereafter responsible for administering water law in the State of Arkansas; and

(2) One named by resolution duly adopted by the Oklahoma Water Resources Board, or such other State agency as may be hereafter responsible for administering water law in the State of Oklahoma; and

(3) The third chosen by the two arbitrators who are selected as provided above.

If the two arbitrators fail to select a third within sixty (60) days following their selection, then the third arbitrator shall be chosen by the Chairman of the Commission.

4.10 At each annual meeting of the Commission, the order of business, unless agreed otherwise, shall be as follows:

1. Call to Order;
2. Introductions and Announcements;
3. Approval of Agenda;
4. Reading, Correction and Approval of the Last Meeting;
5. Report of the Chairman;
6. Report of Secretary;
7. Report of Treasurer;
8. Report of Commissioners;
9. Report of Committees;

10. Unfinished Business;
11. New Business; and
12. Adjournment.

4.11 All meetings of the Commission, except executive sessions, shall be open to the public. Executive sessions shall be open only to members of the Commission and such advisers as may be designated by each member and employees as permitted by the Commission; provided, however, that the Commission may call witnesses before it when in executive session. The Commission may hold executive sessions only for the purposes of discussing:

(1) The employment, appointment, promotion, demotion, disciplining or resignation of a Commission employee or employees, members, advisers, or committee members;

(2) Pending or contemplated litigation or litigation settlement offers, and matters where the duty of the Commission's counsel to its client, pursuant to the Code of Professional Responsibility, clearly conflicts with the public's right to know; or

(3) The report, development, or course of action regarding security, personnel, plans, or devices.

No executive session may be held except on a vote, taken in public, by a majority of a quorum of the members present. Any motion or other decision considered or arrived at in executive session shall be voidable unless, following the executive session, the Commission reconvenes in public session and presents and votes on such motion or other decision.

ARTICLE V
COMMITTEES

*** **5.1** There shall be the following standing committees:
(a) Budget Committee;
(b) Engineering Committee;
(c) Environmental and Natural Resources Committee; and
(d) Legal Committee.

*** **5.2** The Committees shall have the following duties:
(a) The Budget Committee shall prepare the annual budget and advise the Commission on all fiscal matters that may be referred to it.
(b) The Engineering Committee shall advise the Commission on all engineering matters that may be referred to it.
(c) The Environmental and Natural Resources Committee shall advise the Commission on all environmental and natural resource matters including:
(1) the identification of common areas of environmental concerns and potential solutions to shared environmental and natural resource problems;
(2) the promotion of environmental awareness and sustainable economic development; and

(3) other environmental and natural resource matters that may be referred to it.

(d) The Legal Committee shall advise the Commission on all legal matters that may be referred to it.

5.3 Members of the standing committees shall be appointed by the Commission. The number of members of each committee shall be determined by the Commission. Each state shall be represented by an equal number of members on each committee with the Chairmanship for each committee alternating annually between the States of Arkansas and Oklahoma. Each state shall nominate the member or members representing the state to serve on each committee.

5.4 Formal committee reports shall be made in writing by the Chairman thereof, and shall be filed with the Commission at least ten days prior to the meeting scheduled for its discussion.

ARTICLE VI
RULES AND REGULATIONS

6.1 So far as is consistent with the Arkansas-Oklahoma Arkansas River Basin Compact, the Commission may adopt rules and regulations and may amend them from time to time. Amendments and/or revisions to the rules, regulations and modes of procedure may be made at any meeting of the Commission.

6.2 Rules and regulations of the Commission may be compiled and copies may be prepared for distribution to the public under such terms and conditions as the Commission may prescribe.

ARTICLE VII
FISCAL

7.1 All Commission funds shall be deposited in a depository, or depositories, designated by the Commission under the name of the "Arkansas-Oklahoma Arkansas River Compact Fund." Such funds shall be initiated and maintained by equal payments of each state into the fund.

**** **7.2** Disbursements of funds in the hands of the Treasurer shall be made by check signed by the Treasurer and another authorized signatory upon voucher approved by and reported to the Commission. All Commissioners are authorized signatories.

7.3 At each annual meeting of the Commission, the Commission shall adopt and transmit to the Governors of the two states the budget covering an estimate of its expenses for the following fiscal year. For purposes of this rule and requirement, the signatory states may individually assume and carry-out the responsibility of transmitting the Commission's adopted budget to that state's respective Governor.

** **7.4** All Commission receipts and disbursements shall be audited at least once every two years by a qualified independent certified public accountant to be selected by the Commission, and the report of the audit shall be included in, and become a part of, the annual report of the Commission.

7.5 An up-to-date inventory of all Commission property shall be kept at the principal office of the Commission.

7.6 The fiscal year of the Commission shall begin July 1 of each year and end June 30 of the next succeeding year.

ARTICLE VIII
ANNUAL REPORT

8.1 The Commission shall annually make and transmit as soon as available to the Governors of the signatory states, and to the President of the United States, a report covering the activities of the Commission for the preceding fiscal year.

*** **8.2** The annual report shall include the following:

(a) Minutes of all regular, special or emergency meetings held during the year;

(b) All findings of facts made by the Commission during the preceding year;

(c) Recommendations for actions by the signatory states;

(d) Statements as to any cooperative studies made during the preceding year;

(e) All data which the Commission deems pertinent;

(f) The budget for current and future years;

(g) The most recent audit or financial statement of the Arkansas-Oklahoma Arkansas River Compact Fund;

(h) Name, address and phone number of each Commissioner and each member of all standing committees; and

(i) Such other pertinent matters as the Commission may require.

ARTICLE IX
MISCELLANEOUS

9.1 The Commission shall on request make available to the Governor of each of the signatory states any information within its possession at any time.

9.2 All contracts or other instruments in writing to be signed for and on behalf of the Commission, except matters related to the receipt or disbursement of funds, shall be signed by the Chairman when authorized by the Commission and attested to by at least one Commissioner from each State.

9.3 The Commission shall have the power to employ such engineering, legal, clerical and other personnel as in its judgment may be necessary for the performance of its functions under the Compact.

ARTICLE X
HEARINGS BEFORE THE COMMISSION

***** **10.1(A)** As the Commission may determine and direct, the Commission may hold hearings for the purpose of taking testimony and receiving evidence for the identification of interstate problems within the purposes of this Compact and issuing such appropriate orders as it deems necessary for the proper administration of the Arkansas-Oklahoma Arkansas River Basin Compact. Any interested person or entity may make application to the Commission requesting that a hearing be held on any matter arising under, or otherwise within the purview of, the Compact, provided, such applications must meet the following requirements:

(a) The application must be in writing and filed with the Chairman, with a copy thereof being simultaneously furnished, by the applicant, to all Commissioners.

(b) The application must state and describe the identity and address of the applicant(s) and, where appropriate, the applicant's representatives in pursuit of the application; the interest of the applicant(s) in presenting the application and requesting that a hearing be held; the purpose, subject matter, issues, concerns and/or allegations sought to be entertained and considered through the hearing applied for; and, as may be appropriate to the purposes of the hearing sought, the relief or other official Commission action being requested through the hearing.

Unless determined and directed otherwise by the Commission, applications for Commission hearings shall be placed, for Commission review and consideration, on the agenda for the next regularly scheduled annual meeting of the Commission following the filing of the application. Applicant(s) shall be notified, in advance by the Chairman, of the date, time and place of the meeting at which the application will be considered and acted upon by the Commission.

10.1(B) All hearings shall be open to the public and may be scheduled and conducted as part of an annual or special meeting of the Commission or as may be determined otherwise by the Commission. The presiding officers at such hearings shall be one Commissioner from each state designated and appointed to serve as presiding officer by the respective state.

10.2 Orders of the Commission shall be enforceable upon the request of the Commission or any other interested party in any court of competent jurisdiction within the county wherein the subject matter to which the order relates is in existence, subject to the right of review through the appellate courts of the state of situs.

10.3 Any hearing held for the promulgation and issuance of orders shall be in the county and state of the subject matter of said hearing.

10.4 In the event the Commission directs that a hearing be held, all interested parties shall be afforded an opportunity to be heard after reasonable notice. Such notice shall include, among other matters deemed appropriate:

(a) A statement of the date, time, place, and nature of the hearing;

(b) A statement of the legal authority and jurisdiction under which the hearing is to be held;

(c) A reference to any particular matter or any statute or rules involved; and

(d) A short and plain statement of the matters asserted or which are the subject or purpose of the hearing.

If the Commission, or any other interested party, is unable to state the matters in detail at the time the notice is served, the initial notice may be limited to a statement of the issues. Thereafter, and upon application, a more definite and detailed statement shall be furnished.

10.5 A record of the hearing shall be kept and maintained and shall include:

(a) All pleadings, motions and intermediate rulings;

(b) Evidence received or considered;

(c) A statement of matters officially noticed;

(d) Questions and offers of proof, objections, and rulings thereon;

(e) Proposed findings and exceptions thereto;

(f) Any decision, opinion or report by the officers presiding at the hearing; and

(g) All staff memoranda or data submitted to the Commission in connection with their consideration of the matter before such hearing.

10.6 Findings of facts shall be based exclusively on the evidence and on the matters officially noticed by the Commission.

10.7 Oral proceedings or any part thereof shall be transcribed on request of any party and the cost of transcription shall be paid by the requesting party.

10.8 At its hearings, the Commission may admit and give probative effect to evidence which possesses probative value commonly accepted by reasonably prudent men in the conduct of their affairs. It shall give effect to the rules of privileged communications recognized by law. No greater exclusionary effect shall be given any such rule or privilege than would be obtained in an action in court. The Commission may exclude incompetent, irrelevant, immaterial and unduly repetitious evidence. Objections to evidentiary offers may be made and shall be noted in the record. Subject to these requirements, when a hearing will be expedited and the interest of the parties will not be prejudiced substantially thereby, any part of the evidence may be received in written form.

***** **10.9** Documentary evidence may be received in the form of copies or excerpts if the original is not readily available. Upon request, the parties shall be given an opportunity to compare the copy with the original. The record of hearings may be held open for a reasonable length of time to afford either party time to submit additional written statements ~~and/~~or evidence. An original and two copies (or three copies) of each document sought to be introduced into

evidence by a party at a Commission hearing must be presented to the officers presiding over the hearing by the party desiring and moving its admission.

10.10 A party may conduct cross-examination required for a full and true disclosure of the facts.

10.11 Notice may be taken of judicially recognized facts. In addition, notice may be taken of generally recognized technical or scientific facts within the Commission's specialized knowledge. Parties shall be notified, either before or during the hearing or be referenced in preliminary reports or otherwise, of the material noticed, including any staff memoranda or data, and they shall be afforded an opportunity to contest the material so noticed. The Commission's experience, technical competence and specialized knowledge may be utilized in the evaluation of the evidence.

10.12 In the case of hearings involving alleged or apparent violations of the Compact, the following procedures shall apply:

(a) If there is an alleged or apparent violation of the Compact, it should be made known to the Commission;

(b) Alleged violators shall submit an explanation for, or response to, the alleged violation to the Commission within thirty days of receipt of written notification of said violation from the Commission;

(c) The Commission shall refer the alleged violation to the Engineering and/or Legal Committee for investigation and review;

(d) After due investigation has been made, the Engineering and/or Legal Committee shall refer the matter to the Commission with recommendations concerning the action to be taken.

10.13 Any party shall at all times have the right to counsel, provided that such counsel must be duly licensed to practice law in one of the signatory States, or associated with an attorney thereof.

ARTICLE XI
PUBLICITY

11.1 Prior to the close of each meeting, the Chairman may draft a press release as directed by the Commission and submit it to the Commission for approval. All approved releases may be made available to the press by any member of the Commission.

11.2 The Commissioners shall not be restricted from participation in a press conference or interview, conducted at the request of a member of the press or other news media, but may not speak on behalf of the Commission without the prior approval of the Commission.

ARTICLE XII
POLLUTION

12.1 The Commission may provide a forum for the identification and discussion of pollution occurring in the Arkansas River Basin to the end that the signatory states will cooperate with each other and jointly encourage the maintenance of an active pollution abatement program in each of the two states.

12.2 The Commission shall encourage each individual state to take positive steps in the abatement of pollution identified by the Commission to exist in the Arkansas River Basin; provided however, neither state may require the other to provide water for the purpose of water quality control as a substitute for adequate waste treatment.

12.3 The Commission shall collect, analyze and report on data pertaining to water quality within the basin. For this purpose the Commission may enter into contracts as provided by Article IX, A(2) to be approved at a Commission meeting. Unless formally approved by the Commission, no such report shall be published or have any validity.

ARTICLE XIII
PROCEDURE FOR DISAGREEMENT ON CALCULATION OF ANNUAL YIELD*****

13.1 The Arkansas Natural Resources Commission and the Oklahoma Water Resources Board representatives of the Engineering Committee will calculate the annual yield using the following data:

- **(a)** Stream flows (USGS);
- **(b)** Precipitation on reservoir surface (USACE);
- **(c)** Evaporation from reservoir surface (USACE);
- **(d)** Diversions from streams (OWRB and ANRC);
- **(e)** Diversions from reservoir (USACE); and
- **(f)** Return flows (State's DEQ).

13.2 The most recent data available will be used for all calculations. Each state agency shall have free access to the other state agency's data. The states should review, investigate, and possibly include historical data and averages if current year reported data is significantly different from previous years. If there is disagreement regarding the data used in the

calculations, the agencies may schedule a conference call for clarification and resolution of the disagreement.

13.3. Current computation methods used to calculate the annual yield have been agreed to by both state agencies and are attached to these rules as A-1.

13.4 Any state proposing a change to the "Guidelines for the Computation of Annual Yields" for calculating the annual yield for a certain water year must bring the proposed change to the engineering committee for review. If the changes are deemed important enough to be included in the current year's report, the engineering committee members shall hold a conference call to discuss the topic. Prior to adopting the method for usage in the yield report, the engineering committee must agree upon a defined process for using the changed methodology to consistently obtain and calculate data.

13.5 Any grievances regarding the calculation of the annual yield should be presented to the Commission with supporting evidence.

*As amended at the annual meeting, September 25, 1985.
**As amended at the annual meeting, September 25, 1991.
***As amended at the annual meeting, September 24, 1993.
****As amended at the annual meeting, September 27, 2012.
*****As amended at the annual meeting, September 24, 2015.

ARKANSAS RIVER BASIN COMPACT

Guidelines for the Computation of Annual Yields

September 24, 2015

This document describes methods developed and approved by the Arkansas River Basin Compact Commission to compute the annual yields for the Spavinaw Creek, Illinois River, Lee Creek, Poteau River and Arkansas River Sub-basins of the Oklahoma-Arkansas River Compact.

General Description of Computation of Annual Yields

To compute annual yields for the Sub-basins identified above, one must take the following steps:

1. Determine the computation of actual runoff from each Sub-basin.
2. Determine the computation of total depletions or accretions in each of the respective Sub-basins**.**
3. Combine items (1) and (2) to obtain the "annual yield" for each basin.
4. Multiply item (3) by 100 minus the percentage of depletion allowed in Article IV of the Compact.
5. Compute deficiency, if any, by comparing item (4) to (1).

Items 1 and 2 are explained in this document, as these involve interpretation of the Compact, data collection and application of appropriate methods for computation of runoff, accretions, and depletions. Items 3 to 5 are not included herein as these are self-explanatory.

1. Computation of Actual Runoff from each Sub-basin

- The Engineering Committee will compute runoff data from the Sub-basins using the areas defined by the Compact in Article II. Active USGS streamflow gauges should be used to retrieve measured runoff as available. Since most gauges are not located on the Oklahoma-Arkansas state border, estimates of runoff should account for the ungauged flows generated in the drainage area above or below the selected gauge.

  The Engineering Committee will adjust the runoff measured at the gauges for the Spavinaw Creek, Illinois River, Lee Creek,and Poteau River Sub-basins-using simple linear interpolation, as follows:

$$R = R_M * \left[\frac{A_T}{A_G}\right] \qquad \textbf{(Eq. 1)}$$

Where,

R = *Actual runoff at the OK-ARK state line*

R_M = *Measured runoff at the gauge*

A_G = *Contributing area at the gauge*

A_U = *Area ungauged above or below gauge*

A_T = *Total area including ungauged portion. Because water from these Sub-basins originates in the state of Arkansas, then:*

- *If gauge is located on the Oklahoma side:* $A_T = A_G - A_U$
- *If gauge is located on Arkansas side:* $A_T = A_G + A_U$

The annual yields report should include a brief description of the procedure used to compute actual runoff (R) in these Sub-basins, and should also include the measured ungauged drainage areas used for such computation.

The Engineering Committee will use the following formula to calculate runoff for the Arkansas River Sub-basin:

$$Q_A = Q_V - [Q_M + Q_W + Q_2 + Q_3 + Q_4] \quad \textbf{(Eq. 2)}$$

Where,

Q_A = *Total annual discharge originating from the Arkansas River Sub-basin.*

Q_V = *Total annual discharge of the Arkansas River immediately below the mouth of Lee Creek presently measured at the Van Buren gauging station.*

Q_M = *Total annual discharge of the Arkansas River immediately below the mouth of the Grand Neosho River, presently measured at the Muskogee gauging station.*

Q_W = *Total annual discharge of the Canadian River at Eufaula Dam, presently measured at Whitefield gauging station.*

Q_2 = *Total annual outflow from the Illinois River Sub-basin.*

Q_3 = *Total annual outflow from the Lee Creek Sub-basin.*

Q_4 = *Total annual outflow from the Poteau River Sub-basin.*

- The Engineering Committee will obtain data, as available, from the USGS website (http://waterdata.usgs.gov/nwis) for the following gauges (Table 1):

Table 1. Current USGS gauges used for Computation of Runoff at Sub-basins in the Compact Area

Sub-basin	USGS Gauges Required	Drainage Area (mi^2)
Spavinaw Creek	07191220 - Spavinaw Creek near Sycamore, OK	133
Illinois River	07195855 - Flint Creek near West Siloam Springs, OK 07195500 - Illinois River near Watts, OK 07196900 - Baron Fork at Dutch Mills, AR	59.8 635 41
Lee Creek	07249985 - Lee Creek near Short OK	420
Poteau River	07247015 - Poteau River at Loving, OK 07247250 - Black Fork below Big Creek nr Page, OK 07247250 – James Fork near Hackett, AR	269[a] 74.4[b] 147[c]
Arkansas River	07194500 - Arkansas River near Muskogee, OK 07245000 - Canadian River near Whitefield, OK 07250550 - AR River at J. W. Trimble L&D nr Van Buren, AR	84,133 37,876 151,000[d]

[a] Does not include 25.1 sq. miles of ungauged drainage.

[b] Does not include 13.0 sq. miles of ungauged drainage.

[c] Does not include 35.2 sq. miles of ungauged drainage.

[d] Includes 22,200 sq. miles of drainage area in Kansas that "probably is noncontributing".

Data obtained from the eleven (11) above listed gauges is sufficient to accurately compute actual runoff from the Sub-basins, but different gauges could be used for the computation of runoff.

- Review of the Poteau River Sub-basin indicates that there are large portions of runoff that originate in Arkansas but are not included in the gauging. Calculations should be completed to estimate the runoff for these areas using the following equation.

$$R_U = R_M * \left[\frac{A_U}{A_G}\right] \quad \textbf{(Eq. 3)}$$

Where,

R_U *= Calculated runoff at the OK-AR state line from ungauged contributing streams*

R_M *= Measured runoff at the gauge*

A_G *= Contributing area at the gauge*

A_U *= Area contributing runoff for ungauged streams*

- Actual runoff should be computed on an annual basis, and monthly values should be included in the annual yields report as appendices, instead of the daily time series that has been included in previous reports. Units should be consistent, preferably in acre-feet (AF). Flows originating from outside the Compact area should not be included in the computation of actual runoff, unless specified in the Compact. Article II of the Compact defines the drainage areas for each Sub-basin as waters originating in the Compact area. In previous reports, return flows from the White River Basin have been removed from the flow originating in the Arkansas River Basin since the water is being transferred in from another basin. The return flow data is obtained from the water departments of the cities of Fayetteville, Rogers, and Springdale, AR.

2. Computation of Total Depletions or Accretions in each of the respective Sub-basins

The total annual depletion in each Sub-basin will be the sum of the following: **(a)** Total stream diversions minus return flows, **(b)** Depletions and/or accretions by major reservoirs, **(c)** Evaporation losses from other than major reservoirs, and **(d)** Pumpage of ground water alluvium aquifers. Data sources and procedures suggested for computation of these items are described as follows:

a) Total stream diversions minus return flows

Diversions from the Oklahoma side of the Compact, i.e. the Arkansas Sub-basin and the Oklahoma portion of the Lee Creek Sub-basin, should be estimated using information from the Oklahoma Water Resources Board (OWRB). Likewise, diversions from the Arkansas side of the Compact should be obtained from the Arkansas Natural Resources Commission (ANRC). These agencies manage the surface water rights in their respective states, and can provide information on the type of uses, allocated amounts, annual reported use, and estimates of return flows. Values of annual diversions for each sub-basin should be included in the report, along with a brief description of the methods and assumptions used in the calculation of return flows.

b) Depletions and/or accretions by major reservoirs

The Compact defines depletion as the difference between the inflow and outflow, using the following equation:

$$I - O = -P + p \pm \Delta S + E + D$$

in which

I - O *= Depletion in the reservoir.*

P *= Precipitation on reservoir surface.*

p *= Runoff that would have occurred from area covered by reservoir, computed by a derived rainfall-runoff factor c times P, or cP.*

ΔS *= Change in storage volume at beginning and end of period*

E *= Evaporation from reservoir surface.*

D *=Direct diversions from reservoir storage, not included in outflow; seepage from reservoir may also be a factor, and if not included in measured outflow as at ~~gaging~~ gauging station below dam, should be estimated.*

The Engineering Committee will obtain monthly data for the reservoirs of the Compact area from the USACE web page, at http://www.swt-wc.usace.army.mil/. Available data includes reservoir contents, as well as evaporation and precipitation measured over the reservoir surface.

- **Precipitation on reservoir surface (P)**

  The Engineering Committee will obtain monthly values of precipitation data measured over the lakes from the USACE webpage.

- **Runoff (p)**

  This component should be estimated as the product of precipitation (P) and a runoff coefficient. A runoff coefficient of 0.18 has been used since 1974 to determine the runoff quantity. It has been noted that the runoff coefficient value can vary depending on publications and that there is no way to know what existed in the area before the reservoirs were built. For these reasons it is agreed upon by the Engineering Committee to continue the use of 0.18 as the runoff coefficient since this is the value that has been used in all of the previous reports.

- **Change in Storage (ΔS)**

  Change in storage is defined in the compact as the *"Change in the storage volume at the beginning and end of a period"*, which for the water year would be computed as the difference between the contents at the end of the period (September 30th) minus the contents at the beginning of the period (October 1, previous calendar year).

- **Evaporation from reservoir surface (E)**

  The Engineering Committee will obtain monthly values of evaporation strictly measured over the lakes from the USACE webpage. Pan evaporation is used to estimate the evaporation from lakes. There is a correlation between lake evaporation and pan evaporation. Evaporation from a natural body of water is usually at a lower rate because the body of water does not have metal sides that get hot with the sun, and while light penetration in a pan is essentially uniform, light penetration in natural bodies of water will decrease as depth increases. Pan coefficients can vary depending on a number of different variables, including ground cover, levels of relative humidity, and 24 hour wind speed. Previous reports have used a pan coefficient of 0.70 for correlation between reservoir evaporation and pan evaporation.

Further discussion as to the coefficient value that should be used is required by the engineering committee.

- **Direct Diversions from reservoir surface (D)**

  Direct diversions from reservoir storage, not included in the outflow, should be computed using information from the OWRB water rights database. Previous reports only used data from the USACE, but did not include details such as the type of use, the year of the data, and if any return flows had been included in the computation.

c) Evaporation losses from other than major reservoirs

This item has not been addressed in previous reports. The Compact states that *"Evaporation from small lakes, such as those not designed for water supply, including flood-detentions structures, farm ponds, and recreation lakes, may be estimated on basis of average water surface area and appropriate data from evaporation-pan records."*

Further discussion about the data sources and feasibility of including this item in the computation of depletions needs to be discussed by the Engineering Committee. Inclusion of this item in the computation of depletions will be determined by the Engineering Committee.

d) Pumpage of ground water from alluvium aquifers

This item has not been included in previous reports. The Compact states that *Pumpage from stream alluviums may cause appreciable depletions in the stream flow. This is not believed to be a factor at the present (1969) time, but could conceivably be in the future for some stream reaches"* (Appendix I, Item 2, page 119).

Inclusion of this item in the computation of depletions will be determined by the Engineering Committee.

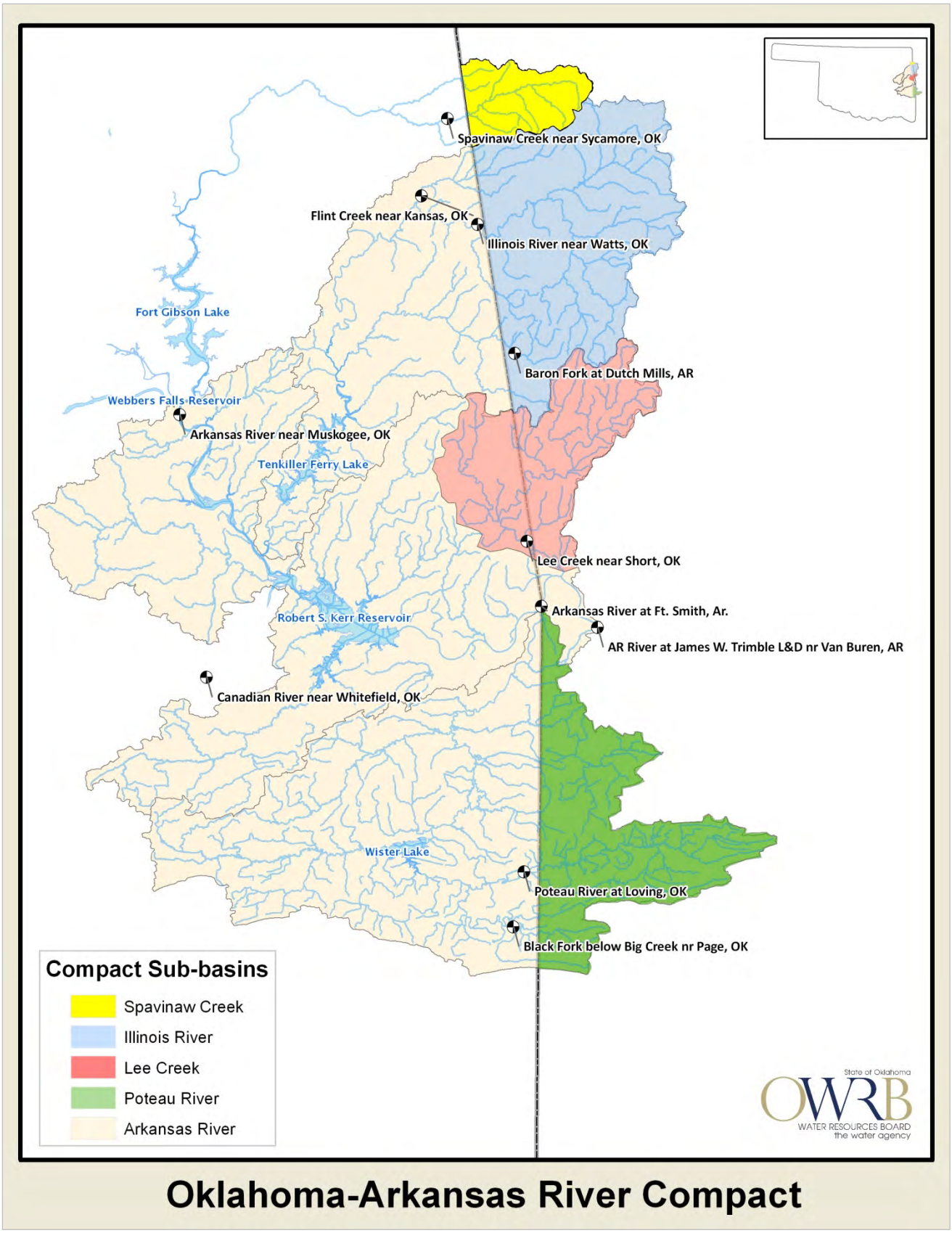


Figure 1. Map of the Oklahoma-Arkansas River Compact Area