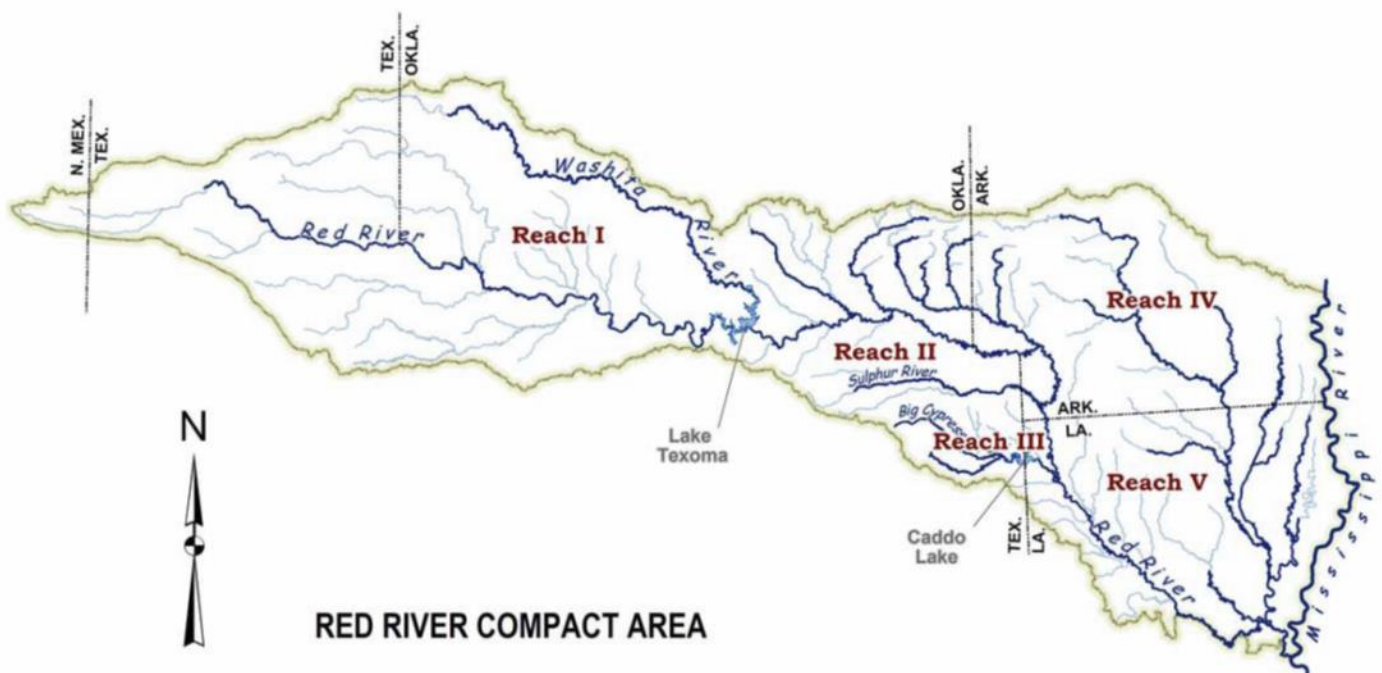
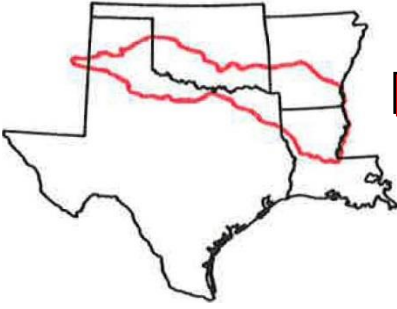


**REPORT
of the
RED RIVER
COMPACT COMMISSION
2021**



Published

2022



RED RIVER COMPACT COMMISSION

March 1, 2022

The President
United States of America

The Honorable Asa Hutchison, Governor
State of Arkansas

The Honorable John Bel Edwards, Governor
State of Louisiana

The Honorable J. Keven Stitt, Governor
State of Oklahoma

The Honorable Greg Abbott, Governor
State of Texas

Dear Mr. President and Governors:

The Red River Compact is an interstate agreement entered into by the States of Arkansas, Louisiana, Oklahoma, and Texas, with the consent of Congress, dealing with the water resources of the Red River Basin.

Pursuant to Section 10.02 paragraphs (d) and (e) of the Red River Compact and as directed by the Red River Compact Commission (RRCC), the interstate body overseeing the Compact, the Compact, at its 41st annual meeting, submitted the report of the RRCC, together with an account of all funds received and expended in the conduct of its work for FY 2020 and a budget covering the anticipated expenses of the Commission for Fiscal Year 2020-2021.

The State of Texas hosted the 41st Annual Meeting on April 27, 2021, in a remote format due to the COVID-19 pandemic.

Pursuant to the previous agreements to rotate the offices of Vice-Chairman and Secretary in connection with the rotation of the annual host state, the State of Louisiana has accepted the responsibility for both offices for FY 2022. The Office of Treasurer remained with the State of Arkansas.

Sincerely,

A handwritten signature in blue ink that reads "Sue Lowry".

Sue Lowry
Chairman and Federal Commissioner

RED RIVER COMPACT COMMISSION



41st ANNUAL MEETING APRIL 26 -27, 2021

Held Virtually Due to COVID-19
(Additional meeting information on page 3&4)

AGENDA

Monday, April 26, 2021: RRCC Committee Meetings - 1:30pm (CST)

- I. 1:30pm - Environmental Committee – Scott Van Winkle, Chair
<https://global.gotomeeting.com/join/487321565>
- II. 2:30pm - Engineering Committee – Scott Van Winkle, Chair
<https://global.gotomeeting.com/join/854852021>
- III. 3:30pm - Legal Committee - Heather Hunziker, Chair
<https://global.gotomeeting.com/join/567675197>
- IV. 4:00pm - Budget Committee – Scott Van Winkle, Chair
<https://global.gotomeeting.com/join/665932693>

Tuesday, April 27, 2021: RRCC Commission Meeting – 8:30am (CST)

<https://global.gotomeeting.com/join/239084549>

- I. Call to Order – Chairman Sue Lowry
- II. Welcome and Introductions
- III. Approval of the Agenda
- IV. Approval of the Minutes of the June 29-30, 2020 RRCC Annual Meeting held virtually due to COVID-19.
- V. Report of the Chairman – Sue Lowry
- VI. Report of the Treasurer – Ryan Benefield, Arkansas
- VII. Report of the Commissioners
 - A. Texas
 - B. Oklahoma

- C. Louisiana
- D. Arkansas

- VIII. Report of the Committees
 - A. Budget Committee – Scott Van Winkle
 - B. Legal Committee – Carl Myers
 - C. Engineering Committee – Scott Van Winkle
 - D. Environmental and Natural Resources Committee – Scott Van Winkle

- IX. Federal Agency Reports
 - A. U.S. Army Corps of Engineers
 - Update from Mike Abate, Chief Civil Works Branch, PPMD, Tulsa District Corps of Engineers
 - B. Bureau of Reclamation
 - C. U.S. Geological Survey
 - Update from Jason Lewis, Director of OK-TX Water Science Center, USGS
 - D. Natural Resources Conservation Service

- X. Updates and Discussion Topics
 - A. Update from Kim Lutz, Executive Director, America's Watershed Initiative
 - B. Resolution for the Funding of USGS Streamflow Gages
 - C. Update from Richard Brontoli, Executive Director, Red River Valley Association
 - D. Update from Laura-Ashley Overdyke, Executive Director, Caddo Lake Institute
 - E. Web presence for Red River Compact Commission
 - a. Online availability of the past few Annual Reports
 - F. Memorial Resolution Honoring Clyde M. Siebman

- XI. New Business
 - A. Annual Report
 - B. Commission Assignments to Committees
 - C. Election of Officers
 - D. Appointments or changes to Committees
 - E. 42nd Annual Meeting – Discussion on meeting host for 2022
 - Appointment of Vice-Chair and Secretary

- XII. Public Comment

- XIII. Adjournment

New to GoToMeeting? Get the app now and be ready when your first meeting starts:
<https://global.gotomeeting.com/install/239084549>

Monday, April 26, 2021: RRCC Committee Meetings (CST)

1:30pm - RRCC - Environmental Committee – Scott Van Winkle, Chair

Mon, Apr 26, 2021 1:30 PM - 2:30 PM (CDT)

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/487321565>

You can also dial in using your phone.

(For supported devices, tap a one-touch number below to join instantly.)

United States (Toll Free): 1 866 899 4679

- One-touch: <tel:+18668994679,,487321565#>

Access Code: 487-321-565

2:30pm - Engineering Committee – Scott Van Winkle, Chair

RRCC - Engineering Committee – Scott Van Winkle, Chair

Mon, Apr 26, 2021 2:30 PM - 3:30 PM (CDT)

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/854852021>

You can also dial in using your phone.

(For supported devices, tap a one-touch number below to join instantly.)

United States (Toll Free): 1 877 309 2073

- One-touch: <tel:+18773092073,,854852021#>

Access Code: 854-852-021

3:30pm - Legal Committee - Heather Hunziker, Chair

RRCC - Legal Committee - Heather Hunziker, Chair

Mon, Apr 26, 2021 3:30 PM - 4:00 PM (CDT)

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/567675197>

You can also dial in using your phone.

(For supported devices, tap a one-touch number below to join instantly.)

United States (Toll Free): 1 866 899 4679

- One-touch: <tel:+18668994679,,567675197#>

Access Code: 567-675-197

4:00pm - Budget Committee – Scott Van Winkle, Chair

RRCC - Budget Committee – Scott Van Winkle, Chair

Mon, Apr 26, 2021 4:00 PM - 5:00 PM (CDT)

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/665932693>

You can also dial in using your phone.

(For supported devices, tap a one-touch number below to join instantly.)

United States (Toll Free): 1 866 899 4679

- One-touch: <tel:+18668994679,,665932693#>

United States: +1 (571) 317-3116

- One-touch: <tel:+15713173116,,665932693#>

Access Code: 665-932-693

Tuesday, April 27, 2021: RRCC Commission Meeting

8:30am (CST)

RRCC Commission Meeting

Tue, Apr 27, 2021 8:30 AM - 12:30 PM (CDT)

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/239084549>

You can also dial in using your phone.

(For supported devices, tap a one-touch number below to join instantly.)

United States (Toll Free): 1 877 309 2073

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Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*
Toby Baker, *Executive Director*



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

April 20, 2021

Ms. Sue Lowry
Chairman and Federal Representative
Red River Compact Commission
Avocet Consulting LLC
5721 Syracuse Road
Cheyenne, Wyoming 82009

Dear Chairman Lowry,

I regret that I am unable to participate in the 2021 annual meeting of the Red River Compact Commission to be held April 26-27, 2021. In my absence, I grant my support and proxy vote as Commissioner to Mr. Richard Scott Van Winkle, Texas Commission on Environmental Quality, Engineer Advisor to the Red River Compact Commission, who plans to attend as representative for the TCEQ.

My best wishes to the Commission for a successful meeting.

Sincerely,

A handwritten signature in black ink, appearing to read "Toby Baker".

Toby Baker
Executive Director

Cc: Mr. Richard Scott Van Winkle, Texas Commission on Environmental Quality,
Engineer Advisor to the Red River Compact Commission

**MINUTES OF THE
RED RIVER COMPACT COMMISSION
41st ANNUAL MEETING**

**Remote Meeting Format
Sherman, Texas
April 27, 2021
8:30 a.m.**

I. CALL TO ORDER

Chairman Sue Lowry called to order the 41st Annual Red River Compact Commission meeting on Tuesday, April 27, 2021. 8:30am, held virtually due to Covid-19.

II. WELCOME

Chairman Lowry welcomed all to the meeting and acknowledged Robin Phillips; newest Commission Member for Texas, replacing Commissioner Siebman.
Commissioner Robin Phillips, of Texas welcomed everyone.
Chairman Lowry asked Commission Members to make a self-introduction; introductions followed.

In attendance: Andrea Williams McCoy, April Harris, Bill Cauthron, Carl Meyers, Christopher Churchill, Christopher Neel, David Brown, Doug Schooley, Edward Knight, Edward Swaim, Gary Burke, Heidi Stewart, James Scoggins, Jason Lewis, Jennifer Sheehan, John Michael Moore, Julie Cunningham, Ken Brazil, Lesia Warren, Marla Peek, Mary Schooley, Michael Bynum, Mike Abate, Nathan Kuhnert, Kirsty Oates, Randy Whiteman, Rich Brontoli, Rob Ziehr, Robin Phillips, Ryan Benefield, Sara Gibson, Scott Van Winkle, Shawn Jackson, Sue Lowry, Trent Gay, Wes Ward, Yohanes Sugeng.
Commissioner Charles Dobbs, Oklahoma was marked absent.

Chairman Lowry asked that everyone take a moment of silence to reflect on the passing of Commissioner Siebman, Commissioner Gibson and Kent Wilkins.

III. APPROVAL OF THE AGENDA

Chairman Lowry asked if there were requests to add to the Agenda that was circulated; there were none.

IV. APPROVAL OF THE MINUTES OF THE JUNE 29-30, 2020 RRCC ANNUAL MEETING HELD VITUALLY DUE TO COVID-19

The minutes stand approved.

V. REPORT OF THE CHAIRMAN

Chairman Lowry stated that the decision to meet virtually this year was due to the fact that it felt as though not enough people would be vaccinated and some states continue to have travel restrictions. She appreciates everyone's participation in the virtual meeting. Other than the deliverance of the resolution to the department of interior and our support of the Stream Gage network, she did again sign the coalition letter in support of the USGS stream gaging program, which was submitted to congress a couple weeks ago, that letter supported the basic stream gaging network of the USGS as well as the next generation observation system. The USGS are identifying 10 smaller basins across the country and to more fully network the gages and then to be able to improve streamflow estimations and other modeling efforts.

Chairman Lowry said that Louisiana state would cover more of the information regarding the hurricanes that have been occurring in the state, but she did add that in the committee meeting the previous day that there were not many days and no consecutive days that met the criteria of the Compact as far as low flow at the varies gages specified by the Compact.

VI. REPORT OF THE TREASURER

Mr. Benefield stated that the statement of the current budget vs actuals for this fiscal year is only a partial report as they are not through the end of the fiscal year. The statement is as of March 31, 2021, they have only spent \$180.76 dollar, mainly due to the virtual nature of the meetings and not having any printing costs. They have at the end of March deposited 2 of the state's annual dues, the 3rd states dues will be deposited in April and the last state's dues are in the mail. They fully expect to have all the annual dues in before the end of the fiscal year. Mr. Benefield said that they have healthy balances in their accounts. The end of March total is \$36 706.26 dollars.

Mr. Benefield added that in the budget committee attachment of the packet includes the annual audit, he said that they did well with regards to the audit. The audit had not been paid for yet as it had just been done but will be paid for in April.

Mr. Benefield concluded his report by stating that the major cost this year was the crime bond; a bond against any kind of theft, it came to a total of \$160 dollars of the \$186.78 dollars for office supplies/Expenses.

Commissioner Cunningham asked what the cost of the audit is. Mr. Benefield stated that the cost did go up from the previous year and that they did have a new auditor, the cost was \$522.50 dollars.

There were no further questions asked.

VII. REPORT OF THE COMMISSIONERS

- A. Texas-** Looking at the weather and drought conditions in Texas as of April 2021, Mr. Van Winkle stated that the United States drought monitor shows that 88% of the state of Texas is in some level of drought with 37% experiencing severe to exceptional

conditions. The severe conditions are being experienced mostly in West Texas, resulting in 77% of the Red River basin experiencing drought conditions with 23% experiencing severe conditions.

The NOAA Climate Prediction Center has predicted that drought conditions will persist for the next couple months, with a 50% - 70% chance of above average temperatures and 30% - 40% of below average precipitation through July for the Red River Basin.

Looking at the Texas State Water Plan of 2017, plans are based on future conditions that would exist in the event of a reoccurrence of the worst recorded drought in Texas History, where water supplies are lowest and water demands are highest. Texas populations are meant to increase more than 70% between 2020-2070. Approximately 5,500 water management strategies recommended in this plan provide 3.4 million acre-feet per year in additional water supplies to water user groups in 2020.

The estimated capital cost to designed, construct, and implement the approximately 2500 recommended water management strategy projects by 2020 is \$63 billion dollars. If strategies are not implemented approximately one-third of Texas' population would have less than half of the municipal water supply they would require during a drought of record in 2070. In addition, if Texas does not implement the State Water Plan estimated annual economic losses resulting from water shortages would range from approximately \$73 billion dollars in 2020 to \$151 billion dollars in 2070. Currently the Texas Water Development Board will consider adopting the 2022 State Water Plan at a Texas Water Development Meeting scheduled for July 2021.

Looking at State Water Implementation Fund for Texas (SWIFT Program) this program was enabled by the Texas Legislature and a state constitutional amendment in 2013 for \$2 million dollars to help communities develop and optimize water supplies at cost effective rates, the program provides low-interest loans extended repayment terms, deferral of loan repayments and incremental repurchase terms for projects contained in the 2017 Texas State Water Plan. This original investment is designed to fund close to \$27 billion dollars in water supply projects over the next 50 years to help ensure that Texas communities have adequate supplies of water during drought.

In conclusion the Texas Water Development Board manages the administration/disbursement of the funds and ensures that they are used to finance needed water supply projects as defined in the Texas State Water Plan prioritization process. Applications for the 2021 SWIFT Program have been submitted and through fiscal year 2019, SWIFT has committed over \$8 billion dollars for projects across Texas.

Commissioner Robin Phillips thanked Mr. Van Winkle for the detailed report and commented on how quickly they lost Clyde Siebman. She expressed appreciation for all the work and effort he and Andrea Williams McCoy put into this meeting. She also said that they honor that contribution along with Grayson College and thanks all the hard work of all involved in making the virtual meeting happen rather seamlessly. Commissioner Phillips looks forward to being a part of the Commission.

B. Oklahoma- Commissioner Cunningham extended a thank you to the hosts of the meeting and said that Clyde was greatly missed. Commissioner Cunningham stated that

Kurt Wilkens, who was also lost this year, was a great spokesperson for the state of Oklahoma and he would be missed.

Regarding the drought outlook for Oklahoma, they are seeing the same long-term outlook as Texas, such as above average temperatures for the next several months.

The comprehensive water plan, as reported the previous year, they are launching into the 10-year update; the water board is required every 10 years by statute to update the plan for the whole entire state. They have their updates agreements with the corps of engineers, the PAS program helped fund the last plan and funded half of the work and the other half is typically paid for through the gross production tax and they are anticipating that continuing. The 10-year update will include a public engagement; this will be pointed towards certain water use groups and certain high growth areas as far as population goes. They also had 8 primary priority recommendations that were proposed in the last plan, they had an extensive 4-year process with several important recommendations which they are still implementing on a statewide basis.

The emphasis in the 2025 plan will be on infrastructure across the water spectrum instead of just the whole drought, public water supply and agriculture.

They have launched and help fund a new water irrigators program that Oklahoma State University is implementing. As an incentive the program is supporting the conservation commission and supporting free soil moisture probes for those who go through the program.

In 2019 they had Senate Bill 1269; a request bill from the water board directed the agency to develop the first ever statewide flood resiliency plan - signed into law, May 2020. They are working with the Oklahoma Emergency management, Oklahoma floodplains managers association, FEMA conservation commission, Department of Commerce, Department of Transportation and Waterways, Kerr McClellan navigation system, Corps of Engineers and the Natural resources conservation service. They have applied for funding through FEMA and HUD, they were not appropriated any dollars the previous year, but it does seem as if they are able to come up with \$1.4 million dollars to start of the initial project.

Commissioner Cunningham wanted to thank and congratulate Yohanes Sugeng for all his hard work regarding the Flood resiliency plan.

As mentioned in the previous year's meeting, Oklahoma is working through the governor's office, the secretary of energy and environment, the department of environmental quality as well as rural water association and this year they added the Oklahoma municipal league to improve the sustainability of rural and small community water and wastewater systems.

As far as water infrastructure programs, they have surpassed the \$5 billion dollar mark in financing and maintained their AAA rating through the pandemic; they were not sure about how systems were going to be in communities as far as repayment and struggling

to pay their bills. They anticipate federal funding coming in and hopefully directing those funds to ready-to-go projects.

Several hydrological investigations in the Red River Basin are underway. They have completed the Ouachita River alluvial aquifer reach 1 and the salt fork of the Red River and are currently working in the upper Red River Basin for 2022 completion, working with the Bureau of Reclamation and the Lugert-Altus Irrigation District as well as Mountain Park District.

The last project is the upper Ouachita Basin with the Bureau of Reclamation, Fort Cobb Reservoir Master Conservancy District.

Regarding the dam safety program, they have financial assistance, division and collaboration with dam safety staff. They have assisted several high hazard dam owners to either obtain loans or to pursue other funding opportunities in order to rehabilitate they dams.

For the well driller program, they have been creative during Covid with online products and services, they have also instituted online certification and testing which was launched early on as well as continuing education programs.

Commissioner Cunningham concluded her report by saying that their legislative session is going on right now and is moving through the process and they have gotten some bills and are still tracking one; a bill requested by the secretary of energy and environment, which directs the water board to update the water quality standards to allow for development of a nutrient training program.

Chairman Lowry had an inquiry about the Master Irrigators Program was received. Commissioner Cunningham stated that the program was very well received.

C. Louisiana- Mr. Pat Landry, with the department of transportation and development gave the report for Louisiana.

Louisiana is currently having an issue with water abundance, there are several reasons for that; they are at the bottom of the Mississippi River. 51% of the state is designated a special flood hazard area which is a FEMA designation; meaning if you live in that special flood hazard area and you have a mortgage, you will need to have flood insurance.

In terms of rainfall, Louisiana gets the second highest rain fall on an average precipitation in the nation per year at 60 inches per year.

The previous year was a highly active hurricane season, particularly for Louisiana, they had 5 names hurricanes hit their coast, the strongest being hurricane Laura; it was a category 4 and it hit southwestern Louisiana.

Regarding the public works and water resources department at DOTD, they have 3 sections: the hydraulic section, the floodplain management section and dams and levees

section. In the state of Louisiana, they have over 600 dams that they inspect, over 100 of them are high or significant hazard dams and there are 21 dams in the state that are state-owned and are maintained specifically by DOTD. They also assist 8 levee districts north of the coastal zone, several of those are along the Red River or the Ouachita River.

The Louisiana watershed initiative has been very instrumental in the state for the past 2-3 years. It is a \$1.2 billion dollar program that the state of Louisiana is receiving through community development block grants from HUD, the grant is being administered through the office of community development.

There are several programs in the watershed initiative such as the round one projects, where entities like parishes and planning districts can submit applications for funding of projects, the watershed initiative has reserved \$100 million dollars of the \$1.2 billion dollars to fund those projects.

Another program is the State Identified Projects, the governor, John Bel Edwards, announced a couple weeks ago that \$163 million dollars of the \$1.2 billion dollars would be funded for State Identified Projects. DOTD has identified 8 dam projects to be part of the of the 15 total projects, they will be putting out contracts design and then eventually construction to do flood mitigation on 8 dams across the state of Louisiana.

The DOTD is currently working on computer modeling, they have selected 7 modeling firms across the state, and they have initiated contracts with the 7 firms and issued a task order number one which began in September/October of last year. The first task order for modelling includes data collection, stakeholder engagement, model design strategy and cost estimates. They will begin the modelling in June/July of 2021, it has been estimated to take up to 28 months to complete. Once the modelling is completed, communities and planning districts can propose projects that the consultants working on the modelling can plug in the proposed projects and see the effects it will have on a particular watershed region.

Regarding stream flows at the Louisiana-Arkansas State Line, they are pleased to report that in 2020 all the major tributaries like the Red River, the Washita River, the Buff River and the Bayou Bartholomew all met compact requirements with a few minimal exceptions. They recommended that the legal committee meet during the coming year to evaluate the provisions in the red river compact to ensure Louisiana receives its fair share of water from Arkansas in the event of a below normal precipitation year.

Mr. Landry concluded his report by briefly discussing the environmental report, they have 126 thousand miles of streams and 2,000 square miles of lakes and reservoirs in the state, Louisiana's DEQ is responsible to protect the chemical, physical and biological integrity of these streams and lakes, they reported that the water quality for Ouachita River and the Red River was acceptable last year.

Chairman Lowry asked how they plan on making sure the 7 different consulting firms working on the modeling do not get siloed. Mr. Landry stated that they are meeting with all 7 firms on a regular basis; at least once a month.

D. Arkansas - Commissioner Ward started his report by thanking the team from Arkansas for all their work and to recognize Mr. John Gibson and to share their condolences to his family. He then stated that the report for Arkansas includes their work with the Mississippi River and the Gulf of Mexico Hypoxia task force. The report also included information on the dam safety risk assessment program, the floodplain management program and includes the Arkansas unpaved roads program. They have new dedicated funding for the unpaved roads program that will help make significant impacts throughout the state and in the Red River Basin.

On water development, in 2020 the natural resources division of the Arkansas Department of Agriculture provided over \$102 million dollars of financial support for the water, sewer and solid waste projects.

Regarding the reach 4 sub-basin 2 compact compliance, there were no 7 consecutive day occurrences of 40 cfs or less at the Arkansas-Louisiana state boundary during the agriculture diversion growing season months in 2020.

They continue to be engaged on the southwest Arkansas navigation feasibility study and working with the legislator in the governor's office.

As mentioned at last years' commission meeting, the feral hogs are a negative aspect in the state but there is a collaboration and efforts that are going towards the feral hog situation. There is a feral hog eradication task force in the state of Arkansas and the majority of the feral hog removals are occurring in the southwest and southeast of Arkansas.

Commissioner Ward concluded his report by stating that Arkansas is getting close to finishing their legislative session, they have several bills that will have an impact on the states agriculture industry. There are several bills that had an impact on levee districts.

VIII. REPORT OF THE COMMITTEES

A. Budget committee- Mr. Scott Van Winkle thanked Mr. Ryan Benefield for developing the 2020 proposed budget.

The 2022 proposed budget covering July 1, 2021 through June 30, 2022 anticipated cash balance on July 1, 2021 of \$25,418.52 dollars, certificate of deposit for August 17, 2020 of \$11,287.74 dollars, proposed budget receipts take the annual dues from the States at \$550 each which put the total funds available at \$38,906.26 dollars.

Total proposed expenditures, \$23 500 dollars with a balance of \$15,406.26 dollars.

Commissioner Cunningham asked if the numbers for the proposed expenditure were typical or if they had changed. Mr. Van Winkle stated that the numbers were consistent and that they had not changed.

Mr Scott Van Winkle recommended that the Commission adopt the 2022 proposed budget. Motion to Approve: John Michael. 2nd: Julie Cunningham. The 2022 Proposed Budget was unanimously approved.

- B. Legal committee-** Mr. Carl Meyers who replaced Ms. Heather Hunziker, gave the report for the legal committee. The legal committee will be meeting later in the year regarding the record number of 5 hurricanes that hit the previous year.
- C. Engineering committee-** Mr. Scott Van Winkle gave a summary of what the committee discussed the previous day - Texas report on reservoir levels stating that overall reservoirs in the basin are 92% full, water use permitting activity, dam safety and stream flow conditions. Flows were highly variable in 2020, with most flows in the normal to above normal range.

Oklahoma reported on dam safety, that included rules updates for fees and minimal standards for inspections as well as high hazard potential dam grants from FEMA. The senate bill approved statewide floodplain and rule changes to water use programs.

Louisiana reported the impact of a record-breaking year with 5 hurricanes making landfall in the state, they received funds for flood mitigation projects as well as state identify projects. Louisiana secured contracts from consulting firms to begin determining the modeling approach that would be used in which acquired data can be leveraged between states to possibly assist with some of the historical issues. Louisiana ended their report explaining their graphics for their state modeling and LiDAR projects.

Arkansas explained the effort to establish a relationship between preset runoff and measured gauge readings in respect to compliance for best river between Eudora and the state line and discuss the USGS map project using ground penetrating radar to identify the geology and strata of the area to potentially determine the interaction between groundwater and surface water. Arkansas ended the report with a summary of their 2020 technical report on Red River Compact streams.

- D. Environmental and Natural Resources committee-** Mr. Scott Van Winkle provided a summary of the meeting the committee had the previous day. Texas reported on their ongoing zebra mussel issue within the basin as well as the success of their clean rivers program and water quality monitoring program.

Oklahoma reported on their beneficial use monitoring program (BUMP), bathymetric mapping activities across the state, their stream gauging partnership with the USGS and their financial assistance program, specifically discussing infrastructure mapping with smaller municipalities.

Louisiana reported that they had finalized their 2020 integrated report and completed their 2020 water resources annual report. They reported that currently their work is focused in the south and in general water quality was improving.

Arkansas stated that they had provided an environmental report and would be happy to answer any questions later if needed. They reported that there were not many changes to the 303 D listing and had numerous non-point projects focused in southern Arkansas.

IX. FEDERAL AGENCY REPORTS

A. U.S. Army Corps of engineers- Mr. Mike Abate, chief of the civil works branch at the Tulsa District, presented the report. A couple years ago they divided the Red River area into 2; Texoma area and Hugo Area, and after reconsideration they have been brought back together so now its only the Red River area. Regarding the FY 2020-2022 Civil Works Budget, in 2020 the construction amount was \$2.7 million dollars, which was for Pine Creek to complete the work on the dam safety project at pine creek. For O&M for the total district which covers the southern half of Kansas, all of Oklahoma and the Red River basin, they had a total of \$107 million dollars, of that \$97 million dollars was regular appropriation and approximately \$10.4 million dollars was work plan. In 2020 they operated about \$19 million in non-routine maintenance. Many of the projects are nearing 50 years old therefore they would like to invest into those projects.

For the FY 2021 there is an overall total of \$2.7 million dollars for investigations, which is for the completion of the dam safety study at Keystone, which is on the Arkansas Basin, the overall total for O&M is \$103 million dollars with \$8.6 million dollars for work plan.

For the FY 2022 it is still to be determined as the president released a “skinny budget” which means they are slated to get \$6.8 billion dollars but there is uncertainty on where those funds will go.

They are finalizing the Shoreline management plan at lake Texoma; it states all the rules and authorities on how to manage the shoreline.

They are in the process of updating the Red River Master Water Control Manual, they awarded the contract last year in June and should be complete with the updates by September 31, 2021.

They have received funding for a PAS study from the Chickasaw Choctaw nation; for small water supply users around the Lake Texoma area. They will be doing a lot of data collection to try map out some of the concerns and issues they have.

B. Bureau of Reclamation- Mr. Nathan Kuhnert gave the report. The primary focal point for the last 10 years has been on the upper Red River Basin study and the upper Ouachita River basin. They are close to wrapping up the upper Red River Basin study, they plan on wrapping it up by end of 2021 or beginning of 2022. The Chickasaw nation currently have a small-scale water efficiency project (SWEPS), generally it is \$75 000 dollars cost share that the Bureau of Reclamation provide, it has been a successful program.

C. U.S. Geological Survey- Mr. Jason Lewis presented this report, one of the projects that is currently in progress is the Red River Focus area, that funded 5-6 years ago and many of the deliverables for this project are wrapping up. With this project they will have a data release, summarizing water use from 2010 and 2015 at the HUC 8 scale throughout the red river basin that will be published. They will have a USGS scientific investigations

report. The PRMS model is in the final phase of approval through their colleague review process. There will also be 2 journal articles coming out for this project; one will deal with ecological flows on the central flows of the basin and the other article will be about ecological flows in the lower part of the basin. They will also have a website developed with the focus area study as the main webpage and all projects and data releases and accompanying data files will be able to be downloaded from this page.

They are still working on the monitoring and zebra mussel work in lake Texoma as well as flood mapping and firm mapping in the basin.

The stream gauge program is ongoing, but they have not added many new gauges recently.

- D. Natural Resources Conservation Service-** Mr. Rob Ziehr gave the report. Over \$86 million dollars was invested in Farm Bill Funding in FY 2020 through the conservation programs.

Environmental Quality Incentives Program (EQIP) is there largest program, through this program they have offered financial assistance to offset the costs of conservation practice implementation. This past year they developed 1800 new equipped contracts with private landowners.

The conservation stewardship program (CSP) is designed to help landowners build on existing conservation efforts and to help them in strengthening their operations. Grassland Conservation Initiative (GCI), this initiative provides financial assistance to help protect grazing us, to conserve and improve soil and water and wildlife resources. The NRCS continues to address watershed issues in all 4 states, the agency works closely with partners, conservation districts and each of the state's respective soil and water conservation boards to complete the dam watershed rehabs and repairs.

X. UPDATES AND DISCUSSION TOPICS

- A. Update from Kim Lutz, Executive Director, America's Watershed Initiative-** Ms. Lutz briefly explained what the America Watershed Initiative does and how their report cards work.

Ms. Lutz briefly highlighted the scores the Arkansas-Red rivers basin received. She stated that they are seeing a decrease in water quality in this basin as well as a 3% decrease in the loss of freshwater wetlands. In terms of flood control and risk protection, there was less flooding in this part of the basin. Water supply had a decreased score due to health code violations. The economy and recreation had lower scores as a result of depressed wages.

- B. Resolution for Funding of USGS Streamflow Gauges-** Mr. Scott Van Winkle thanked the USGS for the work they do in maintaining the stream gauges. Mr. Van Winkle read the resolution for the Funding of the USGS streamflow gauges. Motion to Approve: Julie Cunningham. 2nd: Pat Landry. Unanimously Approve.

- C. Update from Richard Brontoli, Red River Valley Association-** Mr. Brontoli briefly discussed highlights from the report submitted. The Vicksburg district in Louisiana did not receive an adequate amount of O&M for maintenance stretching, therefore the red river waterway commission; state agency dedicated as the local sponsor for navigation projects, have started a project for additional funds. Regarding the feasibility study in Arkansas, they are waiting for the Arkansas delegation to adjourn to see if they will receive funding to initiate the project.
- D.** The chloride control project has not yet been funded but there is a company, GEN, who wants to put in solar ponds which create electricity, they are interested in taking over the project.
Mr. Brontoli concluded his update by discussing the navigation from Texarkana to Denison dam, he stated that his association board has agreed that a committee should be formed that will work with Tulsa district and the Red River authority of Texas to identify benefits to work with the Tulsa district to ensure this study receives all benefits possible.
- E. Web presence for Red River Compact Commission-** Chairman Lowry stated that as discussed, the previous day both Texas and Oklahoma would be willing to host the reports at the state level, no cost to the commission.
- F. Memorial resolution honoring Clyde M. Siebman-** Commissioner Robin Phillips from Texas, read the resolution attached into the agenda packet.
Commissioner Phillips stated that she would be happy to facilitate getting the resolution to each Commissioner to sign personally.

XI. NEW BUSINESS

- A. Annual Report-** The 2019 annual report has been completed and is up on the website. The 2020 report will have progress being made on it now that the minutes have been approved and Chairman Lowry will work with Ms. Andrea Williams McCoy to get all signatures needed to finalize that report.
- B. Commission Assignments-** Chairman Lowry stated that the legal committee should have regular meeting and should involve all states.
Chairman Lowry stated that the legal committee should look at the compact language and take a look at when the volumes as dictated by the compact are not met what happens and take a look at what is available to Arkansas as far as compact administration.
Mr. Carl Meyers enquired about who the point people are for each state in the Legal Committee; Arkansas- Michael Bynum, Oklahoma- Sara Gibson, Louisiana- Michelle Hall
- E. 42nd Annual Meeting- Discussion on meeting host for 2022-** Chairman Lowry asked if she was correct by saying that it was Louisiana's turn to host, which was correct. Commissioner Landry stated that Louisiana would be happy to host, they were thinking of hosting it in Bossier are in Shreveport on the 26th and 27th of April 2022.

Appointment of Vice-Chair and Secretary- Vice-Chair-Pat Landry. Secretary- Ed Knight

E. Appointments or changes to Committees- Commissioner Cunningham mentioned adding Christopher Neel to the budget committee.

XII. PUBLIC COMMENTS

No comments were made.

XIII. ADJOURNMENT

Chairman Lowry thanked all for attending the meeting.

Ms. Andrea William McCoy thanked Chairman Lowry for all her hard work with regards to the commission and all commissioners and expressed appreciation to everyone involved in the organization.

Chairman Lowry adjourned the meeting.



RED RIVER COMPACT COMMISSION

RESOLUTION OF THE RED RIVER COMPACT COMMISSION REGARDING THE FUNDING OF STREAMFLOW GAGES April 27, 2021

WHEREAS, the Red River Compact, signed May 12, 1978, and approved by Congress, apportions the waters of the Red River basin between the States of Arkansas, Oklahoma, Texas and Louisiana;

WHEREAS, the four states have worked cooperatively together to develop and maintain the streamflow gaging network necessary to administer the provisions of the Compact;

WHEREAS, the cooperation and the establishment of this gaging network has resulted in the administration of this Compact with minimal controversy and no interstate litigation;

WHEREAS, the apportionment and calculations required to administer the Compact necessitate the maintenance of streamflow gages along the Red River and its tributaries at critical locations to measure the flow of water;

WHEREAS, it is critical for the administration of the Red River Compact that these streamflow gages be maintained;

WHEREAS, the U.S. Geological Survey (USGS) has historically entered into cost share agreements with cooperators to maintain a nationwide streamflow gaging network through the USGS Cooperative Water Program, now known as Federal Priority Streamgages (FPS), operating under the Groundwater and Streamflow Information Program (GWSIP);

WHEREAS, the USGS established goals to satisfy minimum national streamflow information needs with the intent to support these gages entirely with federal funds;

WHEREAS, a priority goal of the USGS GWSIP is to “meet legal and treaty obligations on interstate compacts and international waters;”

WHEREAS, the streamflow gages necessary to administer the Red River Compact qualify under this priority goal for full federal funding under the USGS GWSIP.

NOW, THEREFORE, BE IT RESOLVED that, the Red River Compact Commission requests that Congress fully fund the USGS GWSIP gages associated with the Red River basin and Red River Compact and the USGS place a priority on funding these gages under this program.

BE IT FURTHER RESOLVED that, federal funding for the USGS GWSIP be restored to ensure the 50/50 cost share for the jointly funded activities with localities and states and fully fund the high-priority federal streamflow gages (historically referred to as the National Streamflow Information Program).

BE IT FURTHER RESOLVED that, a copy of this resolution be sent to the members of the congressional delegations for the States of Arkansas, Oklahoma, Texas and Louisiana, the Secretary of the Interior, and the Director of the USGS.

Sue Lowry

Sue Lowry
Federal Commissioner and Chairman
Red River Compact Commission

Apr 27, 2021

Date Executed
April 27, 2021

Concurred to and supported by:

Scott Van Winkle
(Acting Commissioner for Texas)

Robin Phillips
Commissioner for Texas

Patrick J. Landry, P.E.
Commissioner for Louisiana

John Michael Moore
Commissioner for Louisiana

Charles Lynn Dobbs
Commissioner for Oklahoma

Julie Cunningham
Commissioner for Oklahoma

Wes Wade
Commissioner for Arkansas

Vacant
Commissioner for Arkansas

RED RIVER BASIN STREAMFLOW AND WATER QUALITY GAGES

Number	Name
07300000	Salt Fork Red River near Wellington, TX*
07300500	Salt Fork Red River at Mangum, OK
07301300	North Fork Red River near Shamrock, TX
07301410	Sweetwater Creek near Kelton, TX
07301500	North Fork Red River near Carter, OK*
07303400	Elm Fork of North Fork Red River nr Carl, OK
07308500	Red River near Burkburnett, TX*
07315500	Red River near Terral, OK*
07316000	Red River near Gainesville, TX*
07316500	Washita River near Cheyenne, OK
07331000	Washita River near Dickson, OK*
07331600	Red River at Denison Dam nr Denison, TX*
07332500	Blue River near Blue, OK
07335300	Muddy Boggy Creek near Unger, OK
07335500	Red River at Arthur City, TX
07336820	Red River near De Kalb, TX
07337000	Red River at Index, AR*
07340000	Little River near Horatio, AR
07344210	Sulphur River near Texarkana, TX
07344370	Red River at Spring Bank, AR
07346310	(COE) Caddo Lake at Dam near Mooringsport, LA
07348000	Twelvemile Bayou near Dixie, LA
07348500	(COE) Red River at Shreveport, LA
07350500	Red River at Coushatta, LA*
07355500	Red River at Alexandria, LA*
07362000	Quachita River at Camden, AR*
07362100	Smackover Creek near Smackover, AR
07363500	Saline River near Rye, AR
07364100	Quachita River near Arkansas-Louisiana State Line
07364150	Bayou Bartholomew near Mcgehee, AR*
07369680	Bayou Macon at Eudora, AR
07367690	Boeuf River near Arkansas/Louisiana Stateline

* Indicates water quality monitoring station

For more information see:

<http://waterwatch.usgs.gov/index.php?r=ar&m=real>

<http://waterwatch.usgs.gov/?m=real&r=la>

<http://waterwatch.usgs.gov/?m=real&r=ok>

<http://txpub.usgs.gov/public/BasinMap/BasinMap.html?basinselect=2>

**RED RIVER COMPACT COMMISSION
2021 BUDGET VERSUS ACTUALS
(7/1/2020 - 3/31/2021)**

	ACTUAL	BUDGET	OVER/UNDER	% OF
	FY - 2020	FY - 2020	BUDGET	BUDGET
	7/1/2020	7/1/2020	7/1/2020	7/1/2020
	3/31/2021	3/31/2021	3/31/2021	3/31/2021
Income				
State Annual Dues	\$1,100.00	\$2,200.00	(\$1,100.00)	50.00%
Interest on Checking	\$0.00	\$0.00	\$0.00	
Interest on Certificate of Deposit	\$10.50	\$0.00	\$10.50	
Total Income	<u>\$1,110.50</u>	<u>\$2,200.00</u>	<u>(\$1,089.50)</u>	<u>50.48%</u>
Expenses				
Meeting Expenses	\$0.00	\$5,000.00	\$5,000.00	0.00%
Office Supplies/Expenses	\$186.78	\$2,500.00	\$2,313.22	7.47%
Contingency	\$0.00	\$16,000.00	\$16,000.00	0.00%
Total Expenses	<u>\$186.78</u>	<u>\$23,500.00</u>	<u>\$23,313.22</u>	<u>0.79%</u>
Balance in Checking	\$25,418.52	3/31/2021		
Balance of Certificate of Deposit	<u>\$11,287.74</u>	8/17/2020		
	\$36,706.26			

RED RIVER COMPACT COMMISSION

Statement of Cash Receipts and Disbursements

July 1, 2019 through June 30, 2020

RED RIVER COMPACT COMMISSION
STATEMENT OF CASH RECEIPTS AND CASH DISBURSEMENTS
JULY 1, 2019 THROUGH JUNE 30, 2020

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BRIAN K. SWINDLE, CPA, P.A.

A Professional Limited Company
Certified Public Accountant and Consultant
Greenbrier, Arkansas

Brian K. Swindle

INDEPENDENT ACCOUNTANT'S AUDIT REPORT

Member
American Institute of CPA's
Arkansas Society of CPA's

Red River Compact Commission
Little Rock, Arkansas

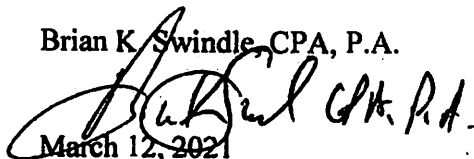
I have audited the accompanying statement of cash receipts and cash disbursements of Red River Compact Commission as of June 30, 2020. The financial statements are the responsibility of Red River Compact Commission. My responsibility is to express an opinion on this financial statement based on my audit.

I conducted my audit in accordance with generally accepted auditing standards generally accepted in the United States of America. Those standards require that I plan and perform the audit to obtain reasonable assurance about whether the financial statement is free of material misstatements. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by the Company, as well as evaluating the overall financial statement presentation. I believe that my audit provides a reasonable basis for my opinion.

The commission's policy is to prepare its financials on the basis of cash receipts and disbursements, consequently, certain revenue and related assets are recognized when received rather than when earned and certain expenses are recognized when paid for rather than when the obligation is incurred. Accordingly, the accompanying statement is not intended to presents results of operations in conformity with the generally accepted accounting principles.

In my opinion, the combined financial statements referred to above presents fairly, in all material respects, the recorded transactions of cash receipts and cash disbursements of Red River Compact Commission as of June 30, 2020 on the basis of accounting described in the preceding paragraph.

Brian K. Swindle, CPA, P.A.



March 12, 2021

RED RIVER COMPACT COMMISSION

STATEMENTS OF CASH RECEIPTS AND CASH DISBURSEMENTS
FOR THE PERIOD OF JULY 1, 2019 THROUGH JUNE 30, 2020

Cash in bank, checking as of July 1, 2019	\$	24,175
Cash Receipts		
Member Assessments		2,200
Interest income		-
		<hr/>
Total Cash Receipts	\$	2,200
		<hr/>
Cash Disbursements		
Audit Fees		275
Bank Charges		57
Office expense		1,377
Bond Costs		161
		<hr/>
Total Cash Disbursements		1,870
		<hr/>
Cash in bank as of June 30, 2020	\$	24,505
Cash in certificate of deposit as of July 1, 2019	\$	11,268
Interest Income		9
		<hr/>
Cash in certificate of deposit as of June 30, 2020	\$	11,277
		<hr/>
Cash and Cash Equivalents as of June 30, 2020	\$	35,782
		<hr/> <hr/>

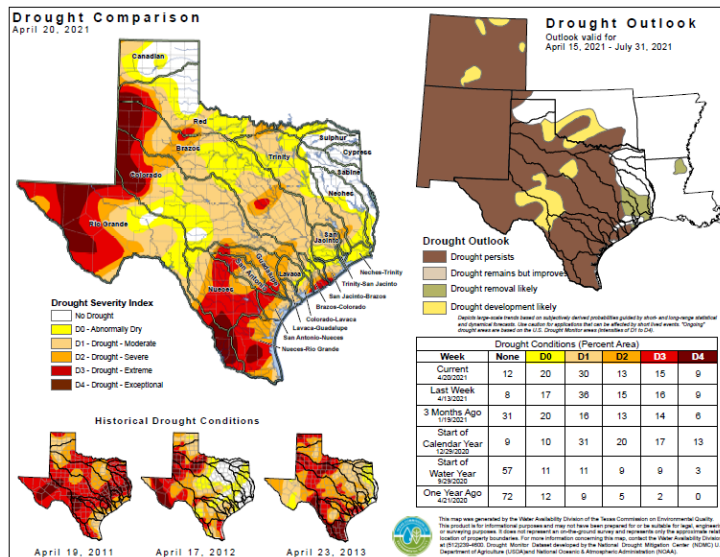
See accompanying Independent Auditor's Report and notes to financial statements.

Red River Compact Commission Texas Commissioners' Report April 27, 2021

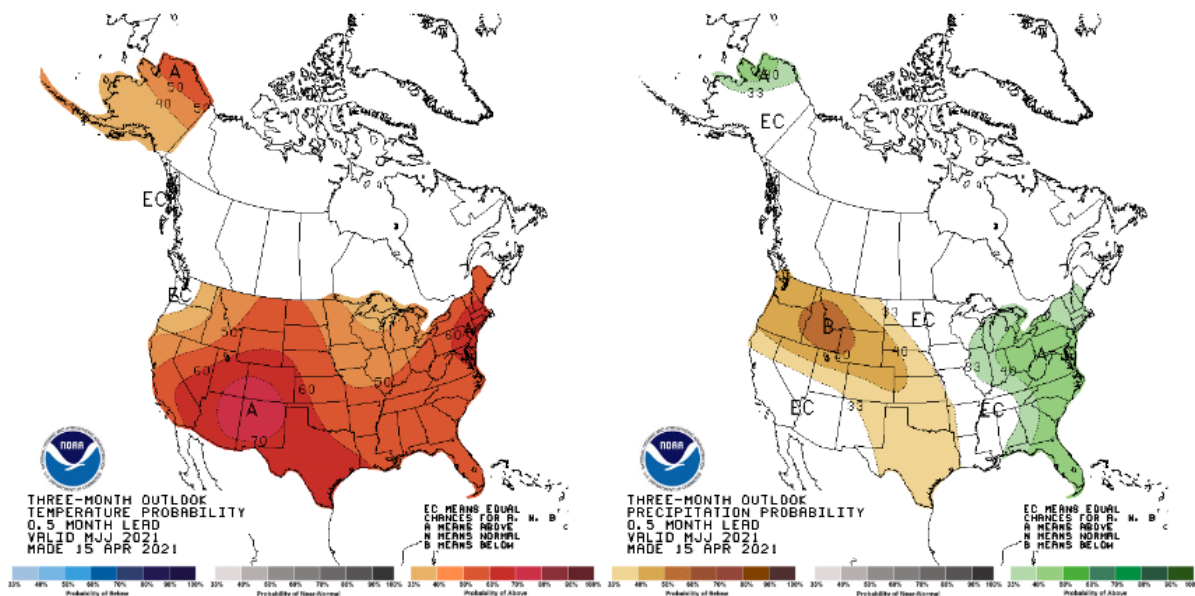
Weather and Drought Conditions

As of April 20, 2021, the United States Drought Monitor shows about 88% of Texas in some level of drought, with 37% experiencing severe to exceptional conditions. This is up significantly from a year ago, when 28% of the state was experiencing some level of drought.

The extreme to severe drought conditions are occurring in the West Texas and Panhandle regions of the state. This includes the upper reaches of the Red River, resulting in 77% of the Red River Basin experiencing drought conditions, with 23% being extreme to severe. In comparison, the most eastern reaches of the Red River Basin, as well as the Sulphur River and the Cypress Creek basins, are currently experiencing no drought.

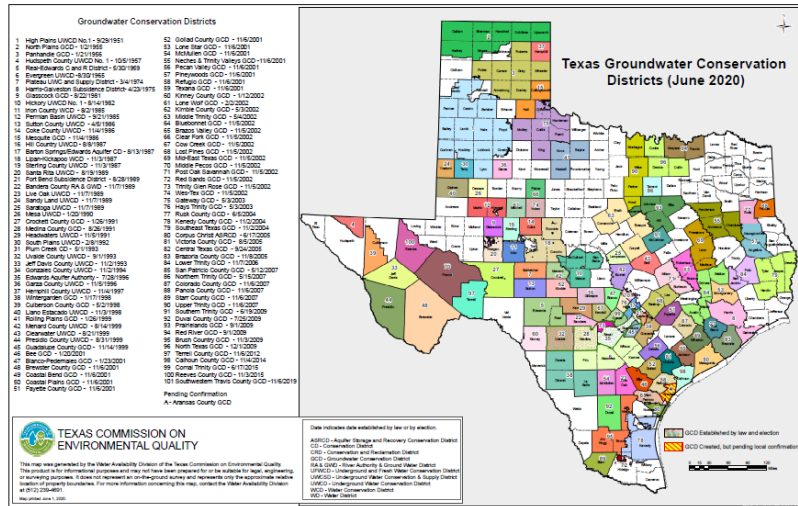


The NOAA Climate Prediction Center's Seasonal Drought Outlook is predicting that drought conditions will persist throughout Texas over the next few months with a 50-70% chance of above average temperatures and 30-40% chance of below average precipitation through July for the Red River Basin.



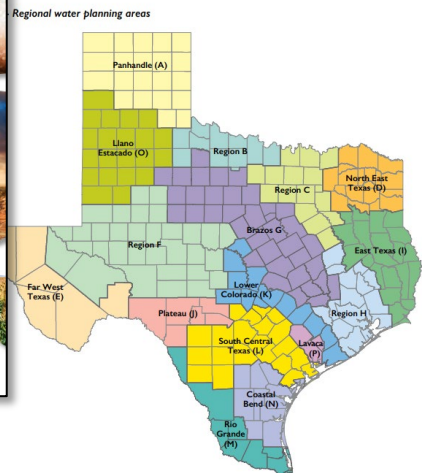
Groundwater

In Texas, landowners own the groundwater below the surface of their land, subject to any regulation by groundwater conservation districts (GCDs), as recognized by the Texas Legislature in 2011. The GCDs enact rules and regulations, including requiring permits, metering, and limitations on the amount of water that may be withdrawn in their area. As of June 2020, a total of 101 GCDs have been created, covering all or part of 180 of the State's 254 counties. There are currently eight GCDs operating in the Red River Basin in Texas.



Texas Water Plan of 2017

Texas' state water plans are based on future conditions that would exist in the event of a recurrence of the worst recorded drought in Texas' history—known as the "drought of record"—a time when, generally, water supplies are lowest and water demands are highest.



Texas' population is expected to increase more than 70 percent between 2020 and 2070, from 29.5 million to 51 million, with over half of this growth occurring in Regions C and H. However, Texas' existing water supplies—those that can already be relied on in the event of drought—are expected to decline by approximately 11 percent between 2020 and 2070, from 15.2 million to 13.6 million acre-feet per year.

Approximately 5,500 water management strategies recommended in this plan would provide 3.4 million acre-feet per year in additional water supplies to water user groups in 2020 and 8.5 million acre-feet per year in 2070. The estimated capital cost to design, construct, and implement the approximately 2,500 recommended water management strategy projects by 2070 is \$63 billion. If strategies are not implemented,

approximately one-third of Texas' population would have less than half the municipal water supplies they will require during a drought of record in 2070. In addition, if Texas does not implement the state water plan, estimated annual economic losses resulting from water shortages would range from approximately \$73 billion in 2020 to \$151 billion in 2070.

The Texas Water Development Board will consider adopting the 2022 State Water Plan at a TWDB meeting tentatively scheduled to be held in July of this year.

State Water Implementation Fund for Texas

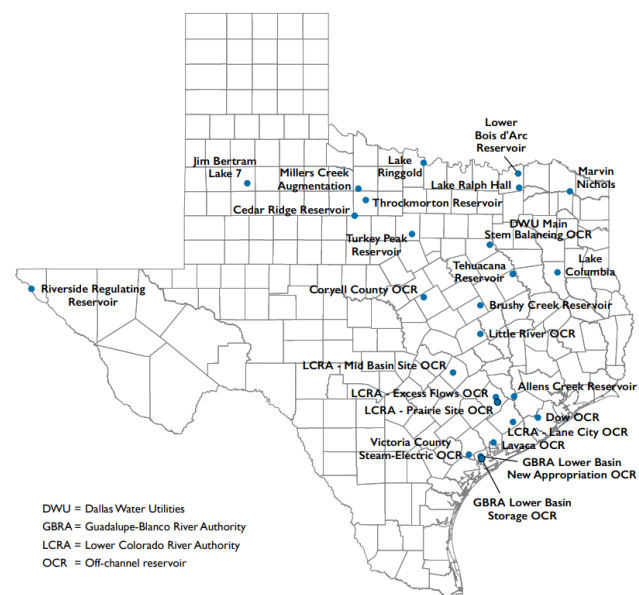
The State Water Implementation Funds for Texas (SWIFT) program was enabled by the Texas Legislature and a State constitutional amendment in 2013, for \$2 billion to help communities develop and optimize water supplies at cost-effective rates. The program provides low-interest loans, extended repayment terms, deferral of loan repayments, and incremental repurchase terms for projects contained in the 2017 State Water Plan. This original investment is designed to fund close to \$27 billion in water supply projects over the next 50 years to help ensure that Texas communities have adequate supplies of water during drought.

The Texas Water Development Board (TWDB) manages the administration and disbursement of funds and ensures they are used to finance needed water supply projects as defined in the Texas Water Plan prioritization process. The applications for the 2021 funding cycle of the SWIFT program have been submitted. Through fiscal year 2019, SWIFT has committed over \$8 billion for projects across Texas.

For more general information on the program, see:

<https://www.twdb.texas.gov/financial/programs/swift/index.asp>

Figure 8.4 - Recommended new major reservoirs



Report of the Budget Committee

Red River Compact Commission

April 27, 2021

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

Anticipated Cash Balance – July 1, 2021	\$ 25,418.52
Certificate of Deposit – August 17, 2020	\$ 11,287.74

PROPOSED BUDGETED RECEIPTS

Annual Dues – Arkansas, Louisiana, Oklahoma, and Texas (\$550/State)*	\$ 2,200.00
-----------------------------------------------------------------------	--------------------

Total Gross Receipts	<u>\$ 2,200.00</u>
-----------------------------	---------------------------

TOTAL FUNDS AVAILABLE	\$ 38,906.26
------------------------------	---------------------

PROPOSED BUDGETED EXPENDITURES

Meeting Expenses	\$ 5,000.00
Office Supplies/Expenses**	\$ 2,500.00
Contingency	\$16,000.00

Total Expenditures	<u>\$ 23,500.00</u>
---------------------------	----------------------------

TOTAL	\$ 15,406.26
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*In accordance with Article IX, Section 9.04.C, of the Compact the amount of such budget shall be borne equally by the signatory states in an equal amount. Therefore, the FY 2021 assessments are \$550.00 per state.

**Includes Personnel Services, Office Expenses, Rent, Travel, and Audit items (4-22-2014).

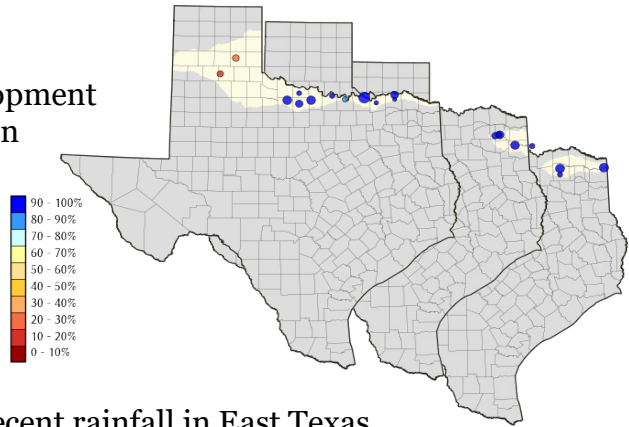
Red River Compact Commission

Texas Engineering Committee Report

April 26, 2021

Reservoir Levels

In the Red River Basin in Texas, there are 20 reservoirs tracked by the Texas Water Development Board's reservoir status tracker application on its website, including the Sulphur River and Cypress Creek basins. Currently basin-wide, the reservoirs are at about 92% full, ranging from 8.6% in some smaller reservoirs in Reach I, to 100% in Reach II, Subbasin 2. Lake Texoma is currently 93% full. All the reservoirs in the Sulphur and Cypress basins are full or nearly full due to recent rainfall in East Texas.

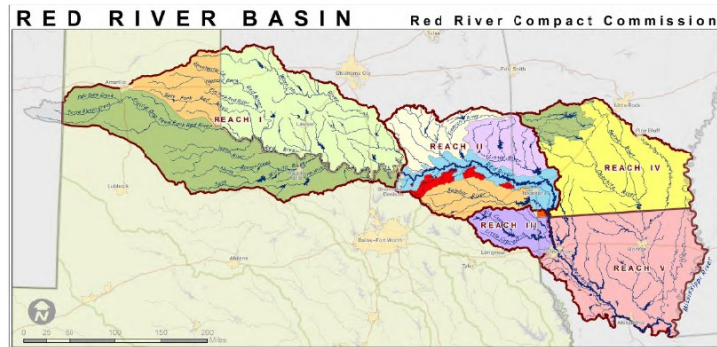


Texas Reservoirs in the Red River Basin				
Reservoir	Percent Full	Reservoir Storage (acre-ft)	Conservation Storage (acre-ft)	Conservation Capacity (acre-ft)
Red River Basin				
Arrowhead	96.3	221,749	221,749	230,359
Bonham	97.0	10,704	10,692	11,027
Crook	98.4	9,064	9,049	9,195
Greenbelt	17.0	10,639	10,207	59,968
Hubert H Moss	99.1	23,950	23,864	24,058
Kemp	84.5	207,330	207,204	245,307
Kickapoo	76.9	66,406	66,406	86,345
Mackenzie	8.6	4,000	4,000	46,450
Nocona	93.2	20,296	19,992	21,444
North Fork Buffalo Creek	92.3	14,216	14,216	15,400
Pat Mayse	100.0	122,274	113,683	113,683
Texoma	93.1	2,316,677	1,158,338	1,243,801
	88.2%	3,027,305	1,859,400	2,107,037
Sulphur River Basin				
Jim Chapman	100.0	303,044	260,332	260,332
Sulphur Springs	91.6	16,252	16,252	17,747
Wright Patman	94.7	294,006	293,959	310,382
	97.0%	613,302	570,543	588,461
Cypress Creek Basin				
Bob Sandlin	100.0	205,019	192,417	192,417
Caddo	100.0	159,247	29,898	29,898
Cypress Springs	100.0	67,436	66,756	66,756
Lake O' the Pines	100.0	250,083	241,363	241,363
Monticello	86.5	30,063	30,063	34,740
	99.2%	711,848	560,497	565,174
Total	91.7%	4,352,455	2,990,440	3,260,672

Water Use Permitting Activity in Texas

In the Red River Basin in Texas, there are 289 active water rights permits for uses, including irrigation, municipal, mining, industrial, and recreation. During 2020 to the present, TCEQ issued three water rights permits, one in the Red River basin and two in the Sulphur River basin. Currently, there are two pending permit applications being reviewed in the Red River Basin and two in the Sulphur River Basin.

The North Texas Municipal Water District's permit to construct the Lower Bois d'Arc Reservoir for 367,609 acre-feet of storage capacity, has been extended until 2024. According to TCEQ's Dam Safety Division, construction is ongoing and the reservoir has started impoundment.



Additional information regarding specific pending applications, the applicant list and project manager's name are provided on the TCEQ website at:
https://www.tceq.texas.gov/assets/public/permitting/watersupply/water_rights/applications/wr_pending.xls.

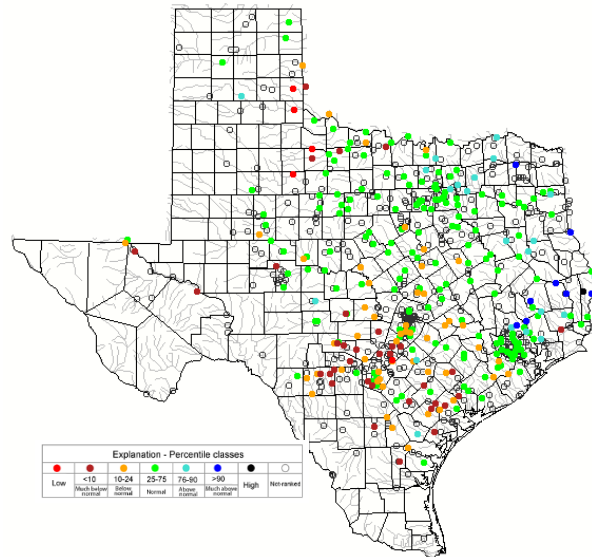
TCEQ's Dam Safety Program

The TCEQ Dam Safety Program monitors and regulates both private and public dams in Texas. There are over 7,230 dams in Texas with more than 4,000 regulated by the Dam Safety Program, including about 1,300 high-hazard, 400 significant-hazard and 2,600 low-hazard, non-exempt dams. The program periodically inspects dams that pose a high or significant hazard and makes recommendations and reports to dam owners to help them maintain safe facilities. TCEQ staff also provides practical and straightforward information on issues that affect anyone who owns or operates a dam including state dam safety laws and regulations and enforcement, requirements for emergency action plans, inspection and maintenance issues for all areas on a dam, and recommendations for correction. Currently, there are no dam safety issues identified within the basin.

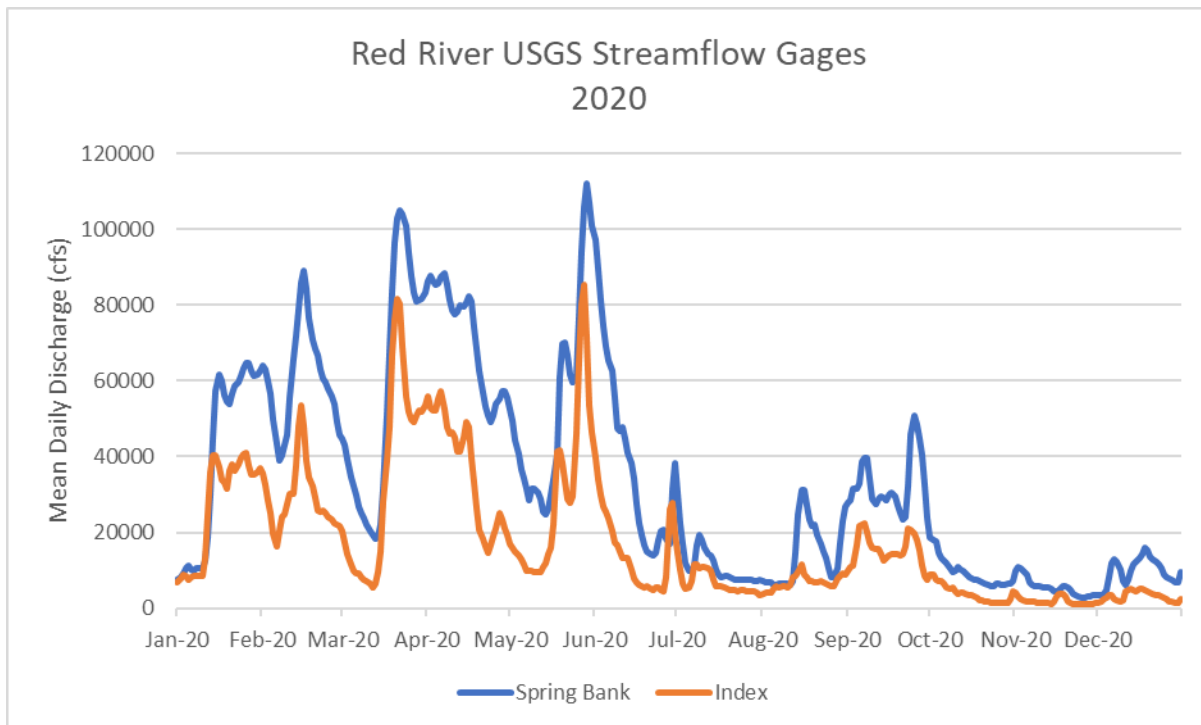
A users' guide is provided for obtaining the precipitation data which is required for dam safety evaluations for particular drainage areas:
https://www.tceq.texas.gov/assets/public/compliance/field_ops/damsafety/PMP-UserGuide.pdf.

Streamflow Conditions

For the calendar year 2020 through the present, streamflows have been highly variable in the Texas reaches of Cypress Creek and the Red and Sulphur Rivers. Currently, most of the flows are in the normal to above-normal range, with some exceptions in the western tributaries of the Red River in Texas.



Flows at the Index and Spring Bank gages, which are indicator flow gages for Texas' Compact compliance, have experienced several high flow events, separated by lower average flows. The highest daily flow at Index was about 85,500 cfs in May 2020, and the low was 980 cfs in November. At the Spring Bank gage, the peak was 112,000 cfs on May 29, 2020, with a minimum of 2,790 cfs, also in November.



2020 BOEUF RIVER MONITORING REPORT

Red River Compact

Presented to Engineering Committee

April 2021



NATURAL RESOURCES
DIVISION



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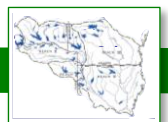
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REPORT OVERVIEW

The Natural Resources Division (NRD) continues to evaluate Boeuf River streamflow at the Arkansas-Louisiana state boundary and Eudora stream gages. NRD provides this *2020 Boeuf River Monitoring Report* to document how often 40cfs or less flow, lasting at least consecutive seven days, occurs at these gages throughout the year. Seasonal low flow conditions historically occur during the nongrowing season in fall and winter months. For compact considerations, we are most interested during periods when diversion is likely to occur and flows are below 40cfs. Historically, this overlap of conditions exists during the months of May and June.

As part of Arkansas' annual reporting effort, NRD completes the following:

- **Monitor real-time data** from USGS Arkansas-Louisiana state boundary and Eudora gages.
- **Document and assess occurrences of 40cfs or less flow** at the state boundary.
- **Summarize Boeuf River flow data** and present to Engineering Committee.
- **Coordinate monitoring efforts** with the Engineering Committee.

BOEUF RIVER FLOW ASSESSMENT

Subbasin 2, Reach IV, provisions include the term “*weekly runoff*” to define Louisiana’s apportionment of water originating in Arkansas. According to Reach IV provisions, Arkansas shall have free and unrestricted use of the water of this reach subject to the limitation that Arkansas shall allow a quantity of water equal to forty (40) percent of the “*weekly runoff*” to flow into Louisiana. In addition, when the use of water in Arkansas reduces Boeuf River flow at the Arkansas-Louisiana state boundary to 40cfs or less, the State of Arkansas pledges to take affirmative steps to regulate diversions of runoff in order to allow the equitable apportionment of water (forty percent of “*weekly runoff*”) to flow into Louisiana.

The assessment is conducted to determine correlation between Eudora and Arkansas-Louisiana state boundary flow gages in Arkansas and Louisiana, and to evaluate flow patterns, if they exist, which occur on an annual basis. Precipitation and water use and USGS flow data from these two stations are used to evaluate low conditions and quantify any correlation between flow, precipitation, and water use during the growing season months.

Based on 2020 Boeuf River flow data, there are no seven consecutive day occurrences of 40cfs or less flow during May-August at the state boundary. The longest duration of 40cfs or less flow occurs from June 1-5 and June 16-20 for five consecutive days each period. Boeuf River flow returns to levels above 40cfs immediately following these periods.

Figure 1. includes weekly precipitation and daily flow data at Eudora and state boundary gages for comparison. Boeuf River flows of 40cfs or less during the months of May-August are highlighted in yellow. As shown in Figure 1., there are 5 days of Null values reported at the state boundary gage during May-August 2020.

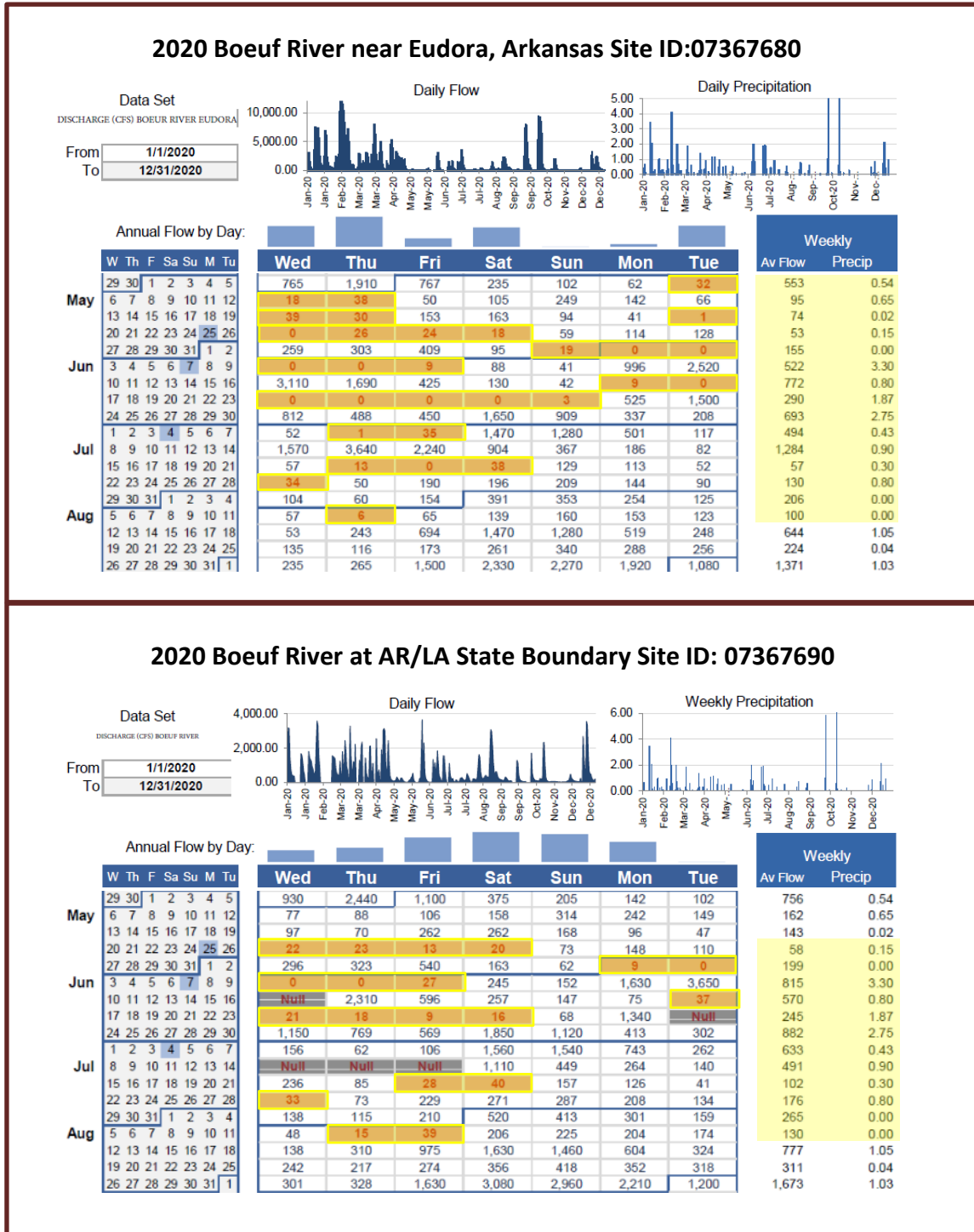


Figure 1. Daily Flow & Precipitation at Eudora and State Boundary

Table 1 and Figure 2 include Boeuf River flow data at the state boundary. The durations of 40cfs or less flow at the state boundary during May-August 2020 does not require any administrative action by NRD to comply with Subbasin II, Reach IV provisions, i.e. there are no durations lasting at least seven consecutive days or longer.

Table 1. 40cfs or less Flow at State Boundary

Time Period	Duration	Average Flow
May 20-23, 2020	5 days	21cfs
June 1-5, 2020	5 days	9cfs
June 16-20, 2020	5 days	17cfs

Data from the Eudora reporting station (Figure 3) indicates a precipitation deficit of 3.13 inches in May 2020 when compared to historic May monthly averages. This data corresponds to the 40cfs or less flow occurrences observed at the state boundary during May and June 2020. Below average precipitation also occurred in November and December 2020 when there is negligible diversion from the Boeuf River.

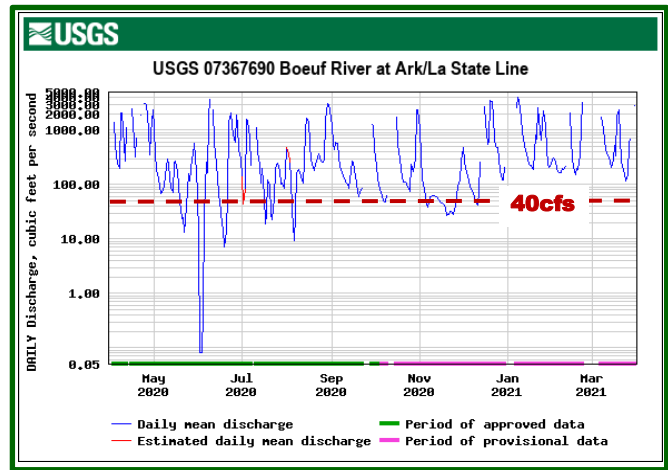


Figure 2. Boeuf River Daily Flow at State Boundary

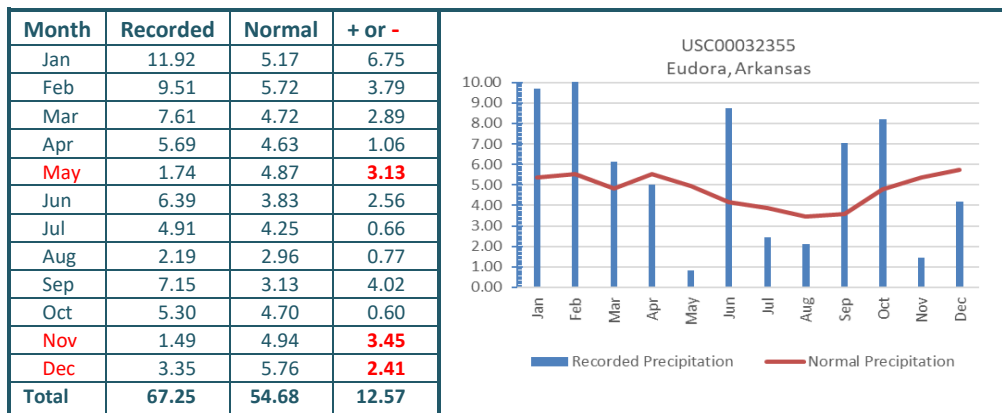


Figure 3. 2020 Monthly Precipitation Data from Eudora Reporting Station

For purposes of NRD’s monitoring and reporting strategy, weekly runoff is estimated by the arithmetic expression which uses a weighted runoff coefficient, precipitation, and basin area. This expression is not reliably accurate for estimating instantaneous weekly runoff for any individual week.

▪ **Weekly Runoff (Q) = Runoff Value (C) x Weekly Precipitation (I) x Basin Area (A)**

Note: While the arithmetic expression is not considered an accurate methodology for estimating real-time instantaneous weekly runoff, it is a useful tool to graph and compare sequential weekly runoff estimates for 52 weeks or longer.

According to Subbasin II Reach IV compact provisions there is no minimum flow requirement at the state boundary. However, Louisiana is apportioned 40% of the weekly runoff when flow is less than 40cfs at the state boundary. The compact specifies Arkansas will take affirmative steps to allow 40% of weekly runoff to pass to Louisiana. In Figure 4, average weekly flow at the state boundary is compared with forty percent (40%) of the estimated *Weekly Runoff* (Q) as computed by the arithmetic expression previously described. There is only a brief period during the growing season when the average weekly flow is less than 40% of the estimated *weekly runoff* (Q). In Figure 4 there are 50 (fifty) out of fifty-two (52) weeks that the flow recorded at the state boundary exceeds forty percent (40%) of the estimated *weekly runoff* (Q). There are fewer 40cfs or less occurrences in 2020 than were recorded in 2019. 2020 recorded Boeuf River flows satisfy the 40% appointment requirement referenced in compact provision for Subbasin II Reach IV.

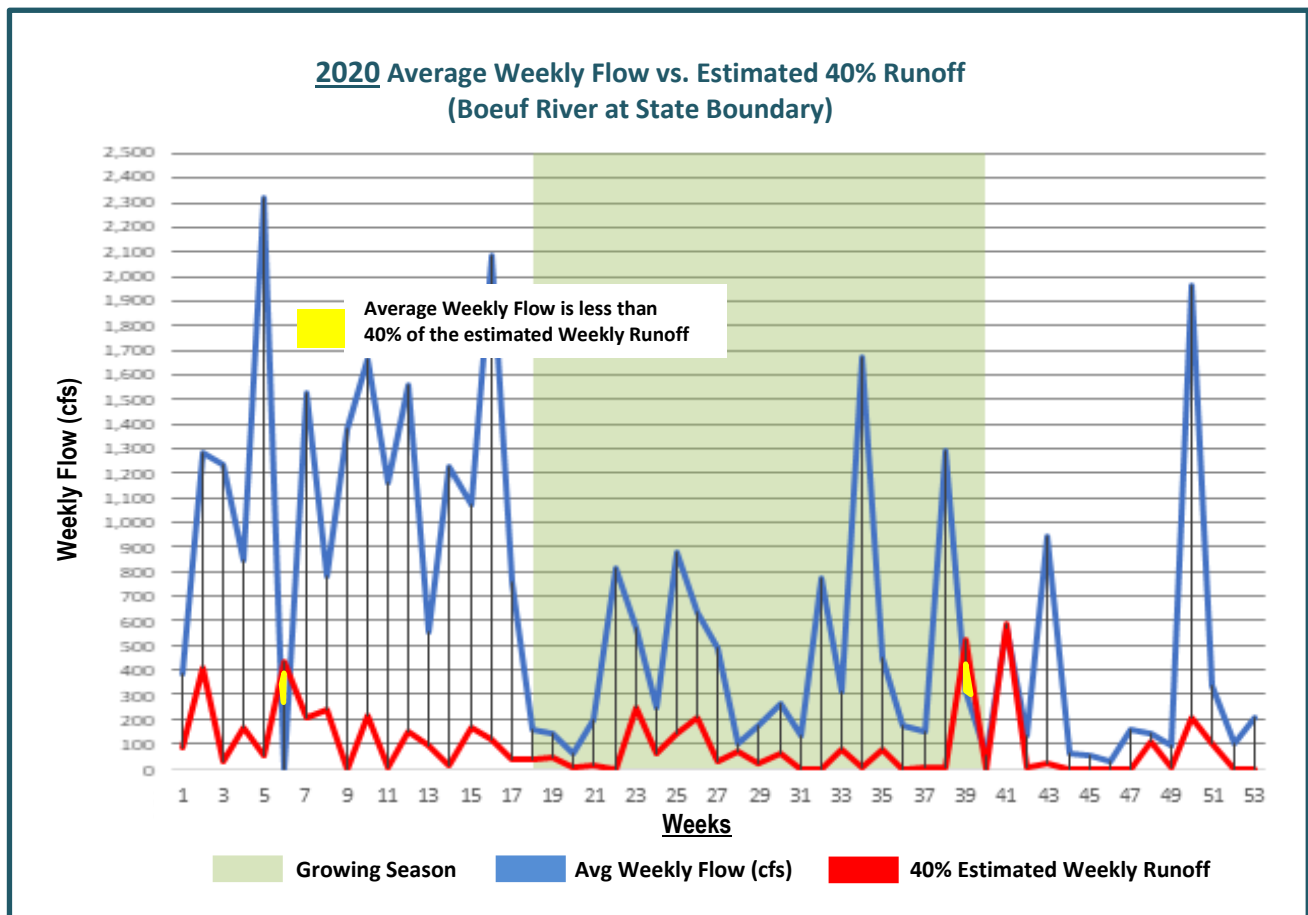


Figure 4. Boeuf River Weekly Flow at AR/LA State Boundary

Surface water data in 2020 was comparable to previous years reported usage. Any changes in location and number of diversions is attributed to localized water needs associated with crop rotation which can vary from year to year. The total volume of reported water use is minimal compared to Boeuf River flows during the growing season. **Note:** *Reported annual water use does not reflect daily withdrawal quantities.*

Eudora and state boundary flows are monitored to identify potential impacts to flow from surface water diversion and use in Arkansas. The following assumptions are made to help identify when and if diversion impacts occur:

- Flows at Eudora gage represent runoff from the upper Boeuf River watershed without diversion losses being considered.
- Flows at state boundary represent combined runoff from upper Boeuf River watershed at Eudora and intervening flows downstream of Eudora to state boundary with diversion and other losses being considered.
- Losses between Eudora and state boundary gages are the result of evaporative processes (lack of precipitation, temperature, soil moisture, surface evaporation, etc.) surface/groundwater interaction, diversion, and other physical or biological influences which are not easily quantified.

In Figure 5 weekly flow at Eudora and state boundary gages exhibit similar patterns, particularly during the growing season months. Figure 5 shows no significant disruption (loss) in weekly flow between the Eudora and state boundary gages. Lower flow periods at Eudora and the state boundary correlate directly to 2020 monthly precipitation data shown in Figure 3 on page 3.

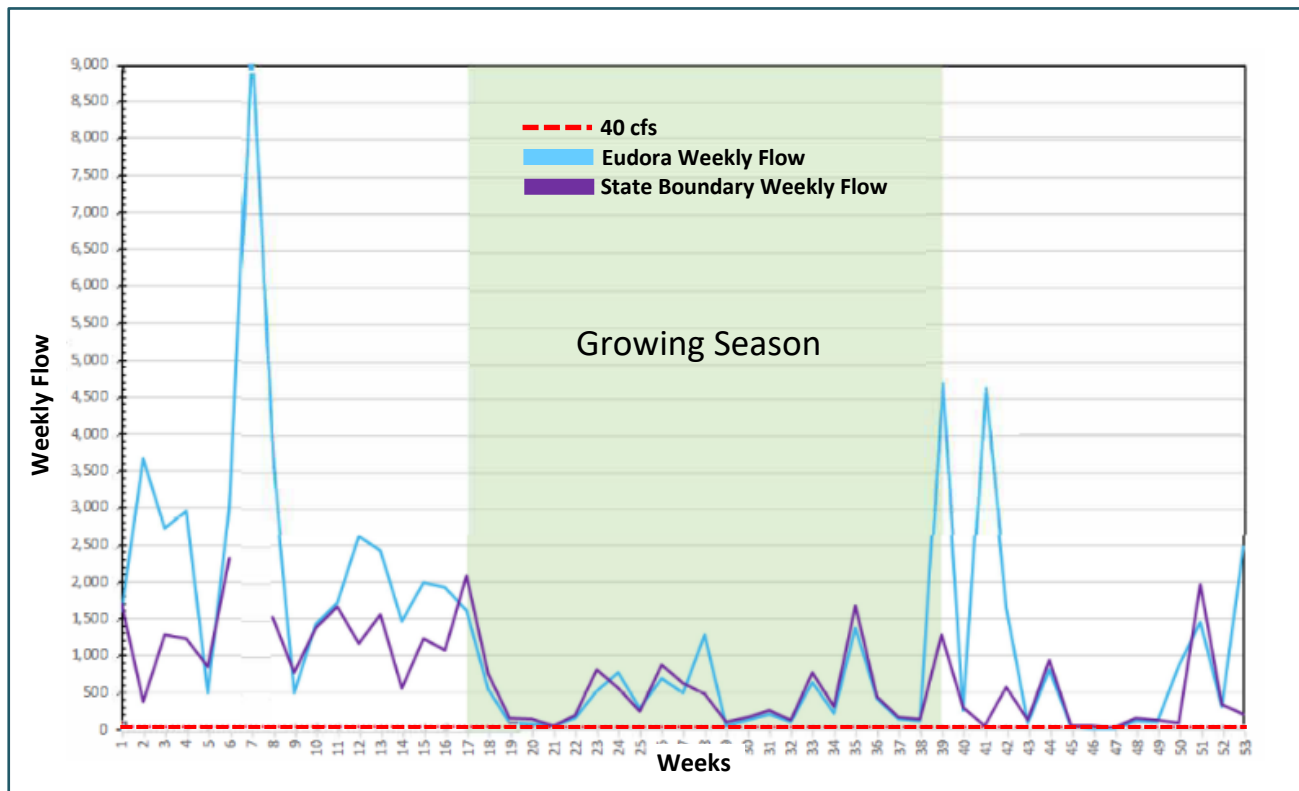


Figure 5. Boeuf River Weekly Flows at Eudora and AR/LA State Boundary Gages

■ REPORT CONCLUSIONS

Several years of monitoring and assessment of Boeuf River flow, precipitation, and water use data has shown average monthly precipitation in the watershed resulted in no occurrences of 40cfs or less flow lasting at least seven consecutive days (week). Monthly precipitation or lack of precipitation is by far the most influencing factor affecting Boeuf River flow at Eudora and state boundary, particularly during the growing season months. This year's data showed below-average monthly precipitation in May 2020 which contributed to three 40cfs or less flow occurrences in the May and June months. However, these occurrences lasted less than seven consecutive days and were ameliorated by subsequent precipitation events and runoff. There were no statistically relevant anomalies in recorded flows at Eudora or state boundary gages during 2020.

The arithmetic expression used in this report is not an accurate method for calculating individual, instantaneous weekly runoff. However, it does provide a means for generating weekly runoff values for 52 week and longer periods which can be compared against recorded flow to help identify baseline flow patterns and future flow anomalies.

NRD recommends continuation of monitoring, evaluation, and reporting of Boeuf River flows through its annual *Boeuf River Monitoring Report*.

STATE OF ARKANSAS
2020 Technical Report on River Red Compact Streams
Subbasin II, Reach IV

Provided to: Engineering & Environmental Committees
April 26, 2021

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Existing Red River Compact Provisions

Article VII of the Red River Compact contains provisions for apportionment of water in Reach IV Sections 7.01 - 7.03, as contained in Article VII, are included below.

Reach IV of the Red River is divided into topographic subbasins, and the water therein allocated as follows:

Section 7.01 Subbasin I - Intrastate streams - Arkansas.

- a) This subbasin includes those streams and their tributaries above last downstream major dam sites originating in Arkansas and crossing the Arkansas-Louisiana state boundary before flowing into the Red River in Louisiana. Those major last downstream dam sites are as follows: Lake Catherine (Ouachita River), DeGray Lake (Caddo River), Lake Greeson (Little Missouri River), and Lake Winona (Saline River).
- b) Arkansas is apportioned the waters of this subbasin and shall have unrestricted use thereof.

Section 7.02 Subbasin II - Interstate Streams - Arkansas and Louisiana

- a) This subbasin shall consist of Reach IV less subbasin I as defined in Section 7.01 (a).
- b) The State of Arkansas shall have free and unrestricted use of the water of this reach subject to the limitation that Arkansas shall allow a quantity of water equal to forty (40) percent of the weekly runoff originating below or flowing from the last downstream major dam site to flow into Louisiana. Where there are no designated last downstream dam sites, Arkansas shall allow a quantity of water equal to forty (40) percent of the total weekly runoff originating above the state boundary to flow into Louisiana. Use of water in this subbasin is subject to low flow provisions of subparagraph 7.02 (b).

Section 7.03 Special Provisions

- a) Arkansas may use the beds and banks of segments of Reach IV for the purpose of conveying its share of water to designated downstream diversions.
- b) The State of Arkansas shall not guarantee to maintain a minimum low flow for Louisiana in Reach IV. However, on the following streams when the use of water in Arkansas reduces the flow at the Arkansas-Louisiana state boundary to the following amounts:
 - 1) Ouachita River -780 cfs
 - 2) Bayou Bartholomew - 80 cfs
 - 3) Boeuf River-40 cfs
 - 4) Bayou Macon - 40 cfs

Collection and Presentation of Data

The State of Arkansas monitors, collects, and presents data to comply with the Compact on an annual basis. Three data sets utilized in monitoring and collection include stream gauge data maintained by USGS, precipitation data maintained by NOAA, and water use registration data from Arkansas Department of Agriculture - Natural Resources Division, formerly Arkansas Natural Resources Commission (ANRC).

The first data set, stream gauge data from USGS, complies with Section 7.03 Special Provisions, subsection b. stipulating minimum flows on the Ouachita River, Bayou Bartholomew, Boeuf River, and Bayou Macon, stream gauge data is monitored and subsequently collected. The gauges utilized for the purpose of the compact are detailed below. Compact gauges are indicated by blue stars. Due to an abundance of “Null” or “No Data” values recorded at the Arkansas/Louisiana state line, a second USGS stream gauge is monitored on the Boeuf River.

USGS 07364078 Ouachita River at Felsenthal L&D (lower) ★

Period of Record: 10/01/2011 - current

Latitude 33.056111, Longitude - 92.120833 NAD83 Union County, Arkansas, Hydrologic Unit 08040202

Datum of gage: 0.00 feet above NGVD29.

Section 7.03 (b) (2): Arkansas-Louisiana state boundary flow: 780 cfs

USGS 07364200 Bayou Bartholomew near Jones, Louisiana ★

Period of Record: 10/01/1995 - current

Latitude 33.990278, Longitude -91.655556 NAD27 Morehouse Parish, Louisiana, Hydrologic Unit 08040205 Drainage area: 1,187.00 square miles

Datum of gage: 79.21 feet above NGVD29.

Section 7.03 (b) (2): Arkansas-Louisiana state boundary flow 80 cfs

USGS 07367680 Boeuf River nr Eudora, Arkansas

Period of Record: 8/1/2014 - current

Hydrologic Unit Code 08050001

Latitude 33.124167, Longitude -91.347778 NAD83

Drainage area 623.00 square miles

USGS 07367690 Boeuf River at Arkansas/Louisiana State Line ★

Period of Record: 10/01/2011 - current

Latitude 33.001389, Longitude -91.438056 NAD83 Morehouse Parish, Louisiana, Hydrologic Unit 08050001

Drainage area: 721 square miles

Datum of gage: 79.75 feet above NAVD88.

Section 7.03 (b) (2): Arkansas-Louisiana state boundary flow 40 cfs

USGS 07369680 Bayou Macon at Eudora, Arkansas ★

Chicot County, Arkansas

Hydrologic Unit Code 08050002

Latitude 33.101389, Longitude -91.254444 NAD83

The second data set, precipitation data, is detailed below. Precipitation monitoring stations are not set out in the compact, so this section provides ancillary data which supports and documents weather and climate conditions occurring during calendar year 2020 which may have influenced hydrologic conditions. The primary sources used in the collection of data are the NOAA National Centers for Environmental Information (<https://www.ncdc.noaa.gov>) and National Weather Service (<https://www.weather.gov/lzk>).

Ouachita River

USC00032475 Felsenthal Lock And Dam, Arkansas

Latitude 33.0597 Longitude -92.1236

Elevation 18.3 feet

Bayou Bartholomew

USC00035866 Portland, Arkansas

Latitude 33.2511 Longitude -91.5058

Elevation 39 feet

Boeuf River and Bayou Macon

USC00032355 Eudora, Arkansas

Latitude 33.1144 Longitude -91.2627

Elevation 41.1 feet

The third data set utilized is Arkansas Water Use Registration collected through the Arkansas Department of Agriculture – Natural Resources Division, formerly Arkansas Natural Resources Commission. In accordance with State laws, any user of surface water withdrawing 1 acre-foot or more per year must report the annual water usage. This involves registration, registration fee, recording usage and finally reporting on each individual site. Reporting is based on a water-year, October 1 – September 30, and is due October 1 through March 1. Water use data is maintained through an agreement with USGS. The data is available through USGS Water Use Site Retrieval - Lower Mississippi Gulf Arkansas at https://wise.er.usgs.gov/wateruse/wateruse_data?q=pub.

The data will be presented in four 4 sections::

1. 2020 Climate conditions including precipitation data,
2. USGS Stream Gauge and Precipitation Data using Compact thresholds.
3. Arkansas water registration data

2020 Climate Conditions

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

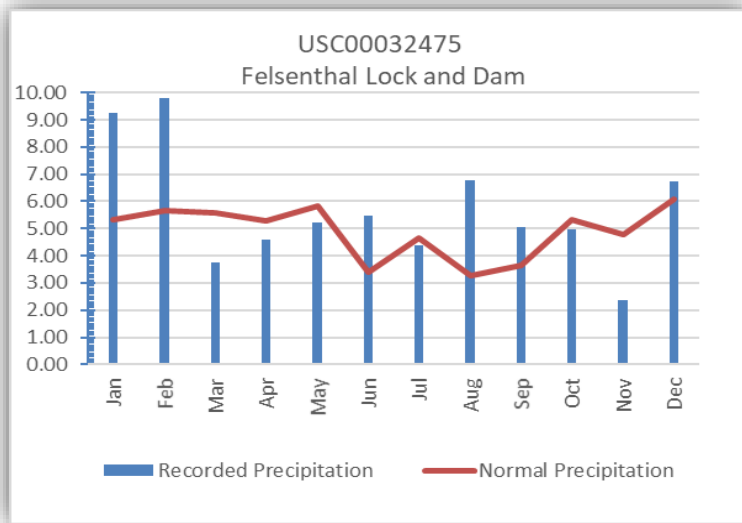
The summary reports statewide precipitation was greater than normal in 2020 with only two months being below average for rainfall (November and December) with March being the wettest month. August is noted for its departure from normal with 3.22 inches above average. Arkansas’ precipitation was influenced by four tropical systems. The systems are listed in table 1.

Table 1-2020 Tropical Systems Impacting Arkansas

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

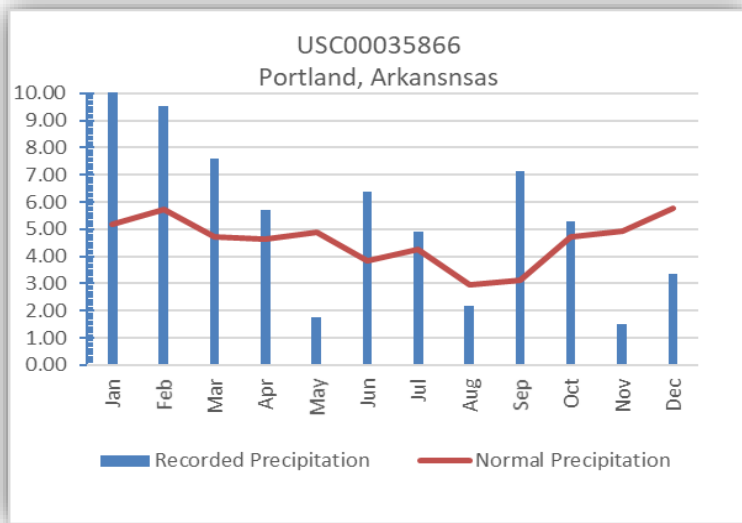
Statistical variability in precipitation occurs between the statewide level and local level of the monitoring stations in Subbasin 2 of the compact. The monitoring station on the Ouachita River deviates from March being the wettest month for the year with a recorded monthly average 1.81 inches below average (figure 1 and table 2). While a higher departure from normal for August is noted statewide due to repeated rounds of showers, thunderstorms, and Hurricane Laura, the monitoring stations for Bayou Bartholomew (figure 2 and table 3), Boeuf River, and Bayou Macon (figure 3 and table 4) recorded below normal rainfall. However, keeping with the statewide trend of higher-than-normal precipitation, the three monitoring stations finished 2020 with 9.58, 10.71, and 12.57 inches, respectively.

Figure 1 and Table 2 – Precipitation values for calendar year 2020 associated with the Ouachita River watershed in southern Arkansas.



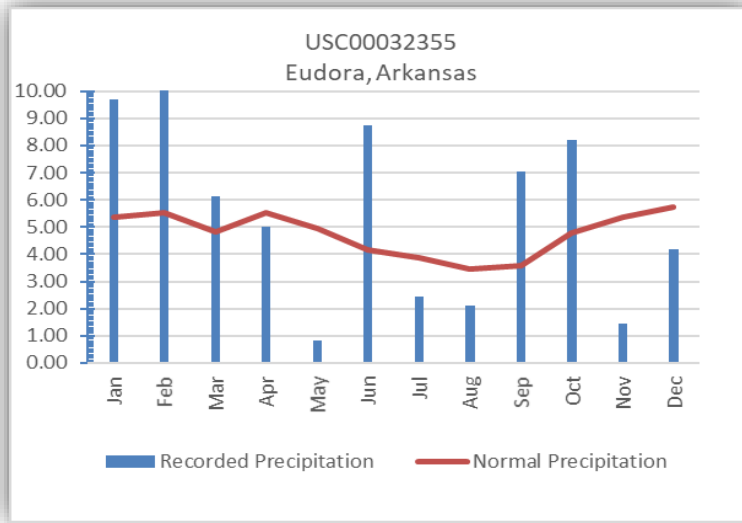
Month	Recorded	Normal	Difference
Jan	9.68	5.35	4.33
Feb	12.03	5.53	6.50
Mar	6.14	4.81	1.33
Apr	5.01	5.53	0.52
May	0.82	4.96	4.14
Jun	8.72	4.16	4.56
Jul	2.43	3.89	1.46
Aug	2.12	3.44	1.32
Sep	7.04	3.60	3.44
Oct	8.22	4.77	3.45
Nov	1.44	5.37	3.93
Dec	4.19	5.72	1.53
Total	67.84	57.13	10.71

Figure 2 and Table 3 - Precipitation values for calendar year 2020 associated with the Bayou Bartholomew watershed in southern Arkansas.



Month	Recorded	Normal	Difference
Jan	9.27	5.32	3.95
Feb	9.80	5.67	4.13
Mar	3.77	5.58	1.81
Apr	4.59	5.28	0.69
May	5.21	5.83	0.62
Jun	5.48	3.39	2.09
Jul	4.40	4.67	0.27
Aug	6.78	3.26	3.52
Sep	5.04	3.64	1.40
Oct	4.96	5.32	0.36
Nov	2.38	4.79	2.41
Dec	6.72	6.07	0.65
Total	68.40	58.82	9.58

Figure 3 and Table 4 - Precipitation values for calendar year 2020 associated with the Boeuf River and Bayou Macon watershed in southern Arkansas.

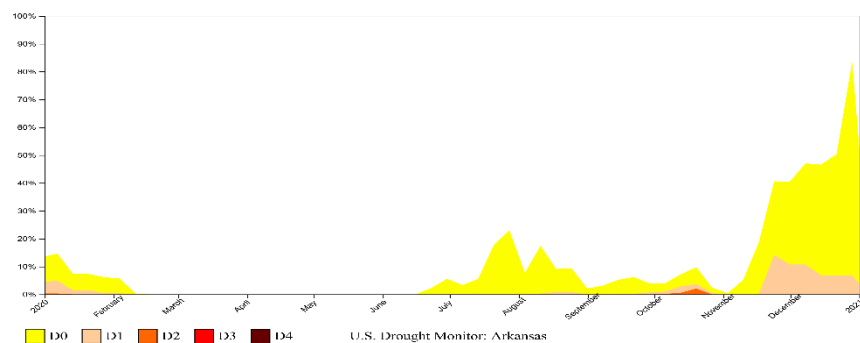


Month	Recorded	Normal	Difference
Jan	11.92	5.17	6.75
Feb	9.51	5.72	3.79
Mar	7.61	4.72	2.89
Apr	5.69	4.63	1.06
May	1.74	4.87	3.13
Jun	6.39	3.83	2.56
Jul	4.91	4.25	0.66
Aug	2.19	2.96	0.77
Sep	7.15	3.13	4.02
Oct	5.30	4.70	0.60
Nov	1.49	4.94	3.45
Dec	3.35	5.76	2.41
Total	67.25	54.68	12.57

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 D_0 and less than 10 percent of the state saw moderate drought conditions as indicated by the symbol D_1 . 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 D_2 during the month of October.

Figure 5 - 2020 Drought condition for Arkansas obtained from the National Integrated Drought Information System (NIDIS)



USGS Stream Gauge and Precipitation Data Using Set Compact Thresholds



Section 7.02 Subbasin II – Interstate Streams – Arkansas and Louisiana subsection b specifies that Arkansas shall allow a quantity of water equal to forty (40) percent of the weekly runoff to flow into Louisiana. Section 7.03 Special Provisions of the compact specify a minimum flow for four streams in Reach VI. The following is a summary of the monitoring for the Ouachita River, Bayou Bartholomew, Boeuf River, and Bayou Macon. Data sheets and graphs are presented following the summary.

Overall, the minimum flow for the four monitoring sites were met during the growing season of May through the end of September. Boeuf River experienced one 7-day period in November when minimum flow fell below set criteria. Bayou Macon experienced three 7-day periods in September, October, and November when minimum flow fell below set criteria. As noted in the drought monitoring section, these periods correlate to times the state was experiencing drought conditions and are visibly noted on the site-specific data sheets. Figure 8 is the summary data sheet for the four monitoring sites.

The data sheets contain provide data collected from the specific sites. Figure 6 is the condensed table data from the individual sheets. The sheet is designed in columns corresponding to the compact stream. The top section identifies the stream and statistics derived from the individual data collected from USGS. Keys to color coded cells are also provided as shown below.

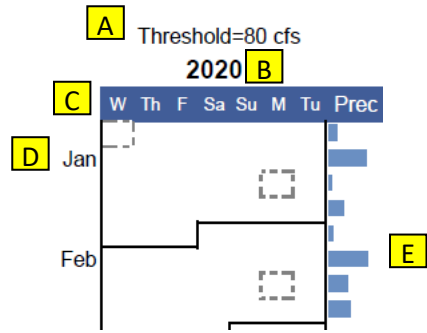
Figure 6 - Summary sheet detail

DISCHARGE (cfs) OUACHITA RIVER		DISCHARGE (cfs) BAYOU BART		DISCHARGE (CFS) BOEUF RIVER		DISCHARGE (cfs) BAYOU MACON	
Data Start	1/1/2020	Data Start	1/1/2020	Data Start	1/1/2020	Data Start	1/1/2020
Max	19,400.00	Max	6,190.00	Max	3,650.00	Max	1,825.73
60%	9,126.00	60%	1,800.00	60%	412.80	60%	257.26
Med	7,765.00	Med	1,445.00	Med	273.00	Med	192.63
Avg	8,709.32	Avg	2,229.27	Avg	652.19	Avg	335.91
40%	6,862.00	40%	1,136.00	40%	177.80	40%	173.51
Min	705.00	Min	168.00	Min	0.05	Min	0.57

	Data value for the day is null		Data value for the day is at or below threshold
-------------------------------------------------------------------------------------	--------------------------------	-------------------------------------------------------------------------------------	-------------------------------------------------

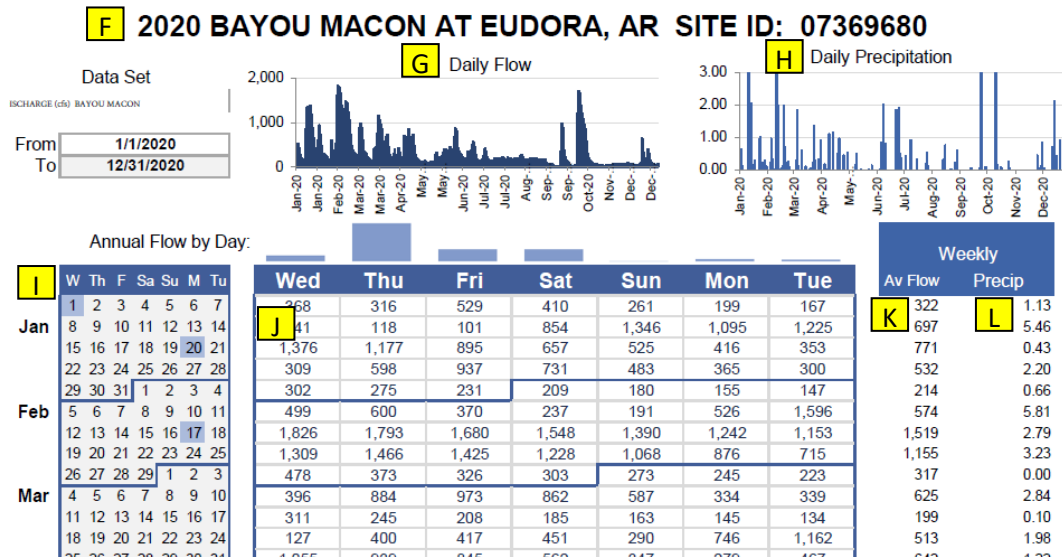
The columns contain the following content: A) compact minimum flow (threshold), B) year, C) day of week, D) month, and E) bar chart for the weekly total of precipitation. Cells contained by a gray dashed line indicate holidays.

Figure 7 - Summary sheet column details



The site-specific data sheets, figures 8, 9, 11, 13, 15, and 17, provide the F) stream name and USGS monitoring station, G) chart expressing daily flow, H) chart expressing daily precipitation, I) daily calendar, J) daily volume (cfs), K) weekly average flow (cfs), and L) weekly precipitation (in).

Figure 8 – Site-specific data sheet details



The data is also presented in the form of a graph in figures 10, 12, 14, 16, and 18. The charts provide the data on a weekly basis contrasting the average weekly precipitation (In) and average weekly discharge (cfs) compared to the minimum threshold and highlighting the growing season.

Ouachita River

The most notable detail which stands out on the sit-specific Data Sheet for the Ouachita River Felsenthal Lock & Dam Site ID 07364078t (Figure 9), are the null recordings from January 13 to July 14. Weekly precipitation for week 27, which began on July 1, is the only 7-day timeframe with a 0.00 recording for precipitation during time of no recordings.

During the later weeks of 2020, specifically week 47, one daily recording falls below the 780 cfs threshold. This one daily occurrence coincides with noted drought conditions previously mentioned. Precipitation is down in the weeks prior to this single day event. Flows on the Ouachita River significantly increased the following day. The discharge, precipitation, and minimum flow for the Ouachita River (figure 10) illustrates the decrease in flow beginning in week 45 and ending in week 47 when flows begin to increase.

The following statistics are taken from the Summary Sheet (figure 8).

Max Flow	60% Flow	Median Flow	Average Flow	40% Flow	Min Flow
19,400	9,126	7,765	8,709.32	6,862	705

Bayou Bartholomew

The data sheet for the compact gage Bayou Bartholomew Near Jones, Louisiana Site ID 07364200 (figure 11) and chart (figure 12) illustrate the minimum flow of 80 cfs for Bayou Bartholomew was passed the entire year. No weekly reading or daily reading fell at or below the threshold.

The following statistics are taken from the Summary Sheet (figure 8).

Max Flow	60% Flow	Median Flow	Average Flow	40% Flow	Min Flow
6,190	1,800	1,445	2,229.27	1,136	168

Boeuf River

The compact gage located at Arkansas/Louisiana State Line Site ID 07367690 and the gage located at Near Eudora, Arkansas Site ID 07367680 were used in analysis and presentation of data. Two reasons exist for utilizing both gages: 1) the compact gage at the Ar/La State Line returns null values 17% of the time, and 2) a correlation between the two gages exists which can be utilized to better assess the volume of water being passed from Arkansas into Louisiana.

Due to the spatial location of the USGS gage on the Boeuf River near Eudora, site ID 07367680, being the upstream gage and providing measurements daily, the data will be presented first. This data is not included on the summary sheet (figure 6) since this is not a compact gage. The data sheet for the gage is figure 13 and the chart is figure 14. The data sheet documents two 7-day periods where flow falls below 40 cfs. The first event begins on June 15th and concludes June 21st. This time frame is not consistent with the data from the Drought Monitor or with the climate summary. Precipitation records at Eudora show a below average recording of 3.13 inches for May which accounts for the lower stream flow. The second event begins November 11th and concludes November 25. This time frame coincides with the drought monitor and climate summary.

In keeping consistent with the presentation of the data, the statistics for the gage at Eudora are as follows.

Max Flow	60% Flow	Median Flow	Average Flow	40% Flow	Min Flow
12,200	521.40	275	1,275.82	185	0.00

These statistics significantly differ from those recorded at the State Line gage and emphasize the need for quality assurance of the hydrologic conditions which exist at the state line. The data sheet and chart for Boeuf River at AR/LA State Line Site ID 07367690 are figure 15 and figure 16 respectively. The low flow pattern for the State Line gage shows is slightly different for discharge below 40 cfs. Of the 27 daily averages which fall below 40 cfs, only 1 seven day or greater period occurs. The period begins November 19th and ends November 25th. The timeframe aligns with both the drought monitor and summary report. Care is stressed in the observation of “null” values expressed on the data page (figure 15). The null values are not indicative of low flow but of an empty or missing recording. In fact, the “null” sets in this instance are more representative of high flows than low flows and is discussed further after the statistics. The data below comes from the summary sheet (figure 8) for records on the Boeuf River at AR/LA State Line Site ID 07367690.

Max Flow	60% Flow	Median Flow	Average Flow	40% flow	Min Flow
3,650	412.20	273	652.19	177.80	0.05

The comparison of the data available for the two gages express a wide deviation for locations approximately 12 miles apart in which the topography changes less than 10 feet. The difference in the statistical computations of flow at Eudora is considerably higher than that at State Line. This is where null values factor into the statistics to present a scenario which is not representative of the conditions at the State Line Gage. Dropping the corresponding “Null” daily values at Eudora then reevaluating the statistics brings the two data sets into better alignment as illustrated below.

Gage	Max Flow	60% Flow	Median Flow	Average Flow	40% flow	Min Flow
Eudora (adjusted)	3,140	271	190	476.26	130.20	0.00
State Line (Unadjusted)	3,650	412.20	272	644.30	198.20	0.05

With a change in elevation of less than or equal to 1 %, or approximately 5 feet of change over 12 miles, which includes additional flow from the confluence of Caney Creek and Lafourche Bayou, it is expected to see higher numbers at the State Line gage which does occur. It is important to note here that this is based on daily records. Since 2020 was leap year, there were 366 days. Of the 366 days, 62 days, or 17%, were null at the State Line gage. 287 days, or 78% of the time, the flow at State Line is greater than at Eudora. 16 days, or 4% of the time, Eudora flows were greater than State Line. Finally, 1 day, less than 1 % of the time, the gages had an equivalent reading.

The work which led to closer scrutiny of the data for the two gages emerged from the patterns illustrating direct correlation between discharge and stage on a weekly basis. The stage or gage height comparison, figure 17, indicates a definitive pattern between the two sites, whereas the discharge comparison pattern, figure 18, is less pronounced due to the “null” values inherent in the record. The obvious time frame of week 1 through week 17 illustrates how the “null” values influence the pattern in discharge between the two sites. the break in the data due to null values. The pronounced highs are not seen in the discharge over the rest of the year due to the hole in the data set created by the null recordings.

Bayou Macon

The last monitoring station is Bayou Macon at Eudora, Arkansas Site ID 07369680. The data sheet and chart for Bayou Macon are figure 20 and figure 21. The minimum flow of 40 cfs was passed on a daily and weekly basis from the beginning of 2020 until September. Three 7-day or longer periods of below 40 cfs occurred in September, October, and November. This time frame aligns with the data seen in the Drought Monitor and partially with the summary report. The following statistics are found on the summary data sheet.

Max Flow	60% Flow	Median	Average	40% Flow	Min Flow
1825.79	267.26	192.63	335.91	173.51	0.57

Figure 8 - CY 2020 Reach IV, Subbasin 2, Data Comparison

DISCHARGE (cfs) OUACHITA RIVER	
Data Start	1/1/2020
Max	19,400.00
60%	9,126.00
Med	7,765.00
Avg	8,709.32
40%	6,862.00
Min	705.00

DISCHARGE (cfs) BAYOU BART	
Data Start	1/1/2020
Max	6,190.00
60%	1,800.00
Med	1,445.00
Avg	2,229.27
40%	1,136.00
Min	168.00

DISCHARGE (CFS) BOEUF RIVER	
Data Start	1/1/2020
Max	3,650.00
60%	412.20
Med	272.00
Avg	644.30
40%	177.00
Min	0.05

DISCHARGE (cfs) BAYOU MACON	
Data Start	1/1/2020
Max	1,825.73
60%	257.26
Med	192.63
Avg	335.91
40%	173.51
Min	0.57



Data value for the day is null



Data value for the day is at or below threshold

Threshold=780 cfs

Threshold=80 cfs

Threshold=40 cfs

Threshold=40 cfs

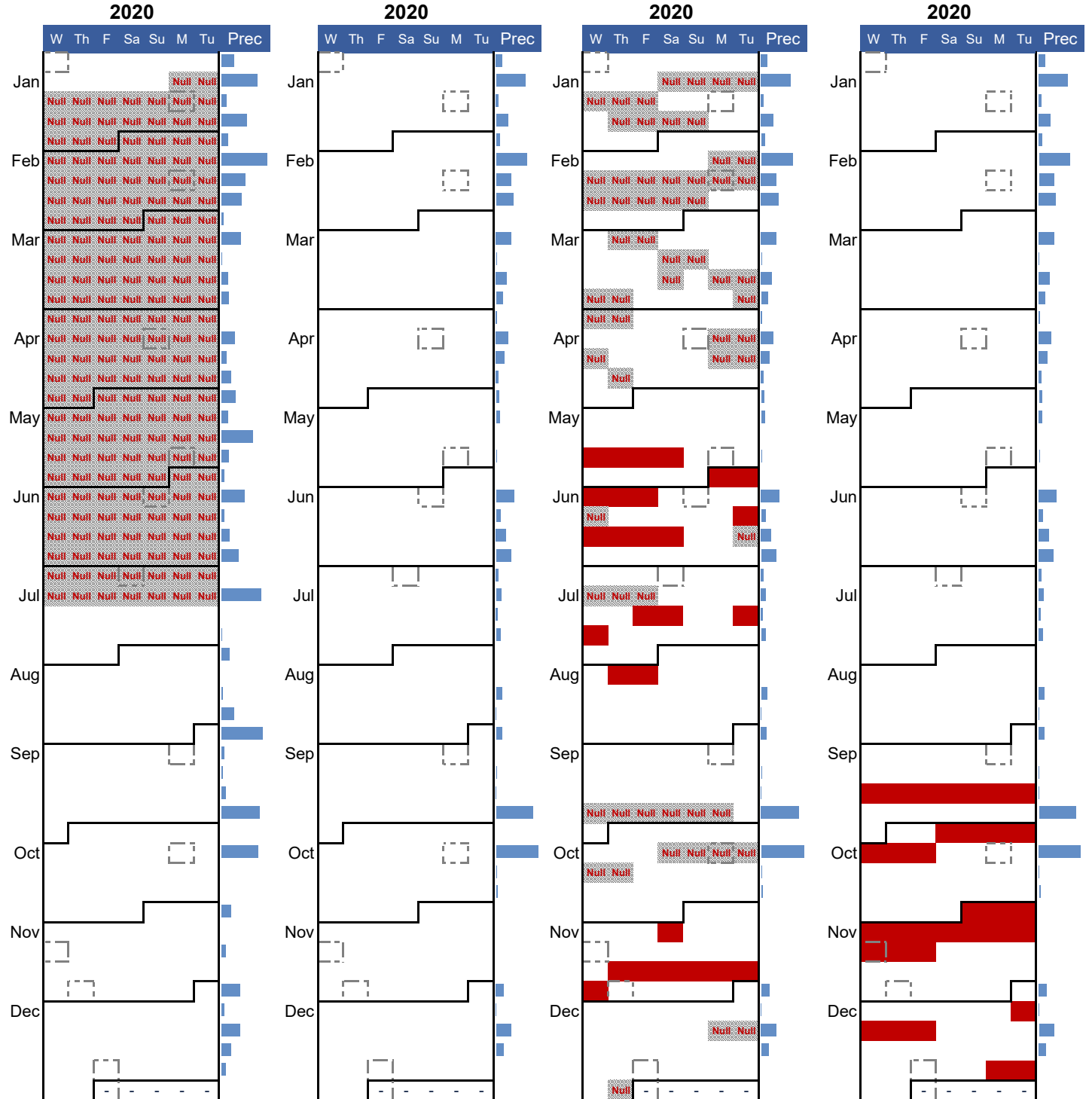
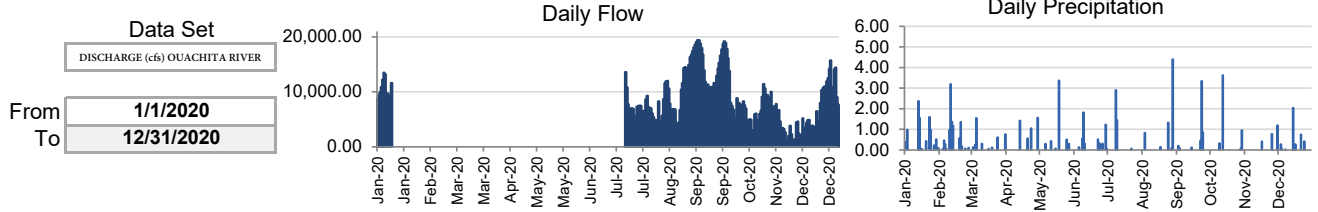


Figure 9 - 2020 Ouachita River Felsenthal Lock & Dam Site ID: 07364080



Data Set		Annual Flow by Day:							Weekly	
DISCHARGE (cfs) OUACHITA RIVER		Wed	Thu	Fri	Sat	Sun	Mon	Tue	Av Flow	Precip
Jan	1	8,790	9,410	9,940	10,900	12,200	13,500	13,200	11,134	1.37
	8	9,570	9,750	9,150	8,370	11,600	Null	Null	9,688	3.93
	15	Null	Null	Null	Null	Null	Null	Null	Null	0.50
	22	Null	Null	Null	Null	Null	Null	Null	Null	2.80
Feb	29	Null	Null	Null	Null	Null	Null	Null	Null	0.71
	5	Null	Null	Null	Null	Null	Null	Null	Null	4.95
	12	Null	Null	Null	Null	Null	Null	Null	Null	2.55
	19	Null	Null	Null	Null	Null	Null	Null	Null	2.16
Mar	26	Null	Null	Null	Null	Null	Null	Null	Null	0.23
	4	Null	Null	Null	Null	Null	Null	Null	Null	2.11
	11	Null	Null	Null	Null	Null	Null	Null	Null	0.05
	18	Null	Null	Null	Null	Null	Null	Null	Null	0.72
Apr	25	Null	Null	Null	Null	Null	Null	Null	Null	0.76
	1	Null	Null	Null	Null	Null	Null	Null	Null	0.00
	8	Null	Null	Null	Null	Null	Null	Null	Null	1.42
	15	Null	Null	Null	Null	Null	Null	Null	Null	0.56
May	22	Null	Null	Null	Null	Null	Null	Null	Null	1.05
	29	Null	Null	Null	Null	Null	Null	Null	Null	1.56
	6	Null	Null	Null	Null	Null	Null	Null	Null	0.72
	13	Null	Null	Null	Null	Null	Null	Null	Null	3.43
Jun	20	Null	Null	Null	Null	Null	Null	Null	Null	0.76
	27	Null	Null	Null	Null	Null	Null	Null	Null	0.30
	3	Null	Null	Null	Null	Null	Null	Null	Null	2.51
	10	Null	Null	Null	Null	Null	Null	Null	Null	0.31
Jul	17	Null	Null	Null	Null	Null	Null	Null	Null	0.84
	24	Null	Null	Null	Null	Null	Null	Null	Null	1.82
	1	Null	Null	Null	Null	Null	Null	Null	Null	0.00
	8	Null	Null	Null	Null	Null	Null	Null	Null	4.33
Aug	15	13,600	10,800	7,740	6,990	6,940	6,970	6,930	8,567	0.00
	22	4,650	5,610	7,330	7,320	7,490	7,440	6,470	6,616	0.07
	29	5,880	6,590	8,600	9,280	7,270	4,300	7,010	6,990	0.83
	5	6,050	5,360	4,770	4,780	4,880	8,300	3,820	5,423	0.00
Sep	12	4,540	5,670	8,680	11,500	11,900	12,000	10,600	9,270	0.14
	19	7,820	6,870	6,850	6,880	6,770	3,710	4,340	6,177	1.33
	26	4,290	6,740	10,400	11,600	14,300	14,500	14,000	10,833	4.48
	3	14,300	14,900	16,300	16,800	17,400	18,100	18,600	16,629	0.28
Oct	10	19,100	19,400	19,400	18,800	18,000	16,800	13,900	17,914	0.12
	17	11,800	11,200	11,300	10,300	10,900	10,900	10,900	11,043	0.45
	24	11,600	10,100	12,900	14,200	15,300	16,600	17,700	14,057	4.19
	31	18,700	19,200	18,900	17,800	16,100	13,800	8,030	16,076	0.00
Nov	7	7,460	6,760	5,110	5,220	8,860	7,980	7,910	7,043	3.94
	14	6,220	7,520	8,290	7,540	6,960	4,890	3,160	6,369	0.00
	21	4,990	4,960	2,950	2,720	5,920	6,030	4,900	4,639	0.00
	28	4,470	6,000	6,570	9,090	11,400	10,600	8,720	8,121	1.02
Dec	4	9,420	8,300	8,930	10,000	7,330	6,910	7,420	8,330	0.00
	11	7,790	4,730	6,680	4,620	2,890	3,440	3,240	4,770	0.41
	18	2,610	1,220	705	1,970	3,850	2,260	991	1,944	0.00
	25	1,310	1,260	4,450	4,600	2,360	1,900	2,130	2,573	1.97
Dec	2	5,180	3,420	2,110	4,350	4,830	4,880	3,170	3,991	0.31
	9	3,850	3,850	2,880	3,650	6,470	4,790	4,860	4,336	2.04
	16	7,970	10,300	10,700	11,000	10,900	11,900	12,500	10,753	1.02
	23	14,200	15,700	10,900	10,600	14,100	14,400	9,010	12,701	0.41
30	7,670	14,900	-	-	-	-	-	11,285	2.94	

Section 7.03 (b) (2): Arkansas-Louisiana state boundary flow 780 cfs

Figure 10 - 2020 Discharge, Precipitation, and Minimum Flow Ouachita River

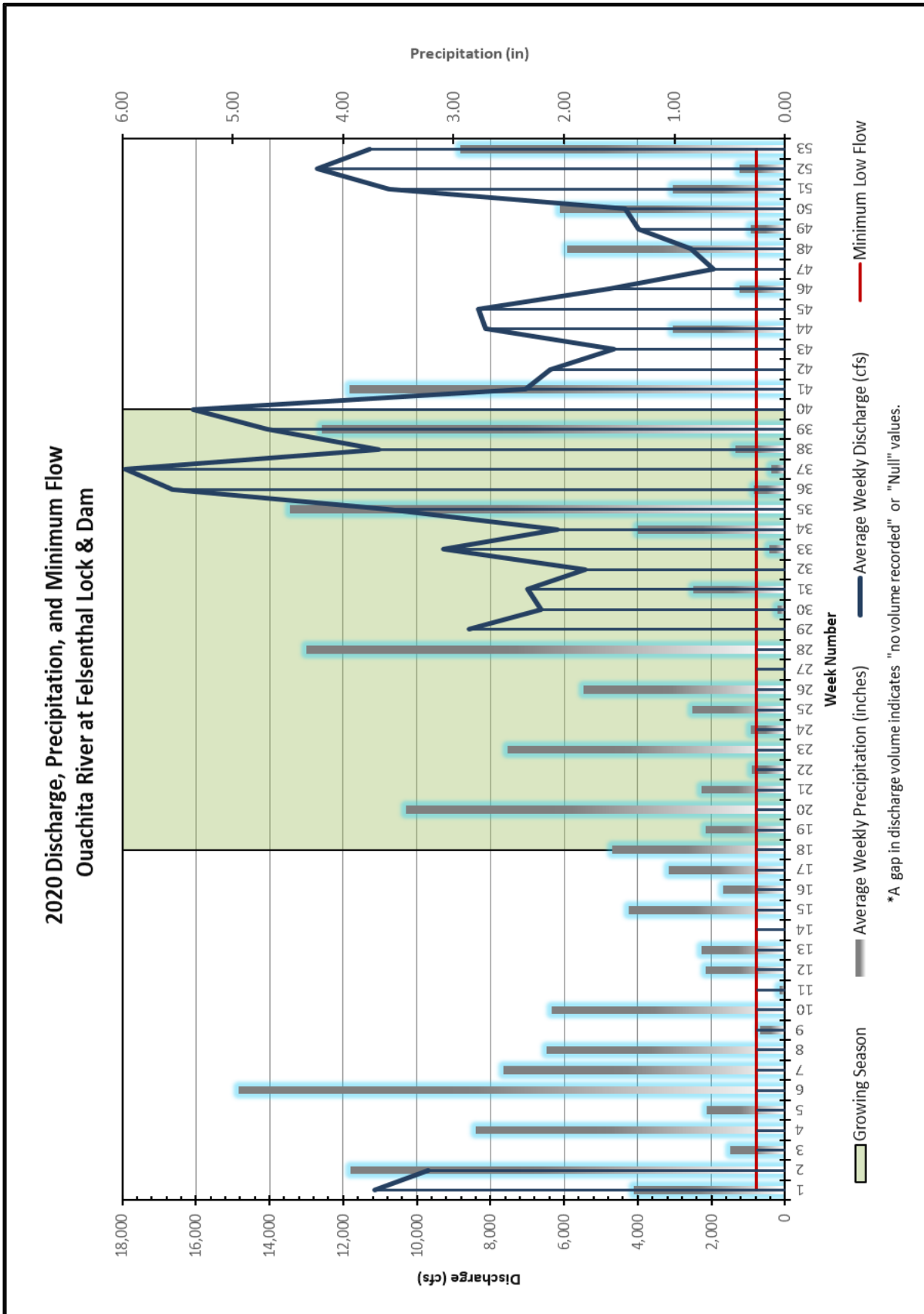
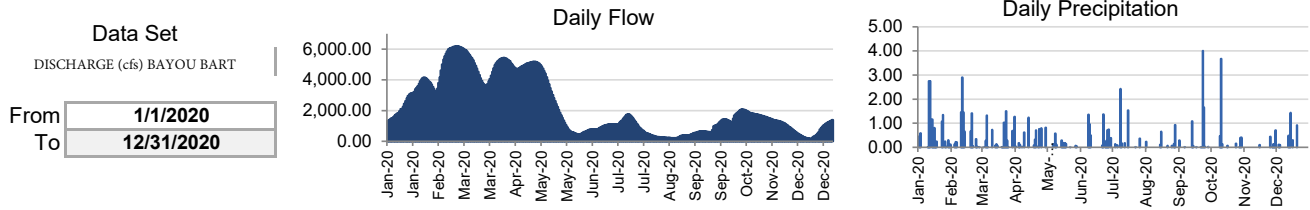


Figure 11 - 2020 Bayou Bartholomew Near Jones, LA Site ID: 07364200



Annual Flow by Day:

	Annual Flow by Day:							Weekly									
	W	Th	F	Sa	Su	M	Tu	Av Flow	Precip								
Jan	1	2	3	4	5	6	7	1,320	1,360	1,410	1,470	1,510	1,580	1,670	1,474	1.04	
	8	9	10	11	12	13	14	1,740	1,800	1,830	1,960	2,100	2,120	2,250	1,971	6.67	
	15	16	17	18	19	20	21	2,440	2,620	2,790	2,940	3,050	3,110	3,140	2,870	1.10	
	22	23	24	25	26	27	28	3,150	3,230	3,400	3,480	3,590	3,750	3,910	3,501	2.68	
	29	30	31	1	2	3	4	4,040	4,120	4,150	4,130	4,070	3,980	3,880	4,053	0.56	
	Feb	5	6	7	8	9	10	11	3,810	3,690	3,540	3,390	3,260	3,190	3,430	3,473	4.78
		12	13	14	15	16	17	18	3,790	4,150	4,610	5,010	5,310	5,520	5,690	4,869	2.12
19		20	21	22	23	24	25	5,850	5,990	6,040	6,070	6,100	6,140	6,170	6,051	2.47	
26		27	28	29	1	2	3	6,190	6,190	6,180	6,150	6,120	6,080	6,020	6,133	0.02	
Mar		4	5	6	7	8	9	10	5,980	5,940	5,840	5,730	5,620	5,500	5,400	5,716	2.34
		11	12	13	14	15	16	17	5,260	5,100	4,920	4,720	4,520	4,310	4,110	4,706	0.28
		18	19	20	21	22	23	24	3,930	3,780	3,690	3,640	3,580	3,720	3,900	3,749	3.02
	25	26	27	28	29	30	31	4,060	4,280	4,520	4,740	4,950	5,070	5,200	4,689	1.96	
	Apr	1	2	3	4	5	6	7	5,270	5,340	5,390	5,410	5,430	5,420	5,390	5,379	0.33
		8	9	10	11	12	13	14	5,340	5,290	5,210	5,080	4,980	4,890	4,790	5,083	1.85
		15	16	17	18	19	20	21	4,730	4,700	4,720	4,760	4,830	4,890	4,920	4,793	1.11
22		23	24	25	26	27	28	4,950	5,030	5,050	5,090	5,110	5,130	5,140	5,071	1.58	
29		30	1	2	3	4	5	5,180	5,180	5,170	5,150	5,110	5,060	4,970	5,117	0.82	
May		6	7	8	9	10	11	12	4,860	4,720	4,580	4,400	4,180	3,950	3,710	4,343	0.81
		13	14	15	16	17	18	19	3,470	3,240	3,010	2,800	2,610	2,430	2,230	2,827	0.82
	20	21	22	23	24	25	26	2,040	1,850	1,680	1,520	1,350	1,190	1,040	1,524	0.01	
	27	28	29	30	31	1	2	900	783	694	634	596	567	532	672	0.10	
	Jun	3	4	5	6	7	8	9	500	474	458	459	463	511	558	489	2.32
		10	11	12	13	14	15	16	609	635	665	715	752	767	771	702	0.49
		17	18	19	20	21	22	23	772	773	769	776	785	840	883	800	1.45
24		25	26	27	28	29	30	913	969	1,010	1,040	1,060	1,070	1,090	1,022	2.13	
Jul		1	2	3	4	5	6	7	1,110	1,120	1,120	1,110	1,110	1,100	1,070	1,106	0.22
		8	9	10	11	12	13	14	1,100	1,210	1,280	1,360	1,470	1,570	1,660	1,379	2.79
		15	16	17	18	19	20	21	1,730	1,750	1,730	1,670	1,580	1,480	1,360	1,614	1.53
	22	23	24	25	26	27	28	1,250	1,130	1,020	912	830	757	688	941	0.37	
	29	30	31	1	2	3	4	623	565	522	498	465	433	402	501	0.23	
	Aug	5	6	7	8	9	10	11	368	343	316	295	285	274	267	307	0.00
		12	13	14	15	16	17	18	260	248	244	244	234	233	231	242	0.76
19		20	21	22	23	24	25	222	217	215	212	208	209	226	216	0.13	
26		27	28	29	30	31	1	255	300	353	374	385	392	399	351	1.36	
Sep		2	3	4	5	6	7	8	396	396	406	430	462	498	533	446	0.01
		9	10	11	12	13	14	15	559	581	602	628	650	654	654	618	1.13
		16	17	18	19	20	21	22	646	637	625	618	611	600	587	618	0.03
	23	24	25	26	27	28	29	728	972	1,020	1,050	1,100	1,170	1,260	1,043	5.69	
	30	1	2	3	4	5	6	1,340	1,400	1,430	1,440	1,420	1,390	1,350	1,396	0.00	
	Oct	7	8	9	10	11	12	13	1,300	1,260	1,220	1,470	1,690	1,770	1,840	1,507	4.26
		14	15	16	17	18	19	20	1,910	1,990	2,040	2,080	2,070	2,050	2,020	2,023	0.07
21		22	23	24	25	26	27	1,970	1,920	1,870	1,840	1,820	1,800	1,780	1,857	0.16	
28		29	30	31	1	2	3	1,770	1,760	1,740	1,720	1,700	1,670	1,640	1,714	0.81	
Nov		4	5	6	7	8	9	10	1,620	1,600	1,580	1,550	1,510	1,480	1,450	1,541	0.00
		11	12	13	14	15	16	17	1,420	1,390	1,370	1,360	1,340	1,320	1,300	1,357	0.10
		18	19	20	21	22	23	24	1,270	1,240	1,200	1,160	1,100	1,040	975	1,141	0.00
	25	26	27	28	29	30	1	921	862	799	731	669	611	546	734	1.39	
	Dec	2	3	4	5	6	7	8	484	432	386	347	305	267	235	351	0.21
		9	10	11	12	13	14	15	208	187	172	168	170	266	315	212	1.93
		16	17	18	19	20	21	22	357	421	510	617	762	875	963	644	1.21
23		24	25	26	27	28	29	1,040	1,100	1,160	1,210	1,250	1,300	1,340	1,200	0.00	
30		31	1	2	3	4	5	1,390	1,580	-	-	-	-	-	1,485	0.00	

Section 7.03 (b) (2): Arkansas-Louisiana state boundary flow 80 cfs

Figure 12 - 2020 Discharge, Precipitation, and Minimum Flow Bayou Bartholomew

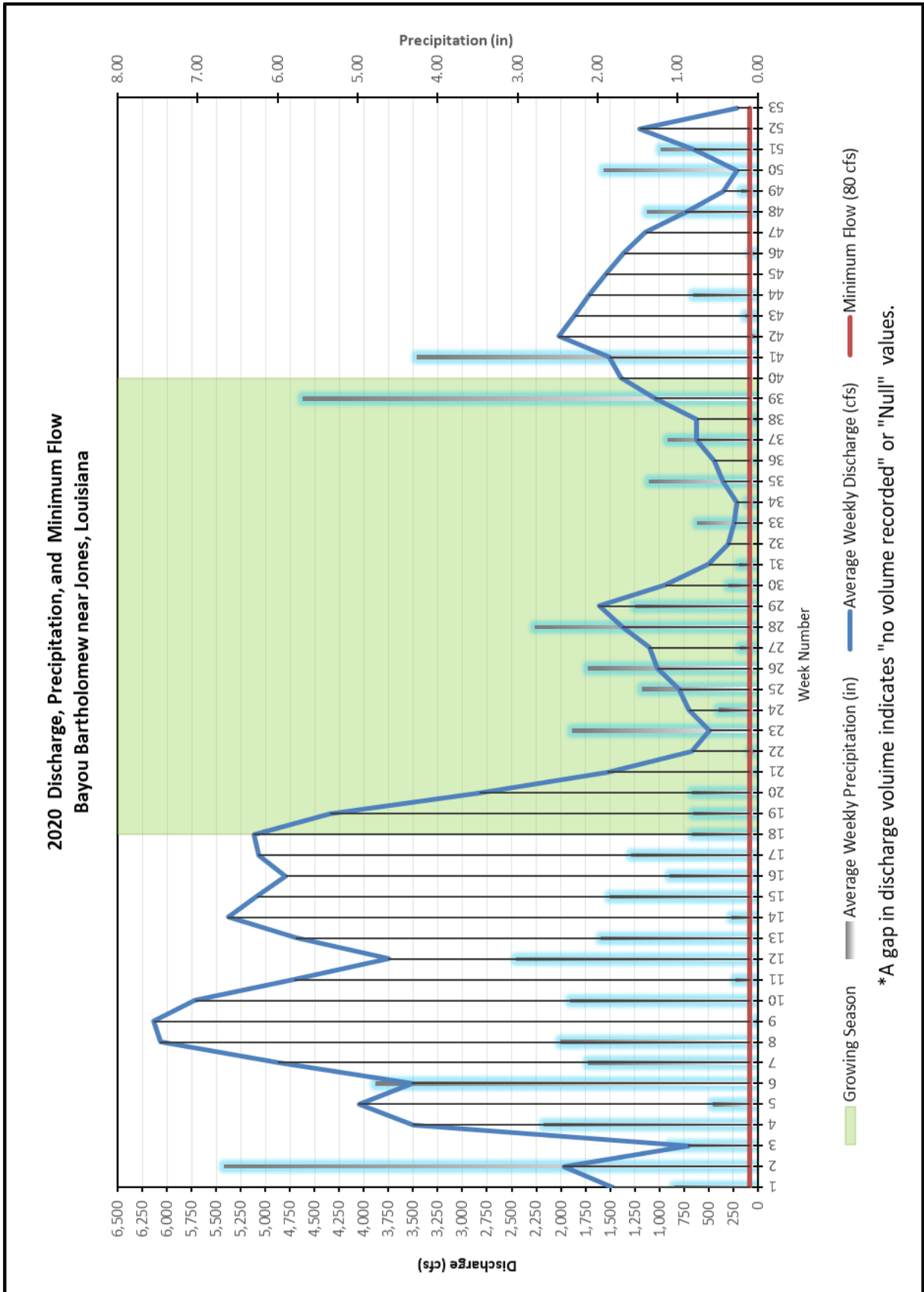
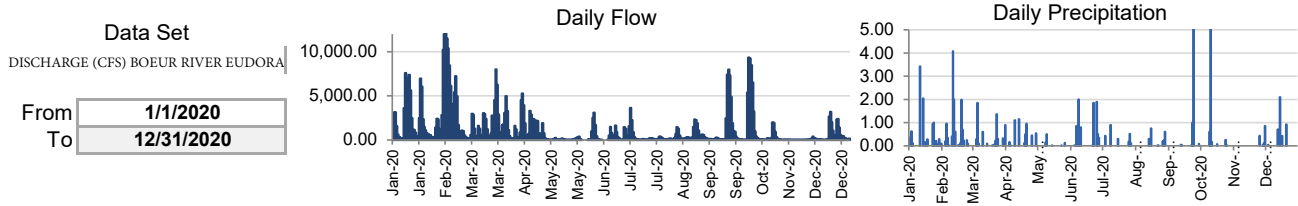


Figure 13- 2020 Boeuf River near Eudora, Arkansas Site ID:07367680



Annual Flow by Day:

	Annual Flow by Day:							Weekly								
	W	Th	F	Sa	Su	M	Tu	Av Flow	Precip							
Jan	1	2	3	4	5	6	7	1,430	1,040	3,140	3,130	1,580	618	344	1,612	1.13
	8	9	10	11	12	13	14	240	165	137	3,610	7,580	7,010	6,940	3,669	5.46
	15	16	17	18	19	20	21	7,380	5,620	2,490	1,190	1,140	834	434	2,727	0.43
	22	23	24	25	26	27	28	253	2,490	6,970	6,040	2,370	1,490	1,100	2,959	2.20
	29	30	31	1	2	3	4	753	697	573	531	319	213	378	495	0.66
	5	6	7	8	9	10	11	1,410	2,410	2,340	1,260	620	2,820	10,200	3,009	5.81
	12	13	14	15	16	17	18	12,000	12,200	11,500	10,400	8,450	6,130	4,020	9,243	2.79
Feb	19	20	21	22	23	24	25	3,830	5,430	7,240	4,960	1,700	994	932	3,584	3.23
	26	27	28	29	1	2	3	1,090	1,010	505	308	255	204	149	503	0.00
	4	5	6	7	8	9	10	571	2,990	2,850	1,300	455	225	1,630	1,432	2.84
	11	12	13	14	15	16	17	1,300	494	575	3,040	2,960	2,390	1,220	1,711	0.10
	18	19	20	21	22	23	24	493	267	712	2,770	1,590	4,530	8,020	2,626	1.98
	25	26	27	28	29	30	31	6,260	2,900	899	351	1,670	1,790	3,060	2,419	1.22
	1	2	3	4	5	6	7	4,970	3,290	1,100	412	229	146	110	1,465	0.19
Apr	8	9	10	11	12	13	14	1,610	1,210	311	163	832	4,530	5,260	1,988	2.25
	15	16	17	18	19	20	21	3,950	1,890	500	270	687	3,310	2,860	1,924	1.58
	22	23	24	25	26	27	28	1,480	2,390	2,070	2,210	2,140	741	253	1,612	0.45
	29	30	1	2	3	4	5	765	1,910	767	235	102	62	32	553	0.54
	6	7	8	9	10	11	12	18	38	50	105	249	142	66	95	0.65
	13	14	15	16	17	18	19	39	30	153	163	94	41	1	74	0.02
	20	21	22	23	24	25	26	0	26	24	18	59	114	128	53	0.15
May	27	28	29	30	31	1	2	259	303	409	95	19	0	0	155	0.00
	3	4	5	6	7	8	9	0	0	9	88	41	996	2,520	522	3.30
	10	11	12	13	14	15	16	3,110	1,690	425	130	42	9	0	772	0.80
	17	18	19	20	21	22	23	0	0	0	0	3	525	1,500	290	1.87
	24	25	26	27	28	29	30	812	488	450	1,650	909	337	208	693	2.75
	1	2	3	4	5	6	7	52	1	35	1,470	1,280	501	117	494	0.43
	8	9	10	11	12	13	14	1,570	3,640	2,240	904	367	186	82	1,284	0.90
Jul	15	16	17	18	19	20	21	57	13	0	38	129	113	52	57	0.30
	22	23	24	25	26	27	28	34	50	190	196	209	144	90	130	0.80
	29	30	31	1	2	3	4	104	60	154	391	353	254	125	206	0.00
	5	6	7	8	9	10	11	57	6	65	139	160	153	123	100	0.00
	12	13	14	15	16	17	18	53	243	694	1,470	1,280	519	248	644	1.05
	19	20	21	22	23	24	25	135	116	173	261	340	288	256	224	0.04
	26	27	28	29	30	31	1	235	265	1,500	2,330	2,270	1,920	1,080	1,371	1.03
Sep	2	3	4	5	6	7	8	551	465	635	587	331	213	155	420	0.00
	9	10	11	12	13	14	15	142	131	114	101	86	137	275	141	0.08
	16	17	18	19	20	21	22	250	159	111	86	71	79	73	118	0.03
	23	24	25	26	27	28	29	2,450	7,430	7,970	7,300	4,880	1,910	1,020	4,709	6.93
	30	1	2	3	4	5	6	917	397	197	124	80	60	45	260	0.00
	7	8	9	10	11	12	13	33	29	36	5,400	9,340	9,240	8,500	4,654	7.87
	14	15	16	17	18	19	20	6,510	3,210	965	398	223	140	105	1,650	0.07
Oct	21	22	23	24	25	26	27	85	66	48	44	54	221	150	95	0.28
	28	29	30	31	1	2	3	107	251	2,000	1,950	918	322	144	813	0.00
	4	5	6	7	8	9	10	81	55	36	29	34	49	50	47	0.00
	11	12	13	14	15	16	17	34	30	22	18	16	13	12	21	0.00
	18	19	20	21	22	23	24	14	14	11	12	15	19	24	16	0.00
	25	26	27	28	29	30	1	35	41	47	45	54	188	403	116	1.44
	2	3	4	5	6	7	8	218	151	114	88	74	60	46	107	0.04
Dec	9	10	11	12	13	14	15	35	26	22	35	120	2,670	3,180	870	2.81
	16	17	18	19	20	21	22	1,990	1,060	483	540	2,340	2,380	1,410	1,458	1.34
	23	24	25	26	27	28	29	578	438	467	280	179	133	114	313	0.00
	30	31	1	2	3	4	5	158	4,790	-	-	-	-	-	2,474	0.00

Section 7.03 (b) (2): Arkansas-Louisiana state boundary flow 40 cfs

Figure 14 - 2020 Discharge, Precipitation, and Minimum Flow 07367680

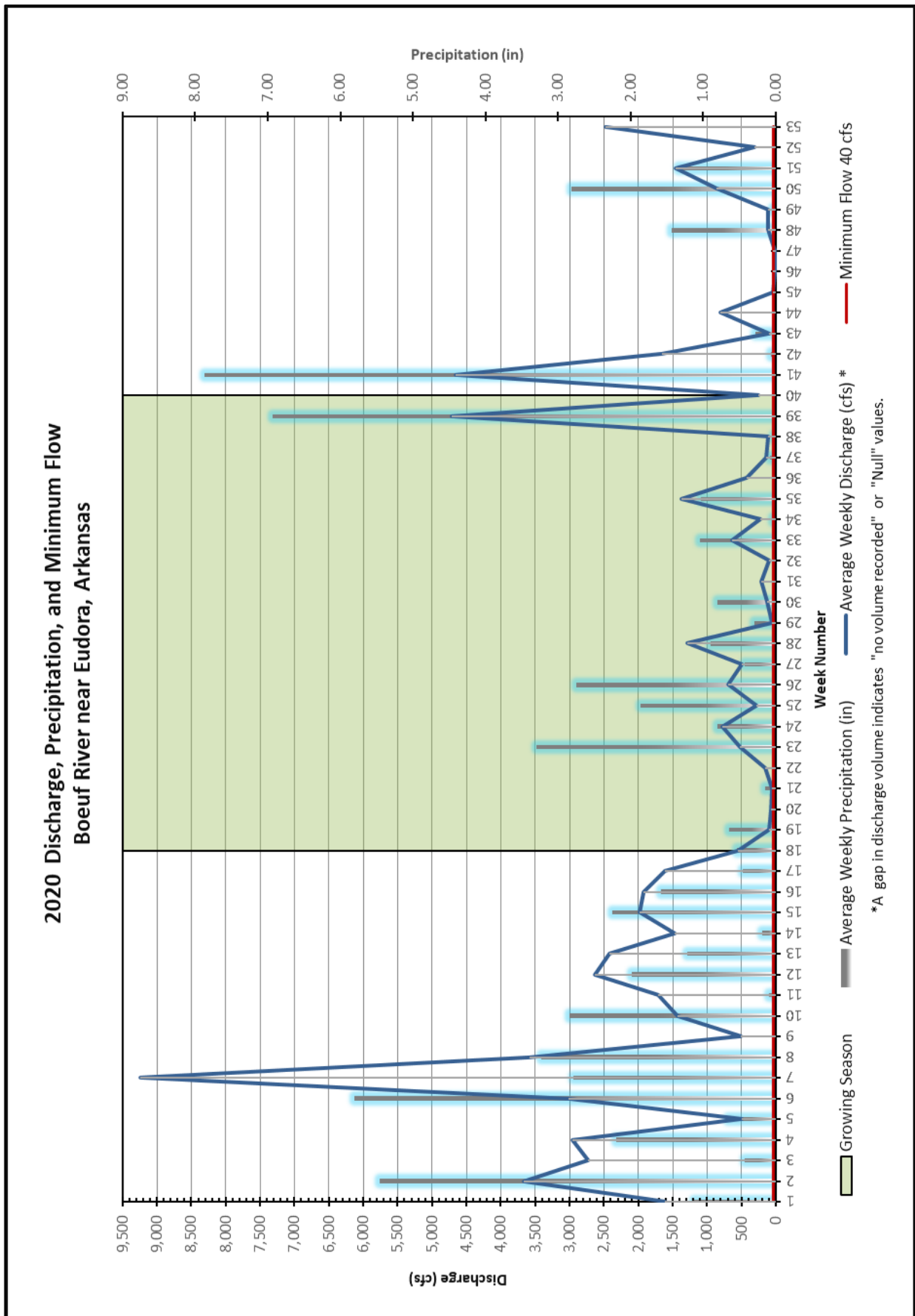
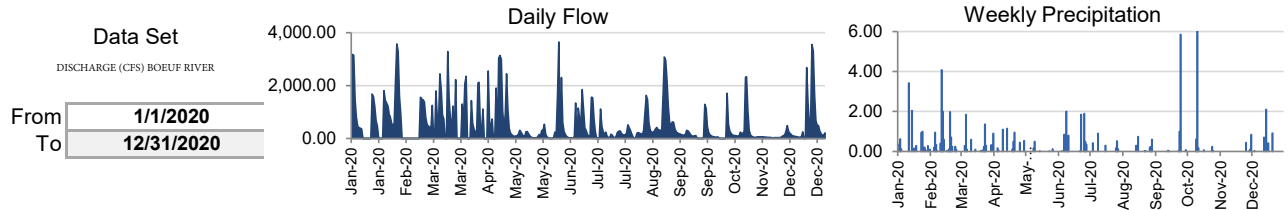


Figure 15 - 2020 Boeuf River at AR/LA State Line Site ID: 07367690



Annual Flow by Day:

	Daily Flow							Weekly								
	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Av Flow	Precip							
Jan	1	2	3	4	5	6	7	1,310	1,130	3,180	3,140	1,470	795	470	1,642	1.13
	8	9	10	11	12	13	14	412	389	355	Null	Null	Null	Null	385	5.46
	15	16	17	18	19	20	21	Null	Null	Null	1,680	1,580	1,200	678	1,285	0.43
	22	23	24	25	26	27	28	456	Null	Null	Null	Null	1,810	1,440	1,235	2.20
Feb	29	30	31	1	2	3	4	1,340	1,230	917	817	590	442	599	848	0.66
	5	6	7	8	9	10	11	2,190	3,580	3,300	1,610	915	Null	Null	2,319	5.81
	12	13	14	15	16	17	18	Null	Null	Null	Null	Null	Null	Null	Null	2.79
	19	20	21	22	23	24	25	Null	Null	Null	Null	Null	1,560	1,490	1,525	3.23
Mar	26	27	28	29	1	2	3	1,460	1,380	809	537	473	429	377	781	0.00
	4	5	6	7	8	9	10	1,250	Null	Null	1,800	791	629	2,440	1,382	2.84
	11	12	13	14	15	16	17	1,870	895	739	Null	Null	3,290	1,530	1,665	0.10
	18	19	20	21	22	23	24	722	483	1,220	Null	2,230	Null	Null	1,164	1.98
Apr	25	26	27	28	29	30	31	Null	Null	1,300	527	2,070	2,350	Null	1,562	1.22
	1	2	3	4	5	6	7	Null	Null	1,430	553	353	249	207	558	0.19
	8	9	10	11	12	13	14	2,100	2,130	531	279	1,110	Null	Null	1,230	2.25
	15	16	17	18	19	20	21	Null	2,550	680	348	732	Null	Null	1,078	1.58
May	22	23	24	25	26	27	28	1,910	Null	3,040	3,140	2,990	1,050	373	2,084	0.45
	29	30	1	2	3	4	5	930	2,440	1,100	375	205	142	102	756	0.54
	6	7	8	9	10	11	12	77	88	106	158	314	242	149	162	0.65
	13	14	15	16	17	18	19	97	70	262	262	168	96	47	143	0.02
Jun	20	21	22	23	24	25	26	22	23	13	20	73	148	110	58	0.15
	27	28	29	30	31	1	2	296	323	540	163	62	9	0	199	0.00
	3	4	5	6	7	8	9	0	0	27	245	152	1,630	3,650	815	3.30
	10	11	12	13	14	15	16	Null	2,310	596	257	147	75	37	570	0.80
Jul	17	18	19	20	21	22	23	21	18	9	16	68	1,340	Null	245	1.87
	24	25	26	27	28	29	30	1,150	769	569	1,850	1,120	413	302	882	2.75
	1	2	3	4	5	6	7	156	62	106	1,560	1,540	743	262	633	0.43
	8	9	10	11	12	13	14	Null	Null	Null	1,110	449	264	140	491	0.90
Aug	15	16	17	18	19	20	21	236	85	28	40	157	126	41	102	0.30
	22	23	24	25	26	27	28	33	73	229	271	287	208	134	176	0.80
	29	30	31	1	2	3	4	138	115	210	520	413	301	159	265	0.00
	5	6	7	8	9	10	11	48	15	39	206	225	204	174	130	0.00
Sep	12	13	14	15	16	17	18	138	310	975	1,630	1,460	604	324	777	1.05
	19	20	21	22	23	24	25	242	217	274	356	418	352	318	311	0.04
	26	27	28	29	30	31	1	301	328	1,630	3,080	2,960	2,210	1,200	1,673	1.03
	2	3	4	5	6	7	8	593	486	631	615	372	257	206	451	0.00
Oct	9	10	11	12	13	14	15	179	174	142	131	114	157	306	172	0.08
	16	17	18	19	20	21	22	294	219	141	97	80	99	113	149	0.03
	23	24	25	26	27	28	29	Null	Null	Null	Null	Null	Null	1,290	1,290	6.93
	30	1	2	3	4	5	6	1,140	442	218	134	97	73	59	309	0.00
Nov	7	8	9	10	11	12	13	49	47	64	Null	Null	Null	Null	53	7.87
	14	15	16	17	18	19	20	Null	Null	1,710	536	290	192	138	573	0.07
	21	22	23	24	25	26	27	111	110	103	89	74	237	199	132	0.28
	28	29	30	31	1	2	3	170	292	2,320	2,330	1,060	308	128	944	0.00
Dec	4	5	6	7	8	9	10	83	61	44	39	61	61	63	59	0.00
	11	12	13	14	15	16	17	64	61	59	53	49	46	45	54	0.00
	18	19	20	21	22	23	24	42	36	27	29	33	33	28	32	0.00
	25	26	27	28	29	30	31	33	41	70	112	117	272	487	162	1.44
Dec	2	3	4	5	6	7	8	269	198	147	113	95	83	69	139	0.04
	9	10	11	12	13	14	15	58	49	42	72	254	Null	Null	95	2.81
	16	17	18	19	20	21	22	2,680	1,360	549	635	3,560	3,310	1,680	1,968	1.34
	23	24	25	26	27	28	29	682	499	486	280	177	122	119	338	0.00
30	31	1	2	3	4	5	208	Null	-	-	-	-	-	208	0.00	

Section 7.03 (b) (2): Arkansas-Louisiana state boundary 40 cfs

Figure 16 - 2020 Discharge, Precipitation, and Minimum Flow 07367690

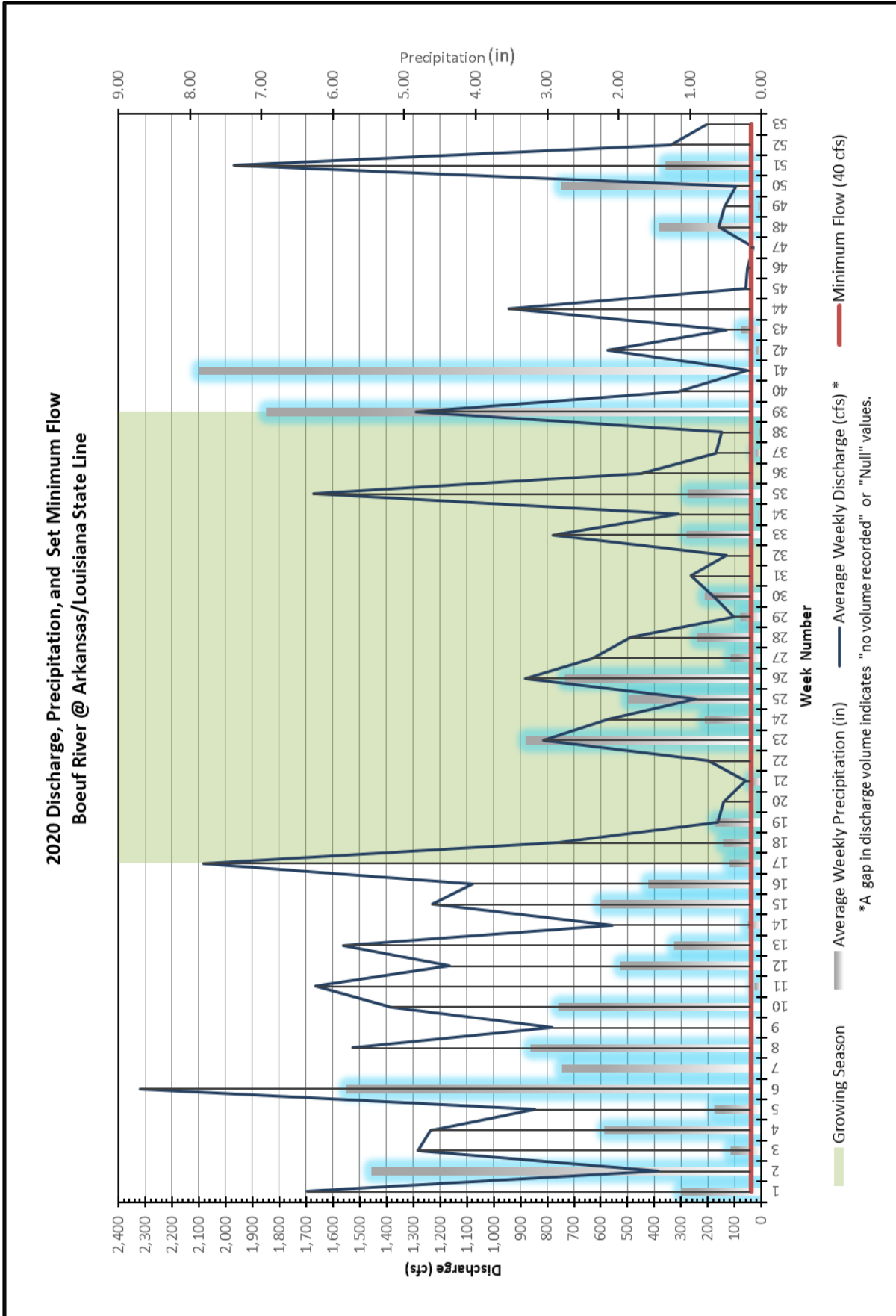


Figure 17 – Weekly Gage Height Comparison

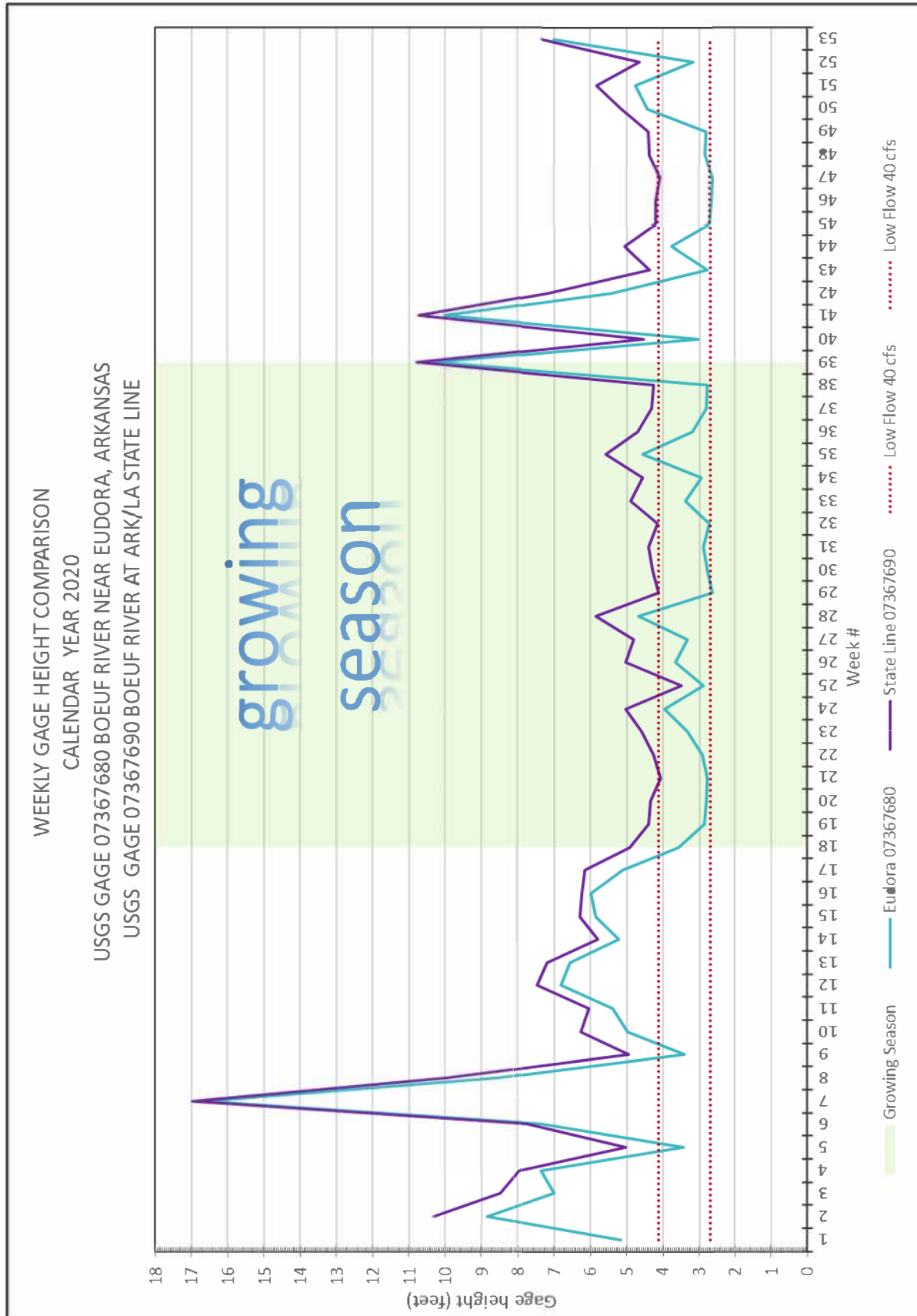


Figure 18 – Weekly Discharge Comparison

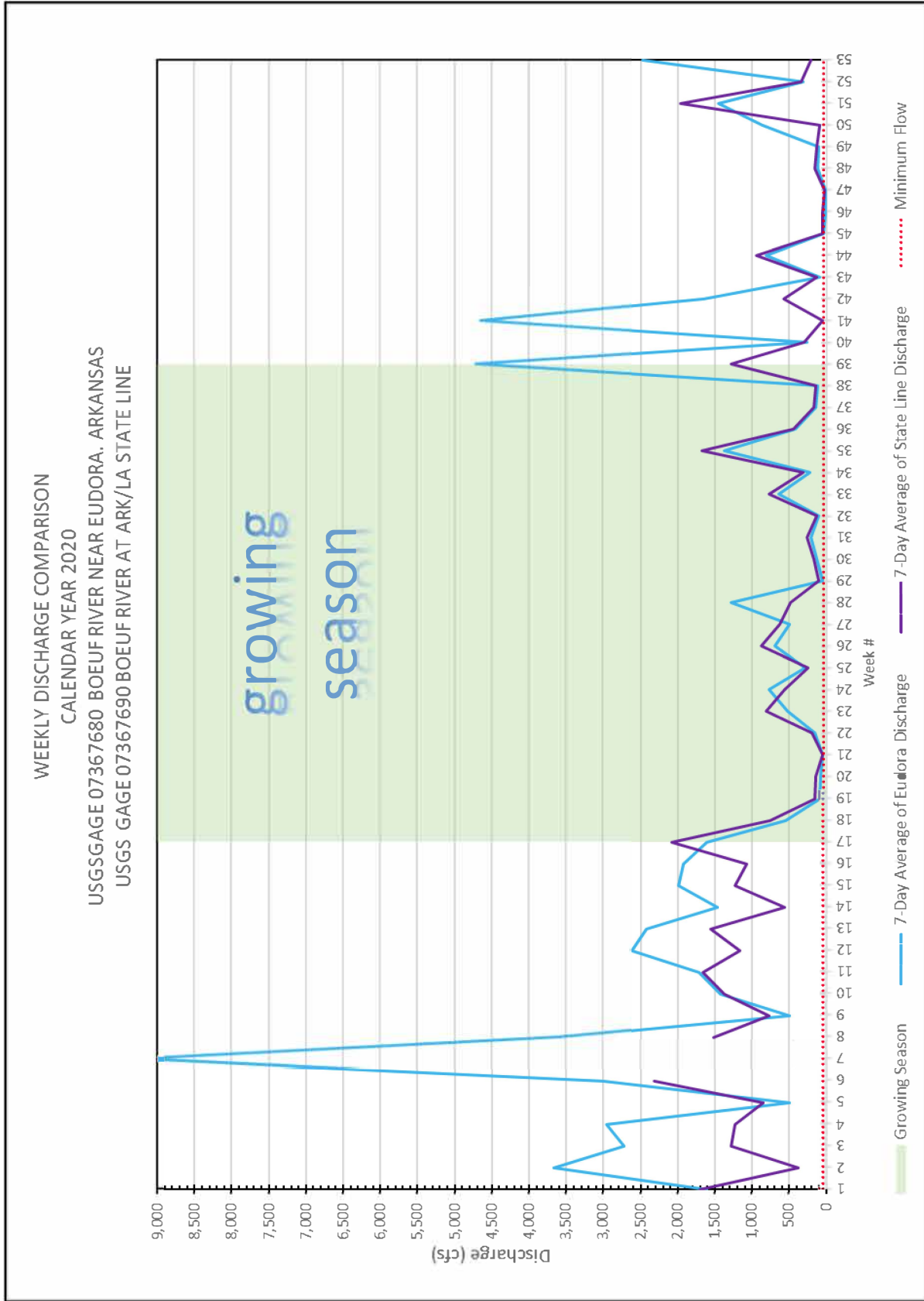
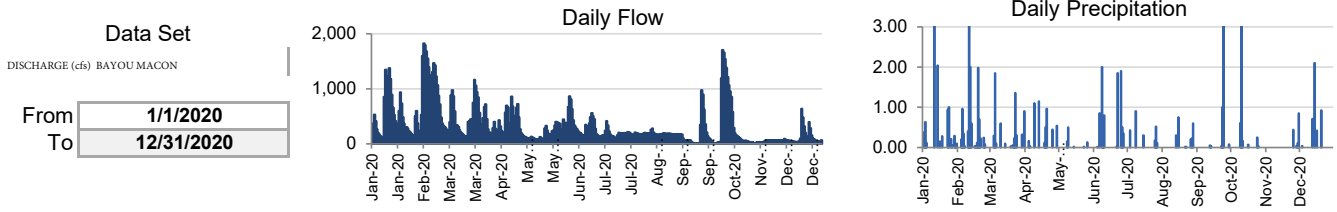


Figure 19 - 2020 BAYOU MACON AT EUDORA, AR SITE ID: 07369680

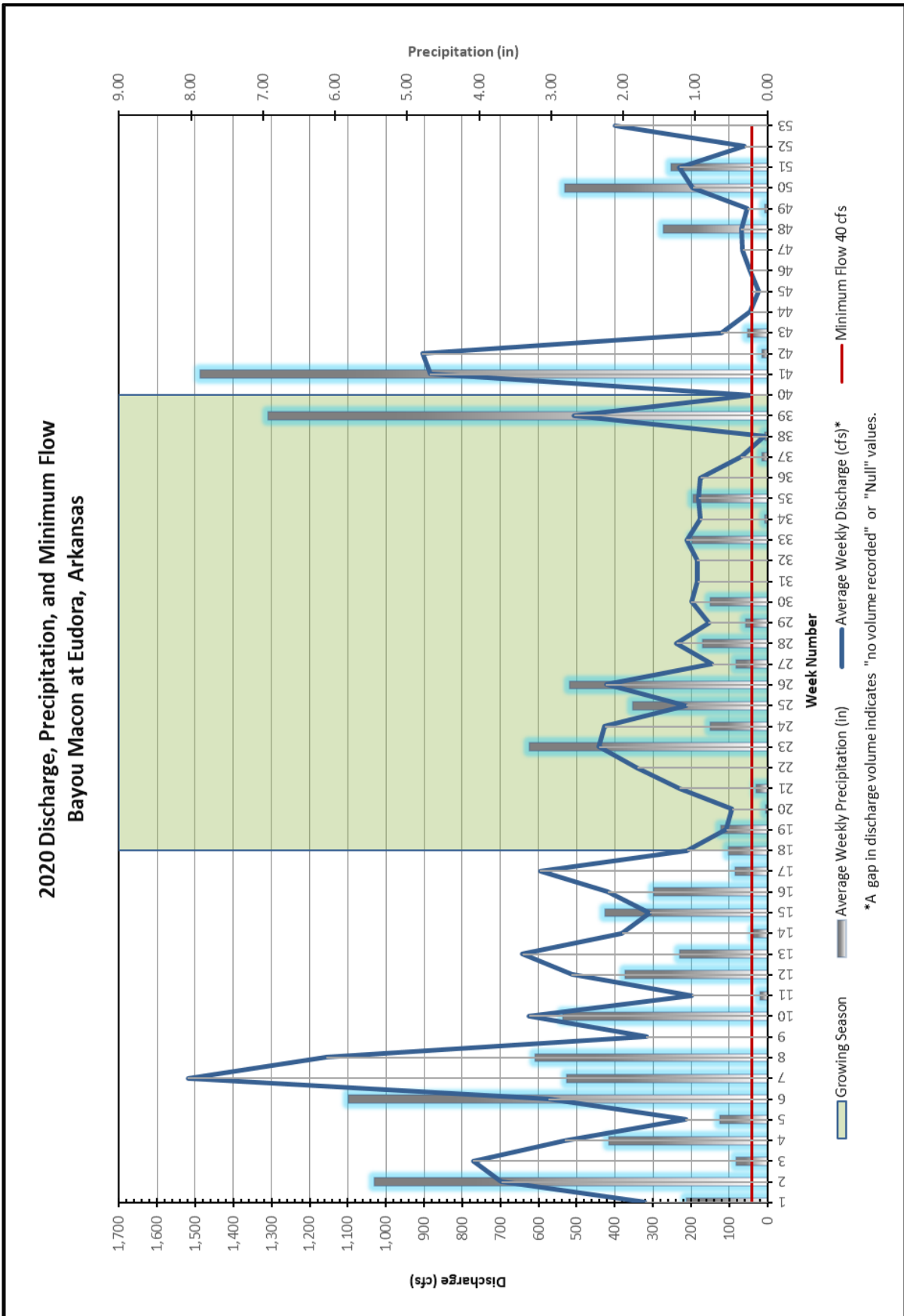


Annual Flow by Day:

	Daily Flow							Weekly								
	W	Th	F	Sa	Su	M	Tu	Av Flow	Precip							
Jan	1	2	3	4	5	6	7	368	316	529	410	261	199	167	322	1.13
	8	9	10	11	12	13	14	141	118	101	854	1,346	1,095	1,225	697	5.46
	15	16	17	18	19	20	21	1,376	1,177	895	657	525	416	353	771	0.43
	22	23	24	25	26	27	28	309	598	937	731	483	365	300	532	2.20
	29	30	31	1	2	3	4	302	275	231	209	180	155	147	214	0.66
Feb	5	6	7	8	9	10	11	499	600	370	237	191	526	1,596	574	5.81
	12	13	14	15	16	17	18	1,826	1,793	1,680	1,548	1,390	1,242	1,153	1,519	2.79
	19	20	21	22	23	24	25	1,309	1,466	1,425	1,228	1,068	876	715	1,155	3.23
	26	27	28	29	1	2	3	478	373	326	303	273	245	223	317	0.00
	4	5	6	7	8	9	10	396	884	973	862	587	334	339	625	2.84
Mar	11	12	13	14	15	16	17	311	245	208	185	163	145	134	199	0.10
	18	19	20	21	22	23	24	127	400	417	451	290	746	1,162	513	1.98
	25	26	27	28	29	30	31	1,055	939	845	562	347	279	467	642	1.22
	1	2	3	4	5	6	7	670	718	448	264	212	186	169	381	0.19
	8	9	10	11	12	13	14	283	398	273	202	252	429	320	308	2.25
Apr	15	16	17	18	19	20	21	234	196	207	571	695	661	371	419	1.58
	22	23	24	25	26	27	28	270	860	675	508	474	662	726	596	0.45
	29	30	1	2	3	4	5	477	266	195	162	140	125	115	211	0.54
	6	7	8	9	10	11	12	108	100	105	131	115	100	92	107	0.65
	13	14	15	16	17	18	19	82	84	80	124	109	84	86	93	0.02
May	20	21	22	23	24	25	26	279	329	240	182	177	179	233	231	0.15
	27	28	29	30	31	1	2	247	333	402	391	383	368	264	341	0.00
	3	4	5	6	7	8	9	152	442	296	382	290	669	863	442	3.30
	10	11	12	13	14	15	16	805	633	429	332	292	265	231	427	0.80
	17	18	19	20	21	22	23	208	193	165	131	163	347	283	213	1.87
Jun	24	25	26	27	28	29	30	322	369	488	558	503	449	273	423	2.75
	1	2	3	4	5	6	7	172	147	135	128	142	158	136	146	0.43
	8	9	10	11	12	13	14	239	415	333	228	172	148	136	239	0.90
	15	16	17	18	19	20	21	131	108	101	158	202	193	186	154	0.30
	22	23	24	25	26	27	28	190	196	196	197	213	211	191	199	0.80
Jul	29	30	31	1	2	3	4	178	161	168	205	198	188	183	183	0.00
	5	6	7	8	9	10	11	174	174	170	187	203	195	190	185	0.00
	12	13	14	15	16	17	18	188	188	257	279	208	185	175	212	1.05
	19	20	21	22	23	24	25	168	162	171	177	179	192	189	177	0.04
	26	27	28	29	30	31	1	184	184	187	185	183	177	166	181	1.03
Aug	2	3	4	5	6	7	8	174	178	180	179	176	174	171	176	0.00
	9	10	11	12	13	14	15	102	68	64	62	62	61	62	69	0.08
	16	17	18	19	20	21	22	33	10	5	2	1	1	1	7	0.03
	23	24	25	26	27	28	29	349	975	893	624	358	207	140	507	6.93
	30	1	2	3	4	5	6	106	80	51	30	16	8	14	44	0.00
Sep	7	8	9	10	11	12	13	28	31	37	1,194	1,705	1,657	1,542	885	7.87
	14	15	16	17	18	19	20	1,380	1,212	1,068	950	853	581	290	905	0.07
	21	22	23	24	25	26	27	191	161	139	122	100	78	61	122	0.28
	28	29	30	31	1	2	3	51	59	58	48	38	32	30	45	0.00
	4	5	6	7	8	9	10	26	18	14	17	26	31	31	23	0.00
Oct	11	12	13	14	15	16	17	31	30	36	43	61	64	63	47	0.00
	18	19	20	21	22	23	24	65	66	67	65	66	66	60	65	0.00
	25	26	27	28	29	30	1	63	61	61	60	65	93	75	68	1.44
	2	3	4	5	6	7	8	65	60	57	54	49	43	37	52	0.04
	9	10	11	12	13	14	15	37	35	33	51	94	637	479	195	2.81
Nov	16	17	18	19	20	21	22	317	204	124	133	397	284	155	231	1.34
	23	24	25	26	27	28	29	96	86	64	51	44	41	37	60	0.00
	30	31	1	2	3	4	5	65	735	-	-	-	-	-	400	0.00
	6	7	8	9	10	11	12	108	100	105	131	115	100	92	107	0.65
	13	14	15	16	17	18	19	82	84	80	124	109	84	86	93	0.02
Dec	20	21	22	23	24	25	26	279	329	240	182	177	179	233	231	0.15
	27	28	29	30	31	1	2	247	333	402	391	383	368	264	341	0.00
	3	4	5	6	7	8	9	152	442	296	382	290	669	863	442	3.30
	10	11	12	13	14	15	16	805	633	429	332	292	265	231	427	0.80
	17	18	19	20	21	22	23	208	193	165	131	163	347	283	213	1.87

Section 7.03 (b) (2): Arkansas-Louisiana state boundary 40 cfs

Figure 20 - 2020 Discharge, Precipitation, and Minimum Flow Bayou Macon



**Red River Compact Commission
Texas Environmental Committee Report
April 26, 2021**

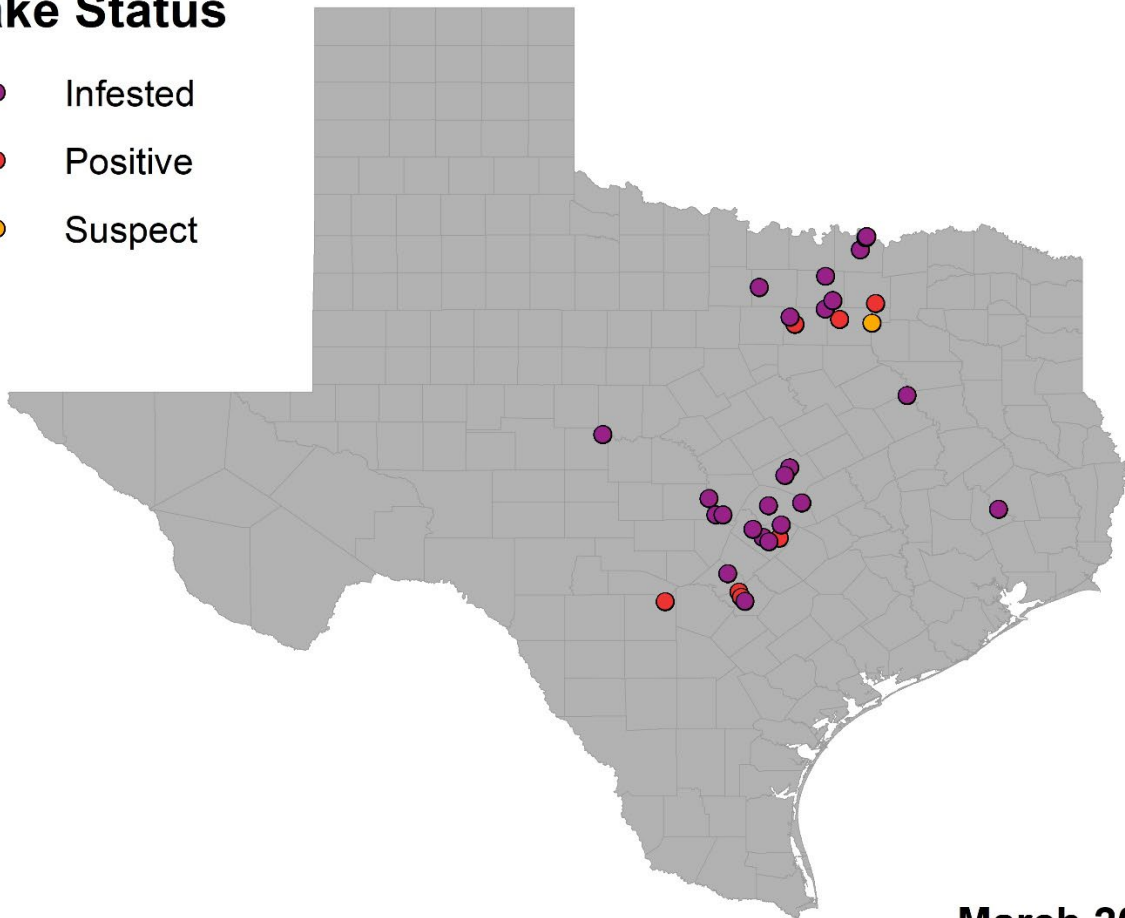
Invasive Species

Zebra Mussels

Texas has twenty-four lakes within six major river basins that has been fully infested by zebra mussels. The Red River Basin became the first basin within the state to have a confirmed infection when an adult zebra mussel was discovered in Lake Texoma on April 3, 2009. Two additional lakes near Lake Texoma have since been listed as fully infested. Lake Dean Gilbert, a 45-acre community fishing lake near the City of Sherman, was listed in 2015; and Randell Lake, near Denson, was listed in 2017.

Lake Status

- Infested
- Positive
- Suspect



Zebra mussel regulations include all of Texas for all types and sizes of boats used on fresh waters. Boaters are required to drain all water from their vessel, including live wells, bilges, motors and any other receptacles, before approaching or leaving a water body. Possession or transportation of zebra mussels in Texas is a Class C misdemeanor for the first offense, punishable by a fine of up to \$500. Repeat offenses can be elevated to a Class B misdemeanor, punishable by a fine of up to \$2,000, jail time up to 180 days, or both.

Other Exotic Aquatic Species

Besides zebra mussels, it is unlawful to transport or possess any exotic aquatic species Texas has listed as harmful or potentially harmful. Special rules for the Red River Basin include provisions for grass, bighead and silver carp.

Grass Carp

The grass carp (*Ctenopharyngodon idella*) is listed as a potentially harmful exotic species in Texas. However, state law allows controlled stocking of triploid (non-reproducing) grass carp to control nuisance aquatic plants. Anyone wishing to purchase or stock these fish in public or private water must first obtain a permit from the Texas Parks and Wildlife Department.

Reservoirs in the Red River Basin with grass carp permitting include Spring Lake Park Pool in Texarkana, Pittsburg City Lake in Camp County, Lake Cypress Springs in Franklin County, and Waterloo Lake in Denison, Texas. If a grass carp is caught in these waters, it must be immediately returned to the water unharmed.

Bighead and Silver Carp

In the attempt to stop, or slow the intrusion of bighead and silver carp it is unlawful to transport live, non-game fishes from the following locations in the Red River Basin: 1) below Lake Texoma downstream to the Arkansas border, 2) Big Cypress Bayou downstream of Ferrell's Bridge Dam on Lake O' the Pines (including the Texas waters of Caddo Lake), and 3) the Sulphur River downstream of the Lake Wright Patman Dam. Nongame fishes collected from these waters may be used as live bait on the water bodies they were collected.

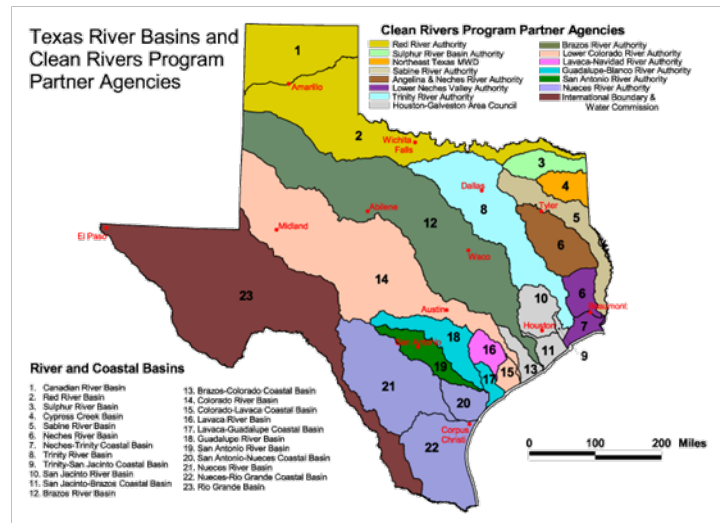
More information can be found on the Texas Parks and Wildlife and Texas Invasive webpages.

Texas Clean Rivers Program

The Texas Clean Rivers Program is a partnership between the TCEQ and regional water authorities to coordinate and conduct water quality monitoring, assessment, and stakeholder participation to improve the quality of surface water within each river basin in Texas. Established in 1991, the Clean Rivers Program (CRP) has become one of the

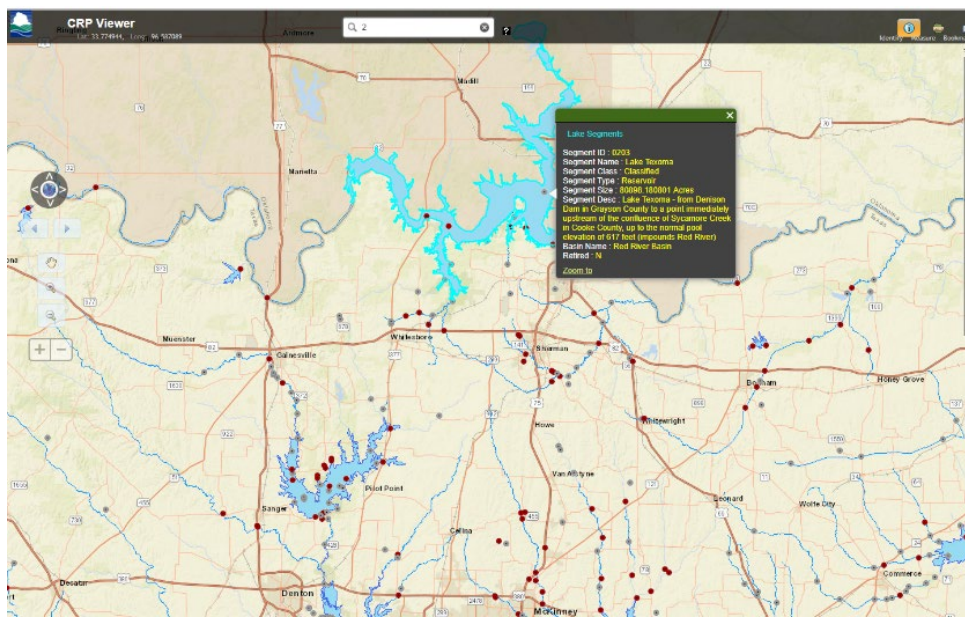
most successful cooperative efforts between federal, state, and local agencies and the citizens of the State of Texas.

Fifteen regional water authorities manage the program in 23 river and coastal basins. The CRP is a hub for water quality information and coordination of monitoring efforts and public participation, for each river basin. CRP partners collect more than 60% of water quality data used by TCEQ.



There are three separate partners with TCEQ for watersheds in the Red River Basin. The Red River Authority of Texas is the partner agency for both the Red and Canadian River Basins. The Northeast Texas Municipal Water District is the partner agency for Cypress River Basin. The Sulphur River Basin Authority of Texas is the partner agency for Sulphur River Basin. The Clean Rivers Program for the Red River watershed in Texas, managed by the Red River Authority of Texas, provides the current state of the basin through the annual Basin Highlights Report found at: <http://www.rra.texas.gov/?dhp=/Publications/CRP/>

TCEQ has developed a map-based tool for the CRP for online viewing metadata associated with TCEQ monitoring stations and a query tool for extracting surface water quality data from the TCEQ's Surface Water Quality Monitoring Information System. These tools can be found at the following links:



<https://www80.tceq.texas.gov/SwqmisWeb/public/crpmmaps.html>

Surface Water Quality Monitoring

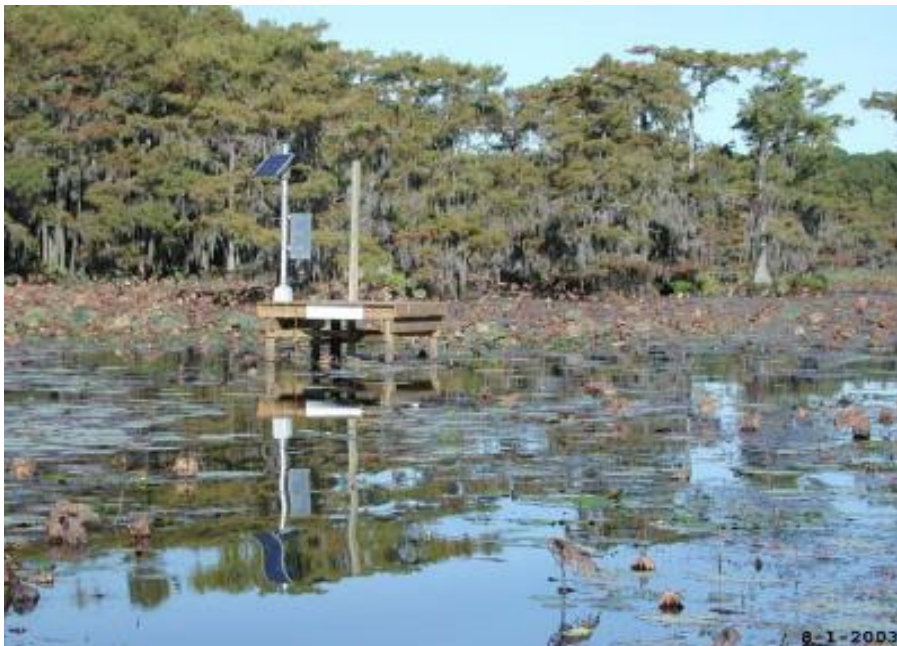
TCEQ's Surface Water Quality Monitoring (SWQM) Program monitors and evaluates physical, chemical, and biological characteristics of aquatic systems as a basis for effective policy. More than 1,800 surface water sites statewide are used to collect physical, chemical, and biological samples as part of the SWQM program.

This data is used by TCEQ to characterize existing conditions or identify emerging problems, evaluate the effectiveness of water quality control programs, or identify trends. The data are also used to determine compliance with the Texas Surface Water Quality Standards through the Texas Integrated Report.

SWQM has an interactive Surface Water Quality Viewer (ArcOnline map) available to the public that allows users to view the stream segments and water bodies (including impairment status) for any body of water in Texas that the TCEQ monitors. Surface Water Quality Monitoring (SWQM) Stations are also included in the viewer.

<https://www.tceq.texas.gov/gis/segments-viewer>

An annual workshop is held each fall to bring together surface water quality monitoring professionals in Texas who provide water quality data to TCEQ to learn about procedures to assure the quality and comparability of data and to share advances in search. The 34th Annual SWQM Workshop was held virtually October 28-30, 2020. For more information on the Annual SWQM Workshop please see:
https://www.tceq.texas.gov/waterquality/monitoring/swqm_workshop



Caddo Lake Monitoring Station



Red River Compact State of Oklahoma - 2021



Environmental and Natural Resources Committee Report

Red River Compact

April 27th, 2021

EXECUTIVE SUMMARY

As with many others, the global pandemic had a large impact on the work that the Oklahoma Water Resources Board (OWRB) would normally undertake. Monitoring as part of the OWRB Beneficial Use Monitoring Program (BUMP), further described below, was suspended on mid-March of 2020. Data collection activities related to funded grants and contracts was resumed in late-summer to early fall. A monitoring initiative more similar to what would normally be conducted was not re-instituted until the winter of 2020-2021. For this reason, there isn't a large amount of "new" water information to bring before the compact this year. It is our fervent hope that 2021 will be a better year than 2020.

It is the intent of all OWRB monitoring activities to advance concepts and principles of the Oklahoma Comprehensive Water Plan (OCWP). Consistent with a primary OCWP initiative, OWRB monitoring initiatives provide invaluable data crucial to the ongoing management of Oklahoma's water supplies as well as the future use and protection of the state's water resources. Oklahoma's decision-makers rely upon this information to address specific water supply, quality, infrastructure, and related concerns. Maintained by the OWRB and updated every 10 years, the OCWP serves as Oklahoma's official long-term water planning strategy. Recognizing the essential connection between sound science and effective public policy, incorporated in the Water Plan are a broad range of water resource development and protection strategies substantiated by hard data – such as that contained in this report – and supported by Oklahoma citizens.

The BUMP exists as a result of the vital economic and social importance of Oklahoma's lakes, streams, wetlands, and aquifers and the associated need for their protection and management. The data contained in this report is scientifically defensible and has been collected and analyzed following procedures outlined in Use Support Assessment Protocols (USAP), developed by OWRB with input and concurrence of Oklahoma's other environmental agencies. Specifically, USAPs establish a consistent method to determine if beneficial uses assigned for individual waters through Oklahoma Water Quality Standards (WQS) are being supported. If the OWRB BUMP report indicates that a designated beneficial use is impaired, threatened, or otherwise compromised, measures must be taken to mitigate or restore the water quality.

Traditionally, the State of Oklahoma has utilized numerous water monitoring programs conducted by individual state and federal agencies. In general, each environmental agency designs and implements its own program with only limited participation with other state, municipal, or federal entities. These

programs collect information for a specific purpose or project (e.g., development of Total Maximum Daily Loads, WQS process, lake trophic status determination, water quality impact assessments from nonpoint and point source pollution, stream flow measurement, assessment of best management practices, etc.). Therefore, the information is specific to each project's data quality objectives (DQOs) and is often limited to a very small geographic area.

The specific objectives of BUMP are to detect and quantify water quality trends, document and quantify impairments of assigned beneficial uses, and identify pollution problems before they become a pollution crisis.

Beneficial Use Monitoring Program Components

Monitoring Rivers & Streams - The OWRB is currently monitoring approximately 84 stations on a 6-week rotation. Fixed station monitoring is based largely upon the 84 planning basins as outlined in the Oklahoma Comprehensive Water Plan (OCWP). In general, at least one sample station is located at the terminal end of each of the planning basins. The OWRB also conducts on-going special studies as well as 25-30 probabilistic monitoring stations annually.

Fixed Station Load Monitoring – The OWRB is currently working with several partners including the United States Geological Survey (USGS), US Army Corps of Engineers (USACE), Grand River Dam Authority (GRDA) and National Weather Service to conduct flow monitoring on all our fixed station sites that are not part of the State of Oklahoma/USGS Cooperative Gaging Network. This cooperative effort will allow for loadings to be calculated, trends to be assessed statewide and provide much needed data for the Use Support Assessment process.

Fixed Station Lakes Monitoring – As part of BUMP, the OWRB conducts sampling on lakes and reservoirs across the State of Oklahoma. To accomplish this task, the OWRB has taken a fixed station approach for the lakes monitoring program. This design allows the state's objectives to be met as well as ensure various sized waterbodies are represented adequately. The survey population includes all lakes above 50 surface acres, which encompasses approximately 206 different waterbodies. The population is then stratified into two groups – lakes greater than 500 surface acres and those below 500 surface acres. The greater than 500 surface acres group includes 68 lakes, of which approximately one-fifth are monitored annually (quarterly samples). They are then monitored again during a subsequent year in the 5-year rotation, so that each lake greater than 500 surface acres is sampled 2 non-consecutive years during each 5 year rotation. The lakes managed by our Federal partners, the USACE and Bureau of Reclamation (BOR) are included in the 68 large multipurpose lakes. Additionally, ten lakes of less than 500 surface acres are sampled annually (quarterly samples) over the 5 year sample frame. All lakes monitored have either the PPWS or SWS designation. Many of these smaller lakes have not been sampled historically through BUMP and include small municipal water supplies.

The OWRB works with other agencies, such as the USACE, for inclusion of additional information when possible on waterbodies managed by the Corps. Data collected consists primarily of water chemistry, nutrients, and chlorophyll-a information. In general, a minimum of three to five stations per reservoir are sampled depending on the size of the reservoir. Stations are located such that they represent the

lacustrine, transitional, and riverine zones of the lake. On many reservoirs, additional sites are monitored, including major arms of the reservoir as appropriate. Water quality parameters have been added to the lakes sampling effort over the years to enhance program ability to make use support determinations.

Groundwater Monitoring (GMAP) – This program was made possible as result of the increase in funding received from the Oklahoma Legislature for water quality/quantity monitoring based on recommendations of the 2012 Update of the Oklahoma Comprehensive Water Plan. These additional monies were utilized to restore funding levels of the Beneficial Use Monitoring Program as well as to implement the new groundwater program. The program prioritizes efforts on Oklahoma’s 22 major groundwater aquifers, with the baseline phase completed at the conclusion of 2017 and long-term trend monitoring scheduled to begin in 2020. The baseline period focused on 4-6 aquifers per year, beginning in 2013, and assessed concentrations of nutrients, metals and major ion species. Sample size was predicated upon and proportional to the surface area of the aquifer with a general goal of 30 wells per aquifer. Some of the state’s larger aquifers exceeded the goal and some of the smaller aquifers were represented by fewer wells (Table 1). At the conclusion of the baseline sampling period there were 695 wells sampled from major aquifers in the statewide groundwater quality network, with an additional 31 wells in minor aquifers. In addition, the OWRB’s annual groundwater level measurement program nearly doubled in capacity from around 530 to 900 wells and has been spatially redistributed. Also over the 5-year baseline period, the OWRB installed 33 continuous water level recorders to obtain daily or hourly measurements that are more sensitive to detecting seasonal changes (brought on by drought or variable climate conditions) than can be obtained by annual measurements.

Table 1. Sample Networks Based on Aquifer Areal Extent.

Areal Extent Category	Sample Site Well Density	Sample Sizes Generated
> 5000 km ²	1 well per 150 km ² (6 Aquifers)	37 – 89
3001 – 5000 km ²	1 well per 100 km ² (5 aquifers)	33 – 48
1501 – 3000 km ²	1 well per 75 km ² (6 aquifers)	25 – 33
751 – 1500 km ²	1 well per 50 km ² (2 aquifers)	16 – 19
≤ 750 km ²	2 aquifers	6 – 10

Program History/Overview

Sampling of the numerous lakes, streams, and rivers across this state was initiated in the summer and fall of 1998. Lake sampling in connection with BUMP began in July of 1998. Sampling on numerous streams and rivers began in earnest in November of the same year. The two sampling programs, one for

lakes and one for streams, had separate starting dates for a number of reasons. First, the OWRB had been conducting a lake-sampling program during the warmer summer months since 1990 as part of the Federal Clean Lakes Program. This historical lake sampling program was funded through federal dollars with the express purpose of determining lake trophic status. The trophic status of a lake can range from oligotrophic (low biological productivity) to hypereutrophic (excessive biological productivity). In general, the more productive a lake is the more water quality problems it is likely to experience. Federal dollars to fund this trophic state assessment of our state's lakes were discontinued in 1994. At that time, the OWRB searched for other funding sources, and through working with the Secretary of the Environment and the Oklahoma Conservation Commission, the OWRB was able to obtain a one-time federal CWA 319 nonpoint source grant to continue the lake trophic state assessment program. The OWRB subsequently initiated a quarterly lake sampling program in the spring of 1998 and was able to roll the existing lake program into BUMP.

The OWRB has developed USAPs for lakes and streams, which are essential if the state is to be consistent in identifying waters that are not meeting their assigned beneficial uses or are threatened. The OWRB has incorporated the USAP into Oklahoma Administrative Code (OAC) 785:46 to ensure that consistent determinations for impairments are made by the all of the monitoring agencies.

The state must follow consistent procedures for listing waters as impaired. Using the OWRB Use Support Assessment Protocols, it has been possible for OWRB staff to assess whether threats or impairments are present in our waterways. With continued funding, identification of impaired waters will be accomplished on additional waters.

Results of Sampling Efforts

Every two years, the OWRB analyzes data collected by BUMP and that data is used to identify if the waters of the state are meeting their assigned beneficial uses. If the stream/river segment is not meeting its beneficial use it is submitted for inclusion on the EPA's 303d list. The latest EPA approved 303d list of impaired waters can be found on the Oklahoma Department of Environmental Quality's website. Data Presented in this Report can be found at several links. Included in this report are the lakes and rivers monitored by the BUMP and the pertinent stream segments listed in the Oklahoma 303(d) List as not supporting their assigned beneficial uses. See the links below for additional information.

BUMP Redesign Efforts

In 2020, the OWRB Water Quality Division Monitoring staff began the first phase of redesign of the agency BUMP. The program has been collecting data for over 20 years and several minor modifications to the program occur every year and holistic evaluation of the program objectives had not occurred since its inception. A number a critical questions needed to be addressed. First, have the original goals and objectives of the program been answered? After 20 years we have begun an intensive examination of that. A number of the questions to be answered when the program was created have by and large been answered, so where to next. Should the focus of the BUMP change? Secondly, a lot has changed in 20 years, so what questions should our program be answering today that wasn't on our radar 20 years ago. Lastly, technology has advanced greatly over time, so what does the BUMP infrastructure needs

look like today and how do we meet those needs? These are the broad overarching questions that needed to be addressed.

After numerous meetings and discussions, staff will be making some final decisions on redesign of the program with changes implemented in July, 2021. Further elucidation on how this may affect the compact will occur in next year's report.

OWRB Bathymetric Mapping Program

The OWRB has been conducting a bathymetric mapping program for several years now to aid in the state's Total Maximum Daily Load (TMDL) process, assessment of dissolved oxygen beneficial use support and to provide needed information for the Oklahoma Comprehensive Water Plan. This past year two bathymetric mapping projects were initiated or completed within the Red River Compact area. The two projects are on Lake Atoka and Dave Boyer Lake. The Dave Boyer work effort has been completed and the Lake Atoka mapping effort has just begun field data collection efforts. For more information on these two efforts please contact Bill Cauthron at bill.cauthron@owrb.ok.gov or at (405) 530-8800.

OWRB Beneficial Use Monitoring Program Results

Streams Monitoring - <http://www.owrb.ok.gov/quality/monitoring/bumpstreams.php>

Lakes Monitoring - <http://www.owrb.ok.gov/quality/monitoring/bumplakes.php>

Groundwater Monitoring - <http://www.owrb.ok.gov/quality/monitoring/GMAP.php>

Oklahoma Department Of Environmental Quality (ODEQ)

Oklahoma's 2018 Integrated Water Quality Report with Appendix C - Impaired Waterbodies 303(d) List - <https://www.deq.ok.gov/water-quality-division/watershed-planning/integrated-report/>

An aerial photograph of a river winding through a lush, green forest. The water is a light brownish-green color, reflecting the sky and the surrounding trees. The forest is dense with various shades of green, indicating a healthy ecosystem. The river flows from the top center towards the bottom right of the frame.

STATE OF ARKANSAS ENVIRONMENTAL COMMITTEE REPORT Red River Compact

April 2021



NATURAL RESOURCES
DIVISION



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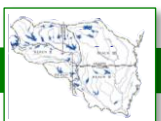
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INTRODUCTION

Water is an essential resource for Arkansas. Accurate information on water quality and quantity is necessary to ensure long-term availability and sustainability of water that is safe for drinking and recreation, and is suitable for industry, irrigation, and fish and wildlife. Abatement of degradation and improvement in water quality throughout the Red River Compact Area is a continuing effort and remains a priority for the state.

Clean Water Act Section 303(d) requires all states to identify waters which do not meet or are not expected to meet applicable water quality standards. The **ARKANSAS DEPARTMENT OF ENERGY AND ENVIRONMENT**'s Division of Environmental Quality (**DEQ**) manages State Water Quality Monitoring Networks for surface and subsurface waters; and conducts routine monitoring activities and intensive investigations of the physical, chemical, and biological characteristics of watersheds and/or aquifers. Data generated from these activities, as well as readily available data from other sources, such as the **ARKANSAS DEPARTMENT OF AGRICULTURE**'s Natural Resources Division (**NRD**) nonpoint pollution prevention and abatement program, are used to prepare the biennial *Integrated Water Quality Monitoring and Assessment 305(b) Report*, the *List of Impaired Waterbodies 303(d) list*, and to develop Total Maximum Daily Loads (TMDLs). This data is used to evaluate designated use attainment and to prioritize restoration and remediation activities. **DEQ** develops the 305(b) Report and 303(d) list every two years and submit to the Environmental Protection Agency (EPA) for acceptance and approval.

Water quality degradation, impairment, and improvement are influenced by both point and nonpoint pollution sources. While **DEQ** is the state's primary authority to regulate point source discharge and to administer other regulatory responsibilities, the **NRD** is responsible for addressing nonpoint source pollution through implementation of voluntary conservation and best management practices which improve water quality and reduce degradation. **NRD**'s nonpoint source pollution management and reduction efforts are prioritized to:

- *increase collaborative and innovative conservation partnerships,*
- *enhance cooperation among government agencies and non-governmental groups, and*
- *demonstrate effective nutrient management and reduction practices that best contribute to water quality improvement.*

Some of **NRD**'s collaborative partners include: USDA Natural Resources Conservation Service (NRCS), Arkansas Department of Energy and Environment, University of Arkansas Cooperative Extension Service, The Nature Conservancy, Arkansas Department of Commerce, Illinois River Watershed Partnership, Beaver Watershed Alliance (BWA), Discovery Farms, Arkansas Association of Conservation Districts, and many other entities which are involved in nonpoint source pollution reduction activities and stakeholder issues. These partnerships are longstanding and vital to sustaining successful nonpoint-nutrient reduction and water quality improvement.

■ WATER QUALITY

This report contains data and information from **DEQ's 2018 Integrated Water Quality Monitoring and Assessment 305(b) Report** and **NRD's Nonpoint Source Pollution Management Plan**. Included are **DEQ's 2018 303(d) list of impairments** within the Red River Compact Area in Arkansas and a description of **NRD's voluntary conservation and nonpoint pollution efforts** to combat these impairments.

In Figure 1., the Red River Compact Area in Arkansas is outlined in red and **DEQ's 305(b) Report Planning Segments** are labeled across the state. Table 1. lists **DEQ Planning Segments** in the Red River Compact's Subbasin I and II, known commonly as the Red River and Ouachita River drainage basins in Arkansas.

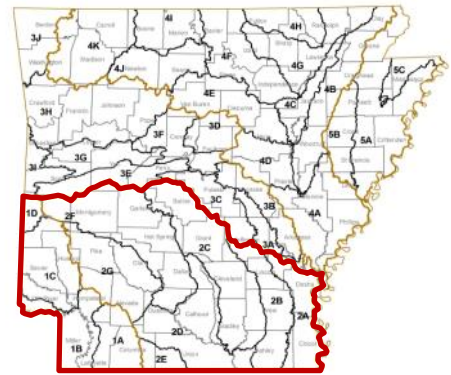




Table 2. Category 5. Designations

Category 5	The waterbody is impaired, or one or more water quality standards may not be attained. Waterbodies in Category 5 will be prioritized as:
High	Truly impaired; develop a TMDL or other corrective action(s) for the listed parameter(s).
Medium	Waters currently not attaining standards but may be de-listed with future revisions to Arkansas Pollution Control & Ecology Commission's Regulation No. 2, the state water quality standards; or Waters which are impaired by point source discharges and future permit restrictions are expected to correct the problem(s).
Low	Waters currently not attaining one or more water quality standards, but all designated uses are determined to be supported; or There is insufficient data to make a scientifically defensible decision concerning designated use attainment; or Waters DEQ assessed as unimpaired but were assessed as impaired by EPA.

Table 3. Abbreviations Used in Category 5. Descriptions



Designated Use Not Supported		Sources of Contamination
AI = agricultural/industrial water supply	FSH = fisheries	AG = agriculture activities
DW = domestic water supply	PC = primary contact	HP = hydropower
FC = fish consumption	SC = secondary contact	IP = industrial point source
Water Quality Standard Non-Attainment		MP = municipal point source
Al = aluminum	PO = priority organics	SE= surface erosion
AM = ammonia	Se = Selenium	UN = unknown
Be = beryllium	SO4 = sulfates	UR = urban runoff
Cl = chlorides	Tb = turbidity	RE = resource extraction
Cu = copper	TDS = total dissolved solids	Cause
DO = dissolved oxygen	Tm = temperature	HG = Mercury
NO3 = nitrate nitrogen	Tox = Toxicity	NU = nutrients
PA = pathogen indicator bacteria	TP = total phosphorus	SI = Siltation
pH = pH	UN = Unknown	
Pb = lead	Zn = zinc	
PCB = Polychlorinated biphenyl	Hg = mercury	

Table 4. Arkansas' 303(d) Category 5 in Red River Basin

Planning Segment 1A -Dorcheat Bayou & Bodcau Bayou 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
11140205-010	Little Bodcau Creek	AL	DO	UN	Low
11140203-022	Dorcheat Bayou		Tb	SE	Low
11140203-020	Dorcheat Bayou		TB	SE	Low
Planning Segment 1B -Red River, Sulphur River, & McKinney Bayou 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
11140106-025	Red River	Al	Tb	SE	Low
11140106-005	Red River	Al	Tb	SE	Low
11140106-003	Red River	Al	Tb	SE	Low
11140106-001	Red River	Al	Tb	SE	Low
11140201-007	Red River		Tb	SE	Low
11140201-011	Red River	Al	Tb	SE	Low
11140201-008	Bois D'Arc Creek		DO	UN	Low
11140201-009	Bois D'Arc Creek		DO	UN	Low
11140302-003	Days Creek		Cu	IP	Medium

Note: **Yellow**= 303(d) stream segment added to 2016 listing**Gray**= 303(d) steam segment removed from 2016 listing



Table 4. (cont.) Arkansas' 2018 303(d) Category 5 in Red River Basin

Planning Segment 1C -Little River & Tributaries 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
11120109-025	Bear Creek		PA	IP	Medium
11140109-033	Mine Creek		SO4	IP	Low
11140109-934	Mine Creek, upper		TDS	IP	Low
11140109-001	Little River		Tm	UN	Low
11140109-819	Short Creek		pH	UN	Low
11140109-921	Caney Creek		pH	UN	Low
11140109-018	Cossatot River		DO	UN	Medium
11140109-014	Saline River		DO	UN	Medium
11140109-919	Rollin Fork Creek (below Tyson Grannis)		SO4	IP	Low
11140109-013	Holly Creek	FSH	DO	UN	
Planning Segment 1D -Mountain Fork & Tributaries 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
11140108-014	Mountain Fork		Tm, Tb	UN	Low
1140108-019	Mill Creek		pH	UN	Low
11140108-907	Barren Creek		pH	UN	Low

Note: Yellow= 303(d) stream segment added to 2016 listing


Gray= 303(d) stream segment removed from 2016 listing

Table 5. Arkansas' 2018 303(d) Category 5 in Quachita River Basin

Planning Segment 2A -Boeuf River & Tributaries 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
08050002-003	Bayou Macon		Cl	UN	Low
08050002-006	Bayou Macon		Cl	UN	Low
Planning Segment 2B -Bayou Bartholomew & Tributaries 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
08040205-001	Bayou Bartholomew		DO, Pb	UN	Low
08040205-907	Chemin-A-Haut Creek	AL	DO	UN	Low
08040205-909	Main Street Ditch	AL	DO, Pb	UR	Low
08040205-902	Harding Creek	AL	Pb	UR	Low
08040205-910	Bayou Imbeau	AL, PC	DO, Pa, Pb		High
08040205-911	Able's Creek		Tb	SE	Low
08040205-901	Bearhouse Creek	AL	DO	UN	Low
08040205-013	Bayou Bartholomew		DO	UN	Low
08040205-006	Bayou Bartholomew		Pb	UN	Low
08040205-905	Cross Bayou		DO	UN	Low
08040205-908	Overflow Creek	AL	Tb, Cl	SE	Low


Note: **Yellow**= 303(d) stream segment added to 2016 listing **Gray**= 303(d) stream segment removed from 2016 listing

Table 5. (cont.) Arkansas' 2018 303(d) Category 5 in Quachita River Basin

Planning Segment <u>2C</u> -Saline River & Tributaries 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
08040203-018	Alum Fork Saline River		pH	UN	Medium
08040203-014	Alum Fork Saline River		DO, pH	UN	Medium
08040203-009	Saline River		Tb	UN	Medium
08040203-007	Saline River		Tb	UN	Medium
08040203-913	Saline River		Tb	SE,UN	Medium
08040203-011	North Fork Saline River		DO	UN	Medium
08040203-019	Middle Fork Saline River		DO	UN	Medium
08040203-021	Cedar Creek		DO	UN	Low
08040203-922	Lockett Creek		DO	UN	Low
08040204-002	Saline River		Tm	UN	Medium
08040204-005	Big Creek		pH, Pb	UN	Low



Note: **Yellow**= 303(d) stream segment added to 2016 listing**Gray**= 303(d) stream segment removed from 2016 listing

Table 5. (cont.) Arkansas' 2018 303(d) Category 5 in Ouachita River Basin

Planning Segment <u>2D</u> -Lower Ouachita River & Tributaries					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
08040201-007	Smackover Creek		DO, pH, Tb, Pb	IP	Low
08040201-006	Smackover Creek		DO, pH, Tb, Pb	IP	Low
08040201-406	Smackover Creek		DO, pH, Tb, Pb	IP	Low
08040201-806	Salt Creek	AL	pH	UN	Low
08040201-606	ECC Tributary	AL	pH, Cu,NO3	IP	High
08040201-905	E. Two Bayou	PC	pH, PA	UN	Low
08040201-001	Moro Creek		DO, Pb	UN	Low
08040201-901	Moro Creek		Pb	UN	Low
08040202-008	Bayou de Loutre	AI, DW	DO, Tb, Pb, Se, Zn,	IP	High
08040202-007	Bayou de Loutre	AI, DW	DO, Tb, Pb, Zn	IP	High
08040202-006	Bayou de Loutre	AI, DW	DO, Tb, Pb, Zn	IP	High
08040202-909	Loutre Creek	AI, DW	Cl,SO4, TDS, Se	IP	High
08040202-004	Ouachita River		DO	UN	Medium
08040201-002	Ouachita River		Pb	UN	Medium
08040201-004	Ouachita River		Pb	UN	Medium


Note: **Yellow**= 303(d) stream segment added to 2016 listing**Gray**= 303(d) stream segment removed from 2016 listing

Table 5. (cont.) Arkansas' 2018 303(d) Category 5 in Ouachita River Basin

Planning Segment <u>2E</u> -Lower Cornie Bayou & Tributaries 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
08040206-015	Cornie Bayou		Do, Tb, Pb	IP	Low
08040206-016	Little Cornie Creek		Pb	IP	Low
08040206-716	Little Cornie Creek		Pb	IP	Low
08040206-816	Little Cornie Creek		Pb	IP	Low
08040206-916	Walker Branch		Pb	IP	Low
Planning Segment <u>2F</u> -Ouachita River: Headwater to Little Missouri River 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
08040102-971	Chamberlain Creek	AL, DW, AI	pH, SO4, TDS, Pb, Al, Be, Toxi	RE	Medium
08040102-970	Cove Creek		pH, Zn, Tox	RE	Medium
08040102-975	Lucinda Creek	AL	pH	RE	Medium
08040102-976	Cove Creek		pH, Zn, Toxi	UN	Medium
08040101-901	Wilson Creek		pH	UN	Medium
08040101-902	Indian Springs Creek		DO, SO4, TDS	UN	Medium
08040101-048	Prairie Creek		DO	UN	High
08040101-032	Fiddlers Creek		DO, pH	UN	Low
08040101-838	Irons Fork Creek		DO, pH	UN	Low
08040101-043	S Fork Ouachita River		DO	UN	Low
08040101-929	Irons Fork Creek		pH	UN	Low
08040102-023	South Fork Caddo		DO	UN	Low
08040101-033	Ouachita River		DO	UN	Low

Note: **Yellow**= 303(d) stream segment added to 2016 listing**Gray**= 303(d) stream segment removed from 2016 listing

Table 5. (cont.) Arkansas' Draft 2018 303(d) Category 5 in Quachita River Basin

Planning Segment <u>2G</u> -Little Missouri River & Antoine River 					
HUC-Reach	Name	Impairment		Contamination	Priority
		Designated Use	Water Quality		
08040103-003	Terre Noir Creek		pH	UN	Low
08040103-002	Terre Noir Creek		pH	UN	Low
08040103-031	Terre Rouge Creek		Tb	SE	Low

Note: **Yellow**= 303(d) stream segment added to 2016 listing **Gray**= 303(d) stream segment removed from 2016 listing

Changes in 303(d) Listing

Arkansas' water quality standards are based on least-disturbed waterbodies, approximately six in each Level III Ecoregion, and their average water quality constituent concentrations. Water quality standards for certain constituents, such as dissolved oxygen, temperature, and pH, cannot be attained due to their susceptibility to changing climatic conditions, i.e. these constituents fluctuate with ambient weather conditions. This leads to frequent removal and addition of waterbodies not meeting attainment levels for these constituents. Changes in 303(d) Listings caused by fluctuations in dissolved oxygen, temperature, and pH are shown in Table 6. For some waterbodies, the natural background concentration of dissolved oxygen, temperature, or pH may be significantly different than the ecoregion average. In this situation, the individual waterbody cannot attain the water quality standards established for the ecoregion.

Table 6. Changes to 303(d) Listing related to Dissolved Oxygen, Temperature, and pH

Constituent	Waterbodies <u>Added</u> to 2018 listing	Waterbodies <u>Removed</u> from 2016 listing
Dissolved Oxygen	29	5
Temperature	1	1
pH	13	1

Note: 2020 303(d) Listings were not available at the time of this report.

Nonpoint Source Management Impacts

The implementation of nonpoint source best management practices has been effective in reducing pollutants entering three of Arkansas' rivers. Leading these efforts, the **NRD** has partnered with landowners in these watersheds to provide education, demonstration projects, technical assistance & expertise, and financial assistance to implement and install best management practices which improve water quality. Results from these activities has been a reduction in contaminant levels enough to remove the waterbodies from the 303(d) impaired waters list. Table 7 shows waterbodies that were removed from the 303(d) as a result of **NRD** nonpoint pollution efforts in these watersheds. Information on these projects can be viewed on EPA's website: <https://www.epa.gov/nps/nonpoint-source-success-stories-arkansas>.

Table 7. Changes to Arkansas 303(d) Listing from NRD Nonpoint Source Pollution Efforts

Constituent	NRD Efforts	Waterbody Removed
Turbidity	<ul style="list-style-type: none"> ▪ Public education & outreach ▪ Financial assistance ▪ Demonstration projects ▪ Technical Assistance ▪ Best Management Practices 	Illinois River
Turbidity		St. Francis River
Turbidity		Days Creek
Lead		Bayou DeView
Turbidity		Cache River

Map of DEQ Designated Waters

Figure 2. contains all DEQ listed streams by assessment and reporting category. These Category 1b, Category 4a, Category 4b, and Category 5 stream segments are listed in the **DEQ 2018 305(b)** Integrated Water Quality Monitoring Assessment Report. Category 1b waters attain all water quality criteria and support all designated uses; however, a Total Maximum Daily Load (TMDL) remains in place for one or more constituents. Category 4a waters do not attain water quality standards for one or more designated uses but the development of a TMDL is not required because a TMDL has been completed for the listed parameter(s). Category 4b waters do not attain water quality standards for one or more designated uses but the development of a TMDL is not required because other management alternatives are expected to result in attainment. Category 5 waterbodies are impaired and prioritized as High, Medium, or Low (full description on page 3).

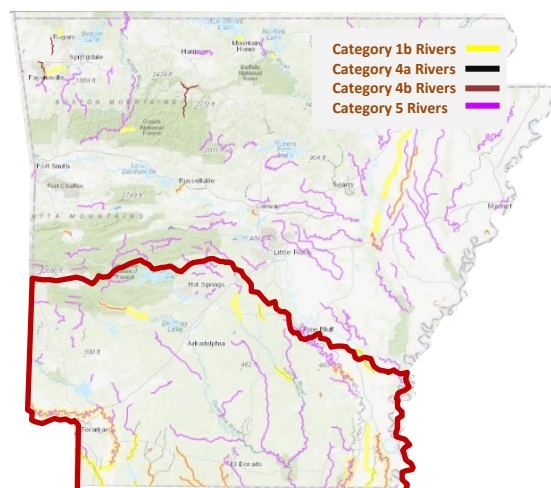


Figure 2. Map of DEQ Designated Waters

TMDL Prioritization

DEQ has developed a “Long-Term Vision for Assessment, Restoration, and Protection” under the Clean Water Act 303(d) Program to comply with measures set forth by the United States Environmental Protection Agency (EPA). DEQ and NRD work cooperatively to direct available and limited resources to priority watersheds which are identified through stakeholder, risk and science-based inclusive processes. Nine of ten watersheds identified through these processes were prioritized for TMDL development. DEQ’s long-term vision plan includes an update to these priorities by the year 2022.

SECTION 319 NONPOINT POLLUTION PROGRAM UPDATE

The 2018-2023 Nonpoint Source Pollution Management Plan identifies several priority watersheds which lie within the Red River Compact Area in southern Arkansas. Projects ongoing during the 2019-2020 time period are described in the following section.



Bayou Bartholomew watershed has been a priority for Arkansas’ nonpoint pollution management efforts since 1998 and was re-designated a priority watershed in the 2018-2023 Nonpoint Pollution Management Plan. Water quality concerns in the watershed include the following:

- siltation/turbidity
- chlorides
- sulfates
- pathogens
- lead
- mercury
- total dissolved solids
- low dissolved oxygen

The current project (#17-400) in HUC 08040205 (Bayou Bartholomew watershed) includes collection, analyzes, and reporting of water quality and discharge data at 10 sites through September 2021. Grab sample techniques and methodologies are being used to collect one field sample per week at each site. Over 2,496 samples are being collected and analyzed for TSS, Turbidity, Total Phosphorus, Total Kjeldahl Nitrogen, Nitrate-Nitrogen, Ammonia Nitrogen, Chloride, and Sulfate concentrations. In addition, pH, Dissolved Oxygen, Specific Conductance, and Temperature readings are also being recorded. This water quality monitoring effort is part of Arkansas’ statewide stream gaging network supported through NRD’s Cooperative Agreement with USGS. Water quality data from this project will be used to evaluate the effectiveness of nonpoint source pollution management activities in the watershed and aid efforts to restore all DEQ designated uses.

Update: As of December 2020, the project has collected 1,806 samples and is on schedule to complete collection of 2,496 samples by November 2021.



Upper Saline River watershed is a priority for Arkansas' nonpoint pollution management effort in the Red River Compact Area. The Upper Saline River watershed has experienced significant increases in commercial, industrial, residential, and recreational development. Urban growth was identified by The Nature Conservancy in 2008 as a major contributor to increases in nutrient and sediment loadings in the watershed. Several monitoring efforts are ongoing in the Alum Fork, Big Creek, and Saline River to assess water quality impairment by

turbidity and pH levels and determine the effectiveness of implemented management practices. Samples are being analyzed for TSS, Turbidity, Total Phosphorus, Total Kjeldahl Nitrogen, Nitrate-Nitrogen, Ammonia-Nitrogen, Chloride, Sulfate, Dissolved Oxygen, Specific Conductance, pH, and Temperature. Trends in water quality parameter concentrations, monthly loading estimations, and unit area loading estimations will be based on water quality data collected at five water quality monitoring stations.

Monitoring will resume in October 2020 as part of a new project which will support improved road crossings, restore aquatic habitat, reduce sedimentation, and communicate water quality data results with partners, stakeholders, and local communities in the watershed. This project, *"Restoring Aquatic Connectivity and Reducing Sedimentation in the Upper Saline River Watershed,"* will be managed by The Nature Conservancy (TNC) and will educate the general public on how and why to implement best management practices on stream barriers and riparian zones. TNC will develop three sites in the North Fork and Alum Fork sub-watersheds near Paron, Arkansas, to demonstrate road/stream crossing design, riparian zone planting, and other water quality improvement techniques. These sites will be used to engage and educate stakeholders, partners, and the public, and encourage adoption of best management practices to reduce sediment loading and other impairment in the Upper Saline River watershed.

Update: The current monitoring project initiated in 2020 proposes to collect 1,465 samples from these five monitoring sites.



Lower Ouachita-Smackover watershed is a priority for Arkansas' nonpoint pollution management effort in the Red River Compact Area. The watershed is generally rural and is (predominately) 83% forested. However, several urban areas including the towns of Bearden, Camden, El Dorado, Fordyce, Hampton and Smackover are located within the watershed. Impairment exists on 16 streams due to Ammonia, Chloride, Copper, Lead, Mercury, Nitrogen (Nitrates), pH, Sulfates, Total Dissolved Solids and Turbidity concentrations. The current project in HUC 08040201 (Lower Ouachita-Smackover watershed) was initiated in 2016 to collect, analyze, and report

water quality and discharge data from 10 monitoring stations established at or near the outfalls of the following 12 digit HUCs: Bryant Creek, Lost Creek, Headwaters Lloyd Creek, Holmes Creek, Sandy Creek, Sloan Creek, Gum Creek, Cypress Creek, Cordell Creek, and Little Two Bayou.

Update: This project ended in December 2020. Data from 2,532 samples showed decreasing TSS, Turbidity, and TN concentrations at several sites in the project area.



Poteau River watershed has been a priority watershed within the Arkansas Nonpoint Source (NPS) Pollution Management Plan since 1998, and thus has been the focus of trans-boundary water quality issues for the last several decades. The watershed originates along the western edge of Arkansas and flows into Oklahoma south of the Arkansas River Valley. Objectives in this watershed included collection and analyses of monthly samples from 10 streams draining HUC 12 watersheds and 3 USGS sites with continuous discharge to estimate loads and water quality trends.

The project and the data provided accurate and complete measurements of water quality parameters and trends at each monitoring site.

Update: Monitoring samples were collected during 2017-2020. The project concluded in December 2020.

The Nature Conservancy is seeking to restore aquatic connectivity and reduce sedimentation in the Upper Saline River through improving stream crossings, restoring in-stream habitat, reducing sedimentation at demonstration sites within the watershed, and providing educational opportunities for local communities and stakeholders within the project area. The project's success will be based on the replacement of two high-priority road stream crossings and executing four volunteer events for the public. This project was initiated in October 2020 and is currently scheduled to conclude in December 2023.

The **Poteau River Watershed Management Plan** (project) is focused on developing a 9-element watershed management plan (WMP) for the Poteau River watershed area in Arkansas. The Poteau River is a priority watershed for Arkansas and is listed on the Arkansas 303(d) list for nutrient and metal impairments. The WMP will contain ranked management measures and identify critical sub-watersheds in need of BMP implementation. This project is scheduled to conclude in December 2022.

A **Bayou Meto Watershed Management Plan** is being developed to address the nonpoint sources of pollution that are impacting water quality within the watershed. SWAT modeling is nearing completion and will be used to identify sub-watersheds where implementation may have the greatest impact to improve water quality. The nine-element plan will help guide the implementation of management practice to address water quality issues, build stakeholder involvement and partnerships, characterize the watershed, identify stakeholder concerns, and develop implementation goals and solutions. This project is scheduled to conclude in March 2022.

In **Bayou Bartholomew Watershed**, the Jefferson County Cooperative Extension Service (JCCES) is currently addressing sediment and nutrient loadings through the creation of 10 demonstrations green infrastructure and Low Impact Development features. Additionally, JCCES is providing outreach, education and involvement of the local watershed community related to these demonstrations. This project began October 2019 and has been promoted via newsletters and local newspapers. As of December 2020, seven low impact development installations, five in-person workshops, and two webinars have been completed. This project is scheduled to have all demonstration and educational components completed by October 2021.

TULSA DISTRICT US ARMY CORPS OF ENGINEERS

RED RIVER COMPACT COMMISSION 41ST ANNUAL MEETING

CORPS OF ENGINEER'S UPDATE

Mike Abate, PMP
Chief Civil Works Branch, PPMD

27 April 2021



Multipurpose
Reservoirs



Hydropower



Interagency and
International
Support



MIKARNS



"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."



**US Army Corps
of Engineers**

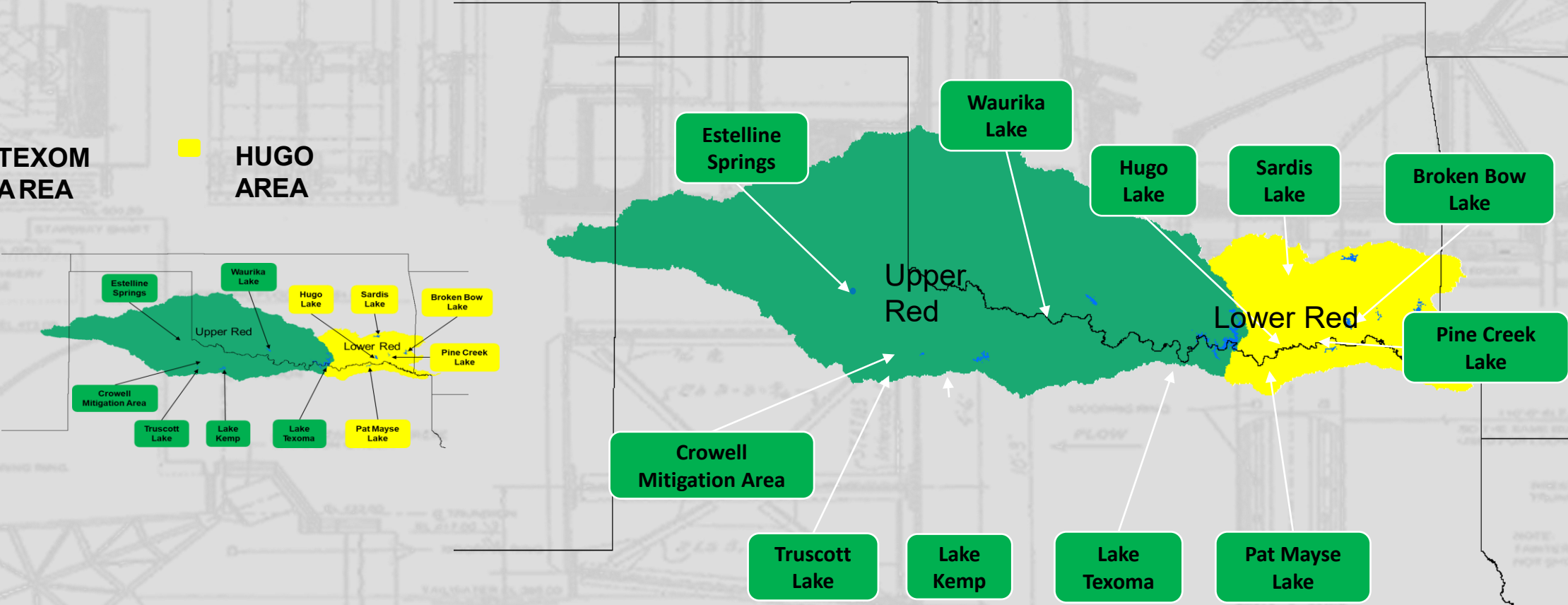


RED RIVER AREA RE-ORGANIZATION



■ **TEXOMA AREA**

■ **TEXOM AREA** ■ **HUGO AREA**



Tulsa District FY 2020 – FY 2022 Civil Works Budget



FY 2020 Allocations

- Investigations - \$0
- Construction - \$2,740,000 (Work Plan)
- O&M - \$107,711,300
 - Regular Appropriation: \$97,317,300
 - Work Plan: \$10,394,000
 - Plan to obligate \$19,014,000 on non-routine maintenance (17.6% of budgeted funds)

FY 2021 President Budget

- Investigations - \$2,700,0000
- Construction - \$0
- O&M - \$103,583,000
 - Regular Appropriation: \$94,983,300
 - Work Plan: \$8,600,000
 - Plan to obligate \$20,386,000 on non-routine maintenance (19.7% of budgeted funds)

FY 2022 President Budget

- Investigations - TBD
- Construction - TBD
- O&M - TBD
 - Regular Appropriation: TBD
 - Plan to obligate TBD on non-routine maintenance (??.% of budgeted funds)

The addition of Work Plan amounts by Congress to the fiscal year appropriation allows the Corps of Engineers to fund activities that have become more important or critical since submission of the budget request. Tulsa District received an additional \$10.4M in FY20 Work Plan (includes \$1.544M for Truscott to carryover into FY21). In FY21 we received a total of \$8.6M in Work Plan funds.

Tulsa District FY 2019 – FY 2021 Civil Works Budget Red River Projects



FY 2020 Allocations

- Investigations - \$0
- Construction - \$0
- O&M - \$25,736,000
 - Regular Appropriation: \$23,682,000
 - Work Plan: \$ 2,054,000
 - Plan to obligate \$3,159,000 on non-routine maintenance (12.3% of budgeted funds)

FY 2021 Allocations

- Investigations - \$0
- Construction - \$0
- O&M - \$19,868,000
 - Regular Appropriation: \$19,868,000
 - Work Plan: \$0
 - Plan to obligate \$764,000 on non-routine maintenance (3.8% of budgeted funds)

FY 2022 President Budget

- Investigations - TBD
- Construction - TBD
- O&M - TBD
 - Regular Appropriation: TBD
 - Plan to obligate TBD on non-routine maintenance (?.% of budgeted funds)

The addition of Work Plan amounts by Congress to the fiscal year appropriation allows the Corps of Engineers to fund activities that have become more important or critical since submission of the budget request. Tulsa District received an additional \$10.4M in FY20 Work Plan (includes \$1.544M for Truscott to carryover into FY21). In FY21 we received a total of \$8.6M in Work Plan funds.

Tulsa District Red River Projects Flood Pool Status

As of 22 April 2021



	Elevation (feet)	% Conservation Pool	% Flood Pool
Foss Lake, OK (Sec 7)	1639.14	88.38%	0.00%
Ft Cobb Lake, OK (Sec 7)	1342.29	100.00%	1.72%
Arkbuckle Lake, OK (Sec 7)	872.29	100.00%	1.89%
Altus Lake, OK (Sec 7)	1537.47	27.19%	0.00%
Tom Steed Lake, OK (Sec 7)	1408.45	83.36%	0.00%
Lake Kemp, TX	1142.04	88.18%	0.00%
Waurika Lake, OK	951.86	100.00%	3.40%
Lake Texoma, OK & TX	614.67	98.27%	0.00%
McGee Creek Reservoir, OK (Sec 7)	573.68	88.40%	0.00%
Pat Mayse Lake, TX	451.82	100.00%	7.44%
Hugo Lake, OK	405.1	100.00%	0.95%
Sardis Lake, OK	599.03	100.00%	0.37%
Pine Creek Lake, OK	448.37	100.00%	12.93%
Broken Bow Lake, OK	601.1	100.00%	1.60%

SWT FY20 Shoreline Management Plan and Master Plan Updates



Project	Description	Program Amount	Kickoff Meeting	Public Scoping Meeting	Alternative Development Workshop	Submit Draft MP or SMP and EA	Public Meeting	Submit Final SMP and EA
Denison Dam, Lake Texoma	Revise shoreline management plan	\$500,000	22 Oct 19	29-30 Jan 20	Completed May 2020	Completed Dec 2020	Completed Jan 2021	Completed Feb 2021

Lake Texoma Final SMP and EA is currently at SWD for BG Beck's approval.

Project	Description	Program Amount	Kickoff Meeting	Public Scoping Meeting	Alternative Development Workshop	Submit Draft MP or SMP and EA	Public Meeting	Submit Final SMP and EA
Hugo Lake	Revise Master Plan	\$300,000	1 Apr 21	19 May 21	01 Nov 21	15 Jul 2022	15 Jul 2022	01 Nov 2022

SWT FY20 Red River Master Water Control Manual Update



- Red River Master Manual final task order award 30 Jun 2020
- Red River Master Manual final manual with all internal reviews incorporated 31 Sep 2021



PAS Study Red River Navigation



- Authorized by Section 22 of the Water Resources Development Act of 1974, as amended (42 U.S.C. 1962d-16).
- Purpose of the Study is to update the navigation benefits along the Red River from Denison Dam to Index, AR.
- Estimated cost is \$360,000 and is cost shared 50/50.
- Estimated duration of the Study is 18 months
- Red River Authority is the Cost Share Sponsor for this Project.
- Cost share Agreement has been signed, waiting on Federal Funding.

SWT FY 20 Non-Routine Maintenance Construction



Project	Description	Contract Award	Percent Complete	Physical Complete Scheduled	Final Payment Scheduled	Contract Amount
Lake Texoma	Design, Construct, Install Flood Gate Hoists	2016/09/30	99%	2019/11/07	2021/05/31	\$7,227,558
Pine Creek	Replace Service Bridge, Gate & Frame seals	2017/09/30	99%	2020/03/21	2021/05/31	\$2,471,376
Hugo	Repair Roof	2020/08/05	100%	2021/02/05	2022/01/31	\$229,681
Sardis	Emergency Gate and Wet Well Repairs	2020/09/29	0%	2021/08/05	2022/01/31	\$973,380
Pine Creek	Splitter Wall and Conduit	2020/09/19	26%	2021/07/19	2022/01/31	\$996,990
Broken Bow	Replace Floating Bulkhead	2020/10/30	0%	NTP Scheduled 15 May 21		\$3,230,000

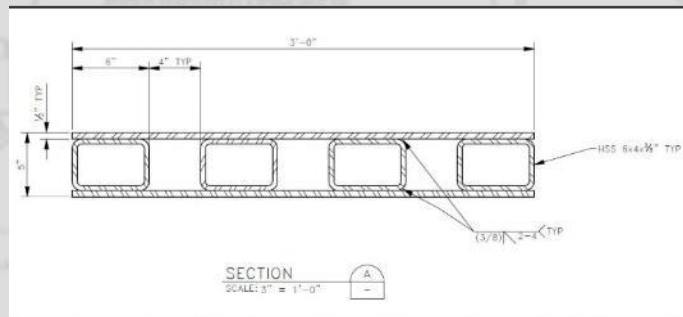
RED RIVER AREA

Lake Texoma – Hugo – Sardis – Pat Mayse – Pine Creek – Broken Bow- Waurika – Truscott/Chloride Control – Estelline Springs - Kemp

MINOR MAINTENANCE UPDATE



- Waurika Lake Electrical Upgrades
- Kiowa Park 1 - Water Line Replacement and 50-amp electrical upgrades
- Soo Lock Crew – Certified welding repairs to bulkhead cradle
- Hugo Lake – Mahaffey Point Day Use Area Primary Electric Repair by Navigation Electrical Crew



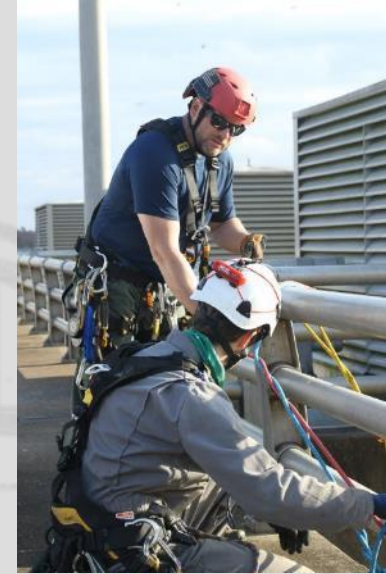
RED RIVER AREA

Lake Texoma – Hugo – Sardis – Pat Mayse – Pine Creek – Broken Bow- Waurika – Truscott/Chloride Control – Estelline Springs - Kemp



FRM UPDATE

- New installation of three piezometers on the Broken Bow Lake Dam
- Hugo tainter gate structural inspection completed 10 Nov 2020
- Hugo Staff replacing cable and re-anchoring bulkhead



TULSA DISTRICT FORESTRY PROGRAM



- Pine Creek blue dot thinning sale complete
- Broken Bow Lake Golf Course timber appraisal completed.
- Archeology work should begin before the end of the month for the next timber sale at Pine Creek Lake



RED RIVER AREA OUTREACH

LAKE TEXOMA – HUGO – SARDIS – PAT MAYSE – PINE CREEK – BROKEN BOW- WAURIKA – TRUSCOTT/CHLORIDE CONTROL – ESTELLINE SPRINGS - KEMP



- Waurika Lake Boy Scout Troop - OKLAHOMA FUR BEARERS ALLIANCE ANNUAL YOUTH TRAPPING CAMP



RED RIVER AREA EVENTS

Lake Texoma – Hugo – Sardis – Pat Mayse – Pine Creek – Broken Bow- Waurika – Truscott/Chloride Control – Estelline Springs - Kemp

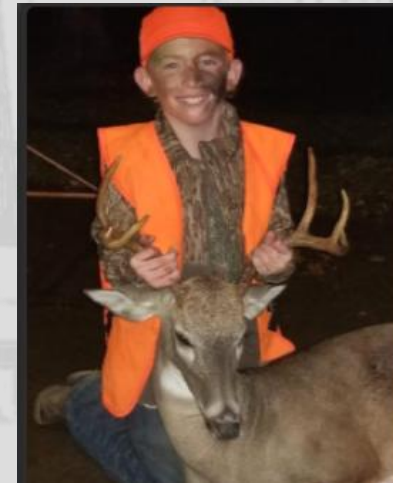


➤ Recent Youth Hunts – Waurika, Hugo and Pine Creek

Total of 55 Kids

31 successful hunters

1 Unlucky Hog



Red River Area – Denison Dam & Lake Texoma 75th Anniversary of the Denison Dam & Lake Texoma



On Friday, April 9, 2021, numerous distinguished guests that included US Congressional delegations from Oklahoma and Texas, heads of state and federal agencies, USACE CG Beck, COL Preston, and numerous other stakeholders gathered to celebrate the 75th Anniversary of the Denison Dam and Lake Texoma. This event created a great platform to educate many students that were in attendance of the Corps many missions. Private tours were given to several stakeholders and students of the “Denison Powerhouse” which provided an excellent opportunity to learn about hydropower production. These type tours have not been available since 2001, due to security protocols and limited staffing. Mrs. Brande Serner was presented a “Challenge Coin” for excellence by USACE SWD CG Beck for her outstanding job of overseeing the organization of the event making it a huge success.



DENISON DAM UNIT 2 TURBINE

Denison Powerhouse Construction started in 1939 and was completed in 1943, with deliberate impoundment in Lake Texoma beginning October 31, 1943. The Denison Powerhouse has two Francis Type turbines attached to vertical generators capable of producing 40 Megawatts of electricity each. The powerhouse is built in the Art Deco/Art Modern style that was popular during the time of construction.

The first unit of the Denison Hydroelectric Powerplant was placed in service and started providing commercial power on July 17, 1944, on an emergency basis at reduced head to meet the shortage of electric power caused by World War II Industrial production. The reservoir completed filling in 1945, and Unit 1 began normal operations. The second unit was commissioned and commercial production began in 1947.

The Denison Unit 2 turbine on display here was in service from 1947 until 2020 and it has produced approximately 8.49 million megawatt-hours of electricity. This is enough power to serve the entire New York City for 2.1 years. In terms of water usage, approximately 25.7 trillion gallons of water have passed through the Unit 2 turbine, which equates to 78.9 million acre feet or the entire state of New Mexico covered by one foot of water.

SCAN ME TO LEARN MORE
ABOUT HYDROPOWER



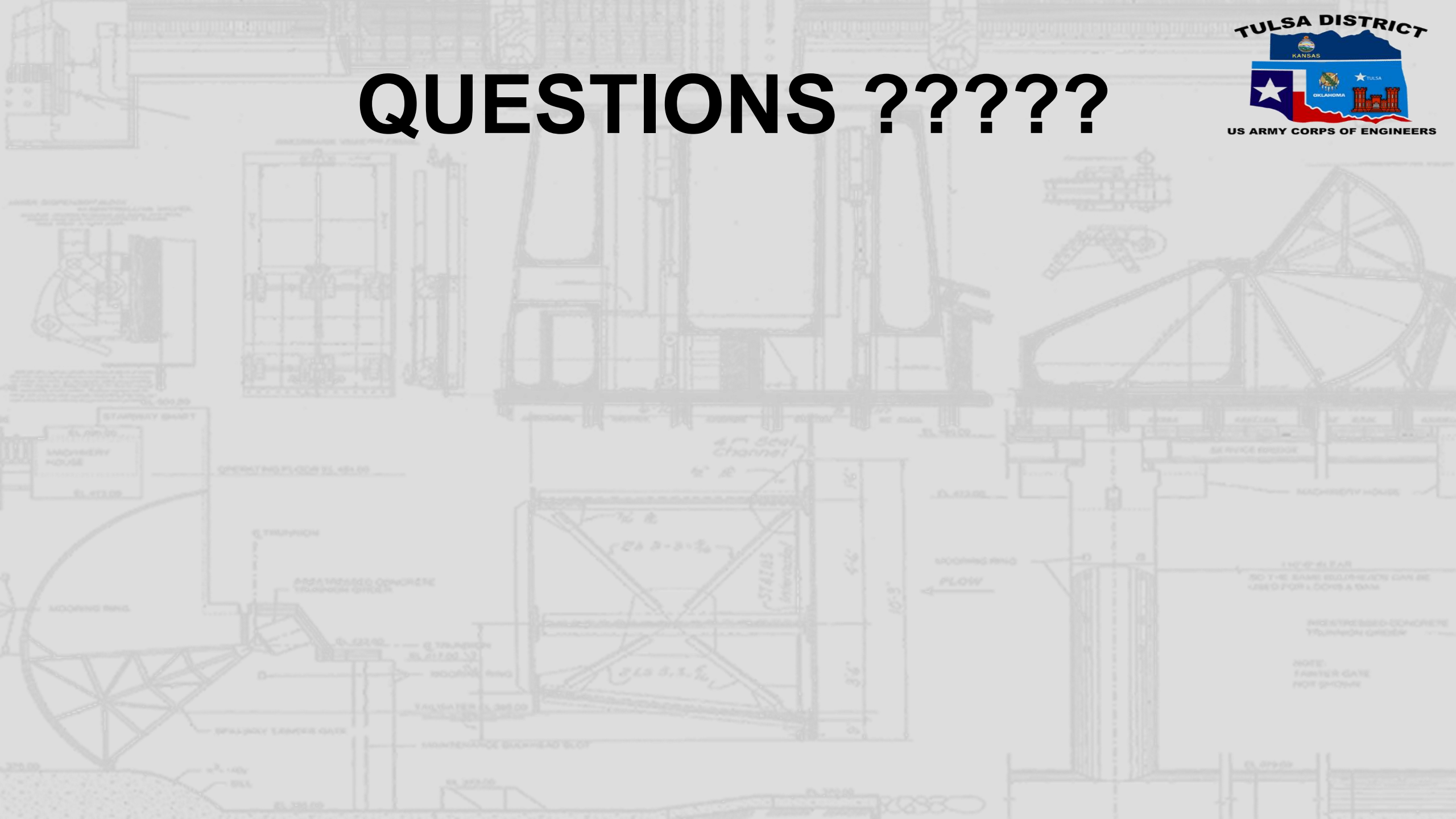
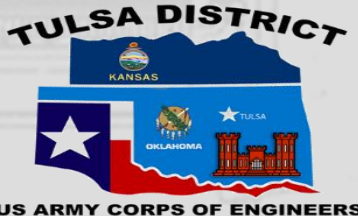
"Staging of Steel Liners Used in Construction of the Dam."



"Construction of Lake Texoma Intake Structures"



QUESTIONS ??????





— BUREAU OF —
RECLAMATION

Summary of Current and Recently Completed Activities

Planning, Construction Assistance, and Grant Programs
Oklahoma-Texas Area Office

Mission Statements

The mission of the *Department of the Interior* is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the *Bureau of Reclamation* is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Introduction

The Bureau of Reclamation (Reclamation) is an agency within the Department of the Interior with a primary mission designated to manage, develop, and protect water and related resources in an environmentally and economically sound manner within the 17 western states. The Oklahoma-Texas Area Office (OTAO) is responsible for administering 11 reservoir projects and associated water distribution systems in southern Kansas, Oklahoma, and Texas. The combined water delivery is more than 680,000 acre-feet (ac-ft) of Municipal and Industrial (M&I) water annually to approximately three million water users, providing additional fish and wildlife, recreation, and flood control benefits. The OTAO supports two Irrigation Districts, one in Oklahoma and one in Texas.

Reclamation works in conjunction with other Federal and state agencies, Indian Tribes, and local entities in performing these responsibilities. Significant areas of activity include providing oversight of operations and maintenance of existing facilities and water resources planning along with construction assistance.

The purpose of this activity report is to provide a summary of current and recently completed activities under the Planning, Construction Assistance, and Grant Programs.

Native American Affairs Program

The Native American Affairs Program, which is a formal program funded through the Native American Affairs line item in Reclamation's budget, is small but integral part of the overall Native American Program. The Native American and International Affairs Office in the Commissioner's Office serve as the central coordination point for the Native American Affairs Program and lead for policy guidance for Native American issues in Reclamation.

Three new projects were recently selected for funding in FY 20 totaling \$549,690 in Federal Funding:

- **Chickasaw Nation**
Additional water supply for the City of Lone Grove
- **Choctaw Nation**
Development of a water infrastructure asset management plan for communities in Choctaw Nation Territory
- **Modoc Nation**
Modoc Nation Water Improvement Plan

Two projects were awarded in FY 19 totaling \$397,610 in Federal funding:

- **Choctaw Nation**
Water treatment processes for regional water service providers

- **Osage Nation**
Water infrastructure assessment project

Two projects were awarded in FY 18 totaling \$375,869 in Federal funding:

- **Chickasaw Nation**
Water Supply for the City of Tishomingo
- **Choctaw Nation**
Improvements for Failing Water/Wastewater Treatment Plants in Choctaw Territory

Four projects were awarded in FY 17 totaling \$277,900 in Federal funding:

- **Cherokee Nation**
Hydraulic and Water Loss Assessment of Cherokee Rural Water District #2
- **Chickasaw Nation**
Davis to Sulphur Pipeline Feasibility Study
- **Kickapoo Tribe of Oklahoma**
Establishing Reference Conditions for the Northern Cross Timbers EcoRegion Using Macroinvertebrate Assemblages
- **Miami Tribe of Oklahoma**
Water Assessment of Tribal Land

Water Conservation Field Services (WCFS) Program

One project was awarded in FY 17 totaling \$100,000 in Federal funding:

- **Central Oklahoma Master Conservancy District (COMCD)**
Evaluate the Effectiveness of Floating Wetland/Breakwater Unit Designs to Reduce the Energy of Wave Action before Contacting the Lake's Shoreline

WaterSMART Program

Reclamation's WaterSMART (Sustain and Manage America's Resources for Tomorrow) Program aims to leverage Federal (up to 50 percent cost-share) and non-Federal funds to improve water management, increase energy efficiency in water delivery, facilitate water marketing projects, protect threatened and endangered species, and carry out activities to address potential climate-related impacts on water resources. Eligible entities include irrigation and water districts, river authorities, tribes, states and other entities with water or power delivery authority.

Basin Study Program

This program addresses water needs on a basin-wide scale through development of future supply/demand projections that include state-of-the-art data on climate variability; an analysis of how infrastructure and operations will perform in the face of changing realities; and development of mitigation strategies and management solutions. Studies are cost-shared on a 50/50 basis with willing state, tribal, and local partners and generally take two years to complete. Reclamation's share of study costs are used to support work done by Reclamation or its contractors.

Upper Washita Basin Study

An ongoing Basin Study on the Upper Washita Basin in Oklahoma partnering with the Oklahoma Water Resources Board (OWRB) and Fort Cobb and Foss Reservoir Master Conservancy Districts is set out to identify sustainable solutions to infrastructure issues and existing and projected imbalances between water supply and demand.

Substantial progress has been made on the UWBS, including but not limited to the development of five hydrologic models (two numerical groundwater models, two reservoir yield models, and a basin-wide network stream model), as well as supply and demand climate risk assessments. OWRB is in the process of completing review of the Washita River Alluvium groundwater model and the Rush Springs Aquifer groundwater model has been completed and publication is out for review. Also, the calibration for the Surface Water Allocation Model (SWAM) is complete. Completion of these models is critical toward being able to evaluate the reliability of existing infrastructure and options under current and future climate conditions, as well as evaluating adaptation and mitigation strategies. A legal review of adaptation strategies is currently in progress. The Fort Cobb Reservoir Master Conservancy District has been working closely with Reclamation to develop conveyance alternatives to address aging infrastructure issues. Designs and cost estimates are under development.

Upper Red River Basin Study

An ongoing Basin Study on the Upper Red River Basin in Oklahoma partnering with the OWRB, Lugert-Altus Irrigation District, and Mountain Park Master Conservancy District is set out to identify sustainable solutions to infrastructure issues and existing and projected imbalances between water supply and demand. The study will evaluate infrastructure and permitting options complimented by a legal review of adaptation strategies that will help ensure long-term reliability of water supplies during critical drought periods.

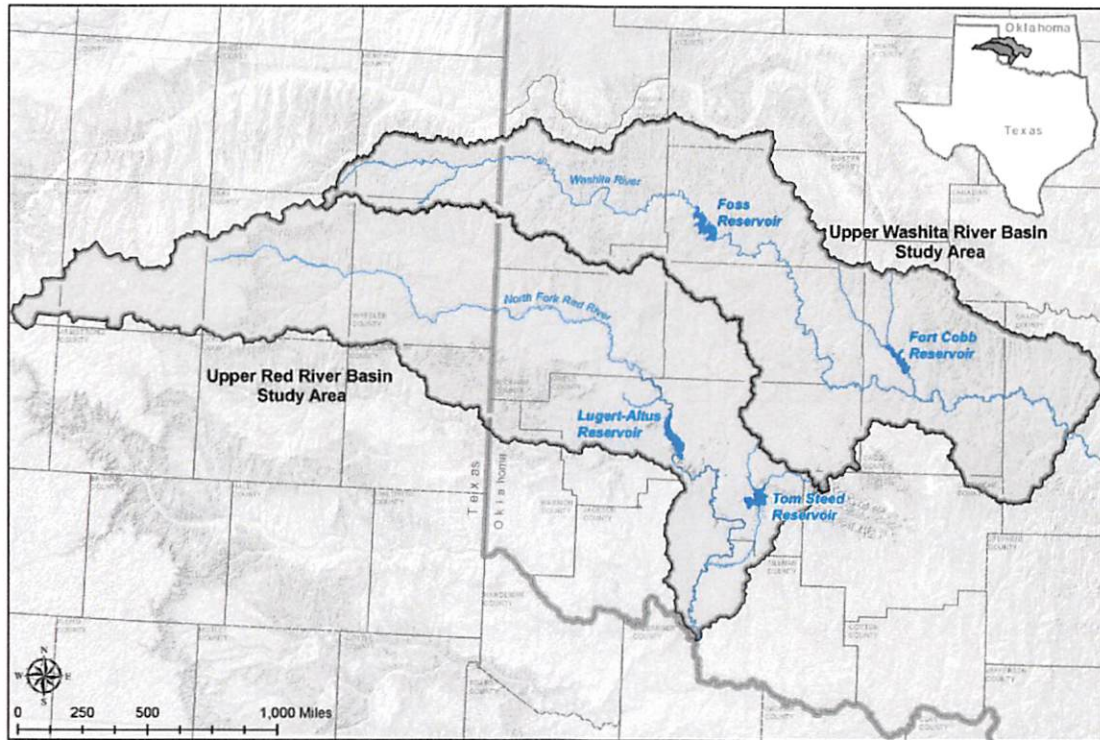


Figure 1: Upper Washita and Upper Red River Basin Study area map.

Substantial progress has been made on the URBS, including the development of four hydrologic models (a numerical groundwater model, two reservoir yield models, and a basin-wide network stream model); supply and demand analyses; climate and hydrologic risk assessments; engineering design and costs of infrastructure alternatives; and most recently, modeling runs of various “status quo” scenarios evaluating a future under existing operations and management.

Applied Science Grants

This relatively new program, which is a component of Reclamation’s WaterSMART Basin Study Program, seeks to develop tools and information that will inform and support water management decisions. Project results must be readily applicable by water managers and include tools and information that can be used to support water supply reliability, management of water deliveries, water marketing activities, drought management activities, conjunctive use of ground and surface water, water rights administration, ability to meet endangered species requirements, watershed health, conservation and efficiency and other water management objectives. Since the program’s inception in FY19, four projects in Texas and Oklahoma have been selected and awarded about \$418,476.

Texas Water Trade

Texas Water Trade was awarded \$150,000 in FY 20 for studying the elucidating aquifer properties in the contributing zone of Comanche Springs.

Oklahoma State University, OK

OSU was awarded \$150,000 in FY 19 for applying unmanned systems for water quality monitoring.

Oklahoma State University, OK

OSU was awarded \$88,476 in FY 19 for improving seasonal streamflow forecasting for irrigation districts by incorporating soil moisture information derived from remote sensing.

Gulf Coast Water Authority, TX

Texas Coast Water Authority was awarded \$30,000 in FY 19 for the enhancement of water availability models of the Lower Brazos Basin.

Water and Energy Efficiency Grants

This program seeks to conserve and use water more efficiently, increase the use of renewable energy, improve energy efficiency, benefit endangered and threatened species, facilitate water markets, carry out activities to address climate-related impacts on water or prevent any water-related crisis or conflict. Since 2010, Reclamation has awarded about \$18.3 million to 48 projects in Texas and Oklahoma with a cumulative project cost of \$61,093,947 million. The estimated total amount of water saved or better managed is about 38,471 acre-feet per year.

Cameron County Irrigation District No. 2, TX

CCID2 is selected to receive \$260,103 in FY 21 for the conversion of 5,960 feet of unlined open canal in a segment of Lateral G2 to buried polyvinyl chloride pipeline, resulting in an annual water savings of 364 acre-feet.

Cameron County Irrigation District No. 2, TX

CCID2 is selected to receive \$208,954 in FY 21 for the conversion of 3,225 feet of unlined open canal in a segment of Lateral E to a buried 42-inch pipeline, resulting in an annual water savings of 350 acre-feet.

Harlingen Irrigation District No. 2, TX

Harlingen Irrigation District No. 2 is selected to receive \$300,000 in FY 21 to convert 3,225 feet of unlined open canal in a segment of Lateral E to buried polyvinyl chloride pipeline, resulting in an annual water savings of 330 acre-feet.

Santa Cruz Irrigation District No. 15

Santa Cruz Irrigation District No. 15 is selected to receive \$250,000 in FY 21 to convert 4,515 feet of the open concrete lined R-6 Canal to 36-inch polyvinyl chloride pipeline, resulting in an annual water savings of 335 acre-feet.

United Irrigation District, TX

United Irrigation District is selected to receive \$500,000 in FY 21 to line 5,900 feet of the concrete-lined Mission Main Canal with a geosynthetic composite canal liner covered with shotcrete, resulting in an annual water savings of 660 acre-feet.

Wichita County Water Improvement District No. 2, TX

Wichita County Water Improvement District No. 2 is selected to receive \$160,684 in FY 21 to convert three high-loss segments of a concrete-lined and earthen PB Lateral Canal to 5,200 feet of 27-inch plastic irrigation pipe.

City of Eufaula, OK

The City of Eufaula is selected to receive \$1,500,000 in FY 20 for major water system improvements comprised of installation and replacement of water lines, installation and replacement of service connections, installation and replacement of gate and pressure valves, and installation and replacement of fire hydrants. The improvements are expected to result in water savings of 265 acre-feet annually.

Cameron County Irrigation District #6 (CCID6), TX

CCID6 is selected to receive \$300,000 in FY 20 for multiple projects within the District. The project is expected to result in water savings of 1,040 acre-feet annually.

Harlingen Irrigation District Cameron County No. 1

Harlingen Irrigation District No. 1 is selected to receive \$300,000 in FY 20 for piping of the Wyrick Canal (Phase II). The project is expected to result in water savings of 92 acre-feet annually and energy savings of 2,733 kwh annually.

City of Wilmer, TX

City of Wilmer is selected to receive \$198,802 in FY 20 for Smart Meter Conversion and SCADA System Implementation Project. The project is expected to result in water savings of 53 acre-feet annually.

City of Durant, OK

The City of Durant, OK was awarded \$1,500,000 in FY 19 to replace 5,999 manual read meters with smart meters and associated advanced metering infrastructure network software. The project is expected to result in water savings of 1,003 acre-feet annually that is currently lost to leaks.

Bayview Irrigation District No. 11, TX

The Bayview Irrigation District #11 was awarded \$300,000 in FY 19 to convert 2,550 feet of the Main Canal, a concrete-lined open canal, to a 48-inch polyvinyl chloride pipeline. The project is expected to result in water savings of 120 acre-feet annually that is currently being lost to seepage and evaporation.

Cameron County Irrigation District No. 2 (CCID2), TX

CCID2 was awarded a total of \$175,841 in FY 19 comprised of conversion of open an unlined open canal in a segment of Lateral 8 to a buried 36-inch polyvinyl chloride pipeline to pipelines and slip gate upgrades. Water savings of 3,440 ac-ft per year and energy savings of 55,950 kilowatt hours per year is expected.

Harlingen Irrigation District Cameron County No. 1, TX

Harlingen Irrigation Dist. No. 2 was awarded \$300,000 in FY19 comprised of converting 6,750 feet of the concrete Wyrick Canal to a 48-inch pressurized polyvinyl chloride pipe.

The project is expected to result in water savings of 112 acre-feet annually, currently lost to seepage and evaporation.

Small-Scale Water Efficiency Grants

Since 2017, Small-Scale Water Efficiency Projects (SWEP) have been awarded \$1.36 million to 19 projects in Texas and Oklahoma totaling over \$2.97 million in cumulative project costs. Eligible projects include installation of flow measurement or automation in a specific part of a water delivery system, lining of a section of canal to address seepage, small rebate programs that result in reduced residential water use, or other similar projects that are limited in scope.

Chickasaw Nation, OK

The Chickasaw Nation is selected to receive \$75,000 in FY 20 to install automatic meter reading (AMR) smart meters within Murray State College (MSC) water distribution system. Installation of these meters will significantly reduce water losses currently experienced within the MSC water distribution, enhance management of current water supplies and make the most efficient use of limited water supplies from Pennington Creek, the community's sole source of water.

McCurtain County Rural Water District No. 2, OK

McCurtain County RWD No. 2 is selected to receive \$75,000 in FY 20 to purchase and install 350 smart water meters and associated hardware and software to replace existing conventional meters. The installation of these meters will serve to significantly reduce water losses currently experienced within the district's water distribution system while also enhancing the management of the community's water supply.

City of Blue Ridge, OK

City of Blue Ridge is selected to receive \$75,000 in FY 20 to upgrade approximately 500 water meters to automated meters allowing for real-time data collection. The project will modernize their infrastructure and provide for accurate and detailed leak and billing data.

El Paso County Water Improvement District No. 1, TX

The El Paso County Water Improvement District Number One, located in El Paso, Texas, is to receive \$75,000 in FY 20 to install concrete lining along 3,700 linear feet of the earthen Isla Lateral. The project will reduce water lost due to seepage and will help ensure consistent water deliveries. The water conserved from this project will help meet shortfalls in water supply during times of drought. The project is supported by the District's 2019 Water Conservation Plan and the 2016 Region E Far West Texas Water Plan.

Guadalupe-Blanco River Authority (GBRA), TX

GBRA is selected to receive \$75,000 in FY 20 to complete a reinforcement project to harden the east levee on Hog Bayou. A total of 250 linear feet will be repaired, preventing the loss of freshwater that has been diverted from the Guadalupe River to serve municipal, industrial, and agricultural customers. It is estimated that repair of the

levee would eliminate up to 10% of freshwater loss in the diversion canal system – or up to 36,200 acre-feet on an annual basis.

Harlingen Irrigation District Cameron County No. 1, TX

Harlingen Irrigation District Cameron County No. 1 is selected to receive \$74,767 in FY 20 to construct a fully automatic checkgate on the District’s main canal to improve the deliveries, system efficiency, and add storage capacity of the Adams Garden Reservoir.

City of Elk City Public Works Authority, OK

Elk City was awarded \$75,000 in FY 19 to continue replacing existing water meters with AMR water meters as since 2016 Elk City has replaced 3,500 of their 5200 water meters and anticipates replacing 970 meters.

City of Tishomingo, OK

The City of Tishomingo was awarded \$28,600 in FY 19 in install automated irrigation systems, including pipes, sprinkler heads and rain sensors, for three Murray State College athletic facilities to replace the portable water cannons that are currently being used in addition to installing a water meter on the City of Tishomingo water line.

Red River Authority of Texas, TX

Red River Authority was \$75,999 in FY 19 to install 550 new advanced metering infrastructure meters, including radio and computer reading equipment and a smart meter software system, for residential and commercial customers. The project will improve water use data collection and the ability to identify leaks.

Sharyland Water Supply Corporation (SWSC), TX

SWSC was awarded \$73,656 in FY 19 for an advanced metering infrastructure project where all SWSC service connections will have an AMI meter (approx.. 18600).

Wichita County Water Improvement District No. 2, TX

Wichita County Water Improvement District No. 2 was awarded \$74,924 in FY 19 for a project to replace 3,200 feet of open concrete ditches and canals with 24-inch buried plastic pipeline to reduce water losses from seepage and evaporation, thereby increasing efficiency and improving reliability.

City of Durant, OK

The City of Durant in Oklahoma was awarded \$75,000 in FY 18 for a project to purchase and install 300 Smart Meters that will serve subdivisions and an apartment complex, assisting in reducing significant water loss currently experienced within the distribution system.

Thomas Public Works Authority, OK

Thomas Public Works Authority in Oklahoma was awarded \$75,000 in FY 18 for a project to purchase and install 12 Smart Meters at important city-owned locations. The new meters will allow TPWA to effectively monitor water loss and identify areas of concern.

City of Tishomingo, OK

The City of Tishomingo in Oklahoma was awarded \$75,000 in FY 18 for a project to purchase and install 27 Automatic Meter Reading (AMR) water meters and the associated software throughout the distribution system in order to address the significant water loss, promote water conservation and inform future water planning.

Water Marketing

This program provides assistance to states, tribes, and local governments to conduct planning activities to develop water marketing strategies that establish or expand water markets or water marketing activities between willing participants, in compliance with state and Federal laws. Reclamation has awarded over \$700,000 to projects in the Oklahoma-Texas Area Office jurisdiction million to three projects since the inception of this program.

In FY 19, McLennan County, TX was awarded \$75,000 to develop a water marketing strategy focused on conjunctive use of groundwater and surface water to stem groundwater depletions and stabilize water supplies in a five-city area. Implementation of the water marketing strategy was designed to meet the Groundwater Replenish Goal identified in the County's 2017 WaterSMART Drought Contingency and Water Supply Resiliency Plan.

In FY 19, City of Garden City was awarded \$139,900 to establish a Water Marketing Strategy where the plan was designed to identify potential users of the wastewater effluent and develop a rate structure for the purchase of this new supply.

In FY 18, the Chickasaw Nation was awarded \$149,288 to establish a water bank framework for the Arbuckle-Simpson Aquifer (AS) that will allow for voluntary, market-based transfers of groundwater pumping rights across the region. The Arbuckle-Simpson Aquifer covers approximately 500 square miles and is the principal source of water for more than 100,000 people, supplies water for mining and irrigation, and is the source for nearly 100 known springs that are culturally important. In response to Oklahoma's groundwater regulatory changes, this water marketing strategy will allow landowners in the ASA to deposit water rights, while allowing permitted groundwater users to withdraw those water rights.

Cooperative Watershed Management Program

This program contributes to the WaterSMART strategy by providing funds to watershed groups to encourage diverse stakeholders to form local solutions to address their water management needs. Reclamation is promoting the sustainable use of water resources and improving the ecological resilience of rivers and streams using collaborative conservation efforts. Funding is provided for: 1) Development of Watershed Groups (Phase I) and 2) Implementation of Watershed Management Projects (Phase II). eight CWMPs totaling more than \$764,000 have been awarded since 2016.

In FY 21, Lake of the Arbuckles Watershed Association Inc., (LAWA), OK was selected to receive almost \$136,00 to improve water quality and quantity through soil health improvements.

In FY 20, City of Norman, OK received an award of \$85,000 to collaboratively improve the water quality in the Lake Thunderbird Watershed.

In FY 20, Blue River Foundation, OK received an award of \$99,536 for watershed planning for the Blue River.

In FY 20, Rio Grande International Study Center, TX received an award of \$100,000 for watershed restoration planning for Laredo and upstream affected stakeholders.

In FY 20, Texas A&M Agrilife Extension Service received an award of \$100,000 for Arroyo Colorado/Llano Grande restoration planning.

In FY 19, Lake of the Arbuckles Watershed Association Inc. (LAWA), OK was awarded \$89,000 to implement the Lake of the Arbuckles Watershed Restoration Plan that was developed through in earlier CWMP award.

In FY 18, Grand River Dam Authority (GRDA) was awarded \$100,000 to develop a stakeholder group and restore the Lake O' the Cherokees Sub-Watershed.

Title XVI and Desalination WINN Act Programs

The Water Infrastructure Improvements for the Nation Act (WIIN), P.L. 114-322, was enacted in 2016 to address water resources infrastructure that is critical to the Nation's economic growth, health, and competitiveness. Two important components of the WIIN Act affect the Title XVI Program:

Section 4009(c) of Subtitle J of WIIN amends Reclamation's Title XVI Water Reclamation and Reuse Program (Title XVI), originally established by P.L. 102-575 in 1992. Prior to the enactment of WIIN, funding for water recycling project construction could only be provided for congressionally authorized Title XVI projects. The WIIN amendments now provide Reclamation with blanket authority to fund any new eligible "WIIN Title XVI Project"

Section 4009(a) of Subtitle J of WIIN includes amendments to the Water Desalination Act of 1996 and authorizes Reclamation to provide funding for "Desalination Projects", both ocean and brackish.

To date, approximately \$6.6 million has been awarded to 19 studies within the Oklahoma-Texas Area Office (OTAO) comprised of Feasibility Study and Construction and Research studies.

City of Norman, OK

The City of Norman was recently selected to receive a reward over \$700,000 in FY 19 for a field research project on inland indirect potable reuse (IPR). By expanding its existing water reclamation and reuse with an IPR project, the City of Norman will address reliability concerns at Lake Thunderbird, trim the usage/demand placed on its marginal groundwater supply, and potentially eliminate a need to purchase water from Oklahoma City.

Oklahoma Water Resources Board

The Oklahoma Water Resources Board was awarded a \$150,000 grant in FY 17 for a feasibility study of potential impacts of select alternative produced water management and reuse scenarios. This study responds to both of Oklahoma Governor Mary Fallin's recent mandates to the OWRB to search for ways to use produced water as a benefit to the state as part of the Water for 2060 Initiative and to find solutions that deep-well injection volumes and thereby reduce the threat of seismicity within the state.

City of Ada, OK

The City of Ada, Oklahoma was awarded a \$136,193 grant in FY 17 for a feasibility study within the "Assessment of the Potential for Recycled Water Development to Offset Potable Water Demands with Non-Potable Supply and Reducing Negative Water Quality Impacts in the Receiving Streams within Tribal Territory" Phase II Reuse Study. This study will provide the City with the means to continue down the path of a sustainable water supply future.

City of Bartlesville, OK

The City of Bartlesville, Oklahoma was awarded a \$150,000 grant in FY 17 for a feasibility study to augment Bartlesville water supply with drought-resilient reclaimed water. This feasibility study will determine the environmental, technical and cost viabilities of reclaiming wastewater effluent by relocating the existing Caney River effluent discharge approximately 5 to 7 miles upstream, which places the effluent

City of Garden City, KS

The City of Garden City, Kansas was awarded a \$65,369 grant in FY 17 for a feasibility study to gather information regarding the current state of the fragile water supply and long-term supply outlook with eminent reuse opportunities. The scope of the study will provide the City with information to develop or enhance several policies including enhancing the most cost-effective method to reuse the maximum quantity of water with the lowest cost impact and maximum benefit for long-term water availability.

North Alamo Water Supply Corp. (NAWSC), TX

North Alamo Water Supply Corporation in Texas was awarded a \$90,000 grant in FY 17 for a feasibility study of energy-effluent alternatives for brackish groundwater desalination. This study will build on work recently completed by Reclamation, the Lower Rio Grande Regional Water Planning Group (region M), the Texas Water Development Board and the Rio Grande Regional Water Authority.

Kansas Water Office

The Kansas Water Office (KWO) was awarded a \$199,175 grant in FY 17 for a research study to pilot test produced water near Hardtner, Kansas. The project will involve the treatment of produced oil field water to a quality standard acceptable for agricultural irrigation and the watering of livestock.

Drought Response Program

Reclamation's Drought Response Program aims to provide competitive grants for drought contingency planning, as well as mitigation actions that build long-term drought resiliency. This program focuses on leveraging Reclamation funds to avoid drought-related crises in the short term, while laying a foundation for climate resiliency in the long term. Since FY 15, over \$4.4 million in funding was provided to support 15 drought contingency plans and drought resiliency projects in Oklahoma and Texas.

Drought Resiliency

Projects awarded in FY 21:

Southwest Kansas Groundwater Management District No. 3 was selected to be awarded \$92,026 improve management in 12 counties by building a database to provide annual water management reports to every irrigator in the District. These reports will detail the water use, remaining saturated thickness of the aquifer, an evaluation of the effect a reduction in use would have on the aquifer, a monthly overview of the year's drought monitor during irrigation season, and an economic overview comparing water supply costs with nearby users with similar project conditions.

Projects awarded in FY 19:

City of Celina, TX was awarded \$750,000 in FY 19 to build a six-million gallon ground storage tank at the Celina Pump Station. This tank will more than double the City's capacity to retain water for drought and emergency water storages.

Texas Water Development Board was awarded for approximately \$360,631 in FY 19 for development of a multi-prolonged approach to enhance surface water evaporation monitoring in Texas using start-of-the-art technology for measuring actual evaporation, installing a float pan evaporation station, upgrading Class A pan evaporation stations managed by TWDB, installing new Class A pans and deriving computed evaporation for all upgraded and new sites, identifying currently unmonitored regions and estimating computed evaporation.

Projects awarded in FY 18:

Mountain Park Master Conservancy District was awarded \$300,000 in FY 18 to build a well field and tie in directly to existing infrastructure to pipe directly to a water treatment

plant. This project will increase the amount of water available to District customers during all-to-frequent episodes in southwest Oklahoma. This supplemental and redundant supply, acquired through proposed development of alluvial groundwater immediately below Mountain Park dam, will be relied upon during drought, thus slowing inevitable lake level declines and augmenting yield.

Projects awarded in FY 16:

Altus City Reservoir East Basin Improvements for Drought Preparedness

The City of Altus in Oklahoma was awarded \$300,000 in FY 17 to redirect available raw water from Tom Steed Reservoir, a Reclamation project and the City's principal source of supply, to Altus City Reservoir, a largely unused municipal supply originally constructed in 1940. This two-year project also includes the installation of sluice gates and weirs and renovation of the original pump station, built almost 80 years ago but currently unused.

Little Elm Improvements for Drought Preparedness

The Town of Little Elm, Texas was awarded \$200,000 in FY 16 to construct a 100,000-gallon water reuse storage tank adjacent to their wastewater treatment plant. This two-year project will provide a consistent supply of treated wastewater available for irrigation and other uses during times of drought, saving the imported potable water supply for culinary purposes. This project is also supported by the city's drought plan, which specifically identifies the expanded reuse of treated effluent as a drought mitigation action.

Research and Development Program

Reclamation's R&D Program provides technical and financial assistance to internal and external research projects that help Reclamation accomplish its mission of developing water supplies in a sustainable manner.

Science and Technology Program

Internal research is funded under Reclamation's Science and Technology (S&T) Program. Through S&T, Reclamation can investigate new and innovative solutions on important issues where there may be a unique or unknown risk and for which capital investment may not occur otherwise. Recent research priorities have focused on addressing challenges associated with climate change, invasive zebra/quagga mussels, and advanced water treatment. Over the last seven years, the R&D program has awarded \$50 million to more than 800 research projects. To date, about nearly \$1 million has been awarded to research activities in Texas and Oklahoma. Active projects are listed below:

Cost Modeling of Membrane Desalination Process (Foss Reservoir)

This project will focus on improving Reclamation's Water Treatment Estimation Routine (WaTER) so that it can be used to better understand the costs associated with implementing water treatment technologies and to be able to quantify the cost/benefit of R&D advancements in the field of water treatment. Partnering with Texas A&M and the OTA0 on a recent DWPR project that evaluated the fouling control and water quality improvements of an electrocoagulation (EC) and microfiltration (MF) process compared to MF alone as pre-treatment to Nanofiltration (NF) on brackish surface will further enhance this project.

Investigating Biochar as a Water Treatment Filtration Media for Adsorption and Biological Reduction of Dissolved Metals and Fluoride

As climate change and drought continue to negatively impact freshwater availability and quality in the western US, impaired water sources are becoming more attractive to supplement existing freshwater supplies. However, these water sources can be expensive to treat, highlighting the need for more economical forms of treatment. Biochar is gaining attention as a less expensive and more sustainable alternative to granular activated carbon (GAC) for use as an adsorbent and biological filtration (biofilter) media. This project will focus on three case studies in the Mid-Pacific and Great Plains Regions and the use of biochar for the treatment of waters within these Regions contaminated by selenium, metals, and fluoride. Partners include Reclamation Regional Offices. Please use the following link for additional information:

<https://www.usbr.gov/research/projects/detail.cfm?id=1785>

Research Opportunities to Treat Impaired Water Sources Associated with Reclamation Projects: A Case Study in the Great Plains Region

By using a survey-based approach to gather information on water quantity and quality challenges associated with Reclamation projects, can we better inform future investments under programs such as the Title XVI and Research & Development that address core, mission-related needs involving treatment of impaired water sources? This activity has been identified as a high-priority need by the Regional Director for the Great Plains Region. Please use the following link for additional information:

<https://www.usbr.gov/research/projects/detail.cfm?id=1715>

Beneficial Reuse and Waste Minimization of Hexavalent Chrome Ion Exchange Brine

Hexavalent chromium occurrence in potable water sources is of concern to water utilities due to undetermined human carcinogenicity and toxicological effect. EPA is currently reviewing health assessments to determine if new federal standards need to be set for chromium. Minimizing the brine waste generated by ion exchange processes for beneficial purposes through membrane filtration with and without additional chemical addition allows for simpler regeneration processes and decreased operator expertise requirements. The research question to be answered is: Can a system that is simple to operate and inherently contains multiple barriers to chrome release be used to address chromium contamination in potable water sources? Please use the following link for additional information: <https://www.usbr.gov/research/projects/detail.cfm?id=9085>

Refining Interpretation Techniques for Determining Brackish Aquifer Water Quality

This project will define specific research areas required to support geophysical log interpretation for water quality in brackish aquifers. The project will build on the state of practice and methods outlined in the previous scoping level effort by delineating the confounding factors identified by that work and presenting research topics to resolve those factors. This work will be a collaborative effort supported and enhanced by key stakeholders identified in the scoping level effort, including the USGS, Texas Water Development Board, Brackish Water Work Group, and other state and federal agencies. The report produced by this project is intended to supplement the Reclamation S&T Advanced Water Treatment Roadmap and to aid stakeholders in securing funding for and directing future research efforts. Please use the following link for additional information:

<https://www.usbr.gov/research/projects/detail.cfm?id=2924>

Development of Methodologies to Evaluate the Environmental, Financial and Social Benefits of Water Reuse Projects

The TWDB's Texas Water Reuse Research Agenda (2011) identified "triple bottom line" analyses as a top priority research area for Texas. Both water providers and rate payers alike often question whether reuse is worth the financial investment relative to other strategies. In fact, many water reuse projects in Texas have been halted due to a lack of funding or inability to justify the required capital expenditures. Reclamation is coordinating with TWDB and other state and local water suppliers to evaluate the state-of-the-science of TBL analyses, and to develop a clear, well-defined economic and financial evaluation approach that can be used by entities to evaluate the merits of water

reuse projects. Please use the following link for additional information:
<http://www.usbr.gov/research/projects/detail.cfm?id=4180>.

Concentrate Management Toolbox and Selected Case Studies

Concentrate management is an important component driving the cost and feasibility of desalination. The understanding necessary to optimize inland desalination facilities and associated concentrate management solutions is still being improved through detailed assessments, especially as technology advances and provides more flexibility in treatment. A wide variety of concentrate management methodologies exist, and many water purveyors are overwhelmed when considering which technology is the best for their situation. This Concentrate Management Toolbox will inventory existing technologies and identify practical and economical strategies to optimize concentrate management based on various feed water quality parameters, so water planners can more rapidly assess concentrate management options. Reclamation is partnering with the North Texas Municipal Water District in Texas and the Eastern Municipal Water District in California to then apply the Toolbox to a set of site-specific saline source waters and recommend an optimal array of concentrate management technologies. Please use the following link for additional information:
<http://www.usbr.gov/research/projects/detail.cfm?id=5239>.

Desalination and Water Purification Research Program

External research is funded under Reclamation's Desalination and Water Purification Research (DWPR) Program. DWPR was established to facilitate partnerships with academia, private industry, and local communities to develop more cost-effective, technologically efficient means by which to desalinate water. Just over the past six fiscal cycles (FY 19-21), 13 new research projects totaling \$1,833,625 dollars were funded within the Oklahoma-Texas Area Office jurisdiction.

Multi-Effect Nanophotonic Enabled Direct Solar Membrane Distillation to provide Distillation to High-Efficiency Lost-Cost Desalination – FY 21

John Allen Floyd, SolMem LLC proposes a direct, concentrated sunlight driven multi-effect membrane distillation process for desalination of high salinity water. The research consists of developing a 3-D mathematical model to describe the complex, coupled heat and mass transfer in the membrane process which will be used to determine the impact of feed water quality on performance. An evaluation and optimization process will be conducted as well as a technoeconomic analysis to determine commercial feasibility.

Contorted Polyamide Membranes for High Performance Desalination – FY 21

The proposed research aims to overcome the permeability-selectivity tradeoff that limits the performance of conventional polymeric desalination membranes by developing contorted polyamide membranes with improved permselectivity. Successful completion of the project is expected to achieve control over free volume and enhanced permselectivity in polyamide desalination membranes by incorporating contorted monomers in a scalable fabrication process.

Stimuli Responsive Block Copolymer Brush Grafted Carbon Nanotube Coating for Active Mineral Scaling Control – FY 21

The team proposes to develop membrane coatings consisting of stimuli-responsive block copolymer brush (SRBCB)-nanomaterial complexes for active control of mineral scaling in membrane desalination systems using a periodic electrical signal. The proposed project will design and synthesize SRBCBs, evaluate the impact, and develop and optimize techniques to apply coatings of SRBCBs-nanomaterial complexes onto reverse osmosis and membrane distillation membranes.

Treatment of High Salinity Produced Water to Reduce Freshwater Utilization for Oil and Gas Operations Using a Novel Thermo Desalination – FY 20

Texas A&M Engineering Experiment Station has a goal develop and optimize low cost, efficient, scalable, and easily implementable processes to reuse some of the 300 million gallons of produced water generated daily in the Permian Basin. This project will look at combining aluminum chemical and electrocoagulation with polymers to induce extremely high rate sedimentation of suspended solids to produce clean brine for reuse in hydraulic fracturing and desalinate clean brine via novel humidification-dehumidification process. This project will bring in partners from industry and international academic institutions.

Building a Multi-Level , Multi-State Modeling Framework for the Analysis and Design of Seawater Desalination Using Renewable Energy – FY 20

Texas A&M University-Kingsville expected outcomes of this research will include an expanded knowledge base of a technological field and an emerging industry as well as a modeling tool to improve the understanding and design of seawater desalination using renewable energy systems which may contribute to accelerated adoptions of technology. The seawater desalination plant currently under permitting phase in the City of Corpus Christi, TX will be used as a location to test the model.

Study of Enhanced Water Recovery by a Combination of Photobiological Process and Secondary RO Lifecycle Cost Analysis and Mini-Pilot Study – FY 20

Texas State University will test a new photobiological treatment method for RO concentrate has been developed to enable more water recovery using the secondary RO. This project proposes to demonstrate the continuous, long-term operation of diatom-based photobiological treatment of OR concentrate at full-scale and investigate the secondary RO desalination of photobiologically treated RO concentrate to determine proper pre-treatment requirements. The project will also include a lifecycle cost analysis to evaluate the economic feasibility of the proposed enhanced water recovery scheme.

Forensic investigation of reverse osmosis membranes in potable reuse applications: fouling characterization and implications for cost and performance – FY 19

Texas A&M Engineering Experiment Station will focus on characterizing the surfaces of virgin, fouled, and cleaned membranes by state-of-the-art microscopy and spectroscopy techniques to determine major foulants and its mechanisms. The information obtained can be used to quantify fouling impacts on life-cycle costs filling an important knowledge gap for long-term planning in wastewater treatment.

Solar Thermal Distillation Technology Development for Desalination and Produced Water Treatment Applications – FY 19

Oklahoma State University's primary objective of this research is to develop a cost-effective high-energy solar thermal distillation technology for desalination and produced water treatment applications. This novel solar energy powered thermal distillation system is intended to reduce energy consumption, potentially lower the cost of desalination, as well as reduce the environmental impacts by reducing the volume of produced disposal.

Expanding Water Resources Through Efficient Waste Management in Arsenic Treatment Processes – FY 19

University of Colorado's objective of this project that will involve field activities with City of Norman, Oklahoma is to improve the economics of treating arsenic-impaired water using ion exchange by reducing the operating costs associated with on-site treatment of spent brine and reusing recovered regenerant salt without adversely impacting treatment performance. The work will focus on developing a novel treatment process to reduce the operating costs and waste produced from arsenic ion exchange processes, which currently present an economic barrier to utilizing arsenic-impaired water sources.

Summary of Programs and Funding Opportunities

All Reclamation program Funding Opportunity Announcements (FOAs) for Grants or Cooperative Agreements to utilize Reclamation funding are posted on the Grants.gov website: <http://www.grants.gov/>

The following is a list of specific weblinks for each of the Reclamation programs mentioned above:

Native American Affairs Program: <http://www.usbr.gov/native/>

Water Conservation Field Services Program: <http://www.usbr.gov/waterconservation/>

WaterSMART Program:

Drought Response Program: <http://www.usbr.gov/drought/>

Water and Energy Efficiency Grants: <http://www.usbr.gov/watersmart/weeg/>

Small-Scale Water Efficiency Grants:

<https://www.usbr.gov/watersmart/swep/index.html>

Cooperative Watershed Management Program:

<https://www.usbr.gov/watersmart/cwmp/index.html>

Water Marketing Strategy Grants:

<https://www.usbr.gov/watersmart/watermarketing/index.html>

Title XVI: <http://www.usbr.gov/watersmart/title/index.html>

Basin Studies: <http://www.usbr.gov/watersmart/bsp/>

Applied Science Grants:

<https://www.usbr.gov/watersmart/appliedscience/index.html>

Research and Development:

Science and Technology Program: <https://www.usbr.gov/research/st/index.html>

Desalination and Water Purification Research Program:

<https://www.usbr.gov/research/dwpr/>

Water Prize Challenges: <http://www.usbr.gov/research/challenges/>

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Red River Focus Area Study

Update for the Red River Compact Commission Annual Meeting on April 26, 2021

The Red River Focus Area Study is nearing completion. Here's a brief summary of the status of its various study components and final products:

- A data release summarizing water use in 2010 and 2015 at the HUC-8 scale for the Red River basin is published:
Sargent, B.P., Houston, N.A., Heal, E.N., 2020, Estimated Use of Water by Subbasin (HUC8) in the Red River Basin, 2010 and 2015: U.S. Geological Survey data release, <https://doi.org/10.5066/P9SQ1Y3T>.
- A USGS Scientific Investigations Report for the precipitation-runoff modeling system, or PRMS, is in its final approval phase. Links to the report, data release with model inputs and outputs, and model archive will be added to the focus area study's website.
- A journal article about ecological flows in the central portion of the basin is in revision following review by the journal. A second journal article about ecological flows in the lower portion of the basin is in preparation for journal submission. A data release summarizing fish survey data for the basin is being revised for publication on ScienceBase. Links to all products will be placed on the study's website.
- A new website for the focus area study, using a story board format and incorporating data visualizations, will be released after the publication of all products: https://webapps.usgs.gov/watercensus/redriver_fas/

Please email Jennifer Wilson at jenwilso@usgs.gov with questions.

Background

The USGS is completing a 4-year study of water use, availability, and change in the Red River basin in one of several national "Focus Area Studies" in the Department of Interior's WaterSMART initiative. Focus Area Studies are stakeholder-driven assessments of water availability in river basins with known or potential conflict.

The Red River Focus Area Study (FAS) compiled existing information and added new scientific data and interpretation to facilitate better management of water resources for use by humans and maintenance of water quality and ecological flows in the basin. The study was organized around three important components [water use, rainfall-runoff model, and ecological flows] that are intended to improve the quality and accessibility of information on water availability for humans and ecosystems in the Red River basin, and to advance technical water assessment capabilities.





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Conservation Investments in the Red River Basin FY 2020 Activity Report

June 2021

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Overview

- Farm Bill Programs at work in the Red River watershed
- Initiatives
- Watershed Rehabilitation
- Watershed Operations



Farm Bill Programs at work in the Red River watershed



Farm Bill Funding

- > \$86 million invested
- > 900,000 acres treated
- > 4 million acres planned for treatment



Environmental Quality Incentives Program (EQIP)



**1,788 contracts
on
521,098 acres
for
\$47.7 million**



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Conservation Stewardship Program (CSP)



**1,003 contracts
on
393,130 acres
for
\$35.7 million**

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CSP Grassland Conservation Initiative (GCI)



**277 contracts
on
37,607 acres
for
\$3 million**



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Regional Conservation Partnership Program RCPP



Active RCPP Projects



Bayou Pierre Watershed Project - RCPP

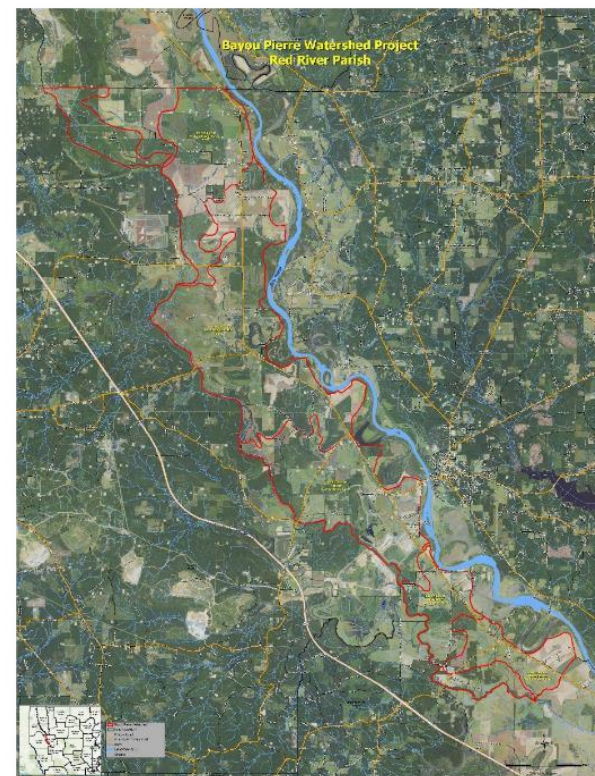
- Partner - Red River SWCD
- > 2,500 acres treated to date
- > \$240,000.00 invested

Grassland Reserve Incentive Program

- Partner - Oaks and Prairie Joint Venture
- > 2300 acres treated
- >\$41,000.00 invested

Limited Applied Irrigation Assistance Program

- Partner – High Plains Underground Water Conservation District
- > 11,000 acres treated
- >\$243,000.00 invested



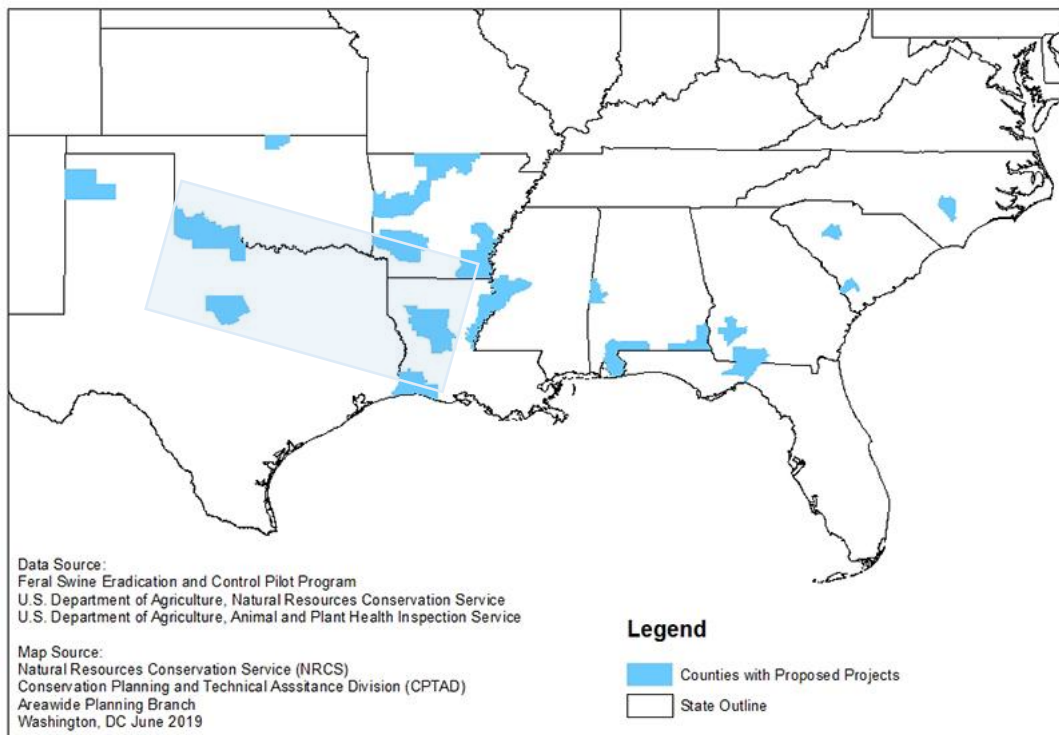
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NRCS Initiatives in the Red River watershed



Feral Swine Eradication and Control Pilot Program

Counties with FY2020 Proposed Pilot Projects for the Feral Swine Eradication and Control Pilot Program



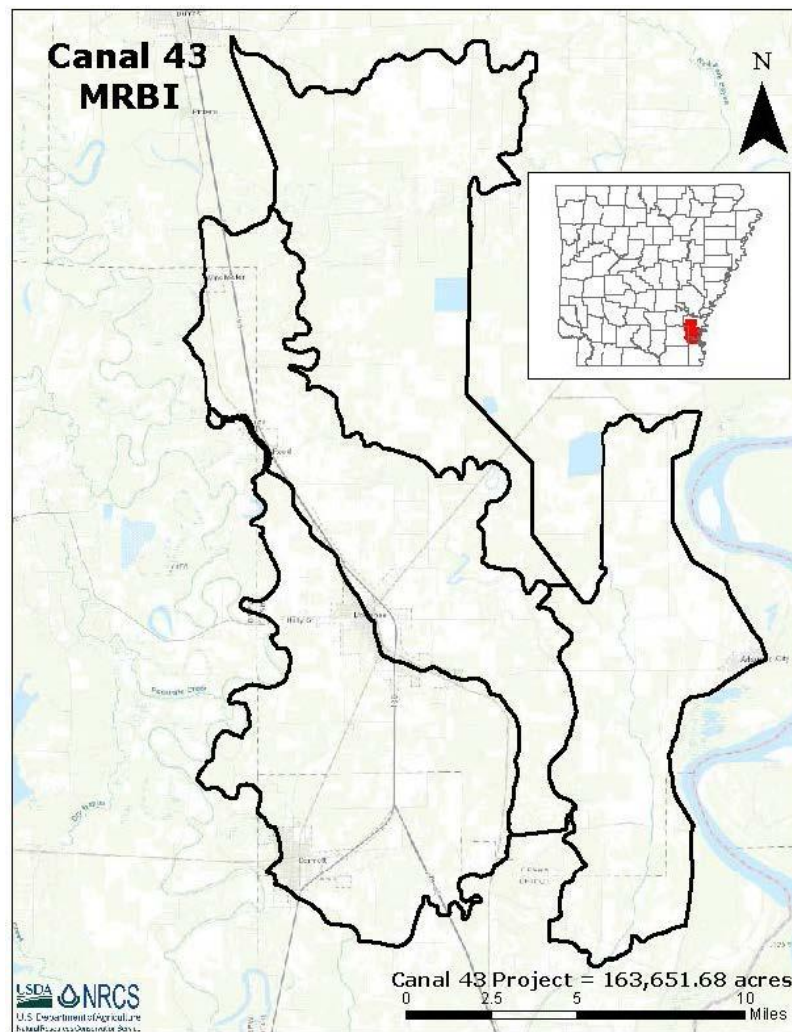
- Established in the 2018 Farm Bill
- Pilot began in FY 2020
- Partnership with APHIS
- 4 pilot areas in the Red River Basin – one in each state



Mississippi River Basin Healthy Watersheds Initiative (MRBI)- Arkansas

- Focuses on addressing
 - Water Quality
 - Sediment
 - Excessive Nutrients

- Anticipated financial Investment
 - \$6 million





United States Department of Agriculture



NRCS Watershed Operations in the Red River watershed

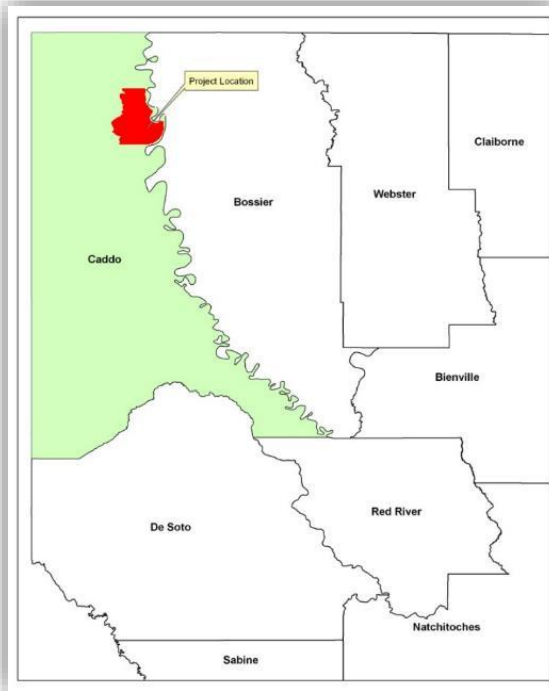


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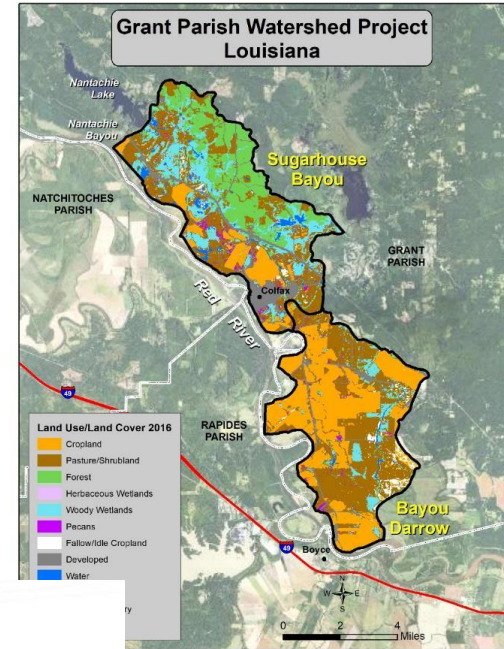
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Ongoing Projects



LA - Red Bayou Project



OK - Caney Coon Creek



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Questions?

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RED RIVER VALLEY ASSOCIATION

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April 27, 2021

To: Red River Compact Commissioners
FM: Richard Brontoli, Executive Director, (318) 393-6207, rrva@rrva.org

RE: Red River Major Projects & Initiatives

1. **Appropriations:** At the end of this update is the FY 2021 final appropriations. The President's FY 22 "Skinny" Budget has been released. It is encouraging that there is \$6.8 Billion and the language appears to be supportive for supporting commercial navigation. The detailed budget, by project, is supposed to be released 22 April.
2. **Navigation FY 2022 O&M:** O&M Funding: The basic annual need is \$13,000,000, which includes \$4,500,000 basic need for maintenance dredging.
3. **J. Bennett Johnston Waterway 12' Navigation Channel:** A request for a 12' channel study for the J. Bennett Johnston Waterway was submitted and was included in the Corps Annual Report, March 2017. We were successful to get the study authorized in the 2018 WRDA Bill signed into law by the President. The next step is to get a feasibility study funded in an appropriation bill. The Red River Waterway Commission, local sponsor, has their 50% cost share and if the Administration does not provide the federal share, they will consider conducting the study by the Section 203 process.
4. **WRDA 2020:** There were two Red River items in this WRDA bill.
 - a) A new levee in the Caddo Levee District, Cherokee Park Levee, has been incorporated into the authorized Red River Below Denison Dam, AR, LA, OK & TX.
 - b) The authorization for a feasibility study on the Sulphur River in TX and Arm below Wright Patman Reservoir.
5. **Degraded Dikes and Revetments:** The major floods of 2015, 2016 and 2018, as well as time, have degraded dikes and revetments. Many have degraded to a point of losing their effectiveness in maintaining a 9' channel, thus requiring additional dredge funds each year. Some are identified as critical and if not repaired, could result in losing the navigation channel in another major flood. Most repairs can be accomplished with O&M funds. We request an additional annual \$5,000,000 in O&M funds for "Channel Improvement" projects.
6. **IMTS Reduced Lock Service Mandate:** After an analysis of the Covid-19 impacts and increased traffic, the Vicksburg staff and Col Hilliard decided to allow our locks to remain operating 24/7/365 for CY 2021. We know there will be a re-evaluation each year and we must show increased activity. In addition to lock closures the waterway was under tow horsepower restrictions and only daylight operations most of the year.
7. **Flood Technical Committee:** A Flood Technical Committee was formed with representation from Caddo & Bossier Parishes, Bossier City, City of Shreveport, Caddo & Bossier Levee Districts, Caddo-Bossier Port, Red River Watershed Management Institute, Red River Waterway Commission and Red River Valley Association (Chair). Meetings have been held with the Vicksburg District, FEMA & NWS to discuss issues to assist the community leadership and emergency management responders to prepare for the next potential flood event. The Vicksburg District will create a Sedimentation Survey and Hydraulic Model. The Corps has collected the required

data and is now analyzing it. The Corps and FEMA provided an interim report to the Flood Technical Committee in August 2019. Everyone was pleased with the model and progress. The final report and findings have been briefed to the Committee. **FEMA has the action to update flood maps, before the levee districts can make necessary adjustments to meet levee certification requirements, mainly a 3' freeboard above the 1% flood levels.**

8. Navigation into SW Arkansas Feasibility Study: The Arkansas Red River Commission (ARRC) is the local sponsor for the authorized federal feasibility study, SW Arkansas Navigation Study. To date they have spent \$5 million, in their cost share, with the Corps of Engineers spending \$4 million on investigating navigation from Shreveport, LA to Texarkana, AR.

The latest effort has resulted in a BCR of 1.8 for three lock & dams to Garland, AR and 1.2 for three lock & dams to Fulton, AR, where I-30 crosses the Red River. The Corps of Engineers has officially agreed to resume the feasibility study to conclusion. The estimate to complete the study is \$3 million and 3 years.

Even with Congress's new Earmark policy we do not believe the Administration would fund this new study, so Arkansas will conduct a Section 203 study. They will be able to select a contractor with Section 203 experience and have total control of the study. Funds will be provided to the Corps for technical assistance to ensure all federal regulations and study procedures are met. Upon completion we will have a federal project signed by the ASA (CW).

9. Levee Meetings: We continue to work with the Arkansas levee districts and Bowie County Levee District to get rehabilitation funding through the authorized project; Red River Below Denison Dam. Joint Levee & drainage meetings will be held in Arkansas & Louisiana, with the Corps, during 2021.

10. Chloride Control Project: The Administration will not fund this project. Construction on the Wichita River will not resume until the earmark ban is changed. GEM has had several meetings with the Corps Tulsa District and Red River Authority of Texas to move their solar pond project forward. **GEM indicated they have a funding source and could begin constructing their prototype this year.**

11. Texarkana to Denison Dam Navigation: North Central Texas Council of Governments is willing to put up \$500,000 to conduct a study to determine if navigation is possible from an engineering perspective. They first want the Texas legislators to pass a bill that commits \$2.5 m for a complete feasibility study and EIS, if the engineering and discovered study is positive. The Texas legislators passed a bill supporting a feasibility study, but did not provide funding. The North Central COG has agreed to provide the funding for an engineering analysis. A meeting was held at the COG on 6 November with the RRVA and Red River Authority of Texas (RRAT) to discuss how the funds will be distributed and the process to select an engineering firm to conduct the analysis. The RRVA & RRAT met with the Tulsa District and discovered that a 1989 study was conducted and indicated it would take 11 L&Ds from Texarkana to Denison Dam. The NCTCOG funds will be used for the local sponsor cost share. RRAT has submitted a Planning Assistance to States (PAS) request to further investigate the economics of navigation on this stretch. **The Corps has approved the funding for this study, a scope of work agreed to and a cooperative agreement with the RRAT has been signed. The study will commence this summer.**

12. Red River Studies:

a. **Corps of Engineers, Wright Patman/Sulphur River:** There is an active study to consider re-evaluate the water use in Wright Patman Reservoir. The study will evaluate reducing flood control storage and reallocate it for municipal use. The top of flood pool is 259.5', which currently provides 30.86' of flood storage. The study proposes three new conservation pool elevations and reduced flood pool capacity for consideration; 232.5' (3.86' into flood pool), 235.0' (6.36' into flood pool) and 242.5' (13.86' into flood pool). It appears that raising the lake elevation to 232.5' or 235.0' msl would not create more downstream flooding and have no impact on navigation.

The Corps recommended the 235.0' elevation. The issue now is that the dam does not meet safety standards at that level, so modifications to the dam will have to be made.

b. Bureau of Reclamation, Upper Red River Basin Study, OK: A grant for a 3 year study of water use in the upper reaches of the Red River in the Lugert-Altus region (FY 2014 – FY 2017). This study is cost shared with the Oklahoma Water Resources Board, Lugert-Altus Irrigation District, Mountain Park MCD; \$640,000 (Federal) + \$860,000 (non-Federal) = \$1,500,000

c. Bureau of Reclamation, Upper Washita Basin Study, OK: The study is cost shared with Oklahoma Water Resources Board, Foss Reservoir MCD & Fort Cobb Reservoir MCD; \$250,000 (Federal) + \$450,000 (non-Federal) = \$900,000.

d. USGS, Red River Basin Study: USGS also has a BOR WaterSMART grant to study the quantity of water available in the Red River, four state watershed. This will be a 5 year study effort, expected to be completed in 2022.

e. Choctaw & Chickasaw Indian Nations are conducting a water study for the Red River watershed in OK.

f. Bureau of Land Management Red River land issue. The BLM is in the process of updating its Resource Management Plan (RMP) for lands managed by the BLM, which includes a 116 mile stretch, an estimated 90,000 acres (since cut to 30,000) that may be considered public domain along the Red River on the border between Texas and Oklahoma in Wilbarger, Wichita, and Clay counties. - See more at: <http://thornberry.house.gov/redriver/#sthash.3y4XXQ78.dpuf>.

13. **Congressionally-Directed Spending (Earmarks)**: Congress shares in the blame for the dire situation of our waterways. With the no 'earmark' policy our delegation is unable to provide additional funding for specific projects. I emphasize this because the Administration, which includes the Corps of Engineers, can provide adequate O&M funding if they choose to. Congress has set the level of O&M funding for the Corps of Engineers, but it is the Administration's decision as to which projects get funded and at what level. The budget process and metrics used were developed by the Administration, not Congress.

For many projects there is a local sponsor with cost sharing responsibility. Those who have contributed, in most cases, millions of dollars to the process, must have the ability to have a voice for their projects to get funded. That voice is through their Congressional delegation. We do not believe that civil works projects are earmarks and projects that have been vetted through an authorization process should be redefined. It is the responsibility of Congress to appropriate funding. Congress should determine what projects get funded and at what level, but they have chosen not to. We constantly remind our delegation that the appropriation process and setting of priorities is their responsibility.

The main issue for industry is reliability of the Waterway. Costs, associated with delays and reduced drafts, will be passed on to industries making them consider alternate modes of transportation. New industries will reconsider locating on our Waterway if reliable navigation and transportation costs are uncertain. Ultimately the costs will be passed on to consumers having a negative impact nationwide.

**RED RIVER VALLEY ASSOCIATION
FY 2022 APPROPRIATIONS (\$000)
CIVIL WORKS**

<u>I. Studies (GI)</u>	FY 21 Enacted	RRVA FY 22 Request	Pres FY 22 Budget	Local Sponsor Requirements
1. Navigation into SW Arkansas: Feasibility Pursuing a Section 203 Study	-0-	-0-	-0-	ARRC - \$1 m Contributed Funds
2. Red River Waterway, LA – 12’ Channel, Recon Approved in WRDA 2018	-0-	500	-0-	(RRWC)
3. Bossier Parish, LA	-0-			(Bossier Levee)
4. SE Oklahoma Water Resource Study: Feasibility	-0-			(OWRB)
5. Washita River Basin, OK	-0-			(OWRB)
6. SW Arkansas Ecosystem Restoration: Recon Study	-0-			(ANRC / AR Game & Fish)
7. Cypress Valley Watershed, TX	-0-			(NETWD)
8. Sulphur River Basin, TX	-0-	-0-	-0-	(AR Game & Fish)
9. Wichita River Basin above Lake Kemp, TX: Recon	-0-			(L)
10. Red River Above Denison Dam, TX & OK: Recon	-0-			(L)
11. Red River Waterway, Index, AR to Denison Dam	-0-			(?)
12. Mountain Fork River Watershed, OK & AR, Recon	-0-			(?)
13. Walnut Bayou, Little River, AR	-0-			(ANRC)
14. Little River County/Ogden Levee, AR, Recon	-0-			(ANRC)
15. Red River Waterway, Index to Denison, Bendway	-0-			(?)
<u>II. Construction General (CG)</u>				
1. Red River Waterway: J. B. Johnston Waterway, LA	-0-	5,750	-0-	(RRWC)
2. Chloride Control Project, TX & OK Texas - 7,500 / Oklahoma - 800	-0-	7,750	-0-	N/A
3. Red River Below Denison Dam; AR & LA a. Bowie County Levee, TX	-0-	6,300	-0-	(Levee Districts)
4. Red River Emergency Bank Protection	-0-	19,600	-0-	(Levee Districts)
6. McKinney Bayou, AR, PED	-0-	50	-0-	(?)

NOTES: Local Sponsor Column – Sponsor indicated in (); (?) indicates No Sponsor identified and need one to continue (L) indicates Sponsor not required now but need one for feasibility; N/A – No Sponsor required.

NOTE: Crossed through studies and projects are not currently active, due to lack of a local sponsor and funding.

NOTE: Additional funds received from the FY18 Omnibus Bill ‘additional funds’ indicated by +XXXX.

Total CG Additional FY 2021 Funds: \$0

Civil Works Budget – Nation Wide

President’s FY21 Budget: \$5.966 Billion

Congress FY 21 Enacted Appropriations: \$7.795 Billion

President’s FY22 Budget: The President’s “Skinny” budget: \$6.8 B

RED RIVER VALLEY ASSOCIATION

CIVIL WORKS PROJECTS

OPERATIONS AND MAINTENANCE (O&M)

FY2022 (\$000)

Project	Enacted FY21	RRVA Request	President FY22
DeQueen Lake, AR	2,925	3,000	
Dierks Lake, AR	2,540	3,000	
Gillham Lake, AR	1,598	2,160	
Millwood Lake, AR	3,405	3,630	
Bayou Bodcau Reservoir, LA	742	1,000	
Bayou Pierre, LA	33	53	
Caddo Lake, LA	286	300	
Wallace Lake, LA	207	383	
J. Bennett Johnston Waterway, LA	11,110	13,000	
Broken Bow Lake, OK	2,674	2,788	
Hugo Lake, OK	2,180	3,352	
Pine Creek Lake, OK	1,497	1,500	
Sardis Lake, OK	1,459	1,500	
Waurika Lake, OK	1,635	2,411	
Chloride Control, Area VIII, TX	0	2,000	
Denison Dam & Lake Texoma, TX	8,483	11,000	
Estelline Springs, TX	39	40	
Lake Kemp, TX	350	400	
Pat Mayse Lake, TX	1,251	1,352	
Jim Chapman Lake, TX	1,907	2,000	
Lake of the Pines, TX	5,607	6,000	
Wright Patman Dam & Lake, TX	4,223	4,971	

NOTE: Additional funds received from the FY20 Omnibus Bill 'additional funds' indicated by +XXXX.
 Total O&M Additional FY 2021 Funds: \$0

Bureau of Reclamation (\$000)

Project Lake	FY 22 Enacted	President FY 22 Budget	Congress Conference
Arbuckle Project	249		
McGee Creek Project	876		
Mountain Park Project	683		
W.C. Austin Project	551		
Washita Basin Project (Foss & Cobb)	1,123		