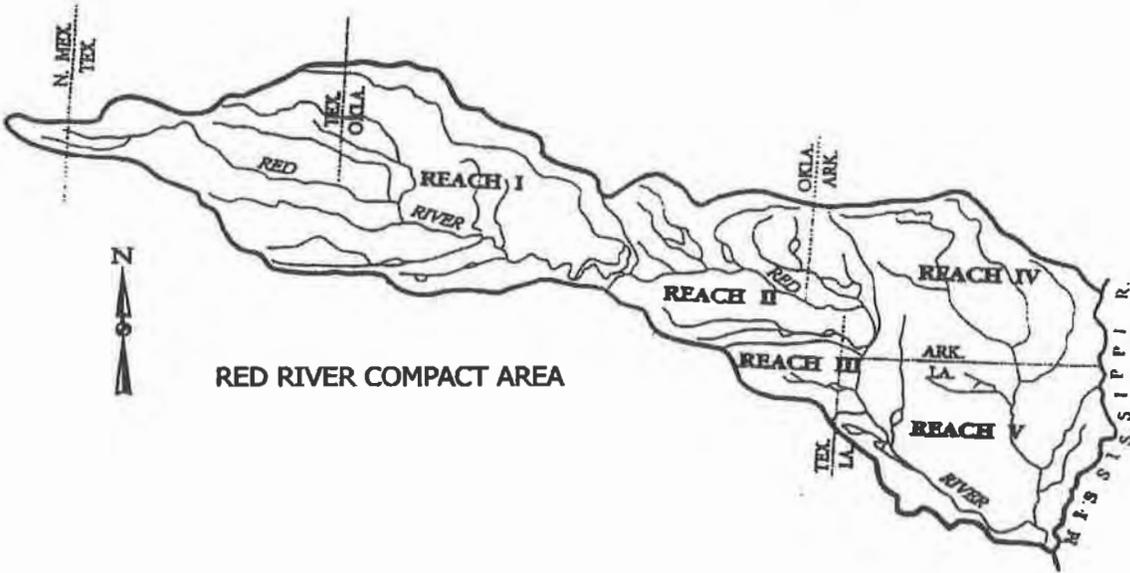


**REPORT  
OF THE  
RED RIVER  
COMPACT COMMISSION  
2018**



Published  
August, 2019



**REPORT  
OF THE  
RED RIVER  
COMPACT COMMISSION  
2018**

**Arkansas**

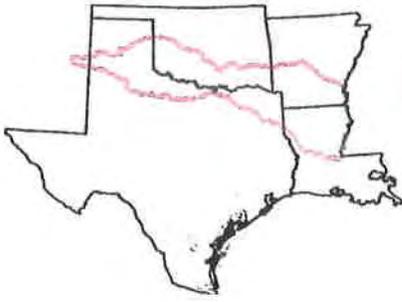
**Oklahoma**

**Louisiana**

**Texas**

Published  
August, 2019





# RED RIVER COMPACT COMMISSION

April 30, 2019

The President  
United States of America

The Honorable Asa Hutchinson, Governor  
State of Arkansas

The Honorable Kevin Stitt, Governor  
State of Oklahoma

The Honorable John Bel Edwards, Governor  
State of Louisiana

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 thirty-eighth 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 2017 and a budget covering the anticipated expenses of the Commission for Fiscal Year 2018-2019.

The State of Arkansas hosted the thirty-eighth annual meeting on April 24, 2018 in Hot Springs, Arkansas.

Pursuant to the previous agreements to rotate the office of Vice-Chairman and Secretary in connection with the rotation of the annual meeting host state, the State of Oklahoma accepted the responsibility for both offices for FY 2019. The Office of Treasurer remained with the State of Arkansas.

Sincerely,

A handwritten signature in cursive script that reads "Sue Lowry".

Sue Lowry  
Chairman/Federal Commissioner



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**MINUTES  
RED RIVER COMPACT COMMISSION  
38<sup>th</sup> ANNUAL MEETING  
HOT SPRINGS HOTEL  
HOT SPRINGS, ARKANSAS  
APRIL 24, 2018  
8:30 a.m.**

**I. CALL TO ORDER and WELCOME**

The Thirty-eighth Annual Meeting of the Red River Compact Commission was called to order at 8:35 a.m., April 24, 2018 at Hotel Hot Springs, Hot Springs, Arkansas. Federal Commissioner and Chairman Sue Lowry recognized a quorum and welcomed everyone to the meeting. She thanked Arkansas for hosting, and then requested each person in attendance make a self-introduction.

**The Red River Compact Commissioners attending:**

Sue Lowry, Federal Chairman, Wyoming

Bruce Holland, Arkansas

John F. Gibson, Arkansas

Julie Cunningham, Oklahoma

Suzy Valentine, Texas (Proxy for Stephanie Bergeron Perdue, Interim Executive Director)

Clyde Siebman, Texas

Patrick J. Landry, Louisiana

John Michael Moore, Louisiana

**Absent:** Charles Dobbs, Oklahoma

**Guests:**

Mike Abate, USACE - Tulsa District, Oklahoma

Bill Baldwin, USGS - Water Science Center, Arkansas

Todd Baumann, USGS – Lower Mississippi-Gulf Water Science Center, Louisiana

Ken Brazil, Ryan Benefield, Crystal Phelps, Edward Swaim, and Laura Brown

Arkansas Natural Resources Commission (ANRC)

Rich Brontoli, Red River Valley Association, Louisiana

Rheannon Hart, USGS - Water Science Center, Arkansas

Heather Hunziker, Office of the Attorney General, Texas

Edward Knight, Louisiana Department of Transportation and Development

Jason Phillips, U.S. Fish and Wildlife Services - Arkansas

Jennifer Sheehan, Arkansas Game and Fish Commission

Yohanes Sugeng, Oklahoma Water Resources Board

Jennifer Wilson, USGS – Water Science Center, Texas

## **II. APPROVAL OF AGENDA:**

Chairman Lowry stated that the agenda had been distributed and that there were two resolutions to add. There being no discussion, she called for a vote. Commissioner Holland moved to approve the agenda with the additional resolutions. Commissioner Landry seconded the motion. The motion was unanimously approved (Attachment 1).

Chairman Lowry stated that she had received the appropriate proxy letter from Commissioner Stephanie Perdue, appointing Suzy Valentine (Attachment 2).

Mrs. Suzy Valentine read the Resolution of Appreciation for Jane Atwood (Attachment 3).

Chairman Lowry read the Stream Gage Resolution (Attachment 4).

There being no questions or discussion. Commissioner Moore moved to approve the resolutions. Commissioner Holland seconded the motion. The motion carried unanimously.

## **III. APPROVAL OF MAY 2, 2017 MINUTES:**

Mr. Edward Knight advised that a draft of the May 2017, Red River Compact Commission minutes were sent for comments and the responses were incorporated. Chairman Lowry asked if there were corrections, additions or deletions to the minutes. Commissioner Cunningham moved that the minutes be approved with a correction to page 7, item B to reflect "report" rather than "presentation." Commissioner Gibson made a second to approve the minutes with the correction. The minutes with the correction were approved unanimously.

## **IV. REPORT OF CHAIRMAN:**

Chairman Lowry advised that earlier she had informed the Commissioners the position of Executive Director for the Interstate Council on Water Policy (ICWP) was offered to her. She sent that information to the Commissioners at that time asking if there was any conflict of interest should she accept the position; none was made and she accepted the position in February. She stated that ICWP works with other states and organizations nationally; Arkansas and Oklahoma are members and ICWP would welcome Louisiana and Texas. She referenced a fact sheet that corresponds to the United States Geological Survey (USGS) resolution that was just passed and explained that one of the main work efforts of ICWP is to support basic water data/stream flow programs of the USGS. However, the President's FY 19 budget request is not sufficient for the stream gaging program or suggested funding.

She reported that she presented the Resolution of Appreciation to Chairman Jeff Fassett; he was very appreciative and asked she say hello to everybody.

## **V. REPORT OF THE TREASURER:**

Mr. Edward Swaim referred to the Treasurer's Report in the Commissioners' packet. He advised that the total checking balance as of July 1, 2017, was \$21,168.16, total expenses to date were low with a combined audit, bank and bond expense of \$461.85. Receipts from Member Assessments totaled \$2,200.00 for a checking balance of \$22,906.31. The Certificate of Deposit earned \$55.31 making that balance \$11,253.76. The TOTAL for both balances as of March 31, 2018 was \$34,160.07. The current books were brought if there were questions; no questions followed. Commissioner Landry moved to approve the Treasurer's Report and Commissioner Holland seconded the motion. The motion carried unanimously.

## **VI. REPORT OF THE COMMISSIONERS:**

**OKLAHOMA** – Commissioner Cunningham presented the Commissioners' Report. She thanked Arkansas for the hospitality adding, she had forgotten how beautiful it is in Arkansas. She advised that the bullets on the first page are Water Plan recommendations that came out of the four-year public participation process and are now the Agency's goals. Under CLIMATE – there is an early and exceptional drought, covering 58% of the state; major wild fires have occurred. The good news is there are full reservoirs in the compact area. The Red River Studies will be completed for the North Fork and Salt Fork of the Red River Basin. Work continues with the Bureau of Reclamation on a three-year study of the Upper Red River Basin looking at supply, demand, risks, long-term reliability during drought and adaptation strategies as well as the legal structure concerning water rights, permitting, barriers and management techniques. WATER FOR 2060 is a statewide goal to use no more fresh water in 2060 than was used in 2010. Oklahoma is working on legislation that would promote the use of marginal-brackish-waters in the licensing of water well drillers; it would include construction standards to protect the preservation of fresh water zones.

The Oklahoma Water Board and Department of Environmental Quality have completed rules for water use and recovery; portable reuse; indirect portable reuse; and aquifer use and recovery. There are communities interested in increasing their storage capacity through aquifer storage.

Produced Water Working Group (PWWG). This group was organized by the Governor in 2016 after severe earthquakes were produced by water injection from the oil & gas industry. The goal is to reduce the amount of water deep-well-injected, through other economically viable solutions and to find options for reuse of that water.

Floodplain management works actively with the Oklahoma Floodplain Managers Association. They are installing signs "Turn around Don't Drown" using a GIS locator to send warnings and document information, etc.

#### Dam Safety Program

The Dam Safety Program began training realtors in dam safety; water well drilling; contamination; protection; water rights administration; etc. In 2017, the Real Estate Commission added two questions to their residential property disclosure form. The questions address water wells and dams on the property. The problem is that downstream development requires a higher level of maintenance and protection by the dam owner.

#### Water Infrastructure Financing

Thirty-three (33) counties within the Red River Basin have water and wastewater infrastructure projects, totaling \$662,000,000. In conclusion, Commissioner Cunningham stated that historically through these programs there was a lot of construction and good work in the Basin.

Chairman Lowry asked how the change was brought about with the realtors – in adding the questions to the property disclosure form.

Commissioner Cunningham explained that a team is sent out to provide training and tries to cover all subjects in a day or less. Water rights are addressed in the real-estate exam; however there was no previous training.

Mr. Yohanes advised that in the beginning the team reached out to the Real Estate Commission to coordinate a meeting; however thereafter it has grown by interest from the individual offices.

**TEXAS** – Mrs. Suzy Valentine (proxy for Commissioner Perdue) presented the Commissioners' Report. She thanked all for their diligent work at the committee meetings and urged all to attend dinner receptions to get to know each other, the issues, and concerns, of the different states and participants.

#### Weather and Drought Conditions

Mrs. Valentine advised that the Red River Basin is almost two different basins. The western portion of the state is 65% in drought conditions and includes the Red and Canadian River Basin. The eastern reaches of the Red River including Sulphur River and Cypress Creek basins have no drought. Currently, 80% of the Red River Basin is abnormally to exceptionally dry.

#### Texas Sunset Advisory Commission Review

The Sulphur River Basin Authority (SRBA) underwent a Sunset Advisory Commission Review. The legislature passed a bill in 2017, which addressed structural and operational changes to SRBA that increase transparency and better meet the needs of the basin.

### Groundwater

Texas is a Rule of Capture State; the landowner owns the groundwater beneath their land. Groundwater conservation districts have the ability within limited terms to regulate withdrawal if someone is within the defined district area. However, the Texas courts have made it clear that landowners have recourse in the courts to prevent limitations of access to the groundwater under their land without compensation if conservation district regulations go too far.

### Environmental Flows

The Environmental Flows Advisory Group has not to date set a schedule for environmental flow Standards in the Canadian, Red, Sulphur or Cypress Creek Basins. The Caddo Lake Institute began working on environmental flow recommendations for the Cypress Creek Basin including Caddo Lake in 2004. The recommendations have been incorporated into the 2017 Texas State Water Plan. The U.S. Army Corps of Engineers and Northeast Texas Municipal Water District have committed to implementing these flow regimes for Big Cypress Bayou by making releases of water from the reservoirs over a test period. One of the experiments to be conducted will reintroduce native fish including the American paddlefish into Caddo Lake. It is hoped the environmental flow recommendations will support those efforts.

### Red River Boundary Commission of Texas

In 2000, Texas and Oklahoma signed the Texoma Area Boundary Agreement which established the boundary in the Lake Texoma reach. At that time the North Texas Municipal Water District (NTMWD) was split between the two states and invasive species issues prevent the full use of that intake facility. The governors signed a Memorandum of Understanding that allows that project to continue. However, Texas desires to reset the boundary to put the entire facility in Texas with offsets that ensure no loss of land to Oklahoma. The Texas legislature extended efforts to eliminate future impacts to the Lake Texoma facilities due to potential invasive species transfers.

### Texas Water Plan of 2017

The Texas Water Plan has been issued. The population of Texas is expected to grow from 29.5 to 51 million people, a 70% increase during the planning period 2020-2070.

### State Water Implementation Fund for Texas

The Texas legislature passed a bill in 2013 that would provide up to \$2 billion to implement the water plan throughout Texas and established the "State Water Implementation Funds for Texas (SWIFT)" program. That program enables low interest loans, extended repayment terms, deferral of loan repayments and incremental repurchase terms to facilitate local projects. Projects must be listed in the 2017 State Water Plan to be eligible for SWIFT program financial assistance. The Texas Water Development Board (TWDB) manages the administration and disbursement of funds and ensures the Texas Water Plan prioritization process that includes 10% of the funds allocated to rural areas. Through fiscal year 2017, SWIFT has committed over \$5.6 billion for projects across Texas. The TWDB anticipates accommodating \$770 million in new applications; \$1.2 billion in

recurring multi-year commitments; and is considering an increase in subsidies offered for rural and agricultural projects. In conclusion, Mrs. Valentine asked if there were any questions.

Commissioner Cunningham asked if the fund was a bond issue or came from a general fund. Mrs. Valentine advised the \$2 billion was appropriated to provide the loans which will be repaid.

Commissioner Clyde Siebman thanked Mrs. Valentine and staff from the Department of Environmental Quality for a great job and stated he was looking forward to working with them and Ms. Heather Hunziker from the Attorney General's office as well.

**LOUISIANA** – Commissioner Patrick Landry advised he had just been appointed to the Commission a month ago, this was new to him. On behalf of his fellow Commissioner John Michael Moore, Mr. Harry Vorhoff and Mr. Edward Knight he thanked Arkansas for their hospitality in beautiful Hot Springs. Next, he read Louisiana's Report "Louisiana continues to ...." He concluded his report stating it would be great to sit down and discuss differences and issues involved to see a resolution; he would commit his resources as Deputy Assistant Secretary of Public Works. Discussion followed.

Chairman Lowry stated that from a procedural standpoint the big issue facing the Commission is that weekly flows are not available from monthly USGS modeling. A USGS presentation would address the modeling issue. She advised that there would be time on the agenda to discuss whether additional meetings and assignments to the Engineering and/or Legal Committees are necessary.

**ARKANSAS** - Commissioner Bruce Holland thanked everyone for their nice comments on coming to Hot Springs and Arkansas. He advised that the first part of the Arkansas report addresses the border compliance issue between Arkansas and Louisiana. He read from the Arkansas Report "Based on the results of Arkansas Natural Resources Commission (ANRC) investigation ...." He advised that the Multi-State Extreme Precipitation Study was partnered with Louisiana and Mississippi to better understand the dam safety and flood management programs. Further, Mr. Swaim is working on the Arkansas Water Plan with the Planning Assistance to States (PAS) project. In conclusion, he stated that Arkansas continues to get Watershed Management Plans in place.

Commissioner Cunningham asked if there were sedimentation problems as far as runoff nutrients or sediment in the watershed management program. Commissioner Holland advised that it changes in the different areas of the state. Nutrient management plans are regulated in the northwest area of the state though encouraged statewide.

Commissioner Gibson asked that water quality impairment (silt) be explained in the Bartholomew.

Mr. Swaim explained that there was nothing unusual however; the 319/Nonpoint Program tries to encourage voluntary/incentive based land use changes to reduce runoff. The focus is on that watershed because of the importance of Bayou Bartholomew ecologically to the state. It is hard to tie the practice to a positive effect in a large watershed as they looked to find patterns; it was inconclusive.

Louisiana is working extensively with Arkansas in the Southeast Arkansas/Northeast Louisiana Feasibility Study. They tried to get more water into the Boeuf River-Bayou Bartholomew. Unfortunately, they could not satisfy the Corps of Engineers Cost to Benefit Ratio in order to build the project.

## **VII. REPORT OF THE COMMITTEES:**

**Budget:** Mr. Edward Swaim presented the Budget Committee recommendations for the FY 2018 - 2019 Budget. He reviewed the report and advised that the Budget Committee recommended no changes. He asked for questions, no discussion followed.

Upon motion duly made and seconded, the FY 2018 -2019 Budget was unanimously accepted.

**Legal Committee:** Mrs. Crystal Phelps advised that the Legal Committee had at least three assignments.

1. Determine goals of compact as drafted with respect to Reach 4, Sub basin 2 by reviewing minutes and researching what is "runoff" with respect to surface water, ground water, and base flow.

The Committee looked at the 1979 interpretive comments and found runoff was defined as that portion of precipitation which runs off the surface of a drainage area and that which enters the streams after passing through the earth.

The Committee was also asked to think about weekly runoff and the supplemental interpretive comments concerning Reach 4. They found weekly runoff is used as a basis for apportionment to assure the State of Louisiana a relatively constant flow and a fair share of the low flow. Section 7.03(b) governs during extreme low flow periods in order to permit and ensure a reasonable and equitable stream flow into the State of Louisiana. The remainder of Article VII (discussing Reach 4) is considered self-explanatory.

Mrs. Phelps commented that the records from those earlier events do not explain the reasons why the actions were taken.

The Legal Committee also discussed the meaning of "flow" and "base flow." Flow is undefined in the Compact, and "base flow" is not a term used within the Compact.

2. Provide additional legal guidance concerning Reach 4, Sub basin 2 runoff methodologies and compliance to the Engineering Committee upon request.

The Legal Committee first looked at the issue alone and then brought in the Engineering Committee. Conference calls helped as the engineers explained what had been done in the past, what had worked, and what had not been done. Both committees were hopeful that the USGS model would answer their problems. The model is fabulous for what it was intended, however the data to calculate weekly flows does not appear to be available with sufficient reliability.

3. Work in conjunction with the Engineering Committee and update the USGS gage resolution.

Mrs. Phelps advised that the Engineering Committee has done that. She concluded the report and asked for questions.

Upon motion duly made and seconded, the Legal Committee Report was unanimously accepted.

BREAK 10:00 to 10:15 AM.

**Engineering Committee:** Mr. Ken Brazil referenced the stream - gaging resolution. He advised that the Engineering Committee was tasked to update the gage list; it is compiled and being double checked. It would be provided to the Commissioners in quick order to accompany the resolution letter.

He advised that there was quite a bit of discussion about flow at the state boundary and everyone shares frustration as there is an impasse on the hopes they had for a runoff calculator. USGS would give a brief explanation on why that is not appropriate. He advised that after the committee meeting he met with Mr. Knight and they agreed to get together to look at the flow data and perform statistics in the same manner to achieve the same interpretations.

The U.S. Army Corps of Engineers (COE) has been paid by both states to continue studies to determine the feasibility of providing supplemental water from Arkansas into the Boeuf River. The states will look at economics for total cost and determine if there is federal interest. To date the COE has not found it a feasible project per their benefit cost ratio.

Mr. Brazil concluded the Engineering Report and asked for questions.

Commissioner Cunningham asked what would be required for the supplemental water.

Mr. Brazil advised that there have been ongoing studies in Arkansas to bring supplemental water to areas, primarily for agricultural need. A COE feasibility study determines the federal interest and requires it be for multipurpose use. It must have a benefit cost ratio

equal to or greater than one. Federal interest allows the COE to participate and then pay the states' portions of the project. This issue came up on the Boeuf River and the COE was asked to make additional economic studies to get sufficient water to pass at the state boundary; Arkansas and Louisiana made cash contributions to match COE dollars. The COE did a quick look back on the economic analysis and benefit cost ratio; they were not able to attain a benefit cost ratio above one; therefore there is no federal interest.

Commissioner Siebman asked how hard it would be to do a daily flow level on the two gages for one year. Mr. Brazil advised that they would have to look at it in the context of what is physically on the ground. Mrs. Valentine suggested it be compared and mapped to the different weirs. Mr. Brazil advised that most of the weirs were old, penetrated by water and none completely obstructed the water. He advised it would be a tremendous effort to generate enough data to model what exactly is going on behind each weir. One thing physically witnessed but not quantified is that you may see no surface water upstream and go twenty miles down the stream and find plenty of water. There is a lot of ground water - surface water interaction that has not been quantified. Data on the weirs and the instream structures would need to be factored in to accurately quantify a process.

Mr. Brazil advised that The "Boeuf River Report Submitted to the Engineering Committee" was a summary of his work over several years; it was not a position of the Engineering Committee. The report was not circulated earlier and the committee had not reviewed it. The Engineering Committee may certainly have questions; he will send actual shape files to Mr. Knight to work with GIS.

Rheannon Hart, USGS - Water Science Center, Arkansas advised that the USGS model was originally designed based on monthly historical climate, temperature and precipitation. There is no historical weekly climate data. They tried to break down the historical climate monthly data from months to weeks but that took away the highs and lows of the precipitation therefore they nixed the weekly model. Low flows prompted the beginning of the study. USGS submitted their methods to the Peer Review Journal and the Peer Review advised USGS not change the data from monthly to weekly precipitation. It is a good monthly model.

Upon motion duly made and seconded, the Engineering Committee Report was unanimously accepted.

Chairman Lowry reiterated that Commissioner Siebman requested a comparison between Eudora and the state line; she thanked Ms. Hart for the report.

**Environmental and Natural Resources Committee:** Mr. Ken Brazil advised that there were no specific assignments from last year. They normally report on environmental issues on the Red and Ouachita Rivers. Dissolved oxygen and chloride levels had not increased and had improved at some places on the Red. Texas continues to deal with zebra mussels and is monitoring their water qualities carefully; that concluded his report.

Discussion followed: The zebra mussels' impact had increased to 20 reservoirs in Texas. Rigorous boat inspections have been instituted to assure boats are properly cleaned before going from one reservoir to another; outboard motors also take up water that holds mussels. Giant Salvinia was recently found in Texas. Texas introduced carp to control Hydrilla and is now watchful of the unintended invasive spread of carp. Water hyacinths are covering the Oxbow Lakes in the Bartholomew, stopping recreational water use.

## **VIII. FEDERAL AGENCY REPORTS:**

### **U.S. Army Corps of Engineers (COE):**

**Mike Abate, Chief of Civil Works - Tulsa District** gave a slide presentation. He reviewed the number of hydroelectric dams; dams managed by the COE; and dams managed by others on the Red River and he advised that the dams prevented over five billion in damages. The dams created recreation and over 60% of the water supply. He explained that the COE flag symbolized all these purposes. The Red River area included COE sites in Texoma and Hugo, Oklahoma. Money received from the Department of Transportation helped replace roads damaged by floods in Hugo. The floating bulkhead at Broken Bow is found to be an effective maintenance technique. He reviewed big projects with Lake Texoma; Copper Dam; Southwestern Power; and the North Texas Municipal Water District. Money was authorized by Congress for hurricane damage in Florida and the Gulf coast area. In conclusion he advised that water is conserved when necessary new waterlines replace old.

**Trevor Timberlake, Civil Engineer – Reservoir Control – Little Rock District** advised that the ANRC Red River Watershed is making a drought study per the State Water Plan. Public assistance to the state project helps the COE flush out water tools that will be used to assist local decision makers. The COE aims to compare historical drought data with economic impact in relation to the Red River Watersheds while trying to understand water supply by itself. He advised that some water provider areas are sold to utilities while other providers have dependencies. This connects drought with economics - the impact to a specific population and trends that forecast economic impact.

**U.S. Bureau of Reclamation: Adam Milligan** - could not attend.

**U. S. Geological Survey: Jessica Wilson, Coordinator - Red River Focus Area Study** advised that a congressional act passed in 2009, lead to the National Water Census Program and the study of potential areas of water conflicts. The Red River study is a three-year study and they are in year two. The objectives include: enhancement; groundwater model; surface water flow model; and eco flows. Data visualization will be incorporated for use on the website.

**NRCS: No show**

**IX. Discussion Topics:**

Commissioner Patrick stated he would like to see the Engineering and Legal Committees meet more often in person or via conference call.

Chairman Lowry asked if it would be reasonable for the Engineering Committee to have a report for the Commission by September 1-15.

Commissioner Cunningham advised that she was on the Engineering Committee for several years and it has met numerous times to work with USGS and the COE. They worked to find a solution for the last three years. Several companies were interviewed to provide other studies. The Engineering Committee had met face to face and worked together, however the USGS study did not apply. She suggested that the Engineering Committee be given direction.

Commissioner Siebman commented if a decision needs to be made or direction given the chairman could do that.

Attorney Phelps advised that Article 4 of the bylaws reads either the chair or commissioners from two states may ask that a special meeting of the Commission be called at any time. Any meeting besides an annual meeting is considered special. There is provision for telephonic meetings via electronic or telephonic. The meeting would be publicized and the public invited; each state could handle public attendance as they saw fit.

Chairman Lowry questioned if there was a time frame for the Commission to hold a conference call. A meeting would be called only if there was something for the Engineering committee to review. She asked if there were specifics to assign the Engineering Committee. She referenced the two USGS gages and a review of Ken Brazil's report.

Commissioner Siebman asked that the Engineering Committee be assigned the task of determining what is happening to the water, is it going underground – evaporating?

Commissioner Cunningham advised that time was needed for the Engineering Committee to decide how to look at the questions.

Mr. Ken Brazil advised that he found face time has been important. He had suggested earlier that the engineers meet and work as engineers and Edward Knight had concurred.

Commissioner Siebman stated that was a good idea as it would take creative thinking outside of the box by the Engineers. He suggested the Engineering and Legal Committees meet in Shreveport/Baton Rouge area then report via a conference call to the commission later in the fall. The legal committee will be available to be called upon as needed by the engineers.

Edward Knight advised this was the direction in the previous year and it worked well.

Chairman Lowry proposed a soft date of September 15.

Ms. Valentine asked that the Engineering/Legal committee tell what concrete steps will be taken to assure Louisiana in the short term.

Commissioner Holland advised that there were limited resources as to what can be monitored and what cannot. He did not know how quickly that data could be gathered before it was understood or controlled.

Ms. Valentine stated a lot of that information has been compiled via the locations. A contact list, if available, will allow calling a meeting in the area and getting the stakeholders involved - they might have solutions.

Commissioner Holland assured that it would be looked into if it can be done.

Chairman Lowry asked Ken Brazil to provide a data base of well locations that could be shared with Louisiana.

Mr. Brazil agreed he talked about water use data and weir data as far as locations. He advised that a day earlier Louisiana requested information on water use for the Boeuf watershed. USGS updated their data management and web services to retrieve that information, however a lot of abnormalities in the data were found and therefore the information was not utilized. Internal quality assurance is needed to know what is going on. He explained there is information as to annual reported usage and location; however, specific information is not collected as to the time in the year it is used.

Chairman Lowry questioned whether an assignment needs to be made to Bartholomew, Bayou Macon rather than Boeuf.

Mr. Brazil explained that the committee initially looked at Bayou Macon because Lake Chicot controlled 70-80% of canal drainage that fed into Bayou Macon. The COE agreed to increase flow to Lake Chicot to provide supplemental flows across the state boundary as long as lake levels were sufficient. The COE asked that they be advised when enough water was received in order to stop the flows. Louisiana planned to form a stakeholder group to dialog with the COE. Essentially that problem was mitigated by having the COE being able to release more water. Arkansas did not have enough resources to work on all of them at the same time and advised Louisiana; the next focus was to be the Boeuf for Louisiana.

Chairman Lowry asked if those were ample assignments, there was no response.

Commissioner Gibson made a motion to assign the Engineering Committee the issue of determining cause of depletion in flows at the state lines and examining every possible reason as data is made available and to include the legal committee as necessary. A second to the motion was made by Commissioner Landry.

Discussion followed: Was a review of the data necessary? The data will generate questions when it is reviewed. The data base is GIS and would get transferred. Article IV. Special Meetings was reviewed.

Chairman Lowry requested something be brought to the commission by mid-September.

The motion carried.

#### **XI. NEW BUSINESS:**

##### **Committee Meetings – Annual Report**

Edward Knight said he should have the 2017 Annual Report out in the fall.

Chairman Lowry asked that materials/PDFs from the present meeting be provided to Laura Brown.

##### **Commission Assignments to Committees**

Elections of Officers – Chairman Lowry advised that Oklahoma will host the 2019 meeting. The tentative meeting date is April 29-30, 2019. Host state staff will chair committees. She asked if there were any changes to Committee memberships.

The Legal Committee representative for Texas will be Heather Hunziker.

The following nominations were made:

|               |                  |
|---------------|------------------|
| Vice-chairman | Julie Cunningham |
| Secretary     | Mary Schooley    |

There being no more nominations Chairman Lowry announced the foregoing nominees were elected to the offices set before their respective names.

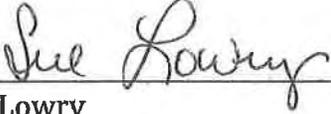
#### **XII. Red River Valley Association - Richard Brontoli**

Mr. Brontoli advised that from 1990 to 2015 there was no flood in the Shreveport area; in 2015 the flood crest was higher but with less flows than 1990. This was created by locks, dams, and major urbanization aboard the river since 1990. The Vicksburg District, COE is analyzing data to determine the cause of a four foot variance from 1990. The data is critically needed for new FEMA flood plain maps. The navigation channel in Louisiana has authorized an increase from 9 to 12 feet. The COE has agreed to look at a 12 foot channel study. The State of Arkansas provided one million dollars to the Red River Commission to work with the COE in continuing to identify a Navigation Feasibility Study. Additionally, there are two authorized projects in Arkansas: bank stabilization and levees. He concluded by asking if there were questions, none followed.

XIII. Public Comment – There was no response.

The tentative meeting dates for 2019 are April 29-30.

There being no further business, the meeting was adjourned at noon.

  
\_\_\_\_\_  
Sue Lowry  
Federal Commissioner & Chairman

  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Laura A. Brown  
2018 Commission Secretary

## **AGENDA**

**RED RIVER COMPACT COMMISSION  
38th ANNUAL MEETING  
Hotel Hot Springs, Hot Springs, Arkansas  
April 24, 2018  
8:30 AM**

- I. Call to Order – Chairman Sue Lowry
- II. Welcome
- III. Approval of the Agenda
- IV. Approval of the Minutes of the May 2017 RRCC Annual Meeting held in Shreveport/Bossier City, Louisiana
- V. Report of Chairman Sue Lowry
- VI. Report of the Treasurer – Edward Swaim, Arkansas
- VII. Report of the Commissioners
  - A. Oklahoma
  - B. Texas
  - C. Louisiana
  - D. Arkansas
- VIII. Report of the Committees
  - A. Budget Committee – Edward Swaim (AR)
  - B. Legal Committee – Crystal Phelps (AR)
  - C. Engineering Committee – Ken Brazil (AR)
  - D. Environmental & Natural Resources Committee – Ken Brazil (AR)
- IX. Federal Agency Reports
  - A. U.S. Army Corps of Engineers
  - B. Bureau of Reclamation
  - C. U.S. Geological Survey
  - D. Natural Resources Conservation Service

- X. Discussion Topics
  
- XI. New Business
  - A. Annual Report – Schedule and Assignments
  - B. Commission Assignments to Committees
  - C. Election of Officers
  - D. Appointments or Changes to Committees
  - E. 39<sup>th</sup> Annual Meeting – Oklahoma to host
  
- XII. Public Comment
  
- XIII. Adjournment

Bryan W. Shaw, Ph.D., P.E., *Chairman*  
Toby Baker, *Commissioner*  
Jon Niermann, *Commissioner*  
Stephanie Bergeron Perdue, *Interim Executive Director*



## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

April 17, 2018

Ms. Sue Lowry  
Chairman and Federal Representative  
Red River Compact Commission  
Avocet Consulting LLC  
5721 Syracuse Road  
Cheyenne, Wyoming 82001

Dear Chairman Lowry:

I regret that I am unable to participate in the 2018 annual meeting of the Red River Compact Commission to be held April 23-24, 2018 in Hot Springs, Arkansas, due to previous commitments. In my absence, I grant my support and proxy vote as Commissioner of the Compact Commission for any considerations of the Commission to Ms. Suzy Valentine, Texas Commission on Environmental Quality, Engineer Advisor to the Red River Compact Commission, Office of Water, who plans to attend as representative for the TCEQ.

My best wishes to the Commission for a successful meeting.

Sincerely,

Stephanie Bergeron Perdue  
Interim Executive Director  
Texas Commission on Environmental Quality  
Commissioner, Red River Compact Commission

cc: Suzy Valentine, P.E., Interstate River Compacts Coordinator, Office of Water  
Clyde Siebman, Commissioner, Red River Compact Commission





## RED RIVER COMPACT COMMISSION

### RESOLUTION OF THE RED RIVER COMPACT COMMISSION

**WHEREAS**, Jane E. Atwood, provided 20 years of valuable service as Legal Adviser to the Commissioners for Texas to the Red River Compact Commission; and

**WHEREAS**, during that time, Ms. Atwood did faithfully and conscientiously carry out her duties to the overall benefit of the Red River Compact Commission; and

**WHEREAS**, she worked successfully on numerous projects and initiatives to benefit the interests of the Compact region, working with many different individuals representing the member States of the Compact and the United States; and

**WHEREAS**, during her tenure as Legal Adviser, Ms. Atwood demonstrated a keen knowledge of the issues related to administering the Red River Compact, resulting in a smoothly running organization which provided great value to the Red River Compact Commission and its stakeholders.

**NOW, THEREFORE, BE IT RESOLVED** that the Red River Compact Commission assembled at its 38<sup>th</sup> Annual Meeting held in Hot Springs, Arkansas, acknowledges the outstanding service of Jane E. Atwood to the people of the Red River Basin and extends to Ms. Atwood its best wishes for a prosperous and enjoyable future.

**BE IT FURTHER RESOLVED**, that the Chairman of the Red River Compact Commission is hereby directed to furnish a copy of this resolution to Jane E. Atwood on behalf of the Red River Compact Commission.

*Unanimously approved at the 38<sup>th</sup> Annual Meeting of the Red River Compact Commission in Hot Springs, Arkansas, on April 24, 2018.*

Sue Lowry  
Federal Commissioner and Chairman  
Red River Compact Commission

24 Apr 2018

Date

Claude M. Siebman  
Commissioner for Texas

Suzy Valentine, P.E.  
Acting Commissioner for Texas

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

John Michael Moore  
Commissioner for Louisiana

Absent

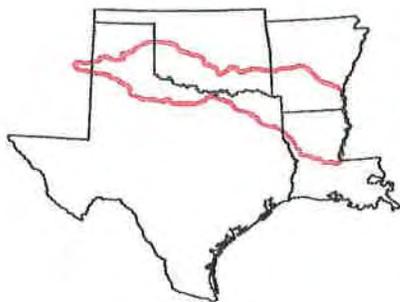
Charles Lynn Dobbs  
Commissioner for Oklahoma

Julie Cunningham  
Commissioner for Oklahoma

John Frank Gibson, Jr.  
Commissioner for Arkansas

Bruce Holland  
Commissioner for Arkansas





# RED RIVER COMPACT COMMISSION

## RESOLUTION OF THE RED RIVER COMPACT COMMISSION REGARDING THE FUNDING OF STREAMFLOW GAGES April 24, 2018

**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 National Groundwater and Streamflow Monitoring Program;

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

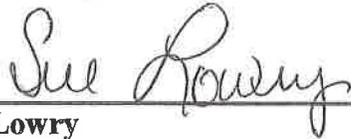
**WHEREAS**, a priority goal of the USGS National Groundwater and Streamflow Monitoring Program is to "meet legal and treaty obligations on interstate compacts and international waters;"

**WHEREAS**, the streamflow gages necessary to administer the Red River Compact qualify under this priority goal for full federal funding under the USGS National Groundwater and Streamflow Monitoring Program.

**NOW, THEREFORE, BE IT RESOLVED** that, the Red River Compact Commission requests Congress fully fund the USGS National Groundwater and Streamflow Monitoring Program gages associated with the Red River basin and Red River Compact and that USGS place a priority on funding these gages.

**BE IT FURTHER RESOLVED** that, federal funding for the USGS National Groundwater and Streamflow Monitoring Program be restored to ensure the 50/50 cost share for the jointly funded activities with localities and states (historically referred to as the Cooperative Water Program) 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.



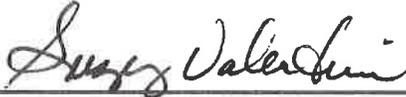
**Sue Lowry**  
Federal Commissioner and Chairman  
Red River Compact Commission

24 Apr 2018

Date



**Clyde M. Siebman**  
Commissioner for Texas

for 

**Stephanie Bergeron Perdue**  
Commissioner for Texas



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



**John Michael Moore**  
Commissioner for Louisiana

Absent

**Charles Lynn Dobbs**  
Commissioner for Oklahoma



**Julie Cunningham**  
Commissioner for Oklahoma



**John Frank Gibson, Jr.**  
Commissioner for Arkansas



**Bruce Holland**  
Commissioner for Arkansas

## RED RIVER BASIN STREAMFLOW AND WATER QUALITY GAGES

| Station Number  | USGS Gage Name                                    |
|-----------------|---|
| <u>07300000</u> | Salt Fork Red River near Wellington, TX           |
| <u>07300500</u> | Salt Fork Red River at Mangum, OK                 |
| <u>07301300</u> | North Fork Red River near Shamrock, TX            |
| <u>07301410</u> | Sweetwater Creek near Kelton, TX                  |
| <u>07301420</u> | Sweetwater Creek near Sweetwater, OK              |
| <u>07301500</u> | North Fork Red River near Carter, OK              |
| <u>07303400</u> | Elm Fork of North Fork Red River near Carl, OK    |
| <u>07308500</u> | Red River near Burkburnett, TX                    |
| <u>07315500</u> | Red River near Terral, OK                         |
| <u>07316000</u> | Red River near Gainesville, TX                    |
| <u>07316500</u> | Washita River near Cheyenne, OK                   |
| <u>07331000</u> | Washita River near Dickson, OK                    |
| <u>07331600</u> | Red River at Denison Dam near Denison, TX         |
| <u>07332500</u> | Blue River near Blue, OK                          |
| <u>07335300</u> | Muddy Boggy Creek near Unger, OK                  |
| <u>07335390</u> | (COE) Pat Mayse Lake near Chicota, TX             |
| <u>07335500</u> | Red River at Arthur City, TX                      |
| <u>07336820</u> | Red River near De Kalb, TX                        |
| <u>07337000</u> | Red River at Index, AR                            |
| <u>07340000</u> | Little River near Horatio, AR                     |
| <u>07344210</u> | Sulphur River near Texarkana, TX                  |
| <u>07344370</u> | Red River at Spring Bank, AR                      |
| <u>07346310</u> | (COE) Caddo Lake at Dam near Mooringsport, LA     |
| <u>07348000</u> | Twelvemile Bayou near Dixie, LA                   |
| <u>07348500</u> | (COE) Red River at Shreveport, LA                 |
| <u>07350500</u> | Red River at Coushatta, LA                        |
| <u>07355500</u> | Red River at Alexandria, LA                       |
| <u>07362000</u> | Quachita River at Camden, AR                      |
| <u>07362100</u> | Smackover Creek near Smackover, AR                |
| <u>07363500</u> | Saline River near Rye, AR                         |
| <u>07364100</u> | Quachita River near Arkansas-Louisiana State Line |
| <u>07364133</u> | Bayou Bartholomew near Garrett Bridge, AR         |
| <u>07364150</u> | Bayou Bartholomew near McGehee, AR                |
| <u>07364185</u> | Bayou Bartholomew near Portland, AR               |
| <u>07364200</u> | Bayou Bartholomew near Jones, LA                  |
| <u>07369680</u> | Bayou Macon at Eudora, AR                         |
| <u>07367690</u> | Boeuf River near Arkansas/Louisiana Stateline     |
| <u>07367680</u> | Boeuf River near Eudora, AR                       |
| <u>07366200</u> | Little Corney Bayou near Lillie, LA               |
| <u>07367005</u> | Ouachita River at West Monroe                     |

*USGS Streamflow Gages Necessary to Administer the Red River Compact*

*Updated 4/18*

| <b>State of Oklahoma</b>  |                  |                             |
|---|------------------|-----------------------------|
| <b>Description</b>  | <b>Station #</b> | <b>Updated Comment</b>      |
| Salt Fork Red River at Mangum, OK   | 07300500         |                             |
| Sweetwater Creek near Sweetwater, OK  | 07301420         |                             |
| North Fork Red River near Carter, OK  | 07301500         | Not a QW monitoring station |
| Elm Fork of North Fork Red River nr Carl, OK  | 07303400         |                             |
| Red River near Terral, OK   | 07315500         | TX station                  |
| Red River near Gainesville, TX  | 07316000         | Not a QW monitoring station |
| Washita River near Cheyenne, OK   | 07316500         |                             |
| Washita River near Dickson, OK  | 07331000         | Not a QW monitoring station |
| Red River at Denison Dam nr Denison, TX   | 07331600         | Not a QW monitoring station |
| Blue River near Blue, OK  | 07332500         |                             |
| Muddy Boggy Creek near Unger, OK  | 07335300         |                             |
| Red River at Arthur City, TX  | 07335500         |                             |
| Kiamichi River near Hugo, OK<br><i>(disc-see USACE release records for Hugo Lake)</i> |                  | Not a USGS station          |
| Red River near De Kalb, TX  | 07336820         |                             |

| <b>State of Arkansas</b>                |                  |                                  |
|---|------------------|----------------------------------|
| <b>Description</b>                      | <b>Station #</b> | <b>Updated Comment</b>           |
| Boeuf River Near Eudora                 | 07367680         | Add discharge gage to list       |
| Red River at Spring Bank                | 07344370         | Cannot confirm this gage exists  |
| Ouachita River at Camden                | 0362000          |                                  |
| Red River at Index                      | 07337000         |                                  |
| Ouachita River at Felsenthal Lock & Dam | 07364078         | Replaced #07364100 at state line |
| Bayou Bartholomew near McGehee, AR      | 07364150         |                                  |
| Bayou Bartholomew near Portland         | 07364185         | Add this discharge gage to list  |
| Bayou Macon at Eudora                   | 07369680         |                                  |
| Little River near Horatio, AR           | 07340000         |                                  |
| Smackover Creek near Smackover, AR      | 07362100         |                                  |
| Saline River near Rye, AR               | 07363500         |                                  |
| Bayou Bartholomew at Garrett Bridge     | 07364133         | Add this discharge gage to list  |

| <b>State of Texas</b>                   |                  |                            |
|---|------------------|----------------------------|
| <b>Description</b>                      | <b>Station #</b> | <b>Updated Comment</b>     |
| Salt Fork Red River near Wellington, TX | 07300000         | WQ Monitoring discontinued |
| North Fork Red River near Shamrock, TX  | 07301300         |                            |
| Sweetwater Creek near Kelton, TX        | 07301410         |                            |
| Red River near Burkburnett, TX          | 07308500         | WQ Monitoring discontinued |
| Red River near Terral, OK               | 07315500         | WQ Monitoring discontinued |
| Sanders Creek near Chicota, TX          | 0733540          | Active for discharge       |
| Sulphur River near Texarkana, TX        | 07344210         |                            |

| <b>State of Louisiana</b>                |                  |                                 |
|--|------------------|---------------------------------|
| <b>Description</b>                       | <b>Station #</b> | <b>Updated Comment</b>          |
| (COE) Caddo Lake at Dam Mooringsport, LA | 07346310         |                                 |
| Twelvemile Bayou near Dixie, LA          | 07348000         |                                 |
| (COE) Red River at Shreveport, LA        | 07348500         |                                 |
| Bodcau Bayou near Springhill, LA         | 07349450         |                                 |
| Red River at Coushatta, LA               | 07350500         |                                 |
| Red River at Alexandria, LA              | 07355500         |                                 |
| Quachita River near AR-LA State Line     | 07364100         | Moved to Felsenthal L&D in AR   |
| Bayou Bartholomew near Jones, LA         | 07364200         |                                 |
| Chemin-A-Haut Bayou near Beekman, LA     | 07364300         |                                 |
| Little Corney Bayou near Lillie, LA      | 07366200         | Station #07366890 was incorrect |
| Ouachita River at West Monroe, LA        | 07367005         |                                 |
| Boeuf River at AR/LA State line (LA)     | 07367690         |                                 |
| Bayou Macon near Kilbourne, LA           | 07369700         |                                 |
|  |                  |                                 |
|  |                  |                                 |

## RED RIVER COMPACT COMMISSION MEETING

**April 24, 2018**  
**8:30 a.m.**  
**Hotel Hot Springs**  
**Hot Springs, Arkansas**

**PLEASE PRINT**  
NAME/TITLE

**PLEASE PRINT**  
BUSINESS/ADDRESS/TELEPHONE/FAX/EMAIL

|  |   |
|--|---|
| JULIE CUNNINGHAM<br>Oklahoma<br>Commissioner | 3800 N. CLAYTON BLVD.<br>OKC OK 73118                                   |
| JOHN F. GIBSON, JR.                          | 207 S main st.<br>Mentzel, AR 71655                                     |
| BRUCE HOLLAND                                |   |
| See Lowery                                   | 5721 Syracuse Rd<br>Cheyenne WY 82009                                   |
| Patrick Landry                               | Capital Access, Rd<br>Baton Rouge La                                    |
| Tom Michael Moore                            | 2250 HOSPITAL DR<br>STE 220<br>BOSSIER CITY, LA 71111                   |
| Clyde Siebman                                | 300 N. Travis, Sherman, TX<br>clyde.siebman@siebman.com<br>903-870-0070 |
| Suzy Valentine                               | TCEQ -<br>P.O. BOX 13087<br>AUSTIN TX                                   |
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## RED RIVER COMPACT COMMISSION MEETING

**April 24, 2018**  
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BUSINESS/ADDRESS/TELEPHONE/FAX/EMAIL

|   |   |
|---|---|
| Suzy Valentine, Acting<br>Commissioner - TX           | TCEQ 512-239-4730<br>P.O. Box 13087<br>Austin TX 78711    |
| @Misty Phelps<br>ANRC Gen Cncl                        |   |
| Jennifer Sheehan<br>Chief, Environmental Coordination | AR Game & Fish Commission<br>jennifer.sheehan@agfc.ar.gov |
| Edward Knight, LA DOTD-PW                             | 1201 Capitol Access Rd<br>Baton Rouge, LA 70804           |
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## RED RIVER COMPACT COMMISSION MEETING

**April 24, 2018**  
**8:30 a.m.**  
**Hotel Hot Springs**  
**Hot Springs, Arkansas**

**PLEASE PRINT**

**NAME/TITLE**

**PLEASE PRINT**

**BUSINESS/ADDRESS/TELEPHONE/FAX/EMAIL**

|  |  |
|--|--|
| Ryan Benefield<br>Deputy Director, ANRC          | RYAN.Benefield@ARKANSAS.GOV  |
| Mike Abate<br>Chief, Civil Works Branch          | MIKE.R.ABATE@USACE.ARMY.MIL  |
| Rich Brantali RRVA<br>Executive Director         | 318-393-6207<br>rrva@rrva.org  |
| Bill Baldwin<br>Data Chief                       | 501 228 3602<br>bbaldwin@usgs.gov                                      |
| Rheannon Hart<br>Hydrologist                     | 501 228 3664<br>rmhart@usgs.gov  |
| TODD BAUMANN<br>DATA CHIEF USGS                  | 225-298-5421 x3128<br>tbaumann@usgs.gov                                |
| Jason Phillips<br>Biologist USFWS                | jason-phillips@fws.gov<br>870-503-1103                                 |
| Jennifer Wilson<br>Hydrologist jenwilso@usgs.gov | USGS Texas Water Science Center<br>1505 Ferguson Lane, Austin TX 78754 |
| TREVOR TIMBERLAKE<br>Hydraulic Engr              | trevor.w.timbertake@usace.army.mil<br>501 324-5032                     |
| EDWARD SWAIM, ANRC                               | EDWARD.SWAIM@ARKANSAS.GOV  |
| Yohanes Sugeng                                   | yohanes.sugeng@owrb.ok.gov   |
| Heather Hunziker                                 | Heather.Hunziker@oag.texas.gov   |
|  |  |





# INTERSTATE COUNCIL ON WATER POLICY: SUPPORT FOR USGS STREAMGAGES

**Critical decisions**, that protect **public safety** and support the **economy**, are being made every day based upon real-time information from U.S. Geological Survey (USGS) streamflow gages. These decisions range from mobilizing emergency management teams to respond to impending flooding, determining the amount of water to release to maintain navigation, choosing to use an alternate source of water for treatment due to water quality, to deciding if it is a good day to boat or fish.



The USGS Groundwater and Streamflow Information Program works in partnership with more than 1,450 Federal, regional, State, Tribal, and local agencies to operate more than 8,200 streamgages. These streamgages are funded using federal appropriated funds for Federal Priority Streamgages or Cooperative Matching Funds in combination with funds from the numerous partners.

Consistent, systematically-collected, and publicly available information is paramount to meet the full gamut of water priorities and responsibilities over the long term related to:

- streamflow forecasting;
- planning and warning to protect lives and property;
- design of water infrastructure;
- water-resource appraisal and allocations;
- operation of locks and dams and power production;
- and recreational safety.

**Federal Priority Streamgages (formerly referred to as National Streamflow Information Program):** This network design consists of 4,760 high priority stream locations important for measuring streamflow to meet strategic long-term Federal priorities and responsibilities.

***Issue:*** Currently, only one quarter of the federal priority streamgages are fully funded by the USGS.

## Cooperative Matching Fund Streamgages

The remaining streamgages are also integral to the USGS mission related to hazard mitigation and water availability for human and ecosystem health. The USGS works with over a thousand partners nation-wide using Cooperative Matching Funds to jointly support streamgages.

***Issue: Insufficient Cooperative Matching Funds have resulted in decreased USGS match and increased costs for their partners and limited options to expand the number of streamgages.***

**Funding Request for Groundwater and Streamflow Information Program**  
Groundwater and Streamflow Information  
Cooperative Matching Funds

FY19 President's Request  
\$35M  
\$29M

-\$7.7M lower than FY17 appropriated level

**Funding Support Needed:**

**Streamflow Information Infrastructure (one-time costs)**

**Water Data Infrastructure Modernization** - Upgrade the enterprise data management systems, information technology infrastructure and real-time data delivery capabilities to provide more comprehensive and responsive flood hazard information. Data infrastructure improvements would be spread out over a three year period at about \$37.3M/yr.

Total Funding Need: \$112M

**Streamgage Equipment Modernization and Hardening** - Update streamgage equipment to meet new data transmitting requirements and harden about half the streamgages in the network to withstand major flood events. About 1,500 streamgages would be updated and hardened each year over a three-year period for about \$79.3M/yr.

Total Funding Need: \$238M

**Streamgage Annual Operation and Maintenance (annual costs)**

**Full Implementation of the Federal Priority Streamgage Network** - Provide funding needed to fully implement the plan to operate streamgages at all 4,760 high priority stream locations.

Total Funding Need: \$125M

**Cooperative Matching Funds** – Increase cooperative matching funds to the Groundwater and Streamflow Information Program to increase the streamgage cooperative match with localities and States and/or increase the number of streamgages.

Total Funding Need: \$70M



**Value of Network to our Members**

*“The independent, science-based streamflow information that we obtain from USGS gages is paramount to assuring compliance under our various interstate compacts with our neighboring states.”*

*Julie Cunningham, Oklahoma Water Resources Board*

*“We simply would not be able to run our complex reservoir management models without the trusted streamflow data we obtain from USGS gages throughout our river basin.”*

*Amy Shallcross, Delaware River Basin Commission*



For more information, Contact:

Sue Lowry, Executive Director

[avocetconsult@gmail.com](mailto:avocetconsult@gmail.com)

307-630-5804

[www.icwp.org](http://www.icwp.org)

Report of the Treasurer  
July 1, 2017 – March 31, 2018  
Red River Compact Commission  
April 24, 2018

**Centennial Bank Balance as of 7/1/2017** **\$21,168.16**

RECEIPTS

Member Assessments \$ 2,200.00

Dividend Income \$ 00

TOTAL \$ 2,200.00

EXPENSES

Bank Charges \$ 47.85

Audit \$ 275.00

Meeting Expenses \$

Printing Report \$

Bond \$ 139.00

TOTAL \$ 461.85

**Centennial Bank Balance as of March 31, 2018** **\$22,906.31**

**Simmons First National Bank**  
**Certificate of Deposit Balance as of 2/15/2018** **\$11,253.76**

**TOTAL TO DATE March 31, 2017** **\$34,160.07**



# OKLAHOMA COMMISSIONERS' REPORT

Red River Compact Commission  
Hot Springs, Arkansas  
April 24, 2018



## OVERVIEW & GOALS

The OWRB continues to focus on implementation of the 2012 Update of the Oklahoma Comprehensive Water Plan (OCWP) and the recommendations of the Water for 2060 Final Report:

- Promoting more widespread adoption of water conservation, reuse and recycling— the cheapest, most feasible alternatives for resolving future water shortages—by seeking adoption of the Water for 2060 Advisory Council’s final recommendations and through other efforts;
- Tackling Oklahoma’s \$82 billion future water and wastewater infrastructure needs through agency Financial Assistance loan programs, providing below-market interest rates to communities by leveraging federal grants and Oklahoma’s new Water Infrastructure Credit Enhancement Reserve Fund;
- Allocating and managing water resources more accurately by creating stream water allocation models and reducing the backlog of statutorily required groundwater basin studies and 20-year updates;
- Detecting and assessing threats to Oklahoma’s water resources by efficiently operating the state’s most comprehensive surface and groundwater monitoring program;
- Considering M&I, tourism, recreation, and ecological water needs within Oklahoma’s overall water management framework through lessons learned from the Illinois River Instream Flow Pilot Study;
- Encouraging and working closely with local and regional stakeholders to develop and execute long-range water plans to prevent future water shortages; including actively assisting in the facilitation of the Grand River Comprehensive Water Plan. Currently working on a regional water-budget and water permitting system
- Supporting the Governor and Legislature in working to resolve the water rights and needs of Oklahoma-based tribal nations;
- Finding solutions to promote reuse of Oklahoma’s produced water by facilitating the Governor’s Produced Water Working Group and its initiatives.

## CLIMATE

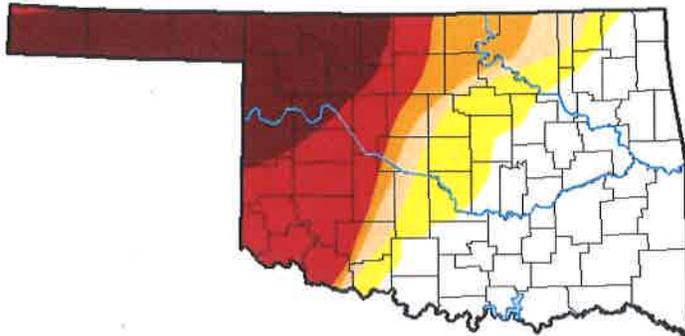
According to the April 19, 2018 U.S. Drought Monitor, a sharp line between no drought and moderate to exceptional drought (D1 to D4) continued to slice across Oklahoma. Abnormal dryness or drought are currently affecting approximately 712,357 people in Oklahoma, but those conditions cover over 58% of the state's area. However, a sharp gradient of precipitation has occurred across Oklahoma since mid-February with the southeast corner of the state receiving ample rainfall with little or no precipitation across the Panhandle. Based on the seasonal outlook favoring below-normal precipitation and above-normal temperatures, drought persistence or development is forecast for western Oklahoma along with western and southern Texas. In mid-April, high-wind events brought blowing dust and a rash of major wildfires to western Oklahoma and portions of neighboring states. The two largest wildfires in Oklahoma have charred more than 300,000 acres of grass and brush and had destroyed more than 100 structures. The Rhea Fire, in Dewey County, had consumed more than one-quarter million acres, while the 34 Complex, in Woodward County, had burned across nearly 70,000 acres.

# U.S. Drought Monitor Oklahoma

**April 17, 2018**  
(Released Thursday, Apr. 19, 2018)  
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

|   | None  | D0-D4  | D1-D4 | D2-D4 | D3-D4 | D4    |
|---|-------|--------|-------|-------|-------|-------|
| Current                                 | 41.71 | 58.29  | 47.44 | 42.07 | 35.54 | 19.50 |
| Last Week<br>04-10-2018                 | 41.72 | 58.28  | 47.44 | 42.07 | 34.85 | 18.35 |
| 3 Months Ago<br>01-16-2018              | 0.00  | 100.00 | 84.04 | 48.14 | 12.10 | 0.00  |
| Start of<br>Calendar Year<br>01-02-2018 | 0.00  | 100.00 | 77.15 | 38.76 | 0.00  | 0.00  |
| Start of<br>Water Year<br>09-26-2017    | 64.46 | 35.54  | 0.77  | 0.00  | 0.00  | 0.00  |
| One Year Ago<br>04-19-2017              | 41.55 | 58.45  | 32.32 | 10.07 | 0.00  | 0.00  |



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

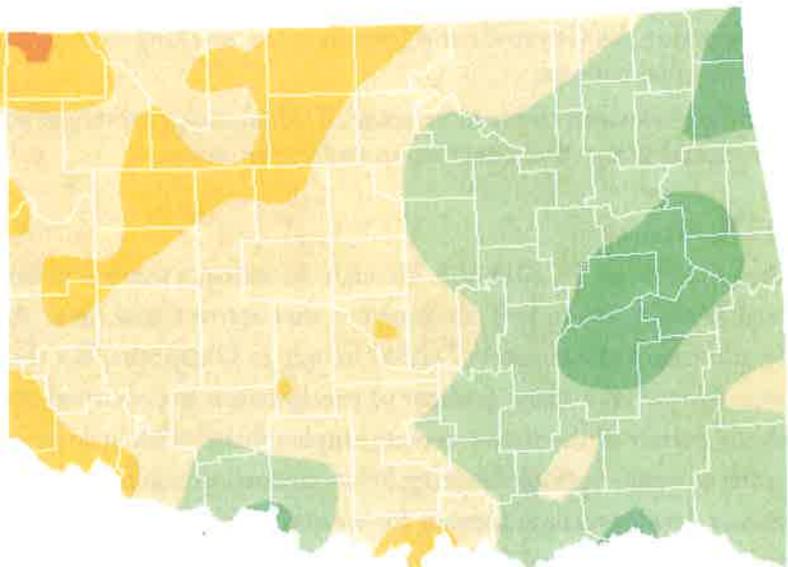
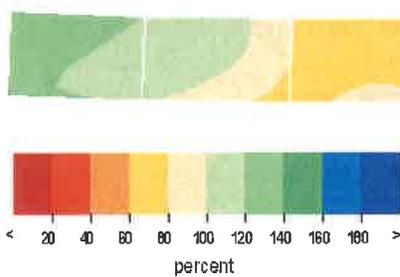
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Brad Rippey  
U.S. Department of Agriculture



<http://droughtmonitor.unl.edu/>



**OKLAHOMA**  
CLIMATOLOGICAL SURVEY

**Percentage of 1981-2010 Normal Rainfall**  
Last 365 Days

Apr 19, 2017 through Apr 18, 2018



## WATER FOR 2060

Since completion of the Water for 2060 Final Report in November 2015, the OWRB has shifted focus to an implementation phase in relation to several of the recommendations found within the report.

This work has included laying the necessary legislative and regulatory framework to expand our options for both reuse of treated waters and the use of marginal waters in the state.

Potable Reuse - The OWRB and ODEQ continue to work on rules for potable reuse in both surface and groundwater by developing rules necessary for aquifer storage and recovery (ASR, see below) and indirect potable reuse (IPR). Efforts are expected to continue in a framework for *direct* potable reuse (DPR) as well over the coming years.

Marginal Quality Water - Use of marginal or brackish waters is being discussed at the legislative level to give OWRB authority to permit water well drillers to complete their wells in the brackish zones. Such waters could be substituted in the O&G industry for hydro-fracking wells. This would save millions of ac-ft of fresh water over the next decade. Additionally, as demand rises and technologies bring down the cost of desalination, brackish water will transition to a more realistic option for WTP upgrades in the future. Updating the State's base of treatable water maps with more detailed information on the 3,000 and 5,000 ppm TDS zones could assist both O&G as well as local communities to find suitable water. We are cautiously optimistic that legislators in this 2018 Session will make such efforts possible.

Supply Reliability - Part of the Water for 2060 initiative was to conserve water without hampering economic growth. Across Oklahoma, as the OWRB steadily completes its statutorily required groundwater basin studies, the resulting allowable withdrawal rate, or "Equal Proportionate Share" (EPS), calculated on a "fully developed" scenario, often goes down by 50% or more. Such results can be seen as burdensome in most basins where actual overall development is only 5% to 10%. Current legislation is moving forward, with little or no opposition thus far, that would allow landowners to *phase-in* their EPS or continue using their default EPS until development within the basin reaches a certain level percentage.

Regional Water & Drought Planning - In addition to policy related work, the OWRB's Planning & Management Division has continued efforts to foster increased regional water planning in portions of Oklahoma who have yet to establish Regional Water Plans or similar guiding documents. Drought contingency and drought resilience is a key part of water planning and fits well with the Water for 2060 platform as communities develop strategies for using, conserving, and sharing resources in concert to better meet future demands. WestFAST, a collection of federal environmental agencies, are working closely with Oklahoma and the Southwest Water Action Team around Altus, OK, to find ways they can assist the region. WestFAST representatives along with state and local officials held a Water Summit in August of 2017 and derived 8 action items for the partners to pursue. More groups such as this have formed and more are expected to begin in the near future throughout Oklahoma. Interest is such that a Senate bill is currently in motion to give additional funding and resources to OWRB to better assist such groups with technical information and some manpower.

Produced Water Working Group - Finally, the Governor's Water for 2060 Produced Water Working Group (PWWG) has continued its efforts in support of the Governor's goal of reducing the amount of produced water injection through the establishment of other economically viable solutions. The PWWG completed its phase 1 high level study to determine the nexus between produced water generation and potential large-scale end users, as well as report and summarize the current status of all the challenges related to produced water in the State. Findings from this study that may be relevant to the Compact Area revealed two feasible options in the near-

term and subsequently evolved into a WaterSMART Feasibility Study from the USBOR. First, a pipeline network for transporting several hundred thousand barrels of PW from the water-rich Mississippi-Lime play serve as frac water for the nearby water-poor STACK play. Such a move would both reduce the current injection volumes, potentially saving billions of gallons of fresh water reserves annually in counties located in the STACK play. The second option involved assessing various evaporation technologies and their economic and environmental viability as a long-term solution. A more in depth look at these ideas began in mid-September and workshops with industry were held in January 2018. A full report is expected fall of 2018. More information on the PWWG, including the latest Study, can be found here: [www.owrb.ok.gov/pwwg](http://www.owrb.ok.gov/pwwg).

Water for 2060 Work Group - A new 2060 Work Group has formed made up of state agencies, larger cities, and NGO's to take on the challenge of making water conservation and the Water For 2060 initiative into a statewide movement. While still in the very early stages, the Work Group is looking at how they can take existing work they are already doing and focus it into a broader, more far-reaching water conservation campaign. More information on Water for 2060, including a PDF of the Final Report, can be found here: [www.owrb.ok.gov/2060](http://www.owrb.ok.gov/2060).

## AQUIFER STORAGE AND RECOVERY

In 2016, the Oklahoma Legislature and Governor Mary Fallin approved Senate Bill 1219 to authorize the OWRB and ODEQ to establish a process for citizens or communities to construct ASR projects. A working group, consisting of state regulators, consulting engineers, scientists, and community leaders, has studied the issue since the summer of 2015 while holding informal public meetings on recommendations for groundwater quality standards.

In February 2017, the OWRB took the first step toward fulfilling the goal of SB 1219 by voting to approve a proposed package of rule amendments to Oklahoma's Water Quality Standards (WQS). The rule provisions were ultimately approved by the Governor in June 2017. The rule amendments to Oklahoma's WQS provide distinct protection for domestic use of untreated groundwater supplies; provide both narrative criteria to be applied to all uses and numeric criteria (primary and secondary MCLs from Safe Drinking Water Act and other human health criteria) specifically applicable to water supply groundwater that will utilize ASR.

A new statute allowing for Limited Scale Pilot studies was approved during the 2017 legislative session. OWRB and ODEQ are currently in the process of promulgating rules for the permitting of ASR facilities. These rule amendments are expected to be finalized in the fall of 2018. This innovative water-management tool will help Oklahomans secure reliable water supplies for decades to come.

## WATER RIGHTS PERMITTING

In 2017, as the state's designated water management agency, the OWRB issued 118 regular permits (65 groundwater & 53 surface water) for a total of 256,231 acre-feet (32,632 groundwater & 223,599 surface water). In addition, the OWRB has issued 1,829 Provisional Temporary (90-Day) permits (372 groundwater & 1,457 surface water). OWRB staff currently track water use and maintain more than 13,000 permits for approximately 2.9 million acre-feet of surface water per year and 3.8 million acre-feet of groundwater per year.

## FLOODPLAIN MANAGEMENT

Floodplain staff continues to conduct Community Assistance Visits, Community Assistance Contacts, and public outreach through various field visits, conferences, technical assistance, and workshops. Floodplain staff also developed new course material for Oklahoma's Floodplain Administrator Accreditation Program. OWRB

staff coordinated with the Oklahoma Floodplain Managers Association (OFMA) and NOAA to provide Low Water Crossing mapping of over 400 Turn Around Don't Drown Sign locations to be synchronized with NOAA Weather Prediction system and the Oklahoma Public Alert System enabling emergency alerts to Oklahoma residents. OWRB partnered with OFMA to distribute an additional 110 new Turn Around Don't Drown Signs across 15 Oklahoma communities. OWRB delivered mapping products in three watersheds as part of FEMA's RiskMAP, bringing critical protection and planning tools to a total of eight Priority Watersheds through the Cooperative Technical Partners Program. Floodplain staff leveraged GIS technology to develop mobile data collection surveys to facilitate field work and automate reporting, and published a new and improved interactive flood hazard map for the agency website. Finally, OWRB Floodplain staff partnered with OFMA, KGOU and KOSU for radio underwriting announcements which provide flood insurance and flood safety information to a statewide audience.

## **DAM SAFETY PROGRAM**

OWRB staff completed 24 low hazard-potential dam inspections and provided inspection reports with breach inundation maps to dam owners at no cost. Staff is conducting more detailed analyses for several dams that have potential to be reclassified. Since 2010, Oklahoma dam safety program prioritize the development of Emergency Action Plan (EAP) for more than 350 high hazard dams in the state. Due to this initiative, 96% of high hazard dams in Oklahoma have an up-to-date EAP on file. The OWRB Dam Safety program hosted a 3-day HEC-RAS 2D workshop in Oklahoma City in April, 2017 which was attended by fifty four engineers and dam safety officials representing private firms, local governments and 14 states. OWRB Dam Safety program also hosted a series of dam safety workshops in multiple locations throughout 2017 and 2018 for the licensed realtors to provided information to their clients about the responsibilities of owning a dam. Effective as of November 1st 2017, Oklahoma Real Estate Commission added two questions to the Residential Property Condition Disclosure form which requires sellers to state if dam(s) and well water(s) are located on their property. In order to reduce the risk of life and property downstream, OWRB also used a portion of the FEMA National Dam Safety Program to partner with Oklahoma Tourism and Recreation Department to fund the engineering costs associated with repairs and modifications to 2 deficient high hazard dams. Along with reimbursement for engineering costs, funding recipients will receive free detailed plans and specifications as well as technical assistance from the OWRB and a third party consulting engineer.

## **WELL DRILLER AND PUMP INSTALLER PROGRAM**

In January, the WDPI program supported the Oklahoma Ground Water Association (OGWA) at their annual conference and tradeshow, to assist more than 150 certified operators meet their continuing education licensing requirements. The OGWA and the WDPI program have partnered up again this year to present 9 continuing education workshops across the state to support industry licensing requirements, with 3 workshops already accomplished. In cooperation with Oklahoma Real Estate Commission (OREC), several workshops were conducted for real estate agents regarding dam safety, floodplain, and well driller program, with a very positive response from real estate professionals and more workshops to come. In cooperation with the Well Driller's Advisory Council and the International Ground Source Heat Pump Association, program staff drafted updates to the minimum standards for constructing heat exchange wells, potentially making Oklahoma the first state to incorporate recommendations from the cutting-edge C448 Series 2016 ANSI international standard. Since January, OWRB staff responded to more than 15 public and industry generated complaints, and performed nearly 30 inspections of groundwater wells across the state. As of the April Board meeting, licenses have been issued to 3 new firms, and certificates have been issued to 14 new operators, and a new member from the

industry was appointed to serve on the Well Drilling and Pump Installation Advisory Council. Program staff completed the digitization of all licensing and certification records to a document management database, and has now begun participating in a digital complaint management tracking system. The WDPI program is currently working with OWRB Records Management staff to perfect a digital workflow that will be used to guide WDPI program staff and licensees seamlessly through the licensing process.

## ADDITIONAL GROUNDWATER STUDIES

Consistent with state law, the OWRB continues to focus on several ongoing hydrologic studies to determine amounts of water that may be withdrawn from Oklahoma’s groundwater basins by permitted water users. Several projects began in fiscal year 2018 including the Boone/Roubidoux aquifer system in northeastern Oklahoma and the Salt Fork of the Arkansas River.

The Rush Springs aquifer study, initiated in 2011 in support of the Upper Washita River Basin project, has been completed and is currently awaiting publication. The OWRB anticipates completing work on the Upper Washita Basin Study in December 2018, a project conducted in collaboration with the Bureau of Reclamation, Foss Reservoir Master Conservancy District, and Fort Cobb Master Conservancy District. The OWRB is also working on groundwater hydrologic investigations in-house as well as contractually with the US Geological Survey.

In February 2017, the US Geological Survey, in cooperation with the OWRB, published a report on the Canadian River Alluvial and Terrace Reach 1& 2 aquifer which quantified its groundwater resources and evaluated the effect of pumping stresses on the aquifer for periods of 20, 40, and 50 years into the future using numerical groundwater flow models.

## WATER INFRASTRUCTURE FINANCING

The OWRB administers the State Financial Assistance Program (FAP), backed by the Statewide Water Development Revolving Fund, which awards loans and grants for the construction and improvement of water and sewer facilities. In all, through the OWRB’s five loan and grant programs, more than \$3.9 billion in financing has been provided for water and sewer projects in Oklahoma with a total estimated savings of more than \$1.3 billion to Oklahoma communities. In 2017, 37 loans were approved totaling \$276,817,984.60, and 14 grants totaling \$1,332,610.79 were approved by the Board.

| PROGRAM                       | NUMBER AND AMOUNT                 |
|-------------------------------|-----------------------------------|
| FAP Loans                     | 384 for \$1,051,865,000           |
| CWSRF Loans                   | 320 for \$1,550,989,377           |
| DWSRF Loans                   | 194 for \$1,228,083,300           |
| REAP Grants                   | 675 for \$59,561,641              |
| Emergency Grants              | 575 for \$34,178,455              |
| Drought Response Grants       | 6 for \$418,848                   |
| Special Purpose               | 8 for \$2,625,000                 |
| <b>TOTAL (as of 04/19/18)</b> | <b>2,163 for \$3, 928,006,119</b> |

The Water Infrastructure Credit Enhancement Reserve Fund—a \$300 million pledge of credit from the state enabled through an OCWP priority recommendation and subsequent passage of State Question 764—has been instrumental to sustaining a rating of AAA for the State Revenue Bond Loan Program from three major rating services. The rating allows municipalities and rural water/sewer districts to receive loans from the program at lower interest rates than what they could receive through conventional financing.

The Financial Assistance Division has funded projects in 33 counties within the Red River Basin totaling \$662,108,224.54 for water and wastewater infrastructure projects.

## WATER QUALITY MONITORING, MAPPING AND WATER QUALITY STANDARDS

The Oklahoma Water Resources Board (OWRB) water monitoring staff announced the release of the agency's 2017 Beneficial Use Monitoring Program (BUMP) reports providing detailed physical, chemical, and biological water data from approximately 1,300 stream, lake, and groundwater well sites across Oklahoma. Created in 1998, BUMP provides data necessary for water quality management decisions by identifying impairments to the "beneficial uses" of Oklahoma's water resources, as well as determining causes for those water quality impairments. The water data contained in the OWRB's annual BUMP report is collected from about 130 lakes and 100 stream segments at approximately 600 sites throughout Oklahoma. For additional information, visit the OWRB's Monitoring & Assessment page: [www.owrb.ok.gov/bump](http://www.owrb.ok.gov/bump).

The Groundwater Monitoring and Assessment Program (GMAP), added to BUMP in 2012, consists of a network of approximately 750 wells in Oklahoma's 21 major aquifers, where the OWRB monitors both water levels and water quality. Assessing Oklahoma's groundwater is achieved through both a baseline monitoring network and a long-term (trend) monitoring network within each of the state's 21 major aquifers. This provides information on individual aquifer characteristics as well as a more general assessment of the Oklahoma's groundwater.

Revision topics for the 2017-2018 Interim Rulemaking included changes to Oklahoma's anti-degradation policy and implementation rules (785:45-5; 785:46-13), implementation rules for Sensitive Water Supply—Reuse Waters (785:46-13), implementation policies for the Oklahoma Groundwater Quality Standards (OGWQS) (OAC 785:45-7), and site specific copper criteria for Mud Creek in southeastern Oklahoma. For information on the draft rule revisions and to view revised language, please visit the OWRB website at [http://www.owrb.ok.gov/util/rules/wqs\\_revisions.php](http://www.owrb.ok.gov/util/rules/wqs_revisions.php). Also, standards changes proposed in the most recent interim revision were recently approved and became state rule in September. Changes relevant to the compact area included:

- Revisions and updates to the Oklahoma Groundwater Quality Standards (OGWQS) (OAC 785:45-7). The revision included the addition of an updated anti-degradation policy for groundwater, revisions to classifications of fresh groundwater, development of a new Domestic Untreated Water Supply beneficial use, and promulgation of numeric and narrative criteria for recharge projects to groundwater.
- Development of rules outlining how a waterbody is re-classified from a Sensitive Water Supply (SWS) designation to a Sensitive Water Supply Reuse (SWS-R) designation. Language outlining the water quality data required to justify the new designation was approved and work will continue on the detailed technical guidance documents that will be developed to continue to move the Indirect Potable Reuse (IPR) process forward.

The OWRB has completed work on the 2017 National Lakes Assessment Study. Sampling on numerous lakes across Oklahoma provides data to assess environmental integrity of the waters of the nation. Work will begin in the summer of 2018 on the "next round" of the National Rivers and Streams Assessment Study collecting data to assess wade able and non-wade able streams over a two year time frame.

The OWRB's groundwater monitoring team assessed Licensed Managed Feeding Operations (LMFO) compliance in an additional 550 wells through a continuing partnership with the Oklahoma Department of Agriculture, Food and Forestry (ODAFF). OWRB Staff continues data migration into the AQUAMS database and enhancement of the database to allow the public greater access to data and to provide tools that streamline the data assessment process for OWRB staff.

## HISTORIC WATER RIGHTS AGREEMENT

In August 2016, the State of Oklahoma, City of Oklahoma City, and Choctaw and Chickasaw nations announced a historic water rights settlement agreement that settles longstanding lawsuits involving water rights in south central and southeastern Oklahoma.

The settlement, which was approved by Congress and signed by President Barack Obama in January 2017, resolves long-standing questions over water rights ownership and regulatory authority over the waters of the Choctaw and Chickasaw nations' historic treaty territories, an area that spans approximately 22 counties in south-central and southeastern Oklahoma. Under the agreement, the state remains the authority to manage and protect water resources in Oklahoma. This way, existing uses of water remain secure, and it provides certainty for future development.

The agreement also gives the Choctaw and Chickasaw nations a voice in specific proceedings addressing water resources within their treaty territories. It also fully resolves the state's debt to the federal government for the construction of Sardis Lake, ensuring Oklahoma City has a reliable water supply while providing a standard to protect lake levels in Sardis, which all agreed is very important. A mechanism is in place to collaboratively address any possible out-of-state water use if out-of-state water use is ever authorized by the Legislature. It provides protections for the source basin and region while ensuring the entire state benefits.

With this agreement, the rural communities and recreational and ecological values of south-central and southeastern Oklahoma are preserved and protected. And Oklahoma City has a path to obtain access to sufficient water to secure the economic posterity of central Oklahoma for generations to come. Without this agreement, existing water rights – for urban, agricultural, industrial uses – and development for future uses and needs would have remained uncertain.

The agreement protects existing rights and provides certainty for the development of future water uses both in and outside southeastern Oklahoma. More information about the agreement can be found by visiting [www.waterunityok.com](http://www.waterunityok.com)

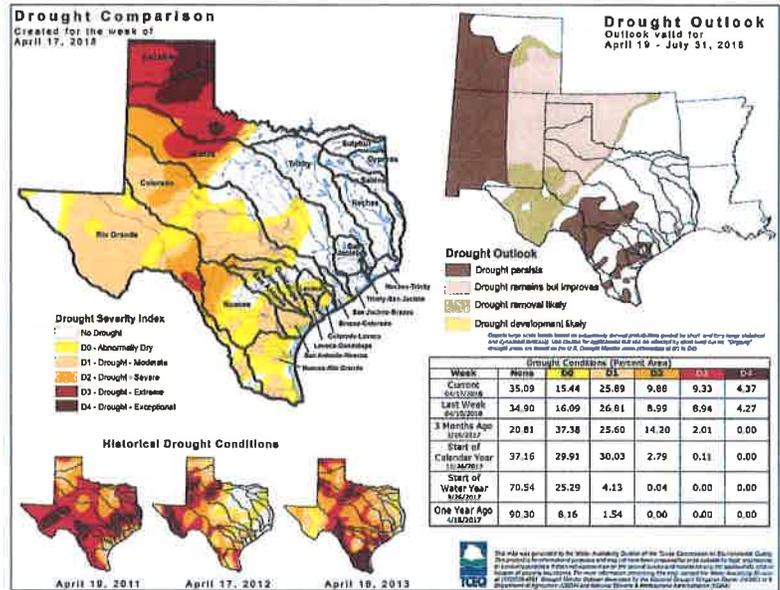


# Red River Compact Commission Texas Commissioners' Report April 24, 2018

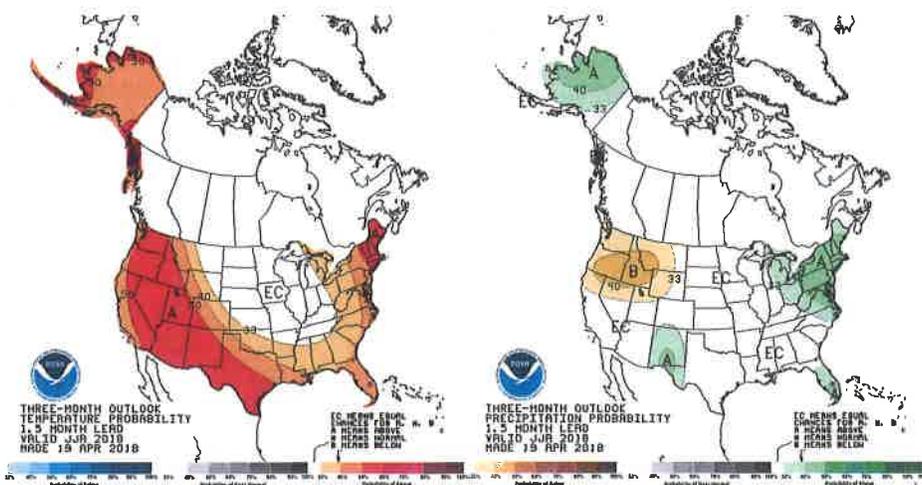
## Weather and Drought Conditions

As of April 17, 2018, the United States Drought Monitor shows about 65% of Texas in some level of drought conditions and a little less than 14% in either extreme to exceptional conditions. This compares to only about 1.3% of Texas in any level of drought conditions and a little less than 10% in abnormally dry conditions one year ago.

Much of the extreme to exceptional drought conditions occurs in the West Texas and Panhandle regions. This includes the upper reaches of the Red River, resulting in almost 80% of the Red River Basin in Texas in abnormally dry to exceptional drought conditions. In comparison, the eastern reaches of the Red River, as well as the Sulphur River and the Cypress Creek basins have zero drought conditions.



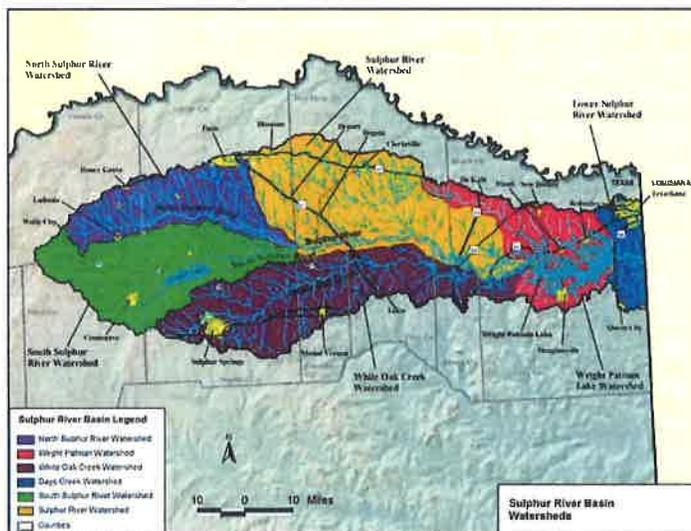
The NOAA Climate Prediction Center's Seasonal Drought Outlook is predicting that the drought conditions in northwest Texas will remain but may improve in some areas over the next few months. However, there is about a 50-60% chance of above normal temperatures and an equal chance of any level of precipitation through the summer. According to the ENSO diagnostic discussion issued April 12, 2018, a La Niña advisory is still in effect. La Niña is expected to transition to ENSO-neutral during April-May, with ENSO-neutral then likely (greater than 50% chance) to continue through the summer.



### Texas Sunset Advisory Commission Review

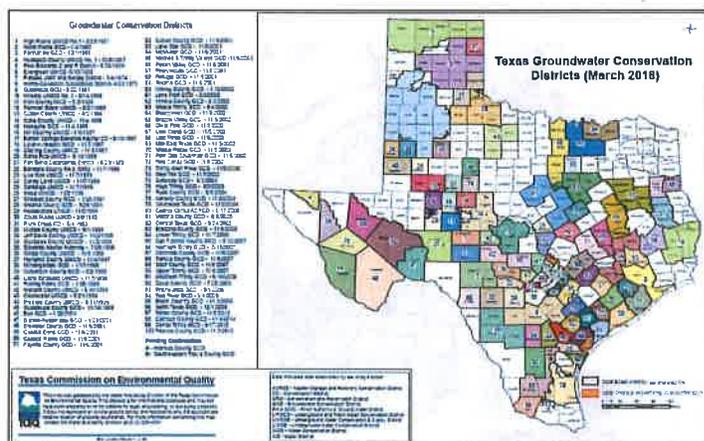
In recent years, various solutions to provide water supplies within the Sulphur River Basin have become contentious between stakeholders. The Sulphur River Basin Authority (SRBA) is a public agency created by the Texas Legislature to provide for the conservation and development of natural resources within the Sulphur River Basin. It is authorized to conduct a broad range of activities, including building and operating reservoirs, selling raw and treated water, conducting wastewater treatment, generating electricity and other operations.

In 2017, the Texas Legislature passed HB 2180 to address the recommendations of the Texas Sunset Advisory Commission regarding their 2016 review of the SRBA. This law makes structural and operational changes to the SRBA board to increase its transparency and better position it to meet the needs of the Basin.



### Groundwater

In Texas, a landowner owns the groundwater below the surface of the landowner's land, subject to 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 September 2017, a total of 102 GCDs have been created, covering all or part of 180 of the State's 254 counties. There are currently eight GCDs in the Red River Basin in Texas.



Texas courts have made it clear that if a GCD's regulations go too far, a landowner may recover just compensation for the taking of his private property based on a monetary impact of the regulation. This was confirmed in 2016 when a Texas jury decided the first case in Texas history in which a landowner successfully sued a government entity for limiting their access to groundwater without compensation.

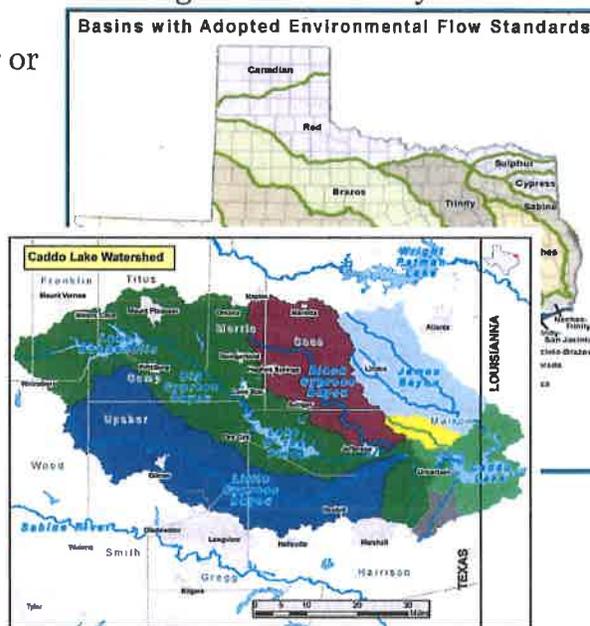
## Environmental Flows

The Environmental Flows Advisory Group of the Texas Legislature has not yet set a schedule for consideration of environmental flow standards in the Canadian, Red, Sulphur or Cypress Creek basins. However, some water rights in these basins do include permit conditions to protect the environment.

Founded in 1992, the Caddo Lake Institute (CLI) is a non-profit scientific and educational organization with the mission of protecting the ecological, cultural and economic integrity of Caddo Lake, its associated wetlands and watershed. The CLI has a new executive director, Laura-Ashley Overdyke, and administrator, Erica Bebeau, with offices in Shreveport, Louisiana.

The Caddo Lake Flows Project was initiated in 2004 by the CLI and the Nature Conservancy, in partnership with U.S. Army Corps of Engineers (USACE), the Northeast Texas Municipal Water District (NETMWD), TCEQ's partner for the Cypress Creek Basin Clean Rivers Program, and others. The project goals are to develop consensus recommendations for environmental flow standards for consideration by State agencies, to determine the feasibility of a new operating plan for releases from Lake O' the Pines to provide some of the instream flows in Big Cypress Bayou, to obtain official recognition of the environmental flow regimes in the official State program, and to develop a long-term adaptive management process for the Cypress Creek basin. According to the CLI website, a series of meetings have been held with natural resource experts and stakeholders from the basin to develop recommendations for environmental flow regimes that mimic the natural flow patterns with monthly, seasonal and yearly variations. Studies were conducted both to test the early recommendations and build a baseline for future reference.

The USACE and the NETMWD have committed to implementing the flow regimes for Big Cypress Bayou with releases of water from Lake O' the Pines for a five-year test period, to the extent water is available. In exchange, the conditions in Big Cypress Bayou and Caddo Lake would be monitored to evaluate the benefit of the releases. One of the experiments is the reintroduction of the American paddlefish. Monitoring projects include tracking changes in soil moisture and vegetation in areas inundated by the recommended high pulse flows.



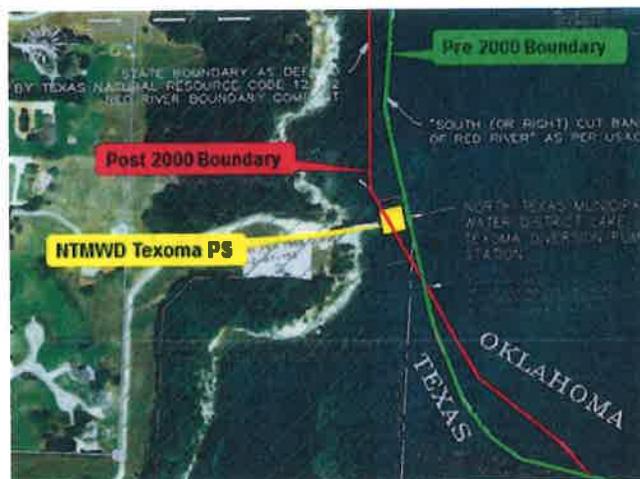
The environmental flow recommendations have been included in the 2017 State Water Plan. The USACE has agreed to provide Caddo Lake with the requested flows. There is a possibility that a feasibility study will be conducted to change the operation and outlet structure of Caddo Lake to allow more flexibility in outflows. So far, the Project has been within the scope of Compact and the rules of the Commission. Proposals for lowering Caddo Lake for cypress regeneration, invasive species management or other purposes, by pumping when the lake is not spilling would also be subject to the limits in the Compact and current Commission rules and coordinated with the Commission.



Additional information on Caddo Lake and its watershed can be found on CLI's data website - [www.caddolakedata.us](http://www.caddolakedata.us).

### Red River Boundary Commission of Texas

In 2000, the states of Texas and Oklahoma signed the Texoma Area Boundary Agreement which established the states' boundary in the Lake Texoma reach and located the boundary on a set of USGS topographic quadrangle maps. Subsequently, a portion of the pump station which had been constructed by the North Texas Municipal Water District (NTMWD) in 1989, was shown to be located within the state of Oklahoma.



In 2009, the invasive zebra mussels were found in Lake Texoma and caused the NTMWD to curtail pumping at the intake facility to prevent the interstate transfer of the mussels per the federal Lacey Act. In 2013, the Texas Legislature re-established the Red River Boundary Commission of Texas to work with representatives of the State of Oklahoma to redraw the boundary between Texas and Oklahoma in the Lake Texoma reach to ensure that it complies with the intent of the Red River Boundary Compact and the Lacey Act. In addition, the bill requires that there is no net loss of property between either state to ensure that the redrawn boundary does not increase the political power or influence of either state.

In 2014, the Texas and Oklahoma governors signed a Memorandum of Understanding agreeing on the operation of the NTMWD facility in Lake Texoma. In 2013 and 2014, U.S. Congress also passed legislation to exempt NTMWD from certain provisions of the Lacey Act for purposes of the invasive zebra mussels. In 2017, the Texas Legislature

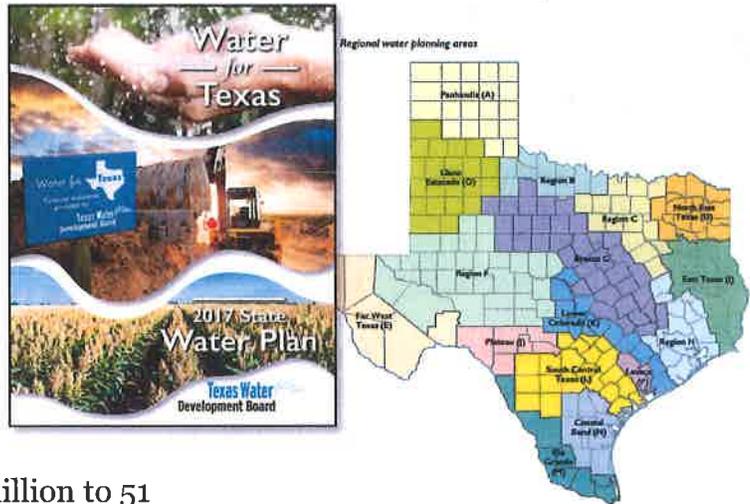
passed a bill which continued the Texas Commission's efforts through 2021 to work with Oklahoma to redraw the boundary and eliminate any future impacts to the Lake Texoma facilities due to potential invasive species transfers or other issues.

### 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.



According to the 2017 State Water Plan,  
by 2070 over **811,000** acre-feet  
of water will come from municipal conservation.  
That's enough gallon jugs\*  
to circle the Earth  
**942** times!  
\* stacked side by side



#txwater  
Texas Water  
Development Board

## 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 2018 funding cycle of the SWIFT program have been submitted.

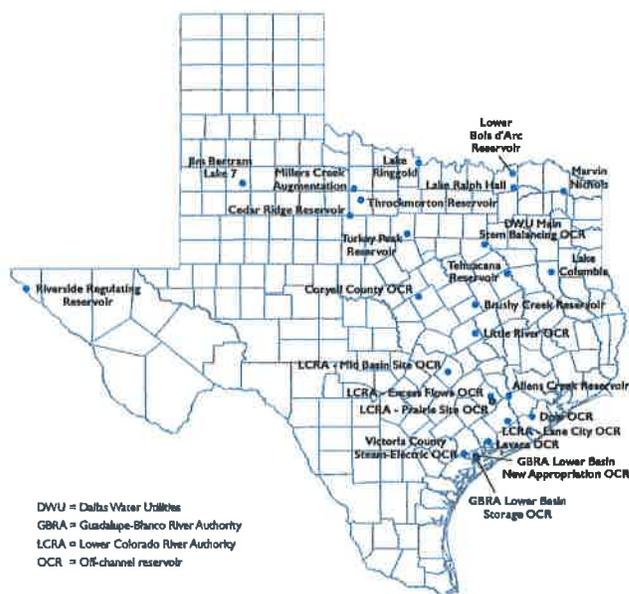
Through fiscal year 2017, SWIFT has committed over \$5.6 billion for projects across Texas. For the 2018 funding cycle, the TWDB anticipates being able to accommodate approximately \$770 million in new applications and \$1.2 billion in recurring multi-year commitments.

Projects must be listed in the 2017 State Water Plan to be eligible for SWIFT program financial assistance. The TWDB is considering an important change for this cycle—the increase of subsidies offered for rural and agricultural projects. Preliminary projections indicate a subsidy level of up to 50% for loans. This year's cycle will provide non-rural entities with interest subsidies that range from 16% to 35% depending upon the length of the loan and type of project.

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



## Red River Compact Commission - Louisiana's 2018 Annual Report

Louisiana continues to be concerned with deficient stream flows at the state line on some streams in Reach IV. These streams are the Boeuf River, Bayou Bartholomew, and Bayou Macon. Of the three streams mentioned, Boeuf River and Bayou Bartholomew were of the greatest concern this year.

Louisiana continues to send weekly gage reports of stream flow on a monthly basis to, among others, Arkansas' Commissioners. These reports show that Bayou Bartholomew had a 25% increase deficient flows from last year with 12 consecutive one week periods below 80 CFS. In the same period, we observe an increase in deficient flows on the Boeuf River. The number of days when the Boeuf River flow was less than 40 CFS this year was 103 days, which is comparable to 104 days of deficient flow observed last year. On the Boeuf River, there were eleven one week periods below Compact requirements. During the eleven week flow deficiency, only approximately 10 to 20 percent of the flow at Eudora, AR crossed the Arkansas-Louisiana state line, which is below Louisiana's equitable share of 40 percent. Lastly, these weekly gage reports show over two weeks of deficient flows on Bayou Macon.

The Louisiana Commissioners continue to be concerned that future demands for water are likely to produce even more serious flow deficiencies at the state line. We ask Arkansas to implement effective and real-time withdrawal control measures to provide the "equitable apportionment of such waters" at the state line, as is stated in the Preamble to the Red River Compact and stated more specifically in Section 7.02 as a flow equal to forty (40) percent of the weekly runoff originating below or flowing from the last downstream major damsite in Arkansas.

While Arkansas does not guarantee to maintain a minimum low flow for Louisiana in Reach IV, when flows on these streams fall below a specified cubic feet per second, Arkansas pledged "to take *affirmative steps to regulate the diversions of runoff* originating or flowing into Reach IV in such a manner as to permit an equitable apportionment of the runoff...to flow into Louisiana" (emphasis added; see Section 7.03 of the Compact).

Based on the information available to Louisiana, we believe Arkansas continues to violate the terms of the Compact by not regulating the diversions of runoff in such a manner to permit an equitable apportionment of the streams in Reach IV, Sub-basin 2. The Commissioners from Louisiana further ask their counterparts in Arkansas to ensure that they have the legal authority and mechanisms in place to regulate those diverting runoff in Sub-basin 2, Reach IV. To the extent Arkansas does not have those mechanisms already in place and to the extent it has prioritized other uses over Louisiana's equitable share, Louisiana considers such legal and regulatory deficiencies a violation of the terms of the compact and an unnecessary delay in compliance.



## **2018 Report of the State of Arkansas to the Red River Compact Commission**

### **Compact Compliance**

Based on the results of Arkansas Natural Resources Commission (ANRC) investigations into compact compliance in the Boeuf River watershed, Arkansas has concluded the following:

- a) Arkansas has taken affirmative steps through ANRC investigations and efforts to ensure and verify Louisiana is receiving its apportionment of runoff from the Boeuf River watershed.
- b) Arkansas has no evidence to contradict ANRC's conclusion that Louisiana is receiving its apportionment of runoff from the Boeuf River watershed as specified in Subbasin II provisions.
- c) There is no legal or administrative requirement in Subbasin II provisions to maintain a minimum flow at the Arkansas-Louisiana state boundary.
- d) Uncertainties associated with significant hydrologic manipulation in the Boeuf River watershed, quantification of instantaneous diversion and runoff, and currently available engineering methods prevent establishment of a direct "cause-and-effect" relationship between water use in Arkansas and Boeuf River flows at the state boundary sufficient to justify regulation of diversions.
- e) Monitoring actions recommended by ANRC staff in the Boeuf River Report are appropriate and sufficient to identify any future reoccurring low flow duration pattern(s) at the state boundary that warrant further compact compliance deliberation.

### **Drought planning**

A major recommendation in the Arkansas Water Plan is to develop a coordinated drought contingency response network. This would include state, regional and local agencies with constitutional and statutory water management duties, federal agencies; drinking water utilities, organizations, and institutions; and the private sector. The network will alert the public about impending droughts, share consistent messages and information, and provide information on voluntary conservation measures to reduce water use.

ANRC entered a contract with a consulting firm to assemble the Drought Contingency Response Network and to facilitate two workshops to move this recommendation forward. The initial meetings focused on:

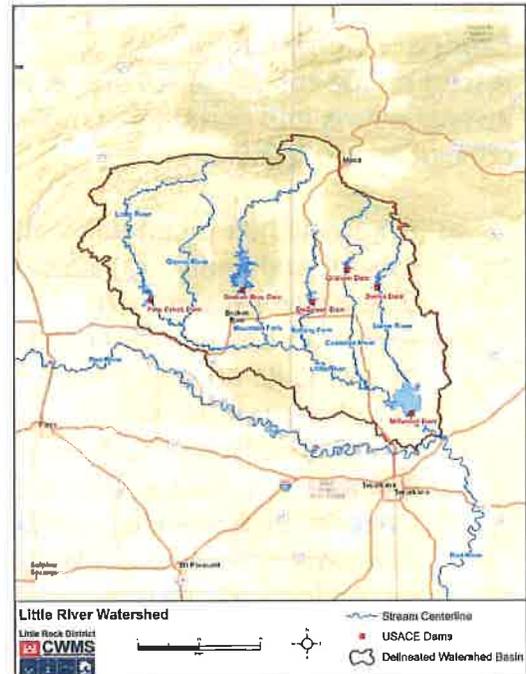
- f) Monitoring, Early Warning, and Prediction
- g) Risk, Impacts, and Vulnerabilities
- h) Mitigation and Response

The final report should be issued in May.

We now have a core group ready to deal with drought issues. We will also dovetail this process with the Arkansas Department of Emergency Management's All Hazards Mitigation Plan.

## **Drought Planning Assistance to States (PAS) project, Little River Basin**

ANRC and the US Army Corps of Engineers Little Rock District have entered into a PAS agreement to establish a group of water-resource partners, representatives and individuals that would have in-depth knowledge of water needs in the Little River basin through a series of 3 – 4 meetings. This Drought Contingency Group (DCG) will initially include representatives from State and federal agencies, drinking water utilities, farming representatives and the private sector. Additional group members may be added as appropriate. USACE's role will be to assist with the coordination of the meetings which will include water-supply experts from the Little Rock District.



The DCG will research Drought Contingency Plans (DCPs) in surrounding states and identify specific conditions that are used to issue a drought declaration in those states. This will involve intense discussions and will include the analysis of various information sources that are, can or should be available to make a drought declaration. USACE's role will be to assist with the coordination of DCG meetings and to lead discussions pertaining to water-supply as well as providing reservoir inflow and release data, analysis of those data, and interpretation of the results. A series of 2 - 4 "what if" drought scenarios will be "tested" in these meetings so that each member of the DCG will understand each other's needs and how one agency's decision to curtail water use might affect another's availability of water to use for their specific needs or interests. After the "what if" scenarios are complete, the USACE will use this information to update the drought contingency plan for the Little River basin.

## **Sun Bio Non-Riparian Permit**

The non-riparian water use permit for construction of a water intake facility on the Ouachita River at Arkadelphia was issued by ANRC in 2017 to allow approximately 25 million gallons per day to be withdrawn from the river for production of forest products.

## **Multi-State Extreme Precipitation Study**

Mississippi, Louisiana, and Arkansas are cooperating on a study to determine probable maximum precipitation. The project results will be used to ensure that emergency spillways and other facilities at permitted dams are sized properly for downstream safety.

### Watershed Management Plans

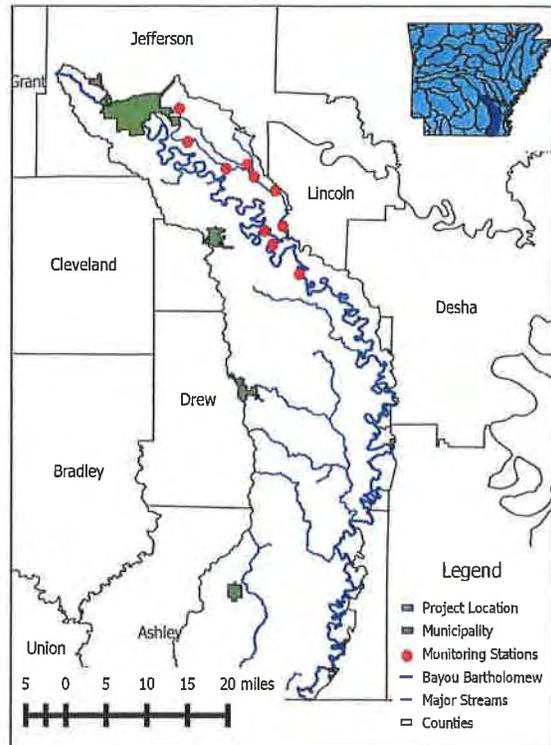
The Arkansas Non-Point Source Management Plan designates three 8-digit Hydrologic Unit Code (HUC) watersheds in the Compact area as “Priority Watersheds.” They are the Upper Saline, Lower-Ouachita-Smackover, and Bayou Bartholomew watersheds. Watershed management plans have been completed for Little River and Bayou Bartholomew.

### Bayou Bartholomew water quality monitoring 319 Project

The final project report was recently released for a project financed by ANRC’s “Section 319” program that monitored water quality in the Bayou Bartholomew Watershed.

This is a priority watershed within the State’s Non-Point Source Pollution Management Plan. Bayou Bartholomew is listed as impaired. From October 2013 through September 2017, pollutants were monitored in the upper reaches of the watershed. Ten permanent water quality monitoring stations were established and produced data to determine loads contributed by 12-digit watersheds within the project area.

Monitoring found that non-point source runoff continues to impair the bayou.



### Groundwater

The Sparta Aquifer is continuing to recover because of Union County’s surface water project for industry and thermoelectric power generation. The static water level in all monitored wells is rising. One well has risen over 117 feet since 2001. This is 79.7 percent of the way to the top of the formation.

### Poultry operations and plans

Arkansas requires registration of poultry operations that house 2,500 or more birds at any given point during a calendar year. In the Red River Watershed counties there are 2,506 poultry houses. Total bird capacity of operations in the watershed is 48,496,206. The latest reported litter generated annually is 414,627 tons.

Arkansas has “Nutrient Surplus Areas” in the Arkansas and White watersheds to the north of the Compact. Litter management plans are required in these areas, and time, place, and manner of application is regulated by ANRC. Applicators must be certified and must keep records.

In the Compact area, ANRC does not require plans or certification. However, many of the poultry integrators require nutrient management and poultry litter management plans. ANRC offers training for plan writers and applicators online and also helps finance water quality technicians in conservation districts to write plans.

### **Red River Navigation Study**

This effort, led by the Arkansas Red River Commission in cooperation with the US Army Corps of Engineers Vicksburg District, continues to study the economic feasibility of extending navigation farther upstream on the Red River. Ongoing work includes surveying potential shippers to determine whether they would use the navigation system if built, and if the estimated volume to be shipped will justify the infrastructure investment.

### **Southeast Arkansas/Northeast Louisiana Feasibility Study**

The Boeuf-Tensas Regional Irrigation Water District, State of Louisiana, and ANRC have been working with the US Army Corps of Engineers Vicksburg District to analyze the potential for ecosystem restoration in the Boeuf River and Bayou Bartholomew watersheds. The latest report finds there are ecosystem restoration options that likely have federal interest. Gravity feed was considered to supply water for ecosystem restoration. However, the analysis indicates it is not reliable enough to ensure significant ecosystem benefits. The report further considered whether agricultural water supply could be added to the ecosystem restoration and found that 100-150 cfs may be available for water supply, but the total project costs would exceed \$60 million. Bayou Bartholomew is an ecologically sensitive stream and diverting Arkansas River water into this stream could introduce invasive species such as zebra mussels and snakehead. The Arkansas River water mineral content is very different from that in Bayou Bartholomew and could cause ecological harm. Although there may be ways to treat the water between the Arkansas River and Bayou Bartholomew, it is likely not feasible in the opinion of the Corps of Engineers. More water for agricultural water supply may be available for Boeuf Bayou from the Mississippi River near Lake Chicot or farther south.

### **National Flood Insurance Program**

ANRC coordinates the National Flood Insurance Program (NFIP) with FEMA Region 6. This includes working with and training the communities that have adopted floodplain ordinances. Upcoming training in the Compact area includes sessions on April 19 in Hope, May 1 in Monticello, and May 3 in El Dorado. These are basic courses focusing on the duties and responsibilities of the floodplain administrator, the permitting process and how to address potential violations.

ANRC is a "Cooperating Technical Partner" (CTP) with FEMA's Risk MAP program. This involves a "Discovery Process" on the 8-digit watershed scale to identify communities that can be provided more precise flood mapping products, risk assessment tools, and planning and outreach support to strengthen local ability to make informed decisions about reducing risk. ANRC is currently working in the Lower Little, Arkansas-Oklahoma Watershed which includes portions of Hempstead, Howard, Little River, Pike, Polk, and Sevier Counties. Flood damage claims paid in these counties

have exceeded \$1.1 million since 1978, and there are over 200 National Flood Insurance policies. Flood risks and opportunities for mitigation exist throughout the watershed: Little River and Sevier Counties do not have modernized Flood Insurance Rate Maps (FIRMs), while Pike County has no FIRMs at all.

The Flood Mitigation Assistance Grant Program administered by ANRC has funded hazard mitigation plans for Bradley, Drew and Desha counties as well as the acquisition and demolition of a severe repetitive loss property in Garland County.

### **Levees**

The Congress has authorized the U.S. Army Corps of Engineers to work with interested states and levee owners and operators to conduct an inventory and review of levees across the nation. The Little Rock District will be examining the levees in Arkansas. The inventory and review of levees effort will collect available levee information and assess the condition and flood risks associated with levees nationally. This information can be used by states and levee owners and operators to make informed decisions on managing flood risks associated with levees. The information collected will be included in the National Levee Database (NLD) to promote community and public awareness of the benefits and flood risks associated with levees.



**Red River Compact Commission  
FY – 2018 and 2019 Budgets**

FY 2018: July 1, 2017 – June 30, 2018

FY 2019: July 1, 2018 – June 30, 2019

|                          |                       |
|--------------------------|-----------------------|
|                          | <u><b>FY 2018</b></u> |
| Meeting Expenses*        | \$5,000.00            |
| Office Supplies/Expenses | \$2,500.00            |
| Contingency              | <u>\$16,000.00</u>    |
| <b>TOTAL</b>             | <u>\$23,500.00</u>    |
|                          |                       |
|                          | <u><b>FY 2019</b></u> |
| Meeting Expenses*        | \$5,000.00            |
| Office Supplies/Expenses | \$2,500.00            |
| Contingency              | <u>\$16,000.00</u>    |
| <b>TOTAL</b>             | <u>\$23,500.00</u>    |

State Assessments

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 2018 and 2019 assessments are \$550.00 per state.

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

**Red River Compact Commission**  
**Statement of Cash Receipts**  
**and Disbursements**  
July 1, 2016 through June 30, 2017

**Red River Compact Commission**  
**Statements of Cash Receipts and Disbursements**  
**For the Period July 1, 2016 through June 30, 2017**

|  |    |                      |
|--|----|----------------------|
| Cash in bank, checking as of July 1, 2016          | \$ | <u>19,549</u>        |
| <br>   |    |                      |
| Cash Receipts                                      |    |                      |
| Member Assessments                                 |    | 2,200                |
| Interest Income - checking                         |    | <u>-</u>             |
| Total Cash Receipts                                | \$ | <u>2,200</u>         |
| <br>   |    |                      |
| Cash Disbursements                                 |    |                      |
| Audit Fees   |    | 275                  |
| Bank Charges                                       |    | 67                   |
| Bond Costs   |    | <u>239</u>           |
| Total Cash Disbursements                           | \$ | <u>581</u>           |
| <br>   |    |                      |
| Cash in bank, checking as of June 30, 2017         | \$ | <u>21,168</u>        |
| <br>   |    |                      |
| Cash in certificate of deposit as of July 1, 2016  | \$ | 11,240               |
| Interest Income - certificate of deposit           |    | 4                    |
| Cash in certificate of deposit as of June 30, 2017 |    | <u>11,244</u>        |
| Cash and cash equivalents as of June 30, 2017      | \$ | <u><u>32,412</u></u> |



**2018 Red River Compact Commission  
Legal Committee Report**

At its May 2, 2017 meeting, the Red River Compact Commission made at least three assignments to the Legal Committee. The Legal Committee met three times via conference calls and then met three more times jointly with the Engineering Committee via conference calls.

**Assignment 1-- Determine goals of compact drafters with respect to Reach 4, Subbasin 2 by reviewing minutes and researching what is meant by “runoff” with respect to surface water, ground water, and base flow.**

“Runoff” is defined under Section 3.01(n) to mean “both the portion of precipitation which runs off the surface of a drainage area and that portion of the precipitation that enters the streams after passing through the portions of the earth.” The 1979 Supplemental Interpretive Comments of the Legal Advisory Committee perfunctorily state that this definition, like all the definitions in that section, is “self-explanatory.” Based on the plain language of the definition, “runoff” comprises surface waters that naturally drain into streams as well as precipitation that enters streams through aquifers in a drainage basin.

Article VII of the Compact, relating to the apportionment of Reach 4, Subbasin 2, allocates water in terms of “weekly runoff.” The Legal Committee could not find any additional evidence in the historic record or any jurisprudence identifying what the Compact drafters meant by “runoff.” The Legal Committee’s 1979 Supplemental Interpretive Comments concerning Reach 4 state:

“[W]eekly runoff” is used as a basis for apportionment to assure the State of Louisiana a relatively constant flow and a fair share of the low flow. Section 7.03(b) governs during extreme low flow periods in order to permit and insure a reasonable and equitable stream flow into the State of Louisiana. The remainder of Article VII [discussing Reach 4] is considered self-explanatory.” Page 22-23.

The Legal Committee also discussed the meaning of “flow” and “base flow.” Flow is undefined in the Compact, and “base flow” is not a term used within the Compact.

**Assignment 2 –Provide additional legal guidance concerning Reach 4, Subbasin 2 runoff methodology and compliance to the Engineering Committee upon request.**

The Legal Committee looked at existing calculation rules for other reaches and compared those rules to rules previously drafted, but never finally adopted, for Reach 4, Subbasin 2. (These rules were adopted provisionally in 2011 but were eventually withdrawn in 2013.) The Rules and Regulations to Compute and Enforce Compact Compliance for Reach II, Subbasin 5 (adopted April 30, 1987) were identified as a potentially helpful template because its methodology is based on weekly runoff. The Legal Committee provided these draft rules to the Engineering Committee.

Some members of the Engineering Committee explained that weekly runoff calculation in the 2011 draft rules for Reach 4, Subbasin 2 would be difficult to implement without significantly more resources. Some members of the Engineering Committee expressed the opinion that the data requirements and complexity of weekly runoff calculations for any stream would require significant engineering efforts and potential additional computer modeling. Committee members could not reach agreement on how natural losses and runoff contribution impact flow.

Members of both the Engineering and Legal Committees jointly discussed weirs and the possibility that USGS's model, still undergoing peer review, could be used to estimate weekly runoff. Once USGS's model is peer reviewed and released, both committees will be in better positioned to recommend whether the model can be used as a methodology for accurately measuring weekly runoff or whether alternatives should be considered.

At the request of Louisiana representatives, Arkansas representatives will provide annual water use reporting data related to Reach 4, Subbasin 2.

**Assignment 3--Work in conjunction with Engineering Committee and work with Engineering Committee to update USGS gage resolution.**

The Engineering Committee representative from each state agreed to work with that state's USGS to update the list of gages within the Compact area. Arkansas compiled an updated list which will be included with the Compact's 2018 resolution requesting funding for the gages.

**Assignment 4--Annotate the Red River Compact Rules and Regulations to Enforce Compact Compliance in a similar manner as what was done for the Rules for the Internal Organization.**

Legal Committee members were unsure whether this was an assignment or a suggestion. The Legal Committee spent most of its time discussing issues related to Reach 4, Subbasin 2; therefore, annotation of the rules, if assigned, will need to be delayed until a later date.

Red River Compact Commission  
Legal Committee Report  
April 26, 2016

During its 2015 annual meeting, the Commission tasked the Legal Committee with a review of the term “eminent” in Commission Rule 4.4. The Legal Committee has reviewed the rule and recommends no change to Rule 4.4 at this time.

Commission Rule 4.4 establishes when the Commission may have emergency meetings:

4.4 Emergency meetings of the Commission may be called by the Chair at any time upon the concurrence of at least two states and such meetings may be conducted by long-distance telephone conference call or other electronic means. Any such long-distance telephone conference call or other electronic communication shall be recorded and made available for public inspection in accordance with the laws of the respective signatory states. Each of the signatory states shall be represented by at least one Commissioner during such an emergency conference and each state concur in any emergency action taken during an emergency meeting. An emergency is defined as a situation involving an **eminent** threat of injury to persons or damage to property or **eminent** financial loss when the time requirements for public notice and travel to a special meeting would make such procedure and travel impractical and increase the likelihood of injury or damage or **eminent** financial loss. (Emphasis added.)

The term “eminent” was added to the rule in 1984 in place of the term “immediate.” It appears the intent was to limit application of the emergency meetings to something more than minor damage or losses. We believe the definition of an emergency in the current rule meets the intent that an emergency meeting only occur for situations involving something more than minor damage or losses when such losses would happen if a meeting is not called quickly.





# BOEUF RIVER REPORT

Submitted to Engineering Committee

Red River Compact Commission

April 2018



ARKANSAS NATURAL RESOURCES COMMISSION'S JURISDICTION



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### **Compliance Question**

Southeast Arkansas and northeast Louisiana received below-average rainfall and above-average temperatures during 2010 and 2011 leading to severe and extreme category droughts in both states during this period. The record rainfall and drought weather systems responsible for conditions in the southern United States were partly attributed to La Nina conditions in the central Pacific Ocean. These droughts produced an extended period of zero flow recorded at the Arkansas-Louisiana state boundary and prompted questions from Louisiana regarding apportionment in Reach IV Subbasin II.

### **Purpose of Report**

This report describes Arkansas Natural Resources Commission (ANRC) efforts to investigate compact compliance questions for the Boeuf River. This work occurred over several years and was conducted in consultation with the Red River Compact Commission's Engineering Committee. The report contains descriptions of: relevant watershed features, computation methods used for estimating runoff, Boeuf River flow evaluation, compliance considerations, and Arkansas' conclusions and recommended policy regarding the Boeuf River watershed.

### **Scope of Investigations**

The ANRC conducted studies to: 1) understand landscape alteration and current "on-the-ground" conditions in the Boeuf River watershed, 2) identify and evaluate methods for estimating and assessing apportionment of runoff, and 3) interpret results and establish Arkansas' policy regarding the Boeuf River. These investigations were completed by ANRC technical staff and by professional services contracts with third party consultants.



### Boeuf River

The Boeuf River, a sub-watershed tributary of the greater Ouachita River Drainage (Figure 1), originates southeast of Pine Bluff, Arkansas, as Canal 19-Cypress Creek and flows south through Jefferson, Lincoln, Desha and Chicot Counties in Arkansas. Canal 19-Cypress Creek becomes the Boeuf River (name designation) just southwest of the Arkansas State Highway 65 Bridge crossing. The Boeuf River's name comes from the French word *bœuf*, which means "bull".

Bayou LaFourche enters the Boeuf River a few miles north of the Arkansas-Louisiana state boundary. The Boeuf

River/Bayou LaFourche channel meanders for approximately 30 miles through Louisiana before it splits into the Boeuf River and Bayou LaFourche Diversion Channel. At this juncture the Boeuf River no longer functions as the primary channel but rather serves as a secondary, side stream that receives overflow from the Bayou LaFourche Diversion Channel. The next 15-20 miles of the Bayou LaFourche Diversion Channel is backwater from the Lake Irwin weir structure. This structure was constructed in the 1950's as part of a wildlife improvement project. The upper reach of this backwater is known as Lake LaFourche and downstream, nearer the weir structure, the reach is called Lake Irwin (see Figure 2). Bayou LaFourche and the Boeuf River parallel one another in a southerly direction for another 30 miles or more southeast of Monroe. Eventually, the Bayou LaFourche Cutoff conveys water east to the Boeuf River before its confluence with the Ouachita River in Catahoula Parish, LA. Parts of the Boeuf River's 230-mile course are navigable and utilized primarily for recreation and agricultural irrigation.



Figure 1. Basin Drainage Area



Figure 2. Lake Irwin



### Hydrologic Manipulation

Naturally meandering parallel through Arkansas and Louisiana, these streams were part of the broader Mississippi River floodplain and an extensive bottomland forested wetland complex. In southeast Arkansas, the Mississippi River floodplain was bordered by Mississippi River natural levees to the east and Bayou Bartholomew-Gulf Coastal Plain escarpments to the west. This broader floodplain, containing low-gradient streams and minute topographic features, initially limited expansion of agriculture. However, continued harvesting of bottomland forests revealed productive and fertile soils ideal for agriculture. After the great lower Mississippi River flood of 1927 and Ohio River flood of 1937 inundated large portions of southeast Arkansas and northeast Louisiana, The Vicksburg District Corps of Engineers (Corps) began in earnest implementing controls on the Mississippi River and its floodplain. These efforts began in the 1940's under *National Flood Control Act* authorization(s). These congressional authorizations provided for channel improvement, flood control, and adequate drainage outlets for tributary lands of major streams in the Boeuf and Tensas Basins in Arkansas and Louisiana. As a result, most tributaries and main stems of the Boeuf River and Bayou LaFourche were channelized, cleaned-out, or straightened to facilitate drainage and improve water conveyance capacity.

Although many flood control and improvement projects were initiated by the Corps after the Mississippi River floods, sparse information on these early Corps efforts is available. Anecdotal evidence was obtained through discussions with long-tenured personnel within the Corps and Arkansas Highway and Transportation Department (AHTD) who had familiarity or knowledge of the drainage improvement measures implemented during the 1950's and 1970's.

One document still available was the Corps' Technical Report H-69-13 entitled "*Low-Water Weirs on Boeuf and Tensas Rivers.....*" Published in 1969, the report identified deficiencies in weir design and recommended modifications to existing and future planned Corps weirs. This research document is an example of the Corps' extensive effort to study flood, drainage, and weir design efficiencies before implementing basin-wide flood control measures. Noteworthy



was the requirement that placement of any instream weirs on tributary and main stem streams could not increase flooding potential or impede overall drainage efficiencies within these watersheds.

The Corps, beginning in the 1990's and continuing to present day, conducted engineering studies on a proposed multi-purpose agricultural water supply and environmental restoration project in southeast Arkansas. Most recently the Corps conducted an economic evaluation to determine the benefit/cost ratio and feasibility of diverting Arkansas River water into southeast Arkansas to improve Boeuf River flows into Louisiana.

Bayou LaFourche Diversion Channel and Bayou La Fourche Cutoff are major conveyances associated with Boeuf River drainage improvement projects in Louisiana. In Figure 3, the natural (historic) channel of the Boeuf River has been cutoff to divert Boeuf River flow into Bayou LaFourche Diversion Channel. This cutoff likely occurred around the same time period implementation of the Lake Irwin wildlife enhancement project occurred (weir constructed in 1950s). Since the diversion channel conveys the majority of flow downstream, the USGS on Bayou LaFourche east of Monroe records the primary flow from the Boeuf River and Bayou LaFourche Diversion Channel. An aerial view of the cutoff of the Boeuf River is shown in Figure 3.

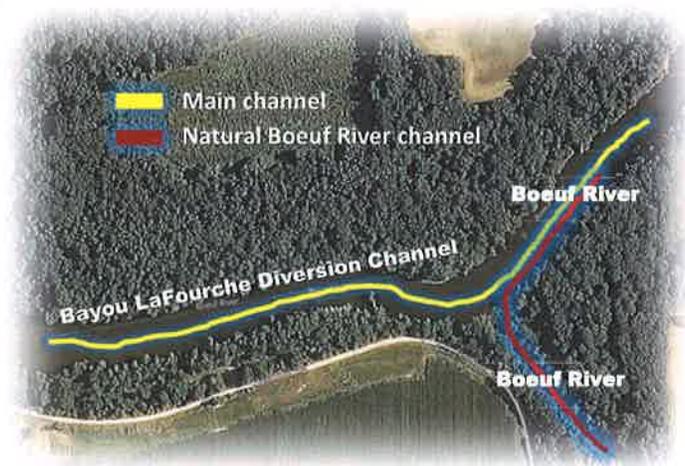


Figure 3. Boeuf River Cutoff

### Boeuf River Weirs

Significant weirs in the Boeuf River watershed are obvious from Google Earth imagery and were not difficult to locate. Construction and placement of these weirs was a consequence of the

Corps' extensive drainage improvement studies begun in the 1940s. Nineteen significant weirs and several low-water concrete bridges with culverts are located in Arkansas.

Weirs observed in the field vary in construction, existing condition, and (assumed) cost. A review of available literature determined that the weirs were likely constructed originally as either: 1) earthen plugs with earthen cores, many of which were later armored and reinforced with rip-rap or other rubble debris, or 2) vertical sheet-pile walls, anchored and reinforced with riprap and capped with horizontal concrete beams. Many of the weirs are obviously well maintained and possessed excellent structural integrity. Other weirs resemble remnant, aging structures in need of repair and reinforcement. Weirs also vary widely in height, although the heights by comparison does not directly indicate quantity of water passing through and over the structure, i.e. from observation a higher weir was not necessarily more restrictive of instream flow passing through and over the structure. Even the most well-maintained and reinforced weirs are "leaking".

One of the originally intended functions of weirs in the Boeuf River watershed was to reduce channel maintenance. After channelizing and straightening (pluming) most of the water courses and conveyances in the watershed, a mechanism to minimize vegetative growth in the channels was needed. Weirs were installed to maintain a minimum level of permanent water in the channels year round to reduce vegetation and future maintenance efforts. It is clear the Corps conducted extensive studies on flooding potential, drainage, and weir design efficiencies before implementing improvements in the watershed. As evidenced in some of the pictures contained in this report, weirs originally constructed by the Corps were of similar design to maximize strength and functional life.

Weir structures in the headwater areas of the Boeuf River and tributaries, such as Canal 19-Cypress Creek, are smaller in size and generally less maintained than weirs further downstream. These headwater weirs were likely constructed as earthen plugs originally and subsequently reinforced with rock and rubble.



Boeuf River main stem weirs downstream in both Arkansas and Louisiana are predominately concrete capped steel sheet-pile walls with significant rock reinforcement. Maintenance on these structures varies greatly, with a few weirs being very well maintained. The Lake Irwin weir structure on Bayou LaFourche Diversion Channel in Louisiana is in poor overall condition, showing no signs of any recent maintenance. The weir at Arkansas State Highway 82 Bridge is in disrepair and may or may not be removed when the Highway 82 Bridge is replaced. At this time, the Corps is not authorized to fund maintenance on any of these weirs. There has been past congressional “ear-marks” to support project specific maintenance work, but this support has historically been infrequent. Significant weir structures located in Arkansas and Louisiana are listed in Table 1 and shown in Figure 4.

**TABLE 1. List of Boeuf River Weirs**

| Weir | State | Description              | Location                | Observed Condition | Latitude  | Longitude  |
|------|-------|--------------------------|-------------------------|--------------------|-----------|------------|
| 1    | AR    | Low Water Bridge         | Canal 19                | Fair               | 34.072538 | -91.624727 |
| 2    | AR    | Rip-Rap                  | Canal 19                | Fair               | 34.067265 | -91.613176 |
| 3    | AR    | Rip-Rap                  | Canal 19                | Good               | 34.041741 | -91.590685 |
| 4    | AR    | Low Water Bridge         | Canal 19                | Good               | 34.041730 | -91.577869 |
| 5    | AR    | Rip-Rap                  | Canal 19                | Good               | 34.033596 | -91.555617 |
| 6    | AR    | Crushed Concrete         | Canal 19                | Good               | 34.029789 | -91.553746 |
| 7    | AR    | Rip-Rap                  | Canal 19                | Good               | 34.022281 | -91.535068 |
| 8    | AR    | Rip-Rap                  | Canal 19                | Good               | 33.984376 | -91.516338 |
| 9    | AR    | Rip-Rap                  | Canal 19                | Good               | 33.925184 | -91.478646 |
| 10   | AR    | Rip-Rap                  | Canal 19                | Fair               | 33.900579 | -91.461115 |
| 11   | AR    | Rip-Rap/Bridge           | Canal 19                | Fair               | 33.882430 | -91.461683 |
| 12   | AR    | Boulder/Rip-Rap          | Canal 19                | Fair               | 33.829635 | -91.442437 |
| 13   | AR    | Boulder/Rip-Rap          | Canal 19                | Fair               | 33.606355 | -91.296847 |
| 14   | AR    | Concrete                 | Canal 19                | Poor               | 33.594400 | -91.293999 |
| 15   | AR    | Low Head Dam             | Boeuf River             | Good               | 33.385675 | -91.353634 |
| 16   | AR    | Sheet Piling/Rip-Rap     | Boeuf River             | Good               | 33.343353 | -91.354546 |
| 17   | AR    | Sheet Piling/Rip-Rap     | Boeuf River             | Good               | 33.309881 | -91.365601 |
| 18   | AR    | Sheet Piling/Rip-Rap     | Boeuf River             | Good               | 33.270223 | -91.354233 |
| 19   | AR    | Sheet Piling/Rip-Rap     | Boeuf River             | Good               | 33.225663 | -91.349049 |
| 20   | AR    | Sheet Piling/Rip-Rap     | Boeuf River             | Poor               | 33.168702 | -91.355139 |
| 21   | AR    | Sheet Piling/Rip-Rap     | Boeuf River             | Fair               | 33.047719 | -91.393354 |
| 22   | LA    | Sheet Piling/Rip-Rap     | Boeuf River             | Good               | 33.001402 | -91.437654 |
| 23   | LA    | Sheet Piling/Rip-Rap     | Boeuf River             | Fair               | 32.989481 | -91.438940 |
| 24   | LA    | Sheet Piling/Rip-Rap     | Boeuf River             | Fair               | 32.976586 | -91.439518 |
| 25   | LA    | Sheet Piling/Rip-Rap     | Boeuf River             | Fair               | 32.941742 | -91.476910 |
| 26   | LA    | Sheet Piling/Rip-Rap     | Boeuf River             | Good               | 32.899674 | -91.498301 |
| 27   | LA    | Sheet Piling/Rip-Rap     | Boeuf River             | Fair               | 32.874306 | -91.544824 |
| 28   | LA    | Sheet Piling/Rip-Rap     | Boeuf River             | Fair               | 32.801143 | -91.590515 |
| 29   | LA    | Earthen Weir             | Boeuf River to Girard   | Fair               | 32.543872 | -91.707615 |
| 30   | LA    | Sheet Piling/Rip-Rap     | Boeuf River to Girard   | Poor               | 32.505086 | -91.765637 |
| 31   | LA    | Sheet Piling/Rip-Rap     | Boeuf River to Girard   | Poor               | 32.513426 | -91.785130 |
| 32   | LA    | Earthen Dam              | Boeuf River to Girard   | Good               | 32.174325 | -91.944805 |
| 33   | LA    | Sheet Piling/Rip-Rap Dam | Bayou Lafourche Cut-Off | Fair               | 32.554561 | -91.859186 |



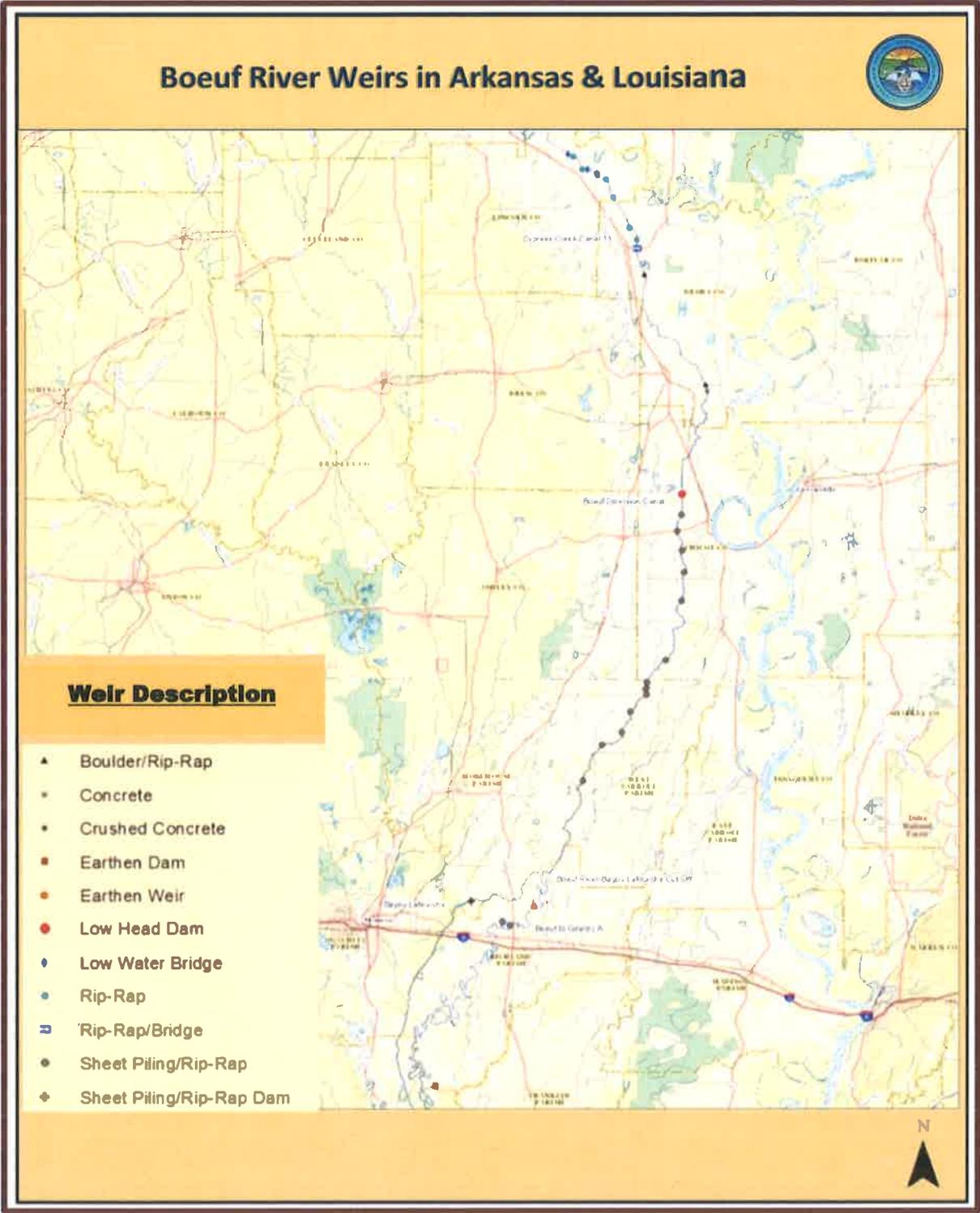
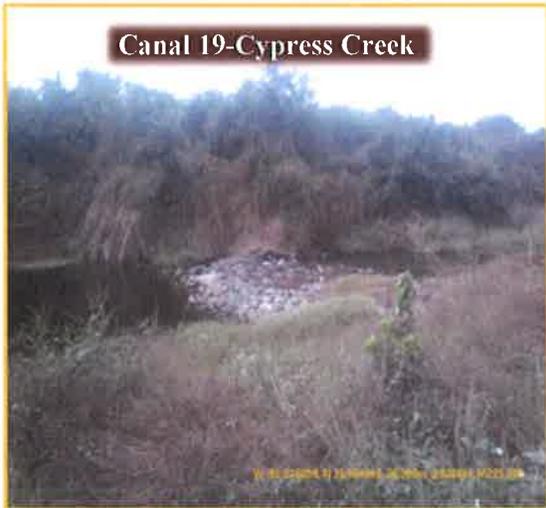


Figure 4. Map of Boeuf River Weirs

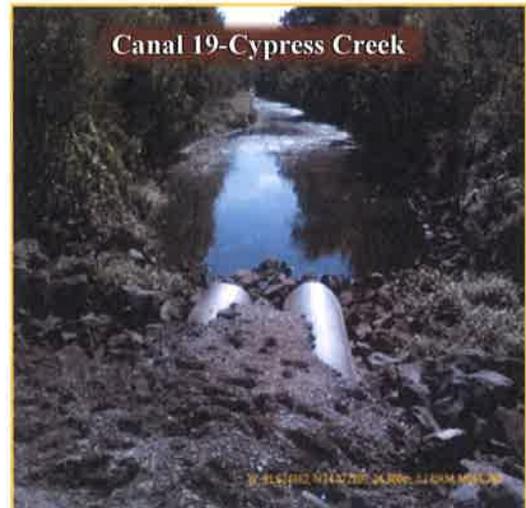


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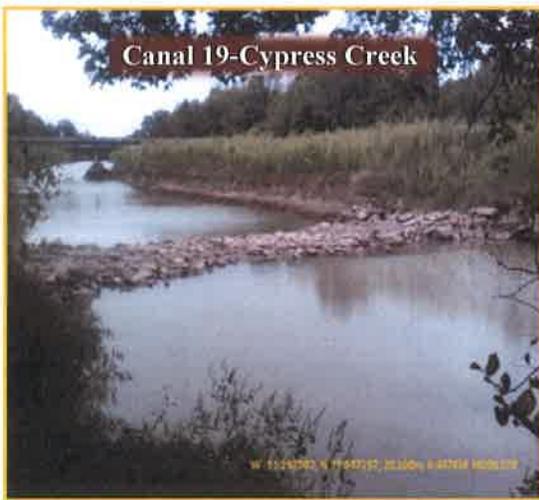
Weirs on Canal 19-Cypress Creek and significant weirs on the Boeuf River and Bayou LaFourche are pictured on the following pages:



Small rock weir on Canal 19-Cypress Creek, possibly an earthen plug that was later armored by landowner. Fair condition with no recent maintenance activity.



Low water bridge north of Cummins Correctional Unit. Structure provides access between properties. Fair condition with visible signs of routine maintenance.



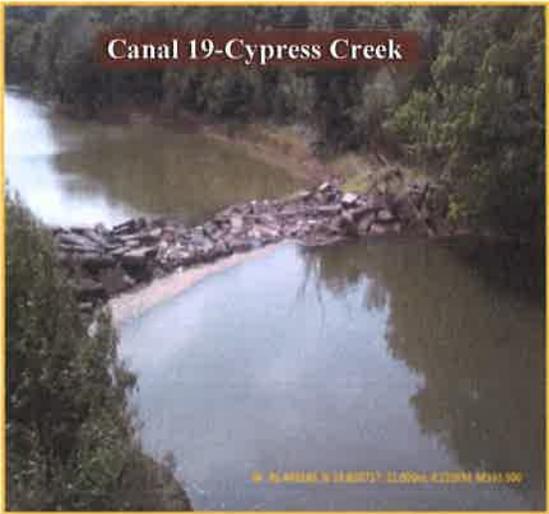
Medium size rock weir on Canal 19-Cypress Creek. Good condition with signs of recent maintenance.



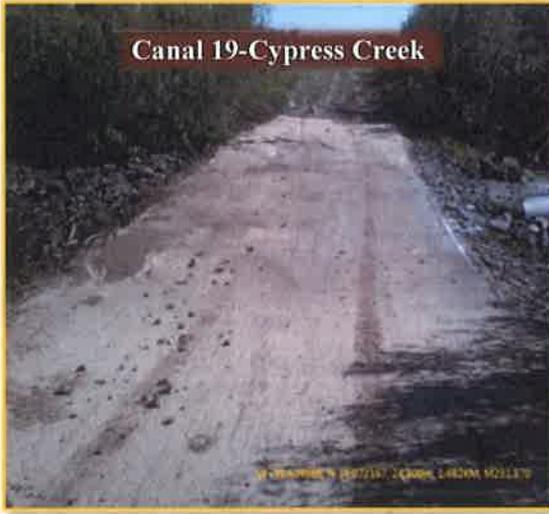
Concrete and rubble structure on Canal 19-Cypress. Poor condition with no signs of recent maintenance.



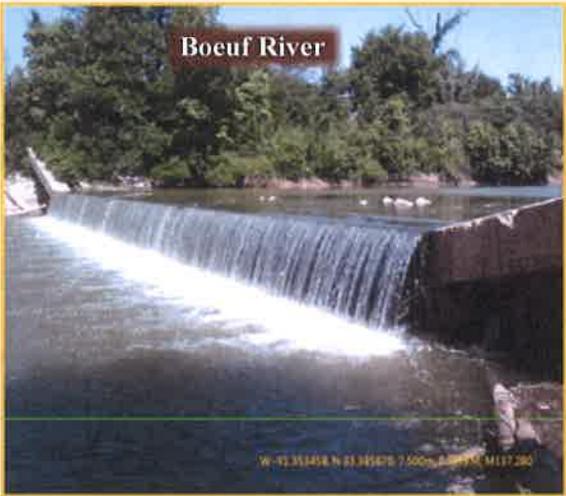
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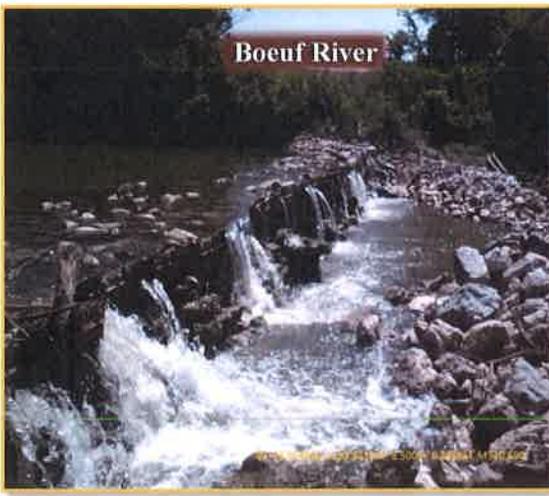
Rock and concrete rubble weir on Canal 19-Cypress Creek. Good condition and well maintained.



Rock and concrete low water bridge on Canal 19-Cypress Creek. Good condition and well maintained.



Concrete weir on Boeuf River Diversion Canal. Structure likely constructed by Corps of Engineers. Some undercutting was observed.



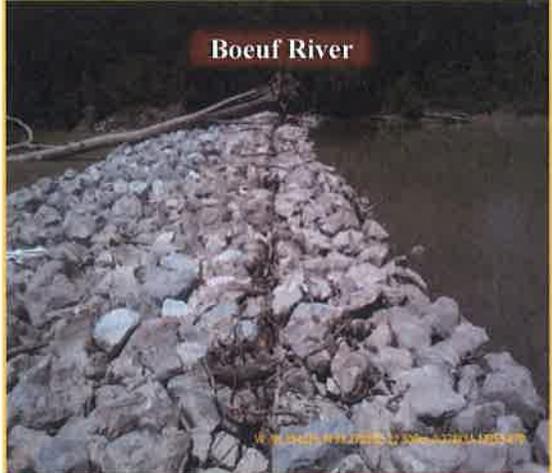
Sheet pile weir reinforced with rip-rap on the Boeuf River. Structure likely constructed by Corps of Engineers. Displacement of rip-rap is evident.



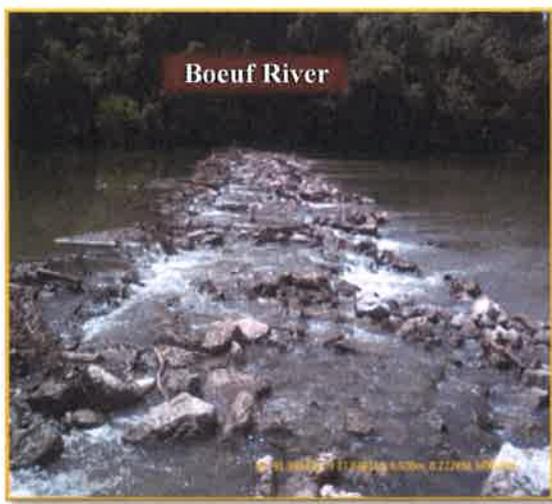
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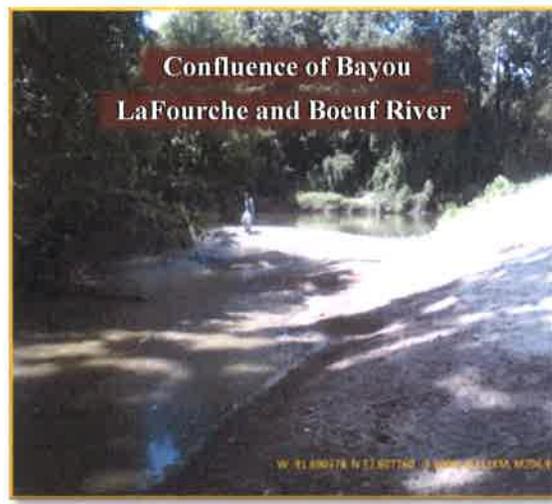
Sheet pile weir reinforced with rip-rap located under Arkansas Highway 82. Structure was constructed in 1955 as a component of Boeuf River Channel Improvement Project. Significant tilting of sheet piles, displacement of rip-rap and plunge pool scour downstream.



Sheet pile weir reinforced with rip-rap on the Boeuf River. Excellent condition- weir was re-armored in 2016.



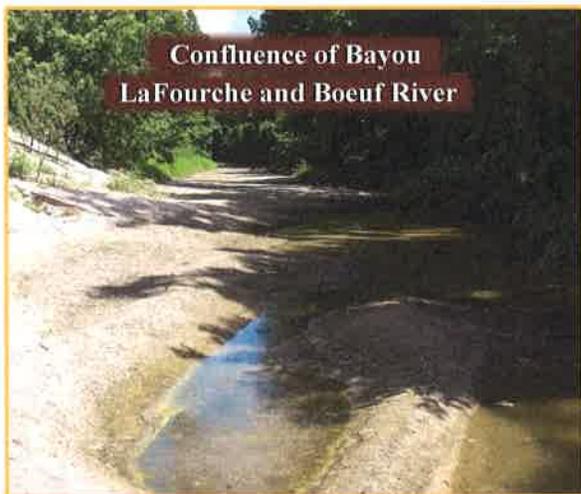
Sheet pile weir reinforced with rip-rap on the Boeuf River. Poor condition and no signs of recent maintenance. Last weir in Arkansas north of AR-LA state boundary.



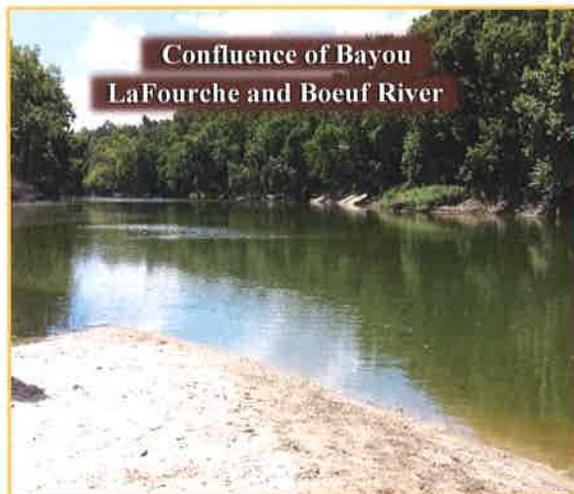
Confluence of Boeuf River and Bayou Lafourche Cut-Off in Louisiana. Photo view looking upstream toward Bayou LaFourche Diversion Channel. Person is standing at confluence.



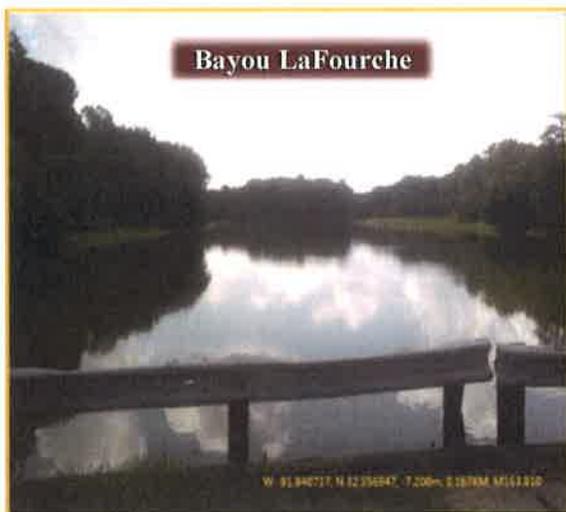
## General Description



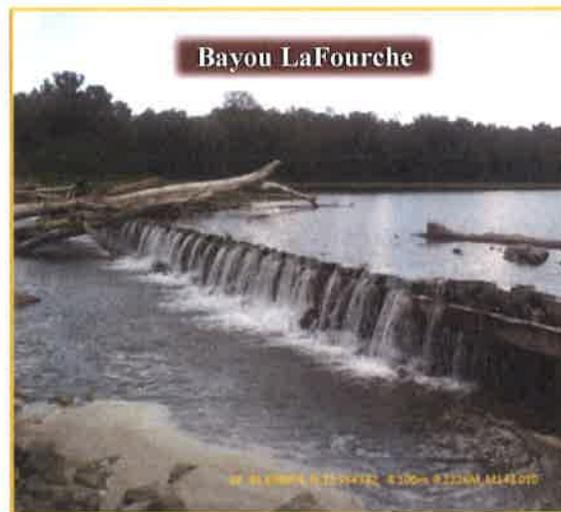
Confluence of Boeuf River and Bayou Lafourche Cut-Off in Louisiana. Photo view looking downstream Boeuf River.



Confluence of Boeuf River and Bayou Lafourche Cut-Off in Louisiana. Photo view looking downstream Bayou LaFourche Diversion Channel.



Bayou Lafourche Diversion Channel in Louisiana. Photo view looking upstream toward Boeuf River confluence.

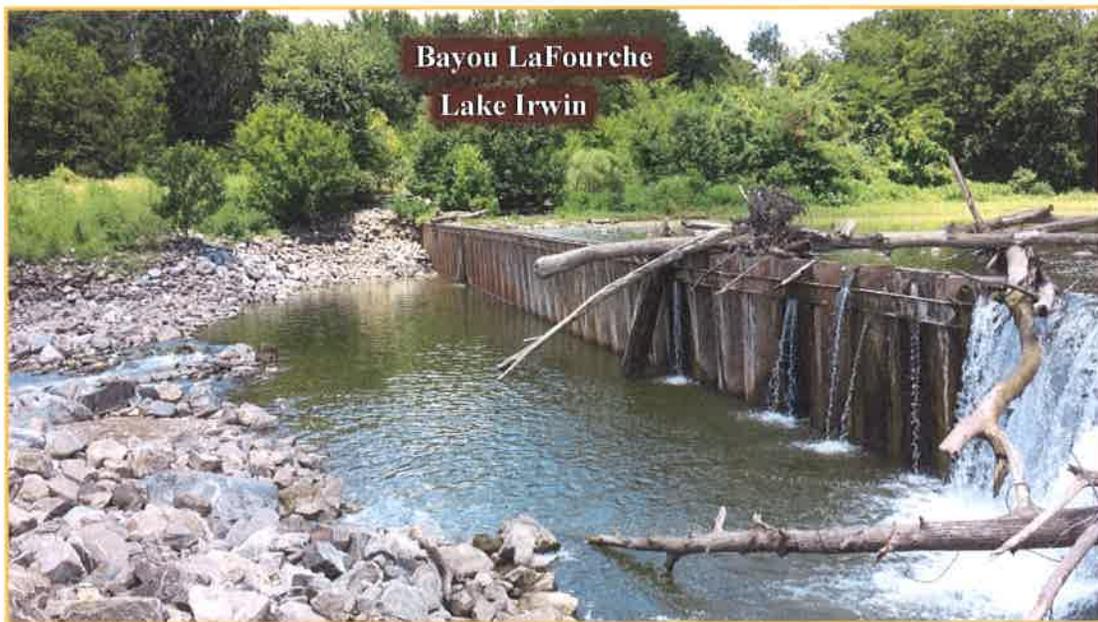


Weir structure on Bayou Lafourche Diversion Channel which creates Lake Irwin. No visible signs of recent maintenance activity.





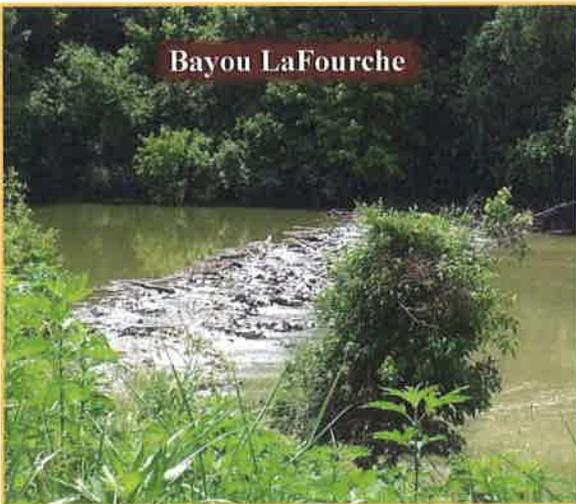
Left descending bank of Bayou LaFourche Diversion Channel at Lake Irwin weir structure. Weir is approximately 600 feet in length.



Right descending bank of Bayou LaFourche Diversion Channel at Lake Irwin weir structure.



## General Description



Likely a sheet pile weir reinforced with rip-rap on Bayou LaFourche in Louisiana. Debris accumulation was evident.



Rock weir on Bayou LaFourche in Louisiana. No visible signs of recent maintenance.

After channelization and straightening occurred, it is logical to assume that imbalances in sediment transport and stream stability in the most heavily altered reaches occurred over time. Weirs probably provided some buffering of these imbalance effects by disrupting accumulation of stream energies (unquantified) during nonpeak flows and reducing the potential for stream down-cutting. However, weirs did concentrate stream energies over the sides and immediately downstream of the structures during high flows. Therefore, erosion near individual weirs was noted but no visible erosional deterioration was observed to extend upstream or downstream beyond general individual weir proximity.

### Methods for Estimating Runoff

It is important to elaborate Reach IV Subbasin II provisions before discussing compliance methods and calculation alternatives. Sections 7.02 and 7.03 provisions, as contained in Article VII, contain specific terms which will be discussed later when describing methods for estimating weekly runoff and determining compliance.



Compact language in Section 7.02 (b) states:

*“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).”*

Compact language in Section 7.03 (a) states:

*“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.”*

Compact language in Section 7.03 (b) states:

*“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 – 780 cfs
- 2) Bayou Bartholomew – 80 cfs
- 3) Boeuf River – 40 cfs
- 4) Bayou Macon – 40 cfs

*“The State of Arkansas pledges to take affirmative steps to regulate the diversions of runoff originating or flowing into Reach IV in such a manner as to permit an equitable apportionment of the runoff as set forth herein to flow into the State of Louisiana. In its control and regulation of the water of Reach IV any adjudication or order rendered by the State of Arkansas or any of its instrumentalities or agencies affecting the terms of this Compact shall not be effective against the State of Louisiana nor any of its citizens or inhabitants until approved by the Commission.”*

Section 7.02 (b) contains the term “weekly runoff”, which is referenced in other articles of the Red River Compact as well. It is assumed the term “weekly runoff” is meant to distinguish conceptually between real-time (present) and annual (end of year) computation, inferring that some form of repeatable computation method is needed when there is legitimate concern as to whether apportionment requirements are being met.



The first computational method used by ANRC to approximate “weekly runoff” utilized sub-watershed runoff coefficients and available precipitation data. This computational procedure, referred to as Method #1, was applied to all Arkansas streams listed in Section 7.03 (b). Several trial runs of the procedure were completed for different times of the year. Computational procedures for Method #1 are described below.

### Method #1

Estimation of “weekly runoff” was calculated by the general formula,  $Q=CIA$ ; where  $Q$  = estimated weekly runoff,  $C$  = weighted runoff value,  $I$  = weekly precipitation value, and  $A$  = drainage area above stream gage. Weighted runoff values were averaged for sub-watershed drainage areas based on available land use/land cover digital data. This approach was based on existing landscape-level coverages available at the time of computation. Daily precipitation data found at [www.weather.gov](http://www.weather.gov) was compiled to calculate previous 7-day average rainfall. Table 2 contains previously determined weighted runoff values for the Boeuf River’s drainage area above USGS gage #0/367700. Table 3 is an example format for reporting compliance on the Boeuf River. Compliance is determined by comparing the estimated 40% weekly runoff to flows recorded at USGS gage #07367700.

**Weighted Runoff Value C = 0.26**  
Boeuf River near AR/LA State Line  
(USGS Gauge- #07367700)  
Drainage Area=785 square miles

| Land Cover | C Value |
|------------|---------|
| 13% Forest | 0.15    |
| 70% Crop   | 0.25    |
| 5% Herb    | 0.25    |
| 2% Pasture | 0.35    |

**Table 2. Runoff Coefficients**

**Table 3. Example of Reporting Format**

| Period    | Rainfall      | Weekly Runoff | 40% Weekly Runoff | USGS Flow | Compliance |
|-----------|---------------|---------------|-------------------|-----------|------------|
| 4/20-4/27 | .0087 inch/hr | 300 cfs       | 130 cfs           | 145 cfs   | Yes        |
| 6/3-6/10  | .0058 inch/hr | 205 cfs       | 82 cfs            | 91 cfs    | Yes        |

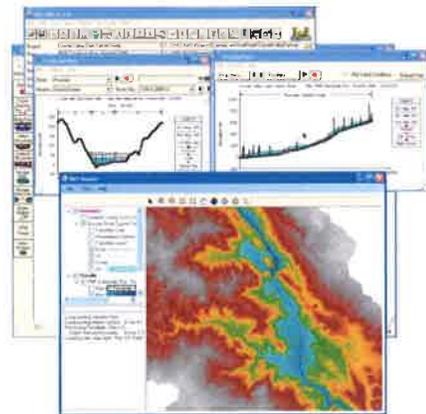
Method #1 was reviewed for efficacy by USGS Louisiana and Arkansas Science Center personnel. The consensus of USGS was: 1) the accuracy of any individual, random 7-day “weekly runoff” estimate could not be confirmed nor disproved. The generalized basin-wide



runoff coefficients used in the calculation introduced sufficient uncertainty to render this method unacceptable as a sole determiner to justify legal action and regulation of water use. However, USGS agreed that uncertainty in computation results could be reduced by increasing the time period used in the calculation from weekly to monthly or even a multiple-month period. Using any of the extended time periods will reduce the level of uncertainty associated with instantaneous anomalies such as uneven rainfall distribution, nonhomogeneous runoff, and unquantifiable losses. The potential application and use of Method #1 is discussed later in this report.

### HEC-HMS and HEC-RAS

Arkansas and Louisiana officials met in Baton Rouge during this time period to discuss alternatives for incorporating more scientifically rigorous and accurate methods to model Boeuf River runoff and watershed conditions. Several programs were discussed for their capacities to simulate runoff: USDA's-NRCS Agricultural Non-Point Source Pollution Model (AGNPS) and Surface Water Assessment Tool (SWAT), and the Corps of Engineers' HEC-HMS and HEC-RAS programs. In February 2013, ANRC initiated and hosted two weeklong technical workshops for engineers and scientists



interested in using the Corps of Engineers' Hydraulic Engineering Center (HEC) Hydrologic Modeling System (HEC-HMS) and (HEC) River Analysis System (HEC-RAS) programs. The workshops were taught by Dr. Art Miller, PhD., P.E., Distinguished Professor Emeritus of Civil and Environmental Engineering at Pennsylvania State University and a nationally recognized expert on this software. These programs were designed to simulate precipitation runoff, output hydrographs and aid studies on water availability, flow forecasting, etc. to allow modeling of open channel systems and computing of water surface profiles. After conclusion of these workshops, ANRC began efforts to model the Boeuf River using HEC-HMS and HEC-RAS



programs. One limitation to the HEC-RAS effort was the lack of data available for model input. Collection of additional data to calibrate a Boeuf River model was originally planned. But, scheduling conflicts and other program priorities prevented completion of additional field surveys and collection of associated data. Attempts to calibrate the base model were unsuccessful and the effort was abandoned. A detailed discussion of the model is not included in this report because HEC-HMS and HEC-RAS base programs are in the public domain and have readily available technical descriptions of input and output components on the internet. ANRC concluded additional elevation, cross-section, and location data will be necessary for calibration of any future mechanistic model development for the Boeuf River watershed.

### Other Methods Considered

Method #1 was judged to be inappropriate for use as a sole mechanism to initiate regulation of diversion and ANRC's attempt to model the Boeuf River using HEC-HMS and HEC-RAS programs was unsuccessful. Therefore, the Engineering Committee decided to request third party proposals to develop other potential methods to estimate "weekly runoff". Three third party proposals were submitted to the Engineering Committee for review and evaluation and are briefly described in Table 4.

**Table 4. List of Third Party Proposals**

| Proposal |                      | Description of Potential Method   | Estimated Cost(s)   |
|----------|----------------------|---|---|
| 1        | Vieux & Associates   | Proprietary software & programming- estimates runoff. Requires intensive maintenance and monitoring within the watershed. | \$160,000- initial model setup<br>\$7,000/month-monitoring network.   |
| 2        | FTN & Associates     | Mechanistic Model- SWAT or other model  | \$45,000- evaluate potential models<br>\$100,000- initial model setup |
| 3        | US Geological Survey | Unaltered Flow Statistical Model- develop weekly model from existing monthly calculator                                   | \$65,000- develop weekly model  |

Of the three methods listed in Table 4, the USGS proposal had the lowest initial cost and built upon their existing statistical-based method for estimating monthly runoff and predicting unaltered flow on streams in the lower Mississippi River Basin. USGS proposed to further refine



their recently developed monthly unaltered flow model to determine if it could accurately predict weekly unaltered flow and thus provide a surrogate for estimating “weekly runoff” through a web-based calculation tool. After review of the three proposals, the Engineering Committee recommended the USGS proposal as the most cost-effective opportunity to improve accuracy of runoff estimations. ANRC accepted this recommendation and contracted the USGS Arkansas Water Science Center to further refine their monthly model and evaluate its accuracy for estimating weekly unaltered flow.

### USGS Model

The USGS model predicts unaltered flow, defined as without anthropogenic influence, and relies heavily upon statistical analyses of abundant precipitation data. More detailed information on this model and analyses can be found in the USGS journal article entitled *Quantifying Hydrologic Alteration in an Area Lacking Current Reference Conditions—The Mississippi Alluvial Plain of the South-Central U.S* when it becomes publicly available. Unaltered predicted flow from the model represents a conservative estimate of total runoff, which includes observed (surface) flow and base (subsurface) flow. Figure 5 is a schematic showing unaltered predicted flow and its relationship to surface and subsurface runoff. It is assumed that observed flow at USGS gages includes the effects of anthropogenic influence and any associated (upstream) runoff losses.

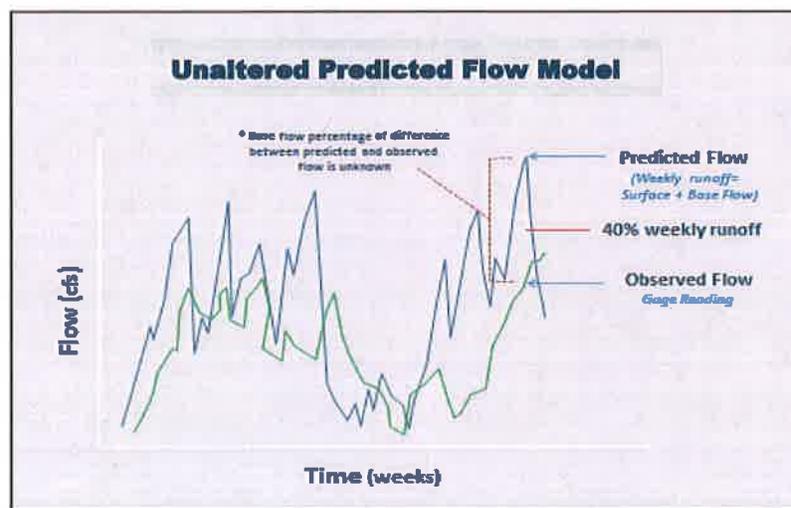


Figure 5. Unaltered Predicted Flow Model



## General Description

The unaltered predicted flow is referred to as “expected flow” when representing results from the model as a ratio of observed flow vs. “expected flow” (O/E ratio). This O/E ratio can be plotted graphically to identify changes in the ratio over a prescribed period of time. Significant variation in the O/E ratio is presumed to indicate anthropogenic influence such as diversion and capture of surface water or other landscape alterations. Of particular interest to the Engineering Committee is whether O/E ratios significantly change over the time period beginning in the late 1970s when the Red River Compact was ratified and ending present day. Figure 6 shows monthly model regressions plotted as O/E ratios for the Boeuf River at USGS Site Number #07368000. In Figure 6, the graph on the left shows a significant declining trend of the monthly O/E ratios from the 1940s-1970s. Implementation of lower Mississippi River basin-wide drainage improvement projects by the Corps of Engineers coincided with this time period. The graph on the right shows a modest or slight slope of the O/E ratios from the 1980s to present day.

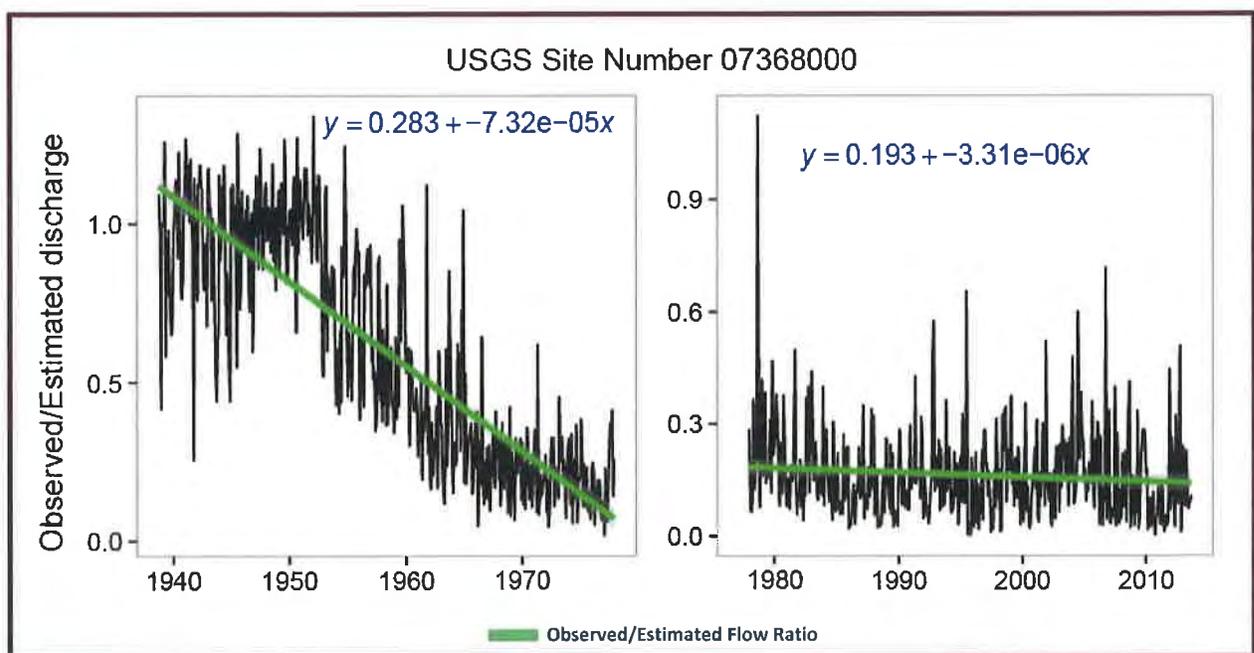


Figure 6. (O/E) Ratio Before and After Ratification of Red River Compact



Results from regression analyses for precipitation and discharge data are shown in Figure 7 below. There is no significant trend identified in the precipitation data from 1940 to present day. However, there is a downward trend of gaged discharge from the 1940s to 1970s, likely the result of massive drainage and channel improvement projects (significant anthropogenic change) implemented by the Corps of Engineers during this time period. From the 1980s to present day there is a slightly decreasing trend for both precipitation and discharge, inferring there have been no statistically relevant changes during this time period.

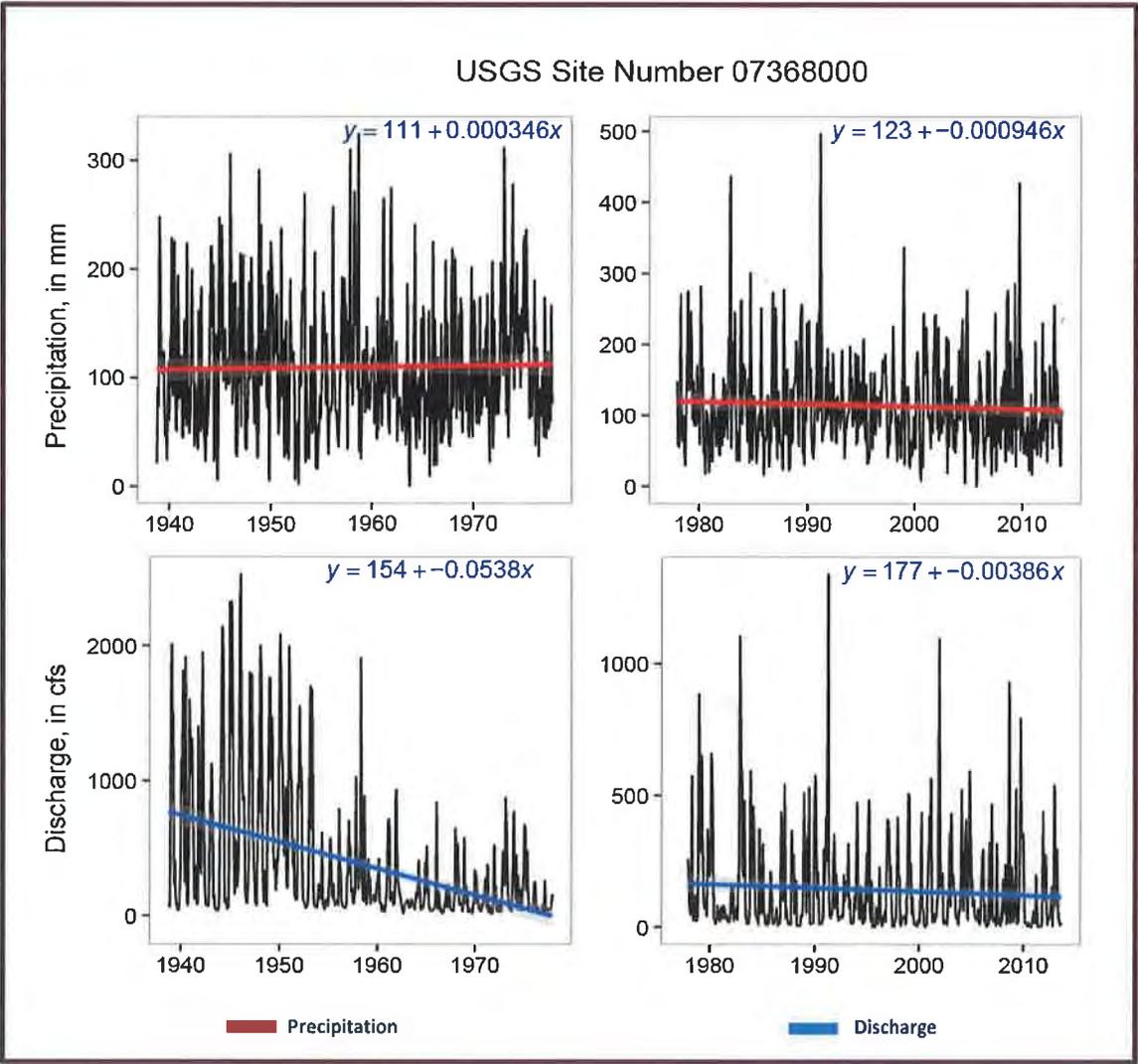


Figure 7. Precipitation and Discharge Trends



### Compliance Considerations

The lack of sufficient and accurate real-time “weekly runoff” calculation methods which can withstand legal and public scrutiny presents a long-term challenge but does not preclude a general assessment of apportionment compliance. An evaluation of existing statutory authorities and cumulative factors which affect apportionment is more useful to water management decision-making than a single computation. Understanding their effect on apportionment is best done through a sequential, logical discussion of these factors as they pertain to Reach IV Subbasin II provisions.

### Water Use Reporting

Fundamental to any water budget is the knowledge of how much water you *have* (supply), how much water you *need* (demand), and *when* will you need it (time and availability). Arkansas requires reporting of all riparian and non-riparian water use on an annual basis when the use equals one acre-foot per year or more. This reporting process allows for collection of general information such as estimated total annual water use, type of use, i.e. surface or groundwater, water source, category of use, i.e. agriculture, municipal, and in some cases monthly use data through the local conservation district. Reported water use is compiled with other relevant data and analyzed for statewide water planning and management purposes. But, this information lacks exactness as to the time and duration of water diversion throughout the year and does not sufficiently quantify water reuse or diversions into and from storage reservoirs. There are efforts to collect real-time water use data in east Arkansas through voluntary installation of meters on individual groundwater wells. ANRC has committed \$333,000 to install and operate these meters from 2015 through 2018.

In the water use program there are quality control mechanisms in place to verify and compare estimated (reported) agriculture use with published water application rates for common crops. But, inconsistencies do exist in implementing these control measures and related processes. ANRC funded a \$122,000 effort to evaluate strengths and weaknesses of the water use



program. The results of this study are included in the 2017 report by FTN Associates Ltd. entitled: *“Water Use Reporting for Agricultural Irrigation in Arkansas”*. The report confirms a tendency by some water users to “over-report” (inflate) annual water use during “wet” years for fear that a decrease in reported annual use could reduce their riparian rights in the future.

ANRC requires non-riparian users to obtain ANRC permits in order to track excess surface water availability for non-riparian water transport and use. However, there is no permitted non-riparian use on the Boeuf River.

In summary, reported water use data has proven to be unreliable and incomplete for determining conditions at an individual location at a specific time. An increase in reported water use statewide occurred during the first few years of the water use reporting program, but this is attributed to gradual adoption and participation from the public in reporting water use. Increases in reported agricultural use in some local areas have not been accompanied by an increase in irrigated acres reported at the county level.

Boeuf River Flows Compact provision 7.03 (b) states *“when the use of water in Arkansas reduces the flow at the Arkansas-Louisiana state boundary to”* 40cfs on the Boeuf River *“the State of Arkansas pledges to take affirmative steps to regulate the diversions of runoff”*. The language *“when the use of water in Arkansas reduces the flow”* infers that an instantaneous (weekly) “cause and effect” condition affecting Boeuf River flow crossing the state boundary exists and regulation of the diversion of runoff is appropriate. Conceptually, this language is straight forward and easily understood, i.e. when Arkansas diversions cause flows at the state boundary to reach 40cfs or less, those diversions will be restricted to allow an equitable apportionment of runoff to flow into Louisiana. However, as a practical matter, the ability to determine and substantiate a “cause and effect” relationship between lawful riparian diversions and Boeuf River flows miles downstream necessitates an accurate quantification of instantaneous (real-time) diversions and runoff. To generate such data would require an accurate weekly runoff computation method and telemetry-enabled metering equipment on



individual surface water pumps to communicate real-time information to ANRC. Arkansas does not require water users to implement meters with this degree of sophistication and expense. There is no legal mechanism to compel this kind of real-time reporting in Arkansas at this time.

An occurrence of Boeuf River flow at or below 40cfs, while referenced as a trigger in the compact, alone does not signify regulation of diversion is warranted. Other factors that influence individual flow measurements such as: discontinuous operation of gage, physical obstructions upstream or downstream of gage, amount of loss or diversion near gage should be fully understood when assessing flow measurements. Table 5 shows the different scenarios of conditions that can exist on the Boeuf River. The shaded bottom row of the table identifies conditions that must exist and that can be verified before regulation of runoff can be considered, i.e. the flow must be below 40cfs, the weekly runoff estimate must be greater than the USGS gaged flow, and diversion of runoff must exist. If any of these conditions do not exist, then there is no requirement to consider regulation of runoff.

**Table 5. Conditions Needed for Possible Regulation of Runoff**

| Boeuf River Flow | 40% Weekly Runoff | *Diversion | Regulation |
|------------------|-------------------|------------|------------|
| > 40 cfs         | --                | <b>YES</b> | NO         |
| > 40 cfs         | --                | <b>NO</b>  | NO         |
| < 40 cfs         | < USGS Gage Flow  | <b>YES</b> | NO         |
| < 40 cfs         | > USGS Gage Flow  | <b>YES</b> | Possible   |

**\*Diversion**- Verifiable Out-of-Stream Consumptive Use



## General Description

Without an available and acceptably accurate method for computing instantaneous “weekly runoff”, we must peruse the period of record flow data for insight into any trend(s) that may be, in part, attributable to impacts from diversion. The Girard gage in Louisiana, located 30 miles or so south of the state boundary, has 80 years of flow record. This lengthy record allows us to identify recurring seasonal flow patterns and compare it to present day recorded flow at the state boundary. When presenting results from analyses beginning in the 1960s before the compact was ratified to near present day, we see longer durations of 40cfs or less days reoccurring during early summer and fall season months, as represented by the red colored numbers in Table 6.

**Table 6. Boeuf River Flow Frequency**

| Average Number of Days Flow Equal To or Less than for the Period 1963-2012 |         |          |       |       |     |      |      |        |           |         |          |          |            |
|--|---------|----------|-------|-------|-----|------|------|--------|-----------|---------|----------|----------|------------|
| Flow (cfs)   | January | February | March | April | May | June | July | August | September | October | November | December | Flow (cfs) |
| 16,000   | 23      | 22       | 24    | 25    | 24  | 26   | 26   | 26     | 26        | 28      | 25       | 23       | 16,000     |
| 1,000  | 16      | 15       |       | 19    | 21  |      |      | 25     |           |         | 22       | 17       | 1,000      |
| 800  | 15      | 14       | 17    |       |     |      | 23   |        | 24        |         |          | 16       | 800        |
| 600  | 13      |          | 16    | 18    | 20  | 22   |      | 24     |           | 26      | 21       | 15       | 600        |
| 500  |         | 12       | 15    | 17    |     |      | 22   | 23     |           |         |          |          | 500        |
| 400  | 12      | 11       | 13    |       | 19  | 21   |      | 22     |           |         |          | 14       | 400        |
| 300  | 10      | 9        | 12    | 16    | 18  |      | 21   | 21     | 22        | 25      | 20       | 13       | 300        |
| 200  | 8       | 7        |       |       |     |      | 20   | 19     | 21        |         |          |          | 200        |
| 180  |         |          | 9     | 14    |     |      |      | 18     | 20        |         | 19       | 11       | 180        |
| 160  | 7       | 6        | 8     | 13    | 16  | 19   | 19   | 17     |           | 24      |          | 10       | 160        |
| 140  | 6       | 5        | 7     | 12    | 15  |      |      | 16     | 19        |         | 18       |          | 140        |
| 120  | 5       | 4        | 6     | 11    | 14  | 18   | 18   | 15     | 17        | 23      |          | 9        | 120        |
| 100  | 4       |          |       |       |     | 17   | 17   |        | 16        |         | 17       |          | 100        |
| 90   | 4       | 3        | 5     | 10    | 13  |      |      | 13     | 15        | 22      |          | 8        | 90         |
| 80   |         |          |       | 9     | 12  | 16   | 16   | 12     | 14        | 21      | 16       |          | 80         |
| 70   |         |          |       |       |     |      | 15   | 11     | 13        | 20      | 15       | 7        | 70         |
| 60   |         |          | 4     | 8     | 11  | 15   |      | 10     |           | 19      | 14       |          | 60         |
| 50   | 3       | 2        |       |       |     | 14   | 14   |        | 11        | 17      | 13       | 6        | 50         |
| 40   |         |          |       | 7     |     |      |      | 9      |           | 15      | 11       | 5        | 40         |
| 30   |         |          | 3     |       | 10  | 13   | 13   | 8      | 10        | 14      | 10       |          | 30         |
| 20   |         |          |       | 6     |     |      | 12   | 7      | 9         | 13      |          | 4        | 20         |
| 10   | 2       | 1        | 2     | 5     | 9   | 12   | 11   | 6      | 8         | 12      | 9        | 3        | 10         |
| 0  | 1       | 0        | 1     | 4     | 8   | 11   | 10   | 5      | 7         | 10      | 7        | 2        | 0          |



Shaded Area represents Boeuf River flow duration at or below 40cfs



Generally speaking, agricultural diversion does not occur during October and November and we can reasonably assume diversion does not influence, with regularity, historical recorded flow during this time of year. However, for May and June months which are in the normal agricultural growing season, it is appropriate to evaluate how diversions may potentially impact flow volume and duration.

When we inspect frequency tables for each individual year during the period 1963 to 2012, a noticeable increase in the number of days and duration of zero flow occurrences is observed beginning in the 1970s and continuing through the early 1980s. This increase is assumed attributable to additional land alterations such as channelization and cutoff, i.e. decrease in watershed storage and capacity to sustain flow between rain events, and increased conversion of land to agriculture production and activities which may increase surface water demand. This time period predates Arkansas' requirement to report annual water use, so no direct analyses of diversion data can be made for this time period. There are no significant increases in frequency and duration of 40cfs or less days during the 1990s and preceding decades to present day.

Partial hydrographs, plotted for the 1960s and 2000s in Figure 8, clearly show change in flow volume and duration between these decades. These changes cannot be assigned to a single cause or event, but are likely the result of continuous, incremental implementation of massive watershed-wide alterations discussed earlier in this report.

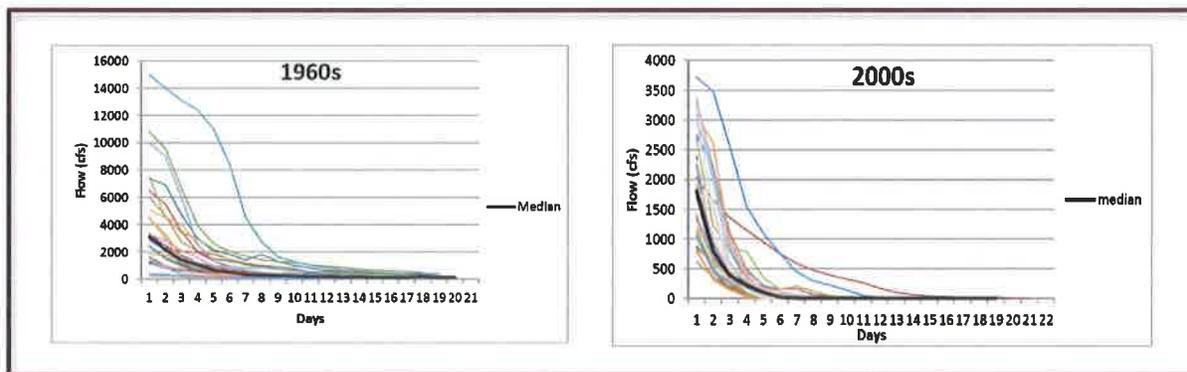


Figure 8. Comparison of Flow Volume and Duration at Girard



## General Description

Arkansas and Louisiana have installed gages at or near the state boundary, but these gages have been operational for less than 10 years. However, it is useful to compare present day recorded flows near the state boundary with the historical record at Girard to identify any similarities in seasonal flow patterns, if they exist. Data from USGS gage #07367690 in Louisiana and near the state boundary is shown in Table 7. Seasonal 40cfs or less “mean of mean” daily values at the state boundary mirror flow patterns identified at the Girard gage, i.e. 40cfs or less “mean of mean” daily values highlighted in red in Table 7 occur during the early summer and fall months.

**Table 7. Boeuf River Mean of Daily Mean Values Near State Boundary**

| Flows in Cubic Feet per Second |     |       |       |       |       |       |      |     |     |     |     |       |
|--------------------------------|-----|-------|-------|-------|-------|-------|------|-----|-----|-----|-----|-------|
| Day                            | Jan | Feb   | March | Apr   | May   | June  | July | Aug | Sep | Oct | Nov | Dec   |
| 1                              | 700 | 303   | 727   | 99    | 169   | 1,150 | 313  | 402 | 286 | 318 | 227 | 347   |
| 2                              | 489 | 401   | 290   | 384   | 114   | 1,560 | 393  | 273 | 218 | 151 | 166 | 174   |
| 3                              | 352 | 911   | 218   | 659   | 514   | 1,160 | 376  | 200 | 146 | 91  | 105 | 172   |
| 4                              | 598 | 397   | 536   | 1,320 | 1,060 | 652   | 185  | 138 | 888 | 348 | 235 | 271   |
| 5                              | 536 | 395   | 434   | 1,390 | 676   | 677   | 97   | 102 | 542 | 167 | 101 | 443   |
| 6                              | 335 | 1,010 | 282   | 702   | 281   | 995   | 532  | 96  | 326 | 90  | 105 | 1,720 |
| 7                              | 446 | 815   | 704   | 465   | 134   | 665   | 482  | 249 | 216 | 48  | 188 | 1,460 |
| 8                              | 263 | 680   | 1,120 | 232   | 83    | 249   | 207  | 338 | 154 | 32  | 135 | 718   |
| 9                              | 301 | 512   | 680   | 144   | 65    | 96    | 343  | 355 | 157 | 24  | 58  | 666   |
| 10                             | 226 | 390   | 298   | 125   | 177   | 37    | 610  | 632 | 160 | 230 | 183 | 1,040 |
| 11                             | 820 | 330   | 673   | 364   | 354   | 18    | 689  | 531 | 93  | 117 | 89  | 1,160 |
| 12                             | 837 | 264   | 764   | 791   | 210   | 15    | 847  | 489 | 58  | 413 | 54  | 624   |
| 13                             | 613 | 266   | 288   | 242   | 621   | 157   | 712  | 624 | 155 | 228 | 45  | 367   |
| 14                             | 355 | 872   | 176   | 472   | 366   | 96    | 500  | 234 | 357 | 124 | 143 | 695   |
| 15                             | 227 | 662   | 418   | 786   | 135   | 185   | 415  | 459 | 180 | 260 | 79  | 685   |
| 16                             | 157 | 1,070 | 257   | 487   | 600   | 86    | 468  | 303 | 78  | 341 | 45  | 671   |
| 17                             | 241 | 1,140 | 403   | 510   | 444   | 313   | 289  | 148 | 118 | 342 | 92  | 565   |
| 18                             | 731 | 621   | 272   | 440   | 471   | 140   | 158  | 374 | 307 | 802 | 186 | 855   |
| 19                             | 107 | 789   | 107   | 733   | 526   | 86    | 302  | 376 | 290 | 473 | 103 | 484   |
| 20                             | 345 | 888   | 82    | 824   | 571   | 60    | 296  | 526 | 192 | 250 | 60  | 347   |
| 21                             | 315 | 750   | 166   | 777   | 266   | 61    | 533  | 360 | 269 | 120 | 39  | 497   |
| 22                             | 273 | 934   | 552   | 436   | 457   | 41    | 413  | 360 | 533 | 62  | 257 | 491   |
| 23                             | 248 | 705   | 670   | 656   | 176   | 28    | 356  | 336 | 380 | 40  | 820 | 250   |
| 24                             | 774 | 363   | 377   | 485   | 490   | 28    | 247  | 252 | 374 | 30  | 817 | 289   |
| 25                             | 757 | 276   | 199   | 603   | 511   | 116   | 101  | 187 | 495 | 25  | 874 | 314   |
| 26                             | 840 | 457   | 789   | 467   | 332   | 114   | 115  | 391 | 225 | 29  | 577 | 639   |
| 27                             | 770 | 516   | 321   | 500   | 83    | 338   | 140  | 282 | 94  | 24  | 123 | 887   |
| 28                             | 519 | 1,250 | 451   | 673   | 330   | 200   | 457  | 160 | 44  | 21  | 372 | 1,260 |
| 29                             | 431 | 273   | 341   | 618   | 845   | 96    | 642  | 131 | 29  | 279 | 790 | 1,520 |
| 30                             | 363 |       | 235   | 340   | 840   | 69    | 290  | 181 | 321 | 103 | 750 | 1,460 |
| 31                             | 327 |       | 270   |       | 1,330 |       | 349  | 217 |     | 89  |     | 909   |



### Compliance Evaluation

With respect to compact compliance, the Girard gage provides a meaningful 80 year historical perspective that reflects the impacts of major landscape and land use changes on the flow record. However, we must remember it is not an accurate representation of Boeuf River flow volumes at the state boundary and should not be used to instigate present day compliance action.

In 2011, from May through November, there were approximately 134 days when the daily mean flow at Girard was recorded as zero. The lengthy and intermittent durations of zero flow during this time period generated concerns about whether an equitable apportionment of runoff was crossing the state boundary. The Boeuf River watershed experienced documented extreme and severe drought conditions during this period, with little to no measureable precipitation from May through August. It's arguable that through much of these lengthy zero flow duration periods there was no runoff and no requirement to provide minimum flows at the state boundary.

An analysis of present day flow at USGS #07367690 near the state boundary shows 40cfs or less flow occurs less frequently and for shorter durations when compared to the historical record at Girard. Despite differences in gage locations and physical settings, similarities in the state boundary and Girard gage flow patterns reveal May and June months are the time of year when the lengthiest 40cfs or less flow durations overlap the normal agriculture diversion season.

Since 2011, there has not been a consistent reoccurrence of 40cfs or less flow lasting 7 days or longer at the state boundary during the early summer months. The compact references apportionment of "weekly runoff", implying runoff should be estimated from a previous 7 day period or prior calendar week. This language provides no specificity regarding the number of consecutive 40cfs or less flow days needed to trigger consideration of management processes affecting apportionment. As a practical matter, it is not reasonable to initiate management processes, given the lack of legal and technical capacity to collect and estimate accurately



instantaneous “weekly runoff” and surface water diversion quantity, if Boeuf River flows are likely to return to 40cfs or more before these management processes can be completed or implemented. The intent of compact provisions is not to initiate administrative processes that are prematurely ended due to fluctuations in Boeuf River flow and which will not produce measurable impact to flows at the state boundary. Therefore, it is strategic to affix a minimum number of days of 40cfs or less flow needing to occur before consideration of “weekly runoff” and apportionment is appropriate. In keeping with the compact’s reference to weekly management, a consecutive, seven day 40cfs or less flow duration at the state boundary is recommended as a minimum to reflect Boeuf River conditions worthy of compact consideration. This seven day minimum provides an opportunity to monitor flow and weather forecasts and to assess the likelihood of continued 40cfs or less flow during the normal agricultural diversion season.

### Level of Effort

The ANRC committed considerable financial and technical staff resources to address concerns regarding apportionment and compact compliance issues in Subbasin II. These efforts included work on data collection and analyses, water use reporting, hydrologic modeling, field surveillance and data collection, and water management that directly or indirectly affect Arkansas’ capacity and ability to implement the Red River Compact. Work efforts are categorized as either direct expenditures for contracting professional services or as staff in-kind time and effort.

Work involving the USGS predictive flow model was approved beforehand by the Engineering Committee. Other projects which advance Arkansas’ state water planning priorities and indirectly impact Arkansas’ ability to implement the Red River Compact were not reviewed by the Engineering Committee beforehand, but these projects are listed in Table 8. The water use reporting program evaluation project was previously discussed in the Compliance Considerations section of this report.



## General Description

ANRC's in-kind effort involved multi-disciplinary personnel from the Water Management and Conservation Divisions comprised of engineers, geologists, environmental program managers, GIS Specialist, surveyor, project manager, and supervisors. These work items represent Arkansas' commitment and response to both addressing concerns regarding Red River Compact apportionment and improving overall statewide water management capabilities and water use efficiencies.

**Table 8. Monetary Value of ANRC's Compact Compliance Investigations**

| Work Area   | Contract         | In-Kind Effort  | Total            |
|---|------------------|-----------------|------------------|
| Boeuf River Flow Analyses                         |                  | \$7,000         | \$7,000          |
| Draft Rules & Monitoring Framework (Trial period) |                  | \$6,000         | \$6,000          |
| HEC-HMS & HEC-RAS workshops                       | \$12,000         | \$4,000         | \$16,000         |
| HEC-HMS Model Development                         |                  | \$4,000         | \$4,000          |
| Runoff Methods Development & Evaluations          |                  | \$10,000        | \$10,000         |
| Boeuf River Weir Investigation                    |                  | \$12,000        | \$12,000         |
| USGS Predictive Flow Model                        | \$65,000         | \$5,000         | \$70,000         |
| Voluntary Water Use Metering                      | \$331,000        | \$3,000         | \$334,000        |
| Installation of Boeuf River Gage                  | \$20,000         |                 | \$20,000         |
| Water Use Program Evaluation                      | \$122,000        | \$7,000         | \$129,000        |
| Miscellaneous- travel, field, etc.                |                  | 10,000          | \$10,000         |
| Boeuf River Report                                |                  | \$7,000         | \$7,000          |
| <b>Total</b>                                      | <b>\$550,000</b> | <b>\$75,000</b> | <b>\$625,000</b> |



### Summary

There are three components affecting criteria in Sections 7.02 (b) & 7.03 (b): Boeuf River flow, weekly runoff, and diversion. An analysis of the historical flow record for Boeuf River at Girard and the state boundary has shown that the lengthiest 40cfs or less flow durations occur during the months of May, June, October and November. Data at the state boundary shows that there is no recurring 40cfs or less flow duration problem during the month of May and June sufficient to require compact action beyond continued monitoring.

After evaluating and testing several methods to estimate instantaneous weekly runoff, an acceptably accurate method sufficient to compel regulation and withstand legal scrutiny could not be developed. To develop such a method would be cost-prohibitive and require significant time and effort to calibrate a model for the Boeuf River watershed. To date, there is no evidential justification to initiate this level of effort.

Future occurrences of 40cfs or less flow durations lasting at least seven consecutive days should be assessed to determine if there are reoccurring conditions which would warrant compliance action. This assessment can be accomplished by: 1) continued review and scrutiny of state boundary flows, especially during the early summer months, 2) continued use of Method #1 rationale to generate gross estimates of runoff (time period greater than one month) which can be compared with other data to evaluate seasonal trends if they exist, 3) use of available forecasting tools to anticipate upcoming drought and low-flow conditions, and 4) annual reporting and discussion of 40cfs or less durations which last for at least seven consecutive days or longer.



## General Conclusions

There is no evidence in recent Boeuf River flow data at the state boundary to substantiate there is an annual, reoccurring flow or duration problem worthy of regulation. This does not delegitimize real concerns over the Boeuf River's lack of capacity to meet all surface water needs in Louisiana and Arkansas. Given there are no legal mechanisms in Arkansas to quantify or regulate instantaneous diversion of runoff, real resistance from policy-makers to justify and implement more regulation and oversight of water use, especially if there is no verifiable, ongoing problem, is inevitable. Sociopolitical attitudes vary widely on the issue of real-time monitoring and management of water use and are not unique to Arkansas. Some believe *"metering and reporting of real-time water use constitutes an objectionable intrusion on individual property rights"* by assuming more information "in the hands" of the government will lead to more regulations. Others say *"additional government oversight is forthcoming as water demands increase and any additional regulatory oversight should be based on scientifically defensible and accurate data obtained through some form of real-time monitoring"*.

Understanding these attitudes is imperative to implementing successful state water planning strategies which can be reasonably implemented and support interstate water agreements and policy. Therefore, the question of "is there sufficient justification and cause for additional effort and cost to attempt more regulation on water use?" cannot be excluded from the discussion in order to promote expectations which may not be explicitly detailed or authorized under reasonable interpretation of Subbasin II provisions.



### Compliance

Based on results from ANRC investigations on apportionment compliance for the Boeuf River watershed, Arkansas has concluded the following:

- 1) Arkansas has taken affirmative steps through ANRC investigations and efforts to ensure and verify Louisiana is receiving its apportionment of runoff from the Boeuf River watershed.**
- 2) Arkansas has no evidence to contradict ANRC's conclusion that Louisiana is receiving its apportionment of runoff from the Boeuf River watershed as specified in Subbasin II provisions.**
- 3) There is no legal or administrative requirement in Subbasin II provisions to maintain a minimum flow at the Arkansas-Louisiana state boundary.**
- 4) Uncertainties associated with significant hydrologic manipulation in the Boeuf River watershed, quantification of instantaneous diversion and runoff, and currently available engineering methods prevent establishment of a direct "cause-and-effect" relationship between water use in Arkansas and Boeuf River flows at the state boundary sufficient to justify regulation of diversions.**
- 5) The actions contained in the recommendation section of this report are appropriate and sufficient to identify any future reoccurring low flow duration pattern(s) at the state boundary which may warrant further compliance deliberation.**



### Recommendations

ANRC's recommended actions to monitor and document flow volume and duration at the state boundary, verify compliance, and maintain open dialogue are listed below.

***Continue monitoring real-time data from USGS gage #07367690 at the state boundary during the months of May and June.***

There are currently no mechanisms to quantify instantaneous runoff and diversion for weekly management of water use. This does not preclude the need for continued monitoring and analyses of Boeuf River flow and duration patterns at the state boundary. Historically, May and June have been when lengthier durations of 40cfs or less flow occurrences overlap the normal agricultural growing season. This is the time period to focus monitoring efforts to evaluate flow and duration occurrences. The USGS gage at the state boundary provides continuous daily flow at 30 minute intervals which is sufficient to identify anomalies in flow patterns.

***Document & Evaluate occurrences when 40cfs or less flow lasts for a minimum of at least seven consecutive days.***

A sustained effort should be made to identify and document 40cfs or less flow durations lasting at least seven consecutive days or longer during May and June months. A minimum time period of seven consecutive days represents a reasonable "starting point" for assessing future occurrences of multiple day low flow periods and the applicability of this duration period to apportionment assessment.

***Compile & Summarize 40cfs or less flow and duration data and present to the Engineering Committee at regularly scheduled Red River Compact meeting.***

A summary of 40cfs or less flow and duration information should be compiled every year and discussed by the Engineering Committee. This will allow a comparison of multiple year occurrences or lack of occurrences during May and June months and with any other potential data related to climatic conditions, water use, etc. An annual compilation and summary of this data in the future will help identify multi-year trend(s), if they exist, that could be relevant to compact apportionment and will provide on ongoing assessment, year by year, of whether there is a problem that needs to be addressed by the compact

***Continue coordination efforts on the Engineering Committee to review, discuss, and assess research studies and projects which use new or advanced runoff methods.***

This coordination effort should not be construed as a prelude to additional financial obligation or commitment by Arkansas, but rather an acknowledgement that continued diligence is needed to maintain a working knowledge of advanced scientific methods as they become available. The Engineering Committee should continue to assess new methods whenever the method may possibly prove advantageous and cost-effective to incorporate into future flow analyses and compact computations.





## ENGINEER COMMITTEE REPORT

### State of Louisiana Report Hot Springs, Arkansas

April 23, 2018

\*\*\*\*\*

#### Committee Meetings

No committee meetings this year  
Two Joint conference calls 12/12/2018 and 2/27/2018

#### **Status of Stream Flows at AR/LA Stateline with Relation to the Specifications of the Red River Compact**

As a follow up to our report at the 2017 meeting in Austin, Texas the Louisiana contingent of the Compact Commission remains concerned with deficient stream flows on some streams at the AR/LA Stateline. The portion of the Compact dealing with Reach IV- ARKANSAS and LOUISIANA, (specifically Sections 7.02 and 7.03) defines the stream flows at Stateline. There is also a general requirement of 40% of the weekly natural runoff in Arkansas for streams crossing the AR/LA Stateline. The streams are Ouachita River, Boeuf River, Bayou Bartholomew, and Bayou Macon.

We are pleased to report that in calendar year 2016, the Ouachita River had no flow insufficiency. The Red River flow across the AR-LA Stateline met the compact requirement as well with only a minor three week period of flows between 1,000 and 3,000 CFS. Bayou Macon had a minor two week flow deficiency. Bayou Bartholomew had a 25% increase deficient flows from last year with 12 consecutive one week periods below 80 CFS. In the same period Boeuf River flows have experience an increase in deficient flows. The number of days when the Boeuf River flow was less than 40 CFS this year was 103 days, virtually no change from 104 days last year. There were eleven one week periods below compact requirements. During the eleven week flow deficiency there was approximately 10 to 20 percent of the gauge flow at Eudora, AR crossing the Arkansas-Louisiana state line.





# Red River Compact

## Environmental Committee Report

### State of Arkansas

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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 of water quality in the Red River Compact Area is a priority for the state of Arkansas.

## REGULATORY

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 Environmental Quality (ADEQ) manages State Water Quality Monitoring Networks for both surface and subsurface waters; and conducts routine monitoring activities and intensive, special 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 Arkansas Natural Resources Commission's (ANRC) 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 develop Total Maximum Daily Loads (TMDLs). The data is used to evaluate designated use attainment and to prioritize restoration and remediation activities. ADEQ develops the 305(b) Report and (303(d) list every two years and provides to the Environmental Protection Agency (EPA) for acceptance and approval.

## NONREGULATORY

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



prioritized to: 1) increase collaborative and innovative conservation partnerships, 2) enhance cooperation among government agencies and non-governmental groups, and 3) demonstrate effective nutrient management and reduction practices that best contribute to water quality improvement. Some of ANRC's collaborative partnerships include: USDA Natural Resources Conservation Service (NRCS), Arkansas Department of Environmental Quality (ADEQ), University of Arkansas Cooperative Extension Service (CES), the Nature Conservancy (TNC), Arkansas Economic Development Commission (AEDC), Illinois River Watershed Partnership (IWRP), Beaver Watershed Alliance (BWA), Discovery Farms, Arkansas Association of Conservation Districts (AACD), and many other entities which are involved in nonpoint source pollution reduction projects and stakeholder issues. These partnerships are longstanding and vital to sustaining successful nonpoint-nutrient reduction and water quality improvement.

## REPORT CONTENT

This report is a compilation of data and information from ADEQ's 2016 Integrated Water Quality Monitoring and Assessment 305(b) Report and the Arkansas Natural Resources Commission's Nonpoint Source Pollution Management Plan and 2017 Annual Report. Included are ADEQ's 2016 303(d) list of impairments within the Red River Compact Area in Arkansas and a summary of ANRC's voluntary conservation and nonpoint pollution efforts to combat these impairments.



### 305(b) REPORTING

A list of Category 5 Impaired Waters that lie within the Red River Compact Area is shown in Table 4 beginning on page 5. These impaired waters are categorized and separated in Table 4 by ADEQ planning segments. Figure 1 shows ADEQ planning segments for Arkansas and the Red River Compact Area (hatched red diagonal lines). These ADEQ planning segments (see Table 1) are: **1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 2E, 2F, and 2G.**

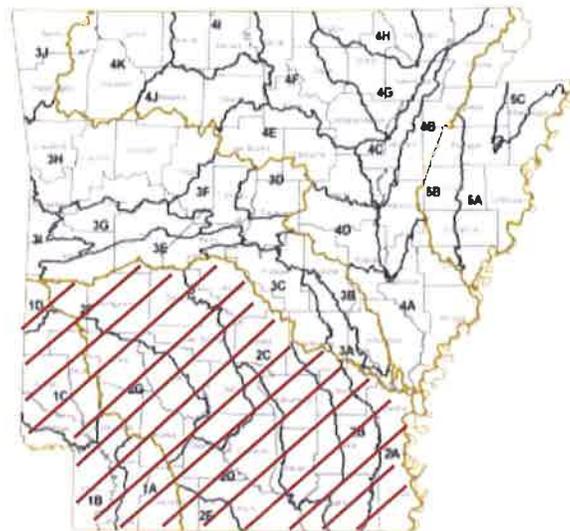


Figure 1. ADEQ Planning Segments and Red River Compact Area

Table 1. List of ADEQ Planning Segments in Red River Compact Area

| Red River Basin |   | Ouachita River Basin |   |
|-----------------|---|----------------------|---|
| 1A              | Dorcheat Bayou & Bodcau Bayou             | 2A                   | Boeuf River & Tributaries   |
| 1B              | Red River, Sulfur River, & McKinney Bayou | 2B                   | Bayou Bartholomew & Tributaries                                   |
| 1C              | Little River & Tributaries                | 2C                   | Saline River & Tributaries  |
| 1D              | Mountain Fork & Tributaries               | 2D                   | Lower Ouachita River & Tributaries                                |
|                 |   | 2E                   | Lower Cornie Bayou & Tributaries                                  |
|                 |   | 2F                   | Ouachita River & Tributaries: Headwaters to Little Missouri River |
|                 |   | 2G                   | Little Missouri River & Antoine River                             |

### CATEGORY 5. WATERBODIES

Category 5 impaired waters from ADEQ's 305(b) Report are shown in Tables 4 and 5. Page 4 contains abbreviations used for description impaired waterbody conditions (see Table 2 and 3) and should be referenced when viewing information contained in this report.



Table 2. Category 5. Designations

|                   |   |
|-------------------|---|
| <b>Category 5</b> | The waterbody is impaired, or one or more water quality standards may not be attained. Waterbodies in Category 5 will be prioritized as:  |
| <b>High</b>       | <b>Truly impaired; develop a TMDL or other corrective action(s) for the listed parameter(s).</b>  |
| <b>Medium</b>     | Waters currently not attaining standards, but may be de-listed with future revisions to APC&EC 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).  |
| <b>Low</b>        | 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 ADEQ assessed as unimpaired, but were assessed as impaired by EPA. |

Table 3. Abbreviations Used in Descriptions for Impaired Waterbody

| 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 | <b>Cause</b>                 |
| 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' 2016 303(d) Listings for Red River Basin (Category 5)

| Planning Segment 1A -Dorcheat Bayou & Bodcau Bayou               |  |                |               |               |          |
|---|--|----------------|---------------|---------------|----------|
| HUC-Reach   | Name                                       | Impairment     |               | Contamination | Priority |
|   |  | Designated Use | Water Quality |               |          |
| 11140205-010  | Little Bodcau Creek                        | FSH            | DO            | UN            | Low      |
| Planning Segment 1B -Red River, Sulphur River, & McKinney Bayou  |  |                |               |               |          |
| HUC-Reach   | Name                                       | Impairment     |               | Contamination | Priority |
|   |  | Designated Use | Water Quality |               |          |
| 11140106-025  | Red River                                  | AI             | Tb            | SE            | Low      |
| 11140106-005  | Red River                                  | AI             | Tb            | SE            | Low      |
| 11140106-003  | Red River                                  | AI             | Tb            | SE            | Low      |
| 11140106-001  | Red River                                  | AI             | Tb            | SE            | Low      |
| 11140201-011  | Red River                                  | AI             | Tb            | SE            | Low      |
| 11140201-008  | Bois D'Arc Creek                           |                | DO            | UN            | Low      |
| 11140201-009  | Bois D'Arc Creek                           |                | DO            | UN            | Low      |
| Planning Segment 1C -Little River & Tributaries                |  |                |               |               |          |
| HUC-Reach   | Name                                       | Impairment     |               | Contamination | Priority |
|   |  | Designated Use | Water Quality |               |          |
| 11140109-033  | Mine Creek                                 |                | SO4           | IP            | Low      |
| 11140109-934  | Mine Creek, upper                          |                | TDS           | IP            | Low      |
| 11140109-001  | Little River                               |                | Tm            | UN            | Low      |
| 11140109-919  | Rollin Fork Creek<br>(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      |



Table 5. (cont.) Arkansas' 2016 303(d) Listings for Ouachita River Basin (Category 5)

| Planning Segment 2A -Boeuf River & Tributaries       |                        |                |               |               |          |
|--|------------------------|----------------|---------------|---------------|----------|
| HUC-Reach  | Name                   | Impairment     |               | Contamination | Priority |
|  |                        | Designated Use | Water Quality |               |          |
| 8050002-003  | Bayou Macon            |                | Cl            | UN            | Low      |
| 8050002-006  | Bayou Macon            |                | Cl            | UN            | Low      |
| Planning Segment 2B -Bayou Bartholomew & Tributaries |                        |                |               |               |          |
| HUC-Reach  | Name                   | Impairment     |               | Contamination | Priority |
|  |                        | Designated Use | Water Quality |               |          |
| 8040205-907  | Chemin-A-Haut Creek    | FSH            | DO            | UN            | Low      |
| 8040205-909  | Main Street Ditch      | FSH            | DO, Pb        | UR            | Low      |
| 8040205-902  | Harding Creek          | FSH            | Pb            | UR            | Low      |
| 8040205-910  | Bayou Imbeau           |                | DO, Pa, Pb    | UR            | Low      |
| 8040205-911  | Able's Creek           |                | Tb            | UN            | Low      |
| 8040205-901  | Bearhouse Creek        | FSH            | DO            | UN            | Low      |
| 8040205-013  | Bayou Bartholomew      |                | DO            | AG            | Low      |
| 8040205-006  | Bayou Bartholomew      |                | Pb            | UN            | Low      |
| 8040205-905  | Cross Bayou            |                | DO            | UN            | Low      |
| 8040205-908  | Overflow Creek         | FSH            | Tb, Cl        | SE            | Low      |
| Planning Segment 2C -Saline River & Tributaries      |                        |                |               |               |          |
| HUC-Reach  | Name                   | Impairment     |               | Contamination | Priority |
|  |                        | Designated Use | Water Quality |               |          |
| 8040203-009  | Saline River           |                | Tb            | UN            | Medium   |
| 8040203-007  | Saline River           |                | Tb            | UN            | Medium   |
| 8040203-018  | Alum Fork Saline River |                | pH            | UN            | Medium   |



Table 5. (cont.) Arkansas' 2016 303(d) Listings for Ouachita River Basin (Category 5)

| Planning Segment 2D -Lower Ouachita River & Tributaries                    |                   |                |                                  |               |          |
|---|-------------------|----------------|----------------------------------|---------------|----------|
| HUC-Reach   | Name              | Impairment     |                                  | Contamination | Priority |
|   |                   | Designated Use | Water Quality                    |               |          |
| 8040201-007   | Smackover Creek   |                | Pb                               | UN            | Low      |
| 8040201-006   | Smackover Creek   |                | DO, Pb                           | UN            | Low      |
| 8040201-806   | Salt Creek        | FSH            | pH                               | UN            | High     |
| 8040201-606   | Elcc Tributary    | FSH            | pH, Cu,NO3                       | IP            | High     |
| 8040201-905   | E. Two Bayou      | PC             | pH, PA                           | UN            | Low      |
| 8040201-001   | Moro Creek        | FSH            | Pb                               | UN            | Low      |
| 8040201-901   | Moro Creek        | FSH            | Pb                               | UN            | Low      |
| 8040202-008   | Bayou de Loutre   | FSH, DW        | DO, SO4, TDS, Pb,<br>Se, Zn,     | IP            | High     |
| 8040202-007   | Bayou de Loutre   | FSH, DW        | DO, SO4, TDS, Pb, Zn             | IP            | High     |
| 8040202-006   | Bayou de Loutre   | FSH, DW        | DO, SO4, TDS, Pb, Zn             | IP            | High     |
| 8040202-909   | Loutre Creek      | FSH, DW        | Cl,SO4, TDS, Se                  | IP            | High     |
| Planning Segment 2E -Lower Cornie Bayou & Tributaries                    |                   |                |                                  |               |          |
| HUC-Reach   | Name              | Impairment     |                                  | Contamination | Priority |
|   |                   | Designated Use | Water Quality                    |               |          |
| 8040206-015   | Big Corney Creek  |                | Tb                               | UN            | Low      |
| Planning Segment 2F -Ouachita River: Headwater to Little Missouri River  |                   |                |                                  |               |          |
| HUC-Reach   | Name              | Impairment     |                                  | Contamination | Priority |
|   |                   | Designated Use | Water Quality                    |               |          |
| 8040102-971   | Chamberlain Creek | FSH, DW, AI    | pH, SO4, TDS, Pb, Al,<br>Be, Tox | RE            | High     |
| 8040102-970   | Cove Creek        |                | Tox                              | RE            | High     |
| 8040102-975   | Lucinda Creek     | FSH            | pH                               | RE            | High     |
| 8040102-976   | Cove Creek        |                | DO, pH                           | UN            | High     |
| 8040101-901   | Wilson Creek      |                | SO4                              | UN            | High     |



Table 5. (cont.) Arkansas' 2016 303(d) Listings for Ouachita River (Category 5)

| Planning Segment 2F -Ouachita River: Headwater to Little Missouri River  |                      |                |               |               |          |
|---|----------------------|----------------|---------------|---------------|----------|
| HUC-Reach   | Name                 | Impairment     |               | Contamination | Priority |
|   |                      | Designated Use | Water Quality |               |          |
| 8040101-902   | Indian Springs Creek |                | DO, SO4, TDS  | UN            | High     |
| 8040101-048   | Prairie Creek        |                | DO            | UN            | Low      |
| Planning Segment 2G -Little Missouri River & Antoine River               |                      |                |               |               |          |
| HUC-Reach   | Name                 | Impairment     |               | Contamination | Priority |
|   |                      | Designated Use | Water Quality |               |          |
| 8040103-003   | Terre Noir Creek     |                | pH            | UN            | Low      |
| 8040103-002   | Terre Noir Creek     |                | pH            | UN            | Low      |
| 8040103-031   | Terre Rouge Creek    |                | Tb            | SE            | Low      |

## CHANGES IN 303(d) LISTINGS

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 of these constituents' concentrations are shown in Table 5. For some waterbodies, the natural background concentration of dissolved oxygen, temperature,

Table 6. Changes to 303(d) Listing Based on Dissolved Oxygen and Temperature

| Constituent      | Waterbodies Added in 2016 | Waterbodies Removed in 2016 |
|------------------|---------------------------|-----------------------------|
| Dissolved Oxygen | 26                        | 4                           |
| Temperature      | 3                         | 8                           |



or pH may be significantly different than the ecoregion average. In this instance, the waterbody cannot attain the water quality standards established for the ecoregion.

The implementation of nonpoint source best management practices has been effective in reducing pollutants entering three of Arkansas' rivers. Leading these efforts, the Arkansas Natural Resources Commission has partnered with land owners in these watersheds to provide education, demonstration projects, technical assistance & expertise, and financial assistance to implement and install best management practices. The results have been a reduction in contaminant levels sufficient to remove the waterbodies from the impaired list. Table 6 shows the waterbodies removed from the 303(d) list as a result of ANRC nonpoint pollution efforts in these watersheds. Information on these projects can be viewed on EPA's website: [http://www.epa.gov/polluted-runoff-nonpoint-source-pollution/nonpoint source success-stories](http://www.epa.gov/polluted-runoff-nonpoint-source-pollution/nonpoint-source-success-stories).

**Table 7. Changes in 303(d) Listing- ANRC Nonpoint Pollution Efforts**

| Constituent | ANRC Efforts   | Waterbodies Removed |
|-------------|--|---------------------|
| Turbidity   | <ul style="list-style-type: none"> <li>▪ Public education &amp; outreach</li> <li>▪ Financial assistance</li> <li>▪ Demonstration projects</li> <li>▪ Technical Assistance</li> <li>▪ Best Management Practices</li> </ul> | Illinois River      |
| Turbidity   |  | St. Francis River   |
| Turbidity   |  | Days Creek          |
| Lead        |  | Bayou DeView        |



## STREAM SEGMENTS REMOVED FROM 303(d) LIST IN 2016

Table 8 contains stream segments that were listed as either Category 4a or Category 5 in ADEQ's final 2014 305(b) Integrated Water Quality Monitoring Assessment Report, but which have been removed from the 303(d) list of impaired waterbodies in ADEQ's 2016 305(b) Water Quality Report.

**Table 8. Stream Segments Removed from List of Impaired Waterbodies in 2016**

| Planning Segment 1A -Dorcheat Bayou & Bodcau Bayou                 |                     |                |                  |               |          |
|---|---------------------|----------------|------------------|---------------|----------|
| HUC-Reach   | Name                | Impairment     |                  | Contamination | Category |
|   |                     | Designated Use | Water Quality    |               |          |
| 11140203-026  | Dorcheat Bayou      | FSH            | pH               | UN            | 4a       |
| 11140203-025  | Beech Creek         | FSH            | DO, Tb, Pb       | UN            | 4a       |
| 11140203-024  | Dorcheat Bayou      |                | pH               | UN            | 4a       |
| 11140203-923  | Big Creek           | FSH            | pH, Pb           | IP            | 4a       |
| 11140203-023  | Big Creek           | FSH, AI        | Cl, SO4, TDS, Pb | UN            | 4a       |
| 11140203-022  | Dorcheat Bayou      | FSH, AI        | pH, SO4, Pb      | UN            | 4a       |
| 11140203-021  | Horsehead Creek     | FSH            | pH, Pb           | UN            | 4a       |
| 11140203-020  | Dorcheat Bayou      | FSH, AI        | pH, SO4, Pb      | UN            | 4a       |
| 11140203-007  | Bodcau Creek        | FSH            | Pb               | UN            | 4a       |
| 11140205-006  | Bodcau Creek        | FSH            | pH, Tb, Pb       | SE            | 4a       |
| 11140205-002  | Bodcau Creek        | FSH            | pH, Tb, Pb       | SE            | 4a       |
| 11140205-010  | Little Bodcau Creek |                | Pb               |               | 5        |
| Planning Segment 1B -Red River, Sulphur River, & McKinney Bayou  |                     |                |                  |               |          |
| HUC-Reach   | Name                | Impairment     |                  | Contamination | Category |
|   |                     | Designated Use | Water Quality    |               |          |
| 11140201-014  | McKinney Bayou      | AI             | SO4, TDS         |               | 4a       |
| 11140201-012  | McKinney Bayou      | AI             | Cl, SO4, TDS     |               | 4a       |



Table 8. (cont.) Stream Segments Removed from List of Impaired Waterbodies in 2016

| Planning Segment 1B -Red River, Sulphur River, & McKinney Bayou  |                   |                |               |               |          |
|---|-------------------|----------------|---------------|---------------|----------|
| HUC-Reach   | Name              | Impairment     |               | Contamination | Category |
|   |                   | Designated Use | Water Quality |               |          |
| 11140201-004  | Red River         |                | TDS           | SE            | 5        |
| 11140201-005  | Red River         |                | TDS           | SE            | 5        |
| 11140201-003  | Red River         | AI             | TDS           | SE            | 5        |
| 11140106-007  | Red River         |                | TDS           | SE            | Low      |
| 11140201-011  | Red River         |                | TDS           | SE            | Low      |
| 11140302-006  | Sulfur River      | FSH, DW        | Tm, Tb        |               | 4a       |
| 11140302-004  | Sulfur River      | FSH, DW        | Tm, Tb        |               | 4a       |
| 11140302-008  | Sulfur River      | FSH, DW        | Tm, Tb        |               | 4a       |
| 11140302-001  | Sulfur River      | FSH, DW        | Tm, Tb        |               | 4a       |
| 11140302-002  | Sulfur River      | FSH, DW        | Tm, Tb        |               | 4a       |
| Planning Segment 1C -Little River & Tributaries                |                   |                |               |               |          |
| HUC-Reach   | Name              | Impairment     |               | Contamination | Category |
|   |                   | Designated Use | Water Quality |               |          |
| 11140109-023  | Little River      | FSH            | Tb            |               | 5        |
| 11140109-010  | Saline River      |                | Tb            |               | 5        |
| Planning Segment 2B - Bayou Bartholomew & Tributaries          |                   |                |               |               |          |
| HUC-Reach   | Name              | Impairment     |               | Contamination | Category |
|   |                   | Designated Use | Water Quality |               |          |
| 8040205-013   | Bayou Bartholomew |                | Cu            |               | 5        |
| 8040205-909   | Main Street Ditch |                | Cu            |               | 5        |
| 8040205-902   | Harding Creek     |                | Cu            |               | 5        |
| 8040205-901   | Bearhouse Creek   |                | Pb            |               | 5        |
| 8040205-005   | Deep Bayou        |                | Cu            |               | 5        |



Table 8. (cont.) Stream Segments Removed from List of Impaired Waterbodies in 2016

| Planning Segment 2C -Saline River & Tributaries          |                 |                |               |               |          |
|---|-----------------|----------------|---------------|---------------|----------|
| HUC-Reach   | Name            | Impairment     |               | Contamination | Category |
|   |                 | Designated Use | Water Quality |               |          |
| 8040203-010   | Saline River    |                | Tb            |               | 5        |
| 8040203-012   | Saline River    |                | Tb            |               | 5        |
| 8040203-013   | Saline River    |                | Tb            |               | 5        |
| 8040203-913   | Saline River    |                | Tb            |               | 5        |
| 8040204-006   | Saline River    |                | Tb            |               | 5        |
| 8040204-002   | Saline River    |                | Tb            |               | 5        |
| 8040204-004   | Saline River    |                | Tb            |               | 5        |
| Planning Segment 2D -Lower Ouachita River & Tributaries  |                 |                |               |               |          |
| HUC-Reach   | Name            | Impairment     |               | Contamination | Category |
|   |                 | Designated Use | Water Quality |               |          |
| 8040201-001   | Moro Creek      |                | Tb, Cu        |               | 5        |
| 8040201-901   | Moro Creek      |                | Tb, Cu        |               | 5        |
| 8040202-008   | Bayou De'Loutre |                | Cl, SO4, TDS  |               | 5        |
| 8040202-007   | Bayou De'Loutre |                | SO4, TDS      |               | 5        |
| 8040202-006   | Bayou De'Loutre |                | SO4, TDS      |               | 5        |
| 8040202-909   | Loutre Creek    |                | Cl, SO4, TDS  |               | 5        |
| 8040202-002   | Ouachita River  | FSH            | Tb            |               | 5        |
| 8040201-005   | Ouachita River  | FSH            | Cu            |               | 5        |
| 8040201-806   | Salt Creek      |                | Cl            |               | 5        |
| 8040201-706   | Flat Creek      | FSH            | Cl            |               | 5        |
| 8040201-007   | Smackover Creek |                | DO            |               | 5        |
| 8040201-006   | Smackover Creek |                | DO            |               | 5        |



Table 8. (cont.) Stream Segments Removed from List of Impaired Waterbodies in 2016

| Planning Segment 2E -Lower Cornie Creek & Tributaries                                    |                       |                |               |               |          |
|---|-----------------------|----------------|---------------|---------------|----------|
| HUC-Reach   | Name                  | Impairment     |               | Contamination | Category |
|   |                       | Designated Use | Water Quality |               |          |
| 8040206-015   | Big Cornie Creek      |                | SO4           |               | 4a       |
| 8040206-016   | Little Cornie Creek   |                | SO4           |               | 4a       |
| 8040206-716   | Little Cornie Creek   |                | SO4           |               | 4a       |
| 8040206-816   | Little Cornie Creek   |                | SO4           |               | 4a       |
| 8040206-916   | Walker Branch         |                | SO4           |               | 4a       |
| Planning Segment 2F -Ouachita River & Tributaries (headwaters to Little Missouri River)  |                       |                |               |               |          |
| HUC-Reach   | Name                  | Impairment     |               | Contamination | Category |
|   |                       | Designated Use | Water Quality |               |          |
| 8040102-975   | Lucinda Creek         |                | Cu            |               | 5        |
| 8040102-971   | Chamberlain Creek     |                | Cu            |               | 5        |
| 8040102-970   | Cove Creek            | FSH, DW, AI    | SO4           |               | 5        |
| 8040102-016   | Caddo River           |                | Cu            |               | 4a       |
| 8040101-048   | Prairie Creek         | FSH            | DO, Cu        |               | 5        |
| Planning Segment 2G -Little Missouri & Antoine Rivers & Tributaries                    |                       |                |               |               |          |
| HUC-Reach   | Name                  | Impairment     |               | Contamination | Category |
|   |                       | Designated Use | Water Quality |               |          |
| 8040103-022   | Little Missouri River |                | Cu            |               | 5        |

### STREAM SEGMENTS ADDED TO 2016 303(d) LISTINGS

Table 8 contains stream segments that were listed not listed as Category 4a or Category 5 in ADEQ's final 2014 305(b) Integrated Water Quality Monitoring Assessment Report, but which have been added to the 303(d) list of impaired waterbodies contained in ADEQ's 2016 305(b) Water Quality Report.



Table 9. Stream Segments Added to List of Impaired Waterbodies in 2016

| Planning Segment 1B -Red River, Sulfur River, & McKinney Bayou  |                    |                |                      |               |          |
|--|--------------------|----------------|----------------------|---------------|----------|
| HUC-Reach  | Name               | Impairment     |                      | Contamination | Category |
|  |                    | Designated Use | Water Quality        |               |          |
| 11140201-011   | Red River          | AI             | TDS                  |               | 4a       |
| Planning Segment 1C -Little River & Tributaries                 |                    |                |                      |               |          |
| HUC-Reach  | Name               | Impairment     |                      | Contamination | Category |
|  |                    | Designated Use | Water Quality        |               |          |
| 11140109-934   | Mine Creek, upper  |                | TDS                  |               | 5        |
| 11140109-919   | Rolling Fork Creek |                | SO4                  |               |          |
| 11140109-013   | Holly Creek        | FSH            | pH                   |               | 5        |
| 11140109-001   | Little River       |                | Tm                   |               | 5        |
| Planning Segment 1D -Mountain Fork & Tributaries               |                    |                |                      |               |          |
| HUC-Reach  | Name               | Impairment     |                      | Contamination | Category |
|  |                    | Designated Use | Water Quality        |               |          |
| 11140108-014   | Mountain Fork      |                | Tm                   |               | 5        |
| Planning Segment 2D -Lower Ouachita River & Tributaries       |                    |                |                      |               |          |
| HUC-Reach  | Name               | Impairment     |                      | Contamination | Category |
|  |                    | Designated Use | Water Quality        |               |          |
| 8040202-008  | Bayou De'Loutre    | FSH, DW        | DO, SO4, TDS, Pb, Zn |               | 5        |
| 8040202-007  | Bayou De'Loutre    | FSH, DW        | DO, SO4, TDS, Pb, Zn |               | 5        |
| 8040202-006  | Bayou De'Loutre    | FSH, DW        | DO, SO4, TDS, Pb, Zn |               | 5        |
| 8040202-909  | Loutre Creek       | FSH, DW        | Cl, SO4, TDS         |               | 5        |
| 8040201-007  | Smackover Creek    |                | Pb                   |               | 5        |
| 8040201-006  | Smackover Creek    |                | Pb                   |               | 5        |
| 8040202-909  | Loutre Creek       | FSH, DW        | Cl, SO4, TDS         |               | 5        |



Table 9. (cont.) Stream Segments Added to List of Impaired Waterbodies in 2016

| Planning Segment 2E -Lower Corne Creek & Tributaries                                     |                      |                |               |               |          |
|---|----------------------|----------------|---------------|---------------|----------|
| HUC-Reach   | Name                 | Impairment     |               | Contamination | Category |
|   |                      | Designated Use | Water Quality |               |          |
| 8040206-015   | Big Corney Creek     | FSH, DW, AI    | Tb            |               | 5        |
| Planning Segment 2F -Ouachita River & Tributaries (headwaters to Little Missouri River)  |                      |                |               |               |          |
| HUC-Reach   | Name                 | Impairment     |               | Contamination | Category |
|   |                      | Designated Use | Water Quality |               |          |
| 8040102-076   | Cove Creek           |                | DO, pH        |               | 5        |
| 8040101-902   | Indian Springs Creek |                | DO, SO4, TDS  |               | 5        |

**MAPS OF IMPAIRED WATERBODIES**

Maps showing Category 1b, Category 4a, and Category 5 waterbodies from ADEQ’s 2016 305(b) Integrated Water Quality Monitoring Assessment Report are shown in Figures 2 and 3. Figure 2 depicts Category 4a and Category 1b waterbodies in Arkansas.

- Category 4a- Impaired Streams with a TMDL 
- Category 1b- Non-Impaired Stream with a TMDL 
- Category 4a- Impaired Lakes with a TMDL 

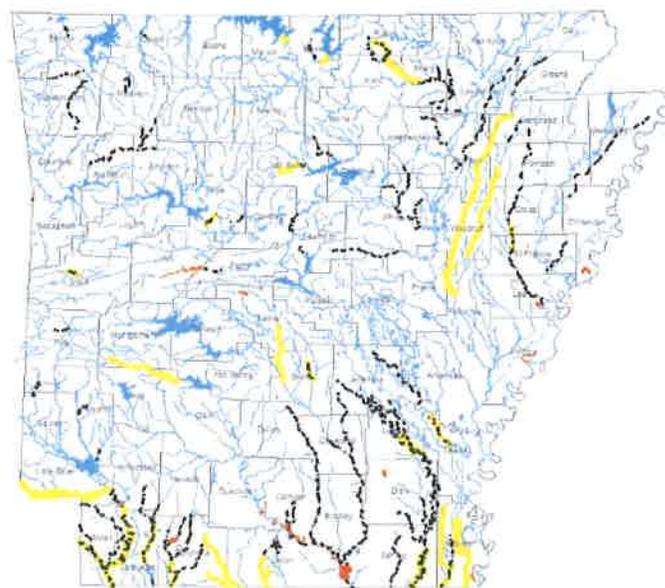


Figure 2. Map of Category 4a and 1b Waterbodies



Category 5 impaired waters are shown in Figure 3.

### TMDL PRIORITIZATION

The Arkansas Department of Environmental Quality (ADEQ) created a “Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act (CWA) 303(d) Program” (4/17/2015) in accordance with the new measures set forth by the United States Environmental Protection Agency (EPA).

ADEQ and ANRC work cooperatively to direct available and limited resources to priority watersheds which have been identified through stakeholder involvement and science-based processes. Nine of ten watersheds identified through these processes have been prioritized for TMDL development. ADEQ’s long-term vision plan includes an update to these priorities by the year 2022.

### SECTION 319 PROGRAM UPDATE

No new projects have been initiated in the Red River Compact Area during the 2017-2018 calendar years. Water quality monitoring continues on Bayou Bartholomew as a component of ANRC’s continuing agreement with USGS to support Arkansas’ surface water monitoring network. A nine-element plan for the Lower Little River Watershed in southwest Arkansas was submitted to the Environmental Protection Agency’s Region 6 office in early 2016.



Figure 3. Category 5 Impaired Waters



Report of the Louisiana Representative to the  
Environmental and Natural Resources Sub-Committee,  
RRCA, meeting of April 23, 2018.

LOUISIANA:

1. On February 10, 2017, the 2016 Louisiana Water Quality Integrated Report was approved by EPA with one Integrated Report Category (IRC) revision to one sub-segment. All other portions of the report have been fully approved by EPA.
2. The Louisiana Water Quality Report 305(b)/303(d) listing, water quality assessments and historical data are available at the following link.  
<http://deq.louisiana.gov/page/water-quality-integrated-report-305b303d>

3. TMDL activity in the Red River basin is as follows:
  - a. There is no current or planned activity within the Red River Basin.

4. Status of water quality conditions:

The water quality for the Ouachita River in Louisiana (based on the near-stateline LDEQ station at Sterlington, La.) and (Stateline to Columbia Lock and Dam) was acceptable. It is understood that these standards may not be reachable during and following high flow events when washout of backwater areas may occur.

RED RIVER – The water quality of the Red River in Louisiana (based on the near-stateline LDEQ station north of Shreveport) is also acceptable. A scan of DO and maximum chloride concentration samples taken are acceptable. The presence of no chloride value above 250 mg/L is notable, as chloride has long been the constituent of interest for this river.

5. Louisiana Department of Environmental Quality (LDEQ)

LDEQ is concerned that the flows from waterbodies crossing into Louisiana periodically fall below values specified by the Red River Compact in some cases for extended periods of time. LDEQ's is concerned about the potential and likely impacts on permitted facilities and the support of water quality criteria and designated uses. Several of Louisiana's permitted facilities either have hydrographic releases (meaning the amount they are permitted to discharge is dependent on the amount of flow in the waterbody) or they utilize the waterbody as a source for cooling water.

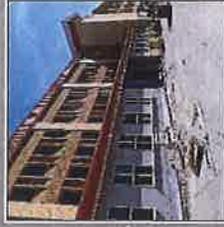
6. Louisiana Water Resources Commission (LWRC) Report on Activities

The summary of meeting presentations for LWRC the Water Institute of the Gulf presented services to the commission. The USGS reported that after decades of over-pumping of the Sparta Aquifer it is close to breaking even with the water naturally entering the aquifer. While conservation and education efforts are a factor industrial closures had the most substantial impact. The Office of Conservation also report on activities in the aquifer, echoed the comments from USGS and further emphasized other strategies for conservation. (See Handout)

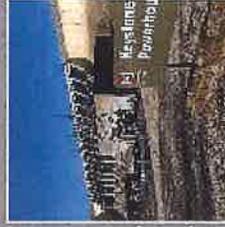


# RED RIVER COMPACT COMMISSION 38<sup>TH</sup> ANNUAL MEETING

Mike Abate  
Chief Civil Works, PPMD  
Tulsa District  
24 April 2018



Military



Hydropower



MIKARNS



Multipurpose  
Reservoirs



Interagency and  
International  
Support



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

# Civil Works Mission Areas

## Water Supply

- 60% of Corps water supply contracts
- 27 lakes, 140 water supply customers
- 2.2 million people served



Tenkiller Lake

## Flood Risk Management

- 38 Corps dams + 12 others
- 15,950,000 acre feet of flood storage
- Arkansas River Basin: \$18.4B in cumulative flood damage reductions
- Red River Basin: \$5.2B in cumulative flood damage reductions



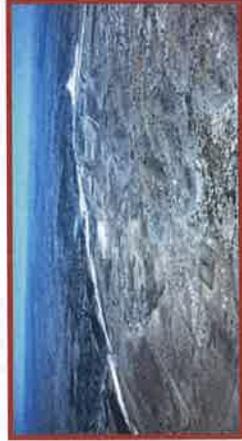
Denison Dam, Lake Texoma

## Environmental Stewardship

- 1.1 million acres of Federal land
- 660,000 acres of wildlife management areas

## Water Quality

- Enhances municipal, industrial, irrigation usage
- Protects endangered species
- Improves degraded streams



Red River Chloride, Area VI

## Hydroelectric Power

- 8 power plants produce 585,000 kw capacity
- Generates power to 8 million customers



Denison Dam Turbine

## Recreation

- 267 recreation areas at 33 projects
- 22.5 million visitors



Hawthorn Bluff Beach, Oologah Lake



McClellan-Kerr Arkansas River Navigation System

- 5 locks & dams
- 3 major ports



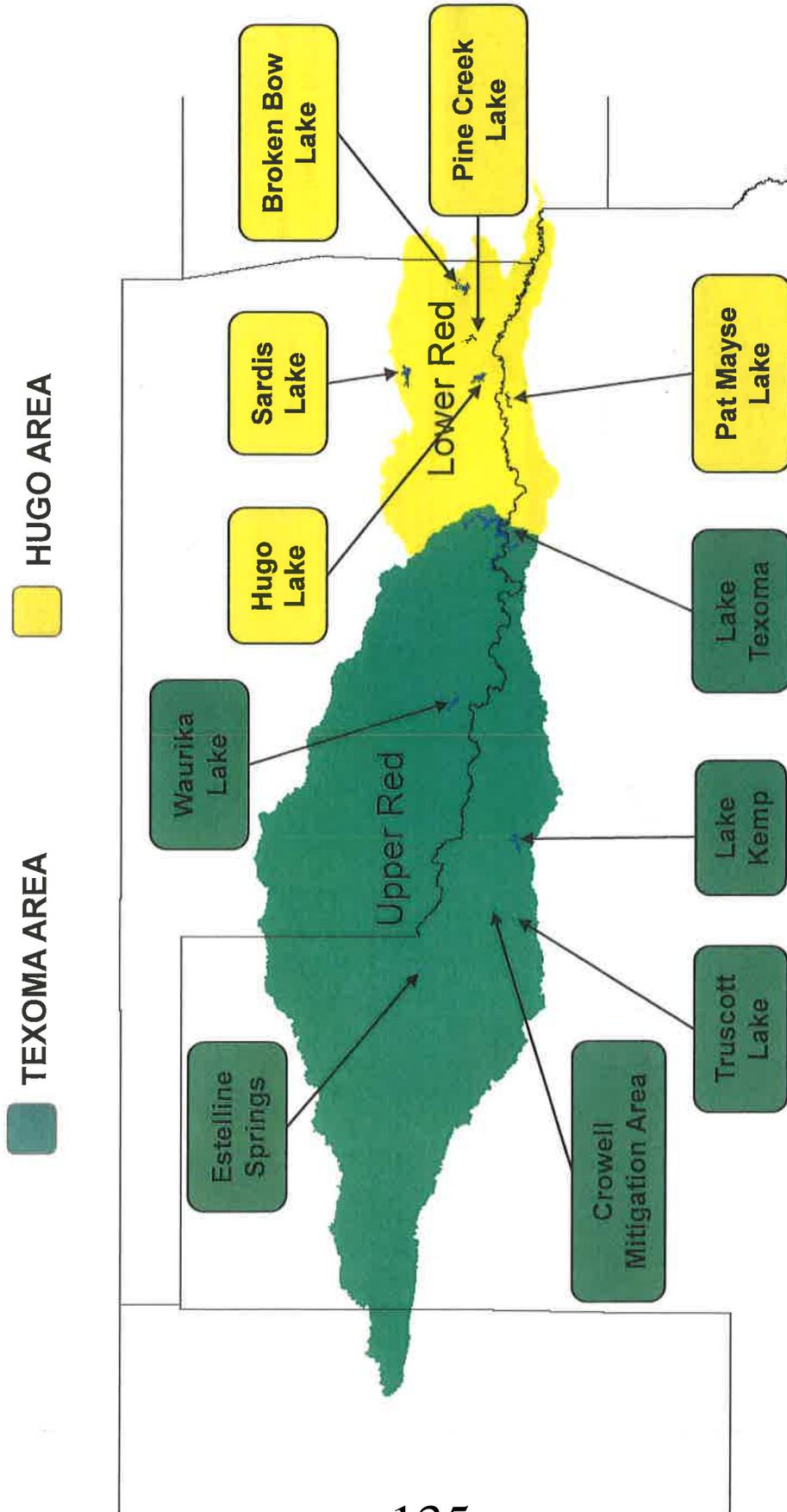
Tenkiller Lake Low Flow Pipe and SDOX



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# Red River Area Organization





# PINE CREEK DAM SAFETY



## Background

Dam Safety Modification Study completed and approved by HQUSACE on 18 September 2013 and identified the following concerns:

- Void around the conduit
- Loss of material through the conduit joints
- Loss of material at the downstream exit face

Hydraulic fracture within the embankment

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## Status of Repairs

- Cutoff wall and vertical filter have been completed (repaired hydraulic fracture and voids)
- Steel conduit installation has been completed (addresses the loss of material through the conduit joints)
- Downstream filter has been completed (addresses the loss of material at the downstream exit face)
- The Project was Physically Completed on 6 April 2018

## Way Forward

- Conduct the Post Risk Assessment Inspection and Evaluation (PIE), scheduled to complete by June 2018 and presented to DSOG in July 2018
- Issue new dam safety rating



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# Denison Hydropower Rehab

## Background

Denison Dam powerhouse contains two 35 MW generating units dating from the 1940s with a total rated generating capacity of 70 MW. Current project scope includes:

- Replacing Francis runners and wicket gates
- Overhauling turbine and auxiliary components, to include replacing oil filled transformers, installing new bus, governors, and bridge crane

- Project scheduled for completion in August 2020



*Flipping U1 Old Runner*



*Flipping U1 New Runner*

## Status of Repairs

- Construction of bridge crane completed February 2017
- Work to replace the turbine runners and wicket gates underway and scheduled for completion in September 2019

## Way Forward

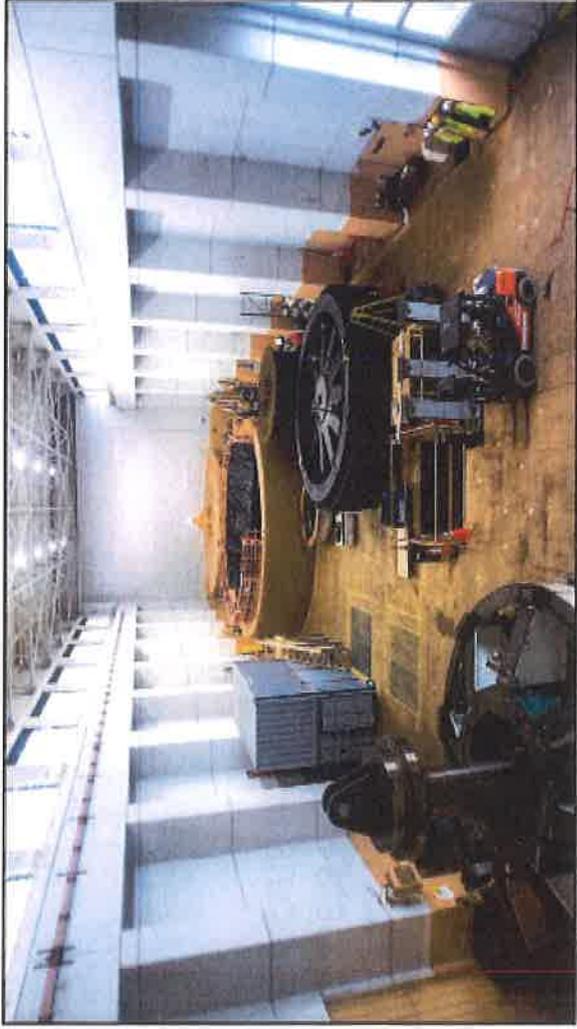
- Powerhouse transformers replacement contract scheduled for award in May 2018
- Bus and switchgear replacement contract to award in July 2018
- Overall project scheduled for completion in August 2019



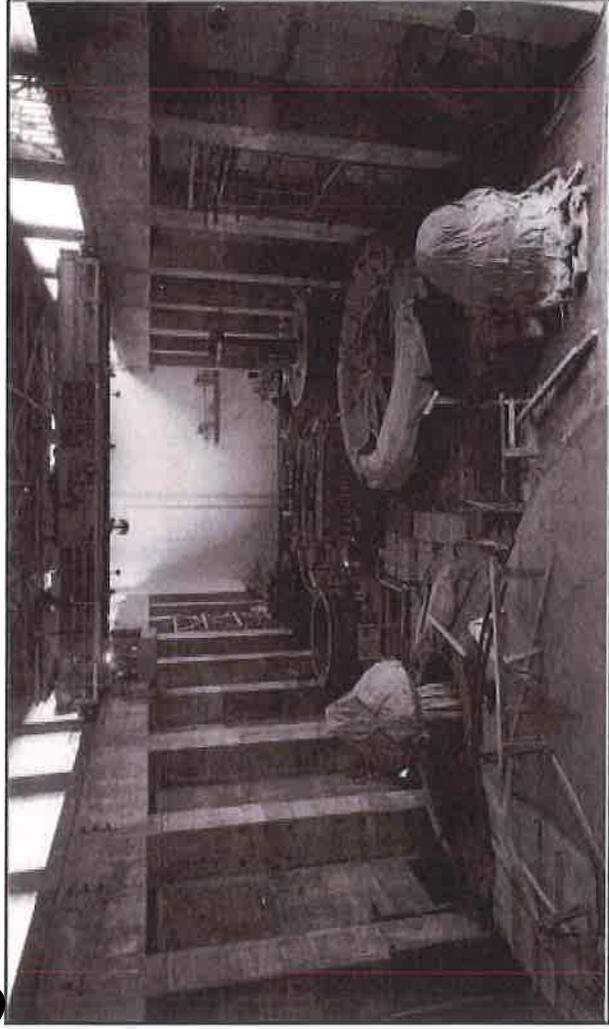
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**DENISON POWERHOUSE: PAST & PRESENT**



**2018 – Major Rehabilitation**



**1944 – Construction in Progress**



# LOWER BOIS D'ARC CREEK RESERVOIR

Proponent: North Texas Municipal Water District

16,400 ac Water Supply Impoundment, Fannin County TX

NTMWD needs additional supplies 2020

5,874 ac of wetland impacts

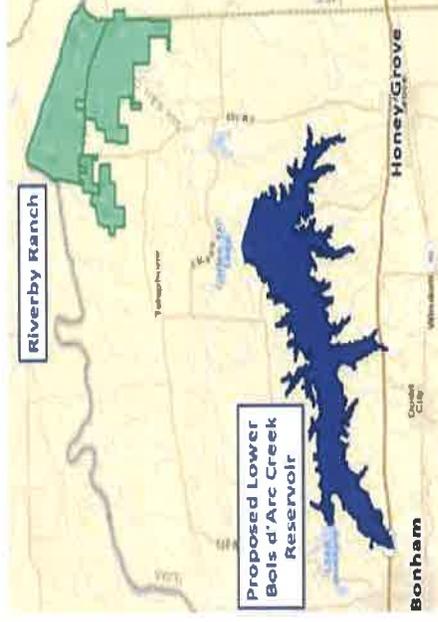
Mitigation: Riverby Ranch 15k ac & Upstrm 1900ac

Construction would take approximately 3 yrs (NTMWD)

EIS required - 3<sup>rd</sup> Party Contract: SOLV LLC (+ ICF)

DEIS rated "3" by EPA Jun2015

RDEIS rated "EC-2" by EPA May 2017



## Major Milestones

- Draft EIS published Feb 2015
- Revised DEIS published March 2017
- WIIN 1147 Report submitted to HQ early June 2017
- Final EIS published November 2017
- Draft Record of Decision 19 Jan 2018
  - Coordinated with EPA per 404Q MOA
- Record of Decision finalized 29 Jan 2018
- Permit Accepted / Issued 2 Feb 2018



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# Tulsa District O&M Funding FY17-FY19

| Project                               | FY17 Allocation | FY17 Flood Supplemental | FY18 President's Budget | FY19 President's Budget |
|---------------------------------------|-----------------|-------------------------|-------------------------|-------------------------|
| Broken Bow Lake                       | \$2,760,120     | \$0                     | \$7,427,000             | \$2,074,000             |
| Hugo Lake                             | \$2,004,870     | \$1,439,000             | \$1,622,000             | \$2,524,000             |
| Pat Mayse Lake                        | \$1,499,130     | \$0                     | \$1,234,000             | \$1,397,000             |
| Pine Creek Lake                       | \$5,974,650     | \$400,000               | \$1,439,000             | \$1,671,000             |
| Sardis Lake                           | \$880,110       | \$26,000                | \$2,245,000             | \$1,285,000             |
| Denison Dam, Lake Texoma              | \$17,675,460    | \$415,000               | \$8,581,000             | \$7,980,000             |
| Estelline Springs                     | \$34,650        | \$0                     | \$35,000                | \$39,000                |
| Lake Kemp                             | \$274,230       | \$0                     | \$291,000               | \$280,000               |
| Red River Chloride Control, Area VIII | \$1,559,250     | \$0                     | \$1,794,000             | \$1,799,000             |
| Waurika Lake                          | \$1,545,390     | \$0                     | \$1,630,000             | \$1,859,000             |

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**PUBLIC LAW 114-322**  
**WATER INFRASTRUCTURE IMPROVEMENTS FOR THE**  
**NATION ACT (WIIN ACT)**

**Sections Specific to Red River Basin Tulsa District**

- Sec 1141, Lake Kemp, TX - Amends Section 3149(a) of WRDA 2007 to change the time from 2020 to 2025.
- Sec 1147, Lower Bois d’Arc Creek Reservoir Project, TX – Directs Corps to use fastest applicable process for environmental decisions and reviews
- Sec 3608, Choctaw Nation of OK and Chickasaw Nation Water Settlement – Ratifies the Settlement Agreement and amended water storage contract at Sardis Lake



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# LAKE TEXOMA AREA FY17 ACCOMPLISHMENTS

- Re-paved roadways in Preston Bend, West Burns Run, Oklahoma Dam-site.
- Repaired campsites
- Re-painted facilities
- Electrical repair
- New shower/toilet – Buncombe Creek
- Tree removal
- Replaced canopies
- Rebuilt shelters
- Replaced sidewalks
- Replaced stairways
- Installed LED lighting at Corps boat ramps

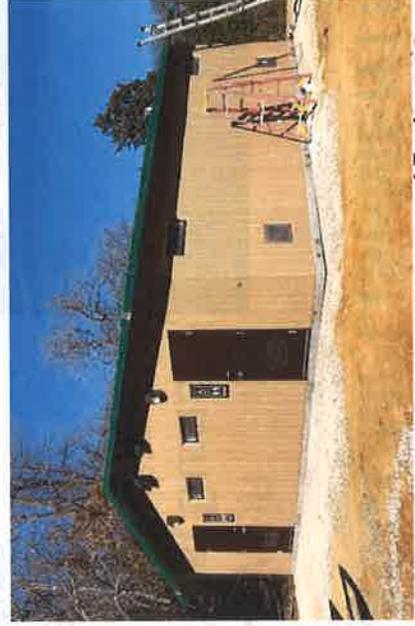


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# LAKE TEXOMA AREA FY18 GOALS

- Flood Supplemental Funding:**
- **Preston Bend:**
  - Shower building replacement
- **Oklahoma Dam site:**
  - Erosion repairs
- **West Burns/East Burns Run:**
  - Repair pavilions
  - Replace storage facilities
- Sustainability Funding:**
- **East Juniper Point:**
  - 100% Waterline replacement - HDPE
- **West Juniper Point:**
  - 100% Waterline replacement - HDPE
- **Lakeside PUA:**
  - Valve replacements and new lines in B-Area
- **Texas Dam-site:**
  - Waterline replacement
- Environmental Package Funding**
- **Project Office:**
  - Main supply waterline replacement
- Damsite Texas:**
  - Shawnee Creek bank stabilization project



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# HUGO AREA FY17 ACCOMPLISHMENTS

Hugo Lake – Pine Creek Lake – Pat Mayse Lake – Broken Bow Lake – Sardis Lake

- \$330k in road repairs through the Emergency Relief for Federally Owned Roads (ERFO) program
- Currently working to execute \$810k in Flood Supplemental road repairs
- Roof repair & mold abatement complete at the Hugo Lake project office
- Initiated replacement of multiple old facilities with one centrally located CXT shower/restroom facility at three different public use areas.
- Acquired ten new CXT restrooms across the Hugo Area.
- Heavy equipment replacement: dump trailers and tractors to assist in debris clean-up



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# HUGO AREA FY18 PLANNED OBLIGATIONS

Hugo Lake – Pine Creek Lake – Pat Mayse Lake – Broken Bow Lake – Sardis Lake

- FY17 carryover and FY18 Budget amount of \$193k in proceeds from timber harvest to be used to perform cultural, re-bedding, seeding and cruise new tract
- Design and construct new Broken Bow bulkhead \$4500k
- Pushing forward to design and construct gable metal roof to cover current flat roof at Hugo project office
- \$300k to replace sequential event recorder at Broken Bow powerhouse
- \$1030k to repair conduit joints and embankment toe drain at Sardis Lake



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of Engineers





# Update on the Red River Focus Area Study

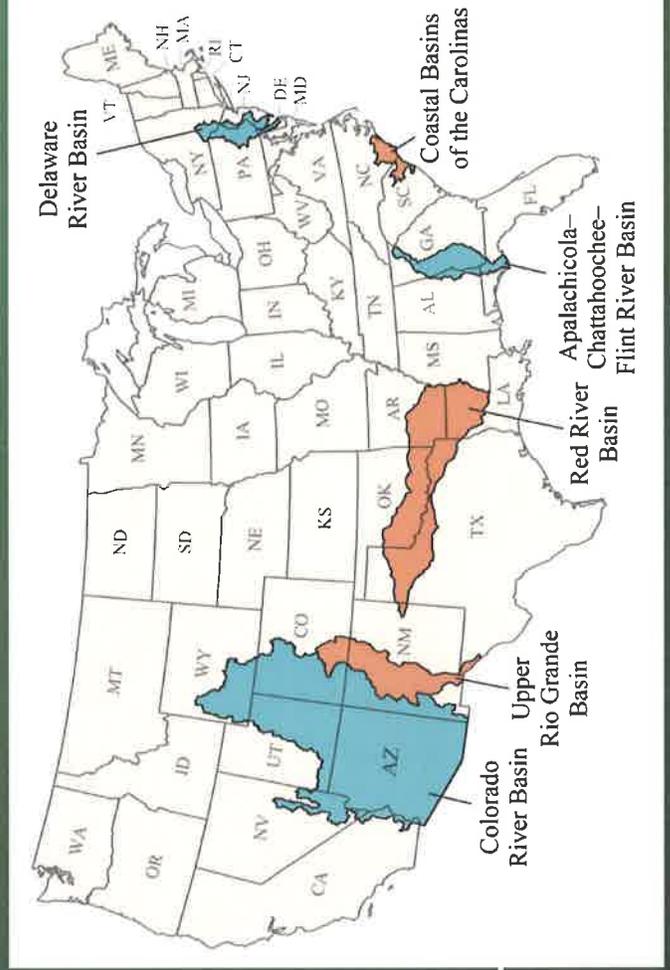
Jennifer Wilson, P.G.  
Supervisory Hydrologist  
Texas Water Science Center

U.S. Department of the Interior  
U.S. Geological Survey

Red River Compact Commission  
38<sup>th</sup> Annual Meeting  
April 24, 2018

# Why are we doing this study?

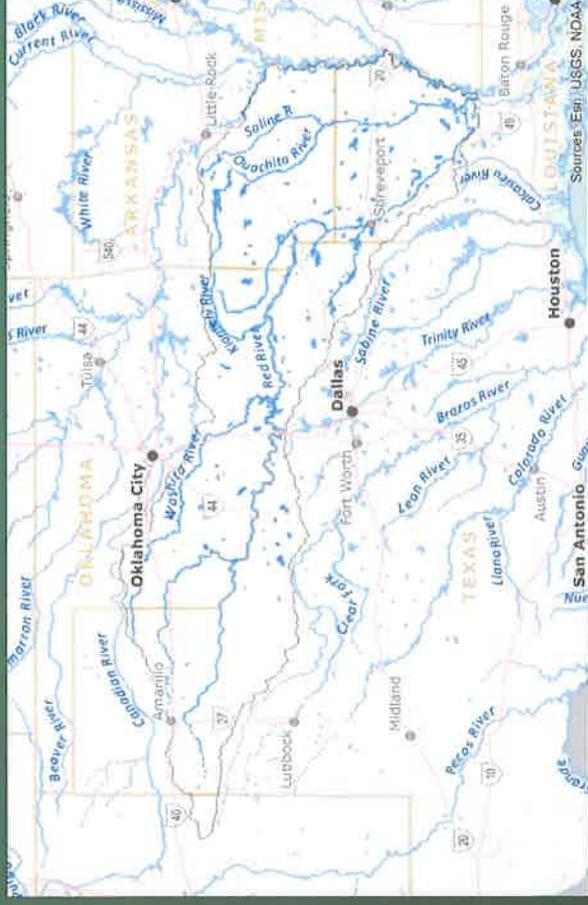
- U.S. Congress SECURE Water Act 2009
- Department of the Interior WaterSMART
- USGS National Water Census
  - Water Availability and Use Science Program
  - Geographic Focus Area Studies: assessment of water availability in large watersheds with potential water-use conflicts



Red River  
Compact Commission  
38<sup>th</sup> Annual Meeting  
April 24, 2018

# Red River Basin – Problems and Concerns

- Large basin (93,200 mi<sup>2</sup>) with population of about 4.3 million people
- Water concerns, conflicts, and increasing demands (Red River Compact)
- Increasingly severe flooding and drought
- Water quality concerns:
  - salinity and chloride
- Disruption of aquatic (fish) ecosystems

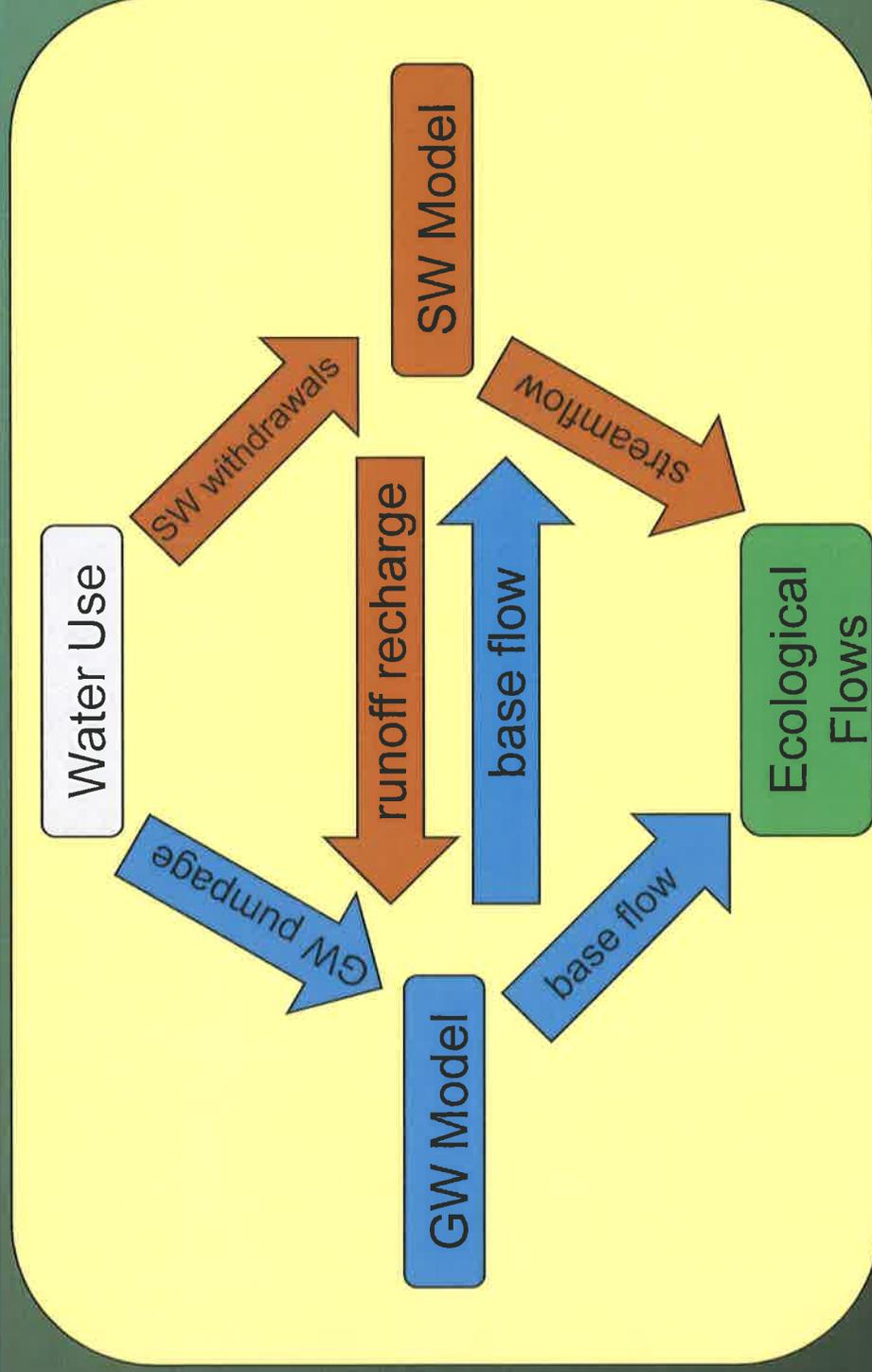


# Red River Focus Area Study-- Study Objectives

- Water Use: refinement and enhancement of water withdrawal estimates to provide a more detailed picture of water use in the basin [lead: B. Pierre Sargent, Baton Rouge, LA]
- Groundwater (GW): develop a groundwater flow model to quantify GW-SW interactions and likely effects of increased GW withdrawals upstream of Lake Texoma Denison Dam [lead: Derek Ryter, Oklahoma City, OK]
- Streamflow: construct rainfall-runoff model (PRMS) to simulate streamflow and compute daily water balances for each hydrologic response unit within the basin [lead: Rheannon Hart, Little Rock, AR]
- Ecological Flows: summarize available fish community data to understand the ecological effects of hydrologic alteration on aquatic ecosystems [lead: Shannon Brewer, Stillwater, OK]



# Red River Focus Area Study— Relations between Study Objectives



GW – groundwater  
SW – surface water

# Water Use Objective – Tasks Included:

1. GW withdrawals from alluvial aquifers upgradient from Lake Texoma Denison Dam from 1994–2015 for GW model
2. SW withdrawals from 1980–2014 for SW model
3. Compile 2010 and 2015 withdrawals (all categories) at the Hydrologic Unit Code-8 (HUC-8) scale
4. Estimate interbasin water transfers
5. Estimate consumptive water use
6. Estimate water use for selected “non-mandatory” categories (wastewater returns, thermoelectric power, and some commercial)



# Water Use Objective – Status of Work

1. GW withdrawals for GW model: **completed**
2. SW withdrawals for SW model : **completed**
3. 2010 and 2015 withdrawals at HUC-8 scale : **completed but need updates with new data/corrections from the state water agencies**
4. Estimated interbasin water transfers: **completed**
5. Estimate consumptive water use: **to be done**
6. Estimate water use for selected “non-mandatory” categories: **to be done**

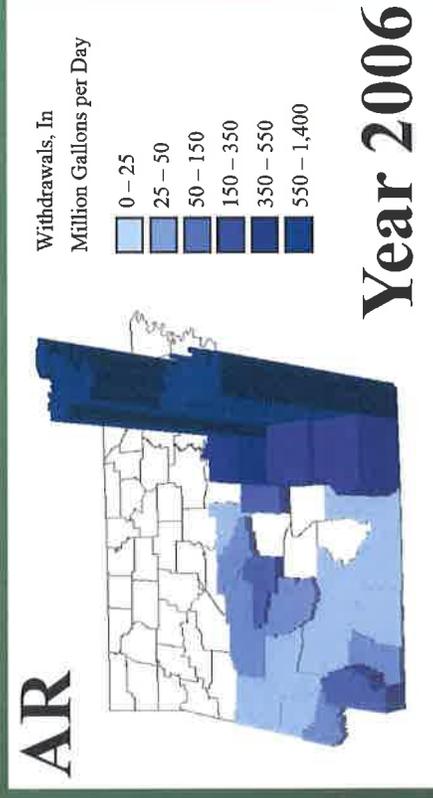
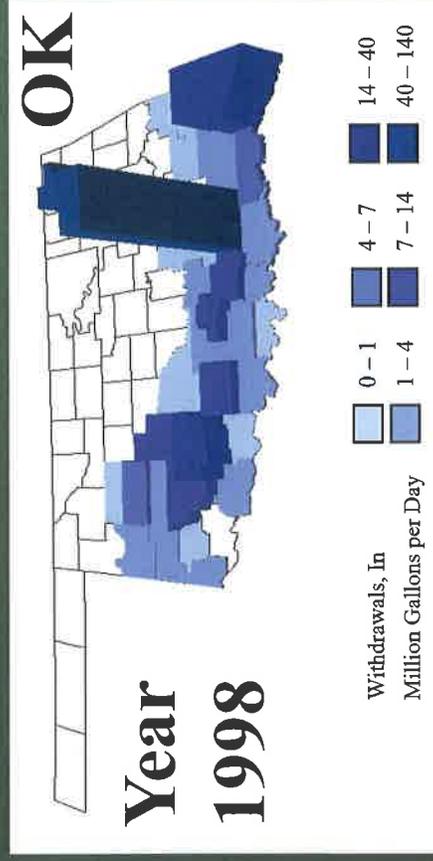


Photo by Jeff Vanuga, USDA Natural Resources Conservation Service.



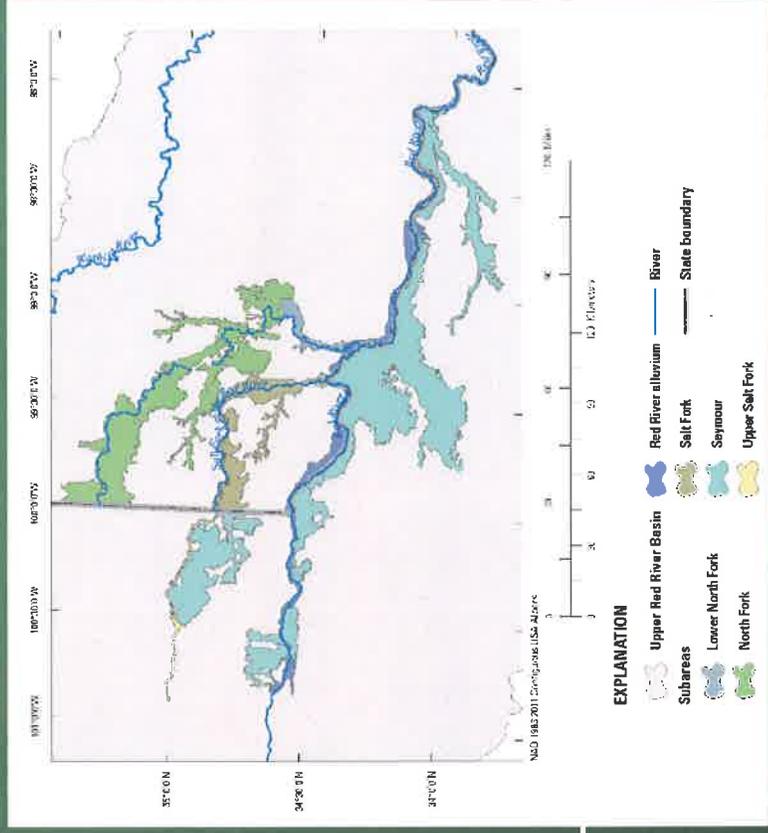
# Water Use Objective – Products & Deliverables

- Data sets in USGS National Water Information System (NWIS) and ScienceBase
- Online, interactive data visualization tools; (static) examples below, illustrating SW withdrawals by county in geographic areas and during time periods of interest to the user



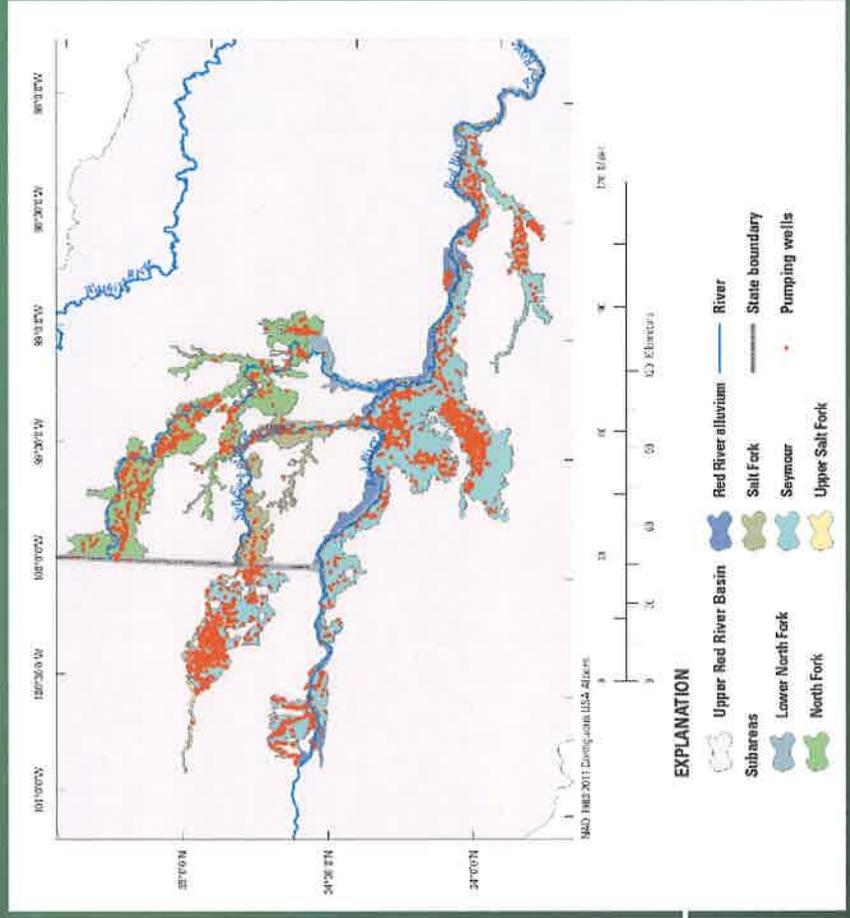
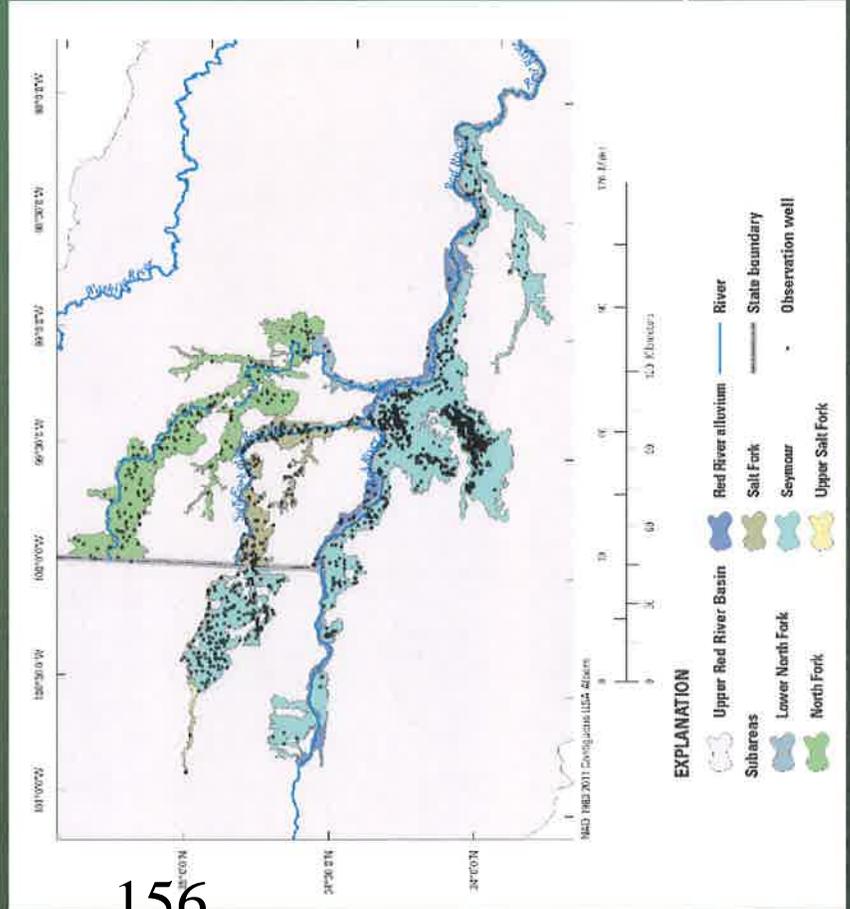
# Groundwater (GW) Modeling Objective – Tasks Included:

- Analyzing and modeling the GW system of the principal alluvial (single layer) aquifers in the upper Red River Basin
  - Seymour, North Fork, Salt Fork, and Red River alluvium aquifers to be included
  - MODFLOW numerical groundwater model with streamflow-routing (SFR) package
  - Loosely couple GW and surface water models
  - Provide range of base-flow conditions to stakeholders and Ecological Flows work



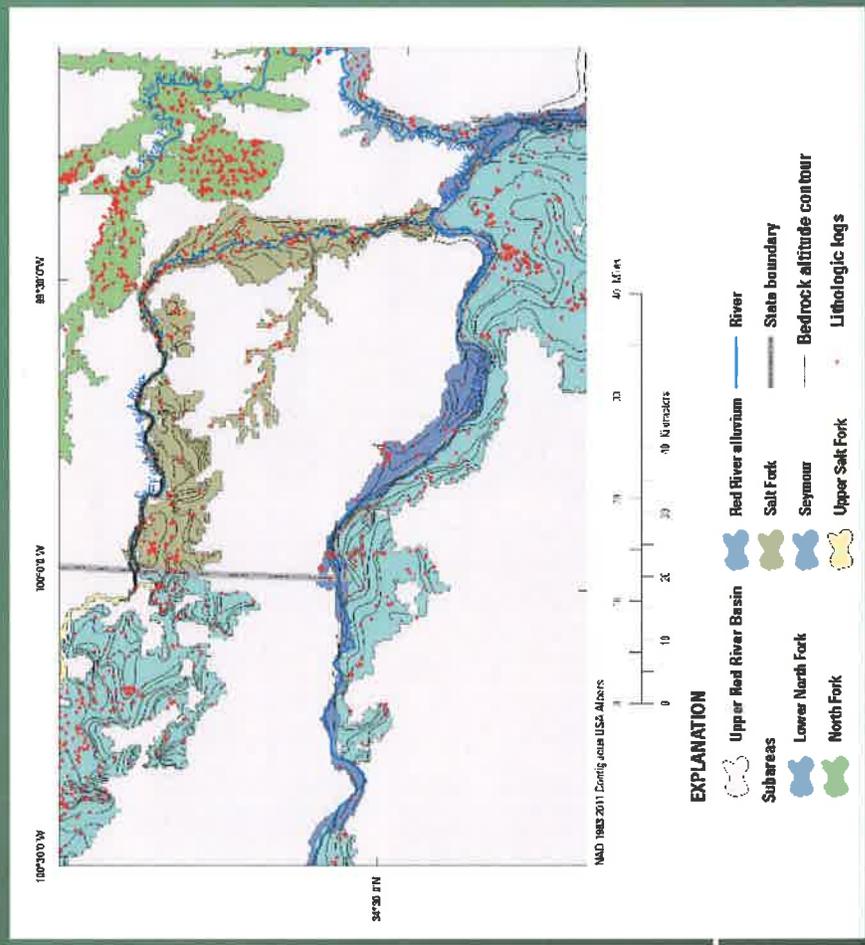
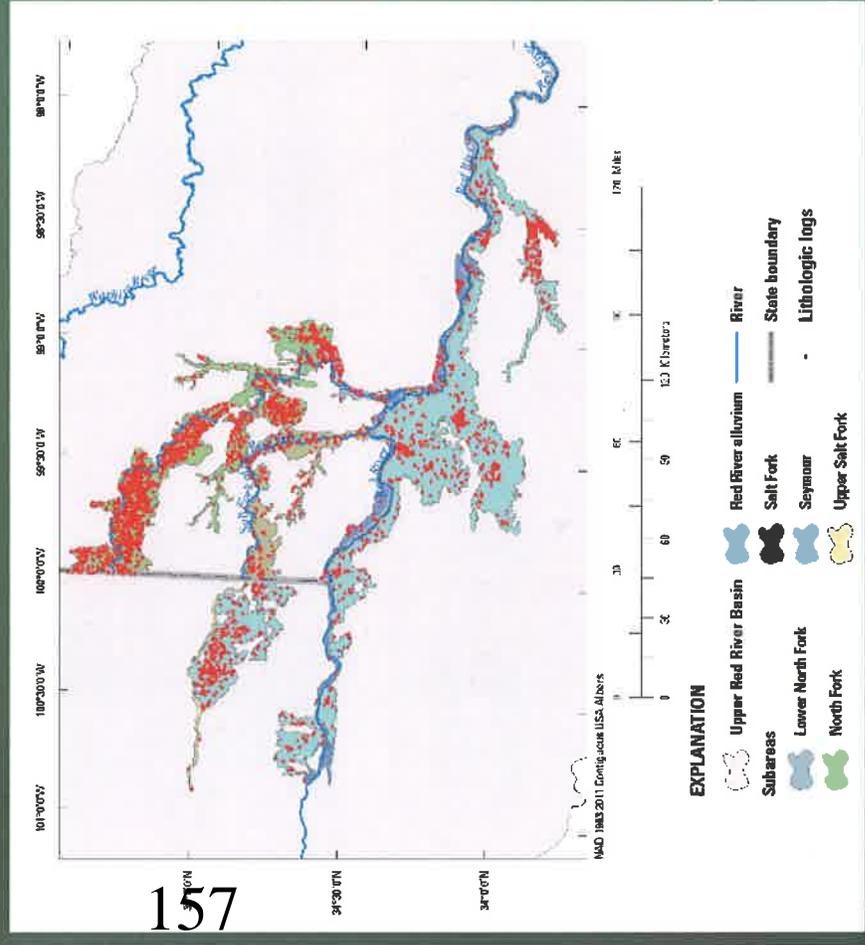
# Groundwater (GW) Modeling – Update on Work Completed

- Compiled historical water levels
- Incorporated GW withdrawals from water use task



# Groundwater Modeling – Update on Work Completed

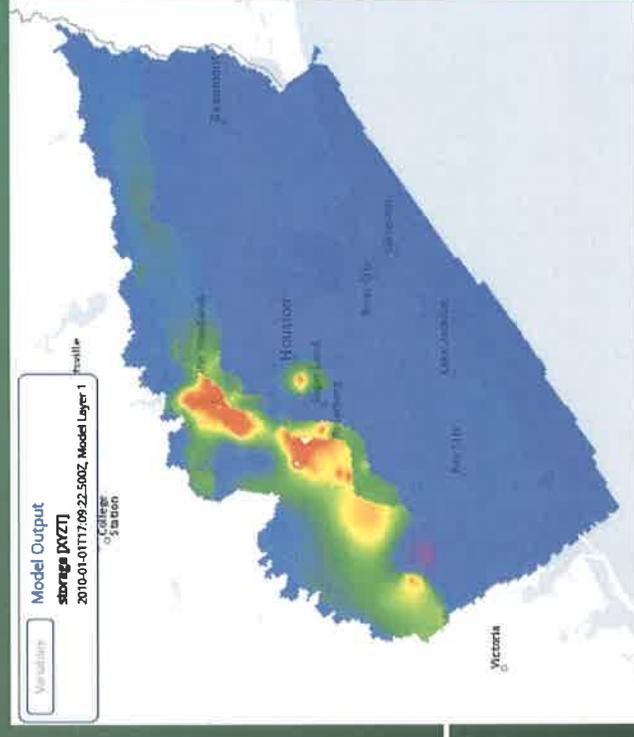
- Obtained and examined lithological logs
- Refined bases of aquifers using well logs



# Groundwater Modeling

## Objective – Next Up:

- Finish the steady-state model and move on to transient model
- Model calibration
- Run predictive scenarios
- USGS Scientific Investigations Report (SIR)
- Model archive including everything needed to run the model (input and output files, metadata)
- Online data visualization; example (right) of GWWebFlow model output (storage) from Gulf Coast aquifer system model

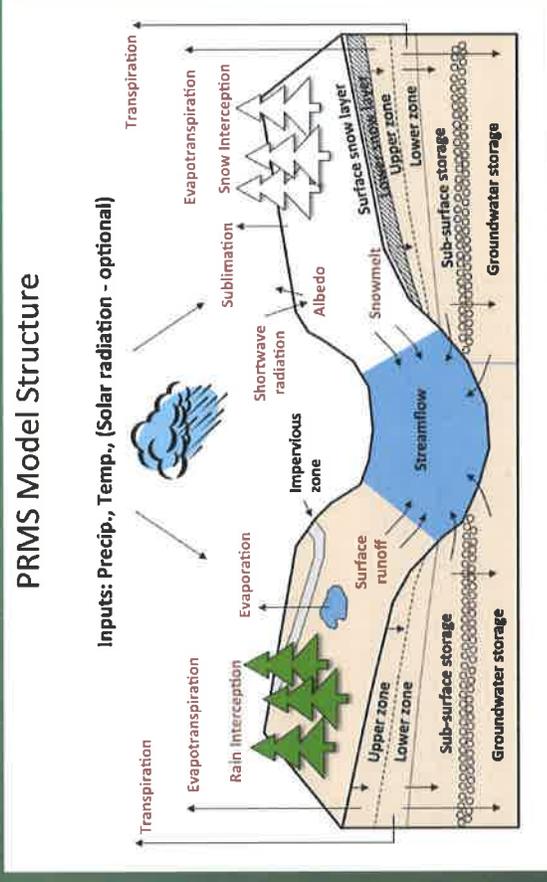


# Surface Water Modeling

## Objective – Tasks Include:

- Simulate and evaluate the effects of precipitation, temperature, land use, soils, and topography on basin response to estimate rainfall-runoff relations in the Red River basin; compute daily water balances for each hydrologic response unit (HRU)
- Build and calibrate a Precipitation Runoff Modeling System (PRMS) daily time-step watershed model for entire basin incorporating:
  - Daily climate (1980–2014)
  - Water use
  - Reservoir releases
  - Dynamic land use

- Loosely couple PRMS watershed model to the groundwater model
- Provide range of hydrologic conditions to stakeholders and Ecological Flows work



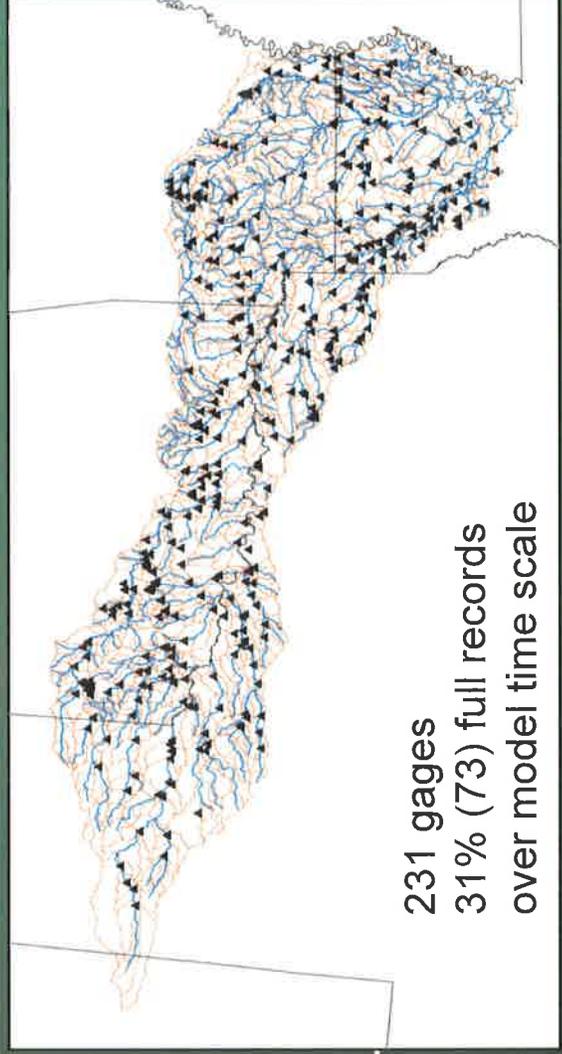
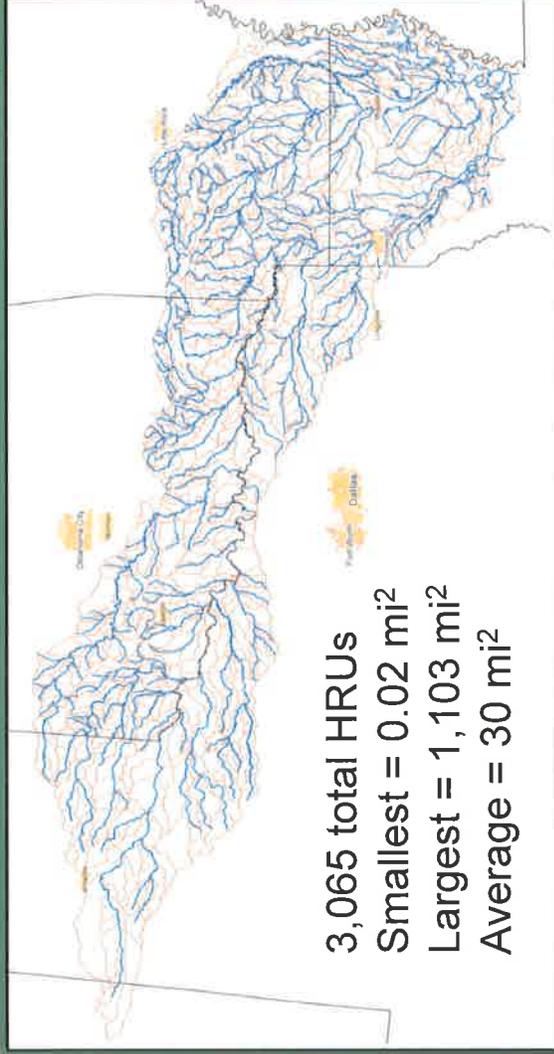
# Surface Water Modeling – Update on Work Completed

- Defined hydrologic response units (HRUs), subwatersheds with similar land uses, soils, and slopes

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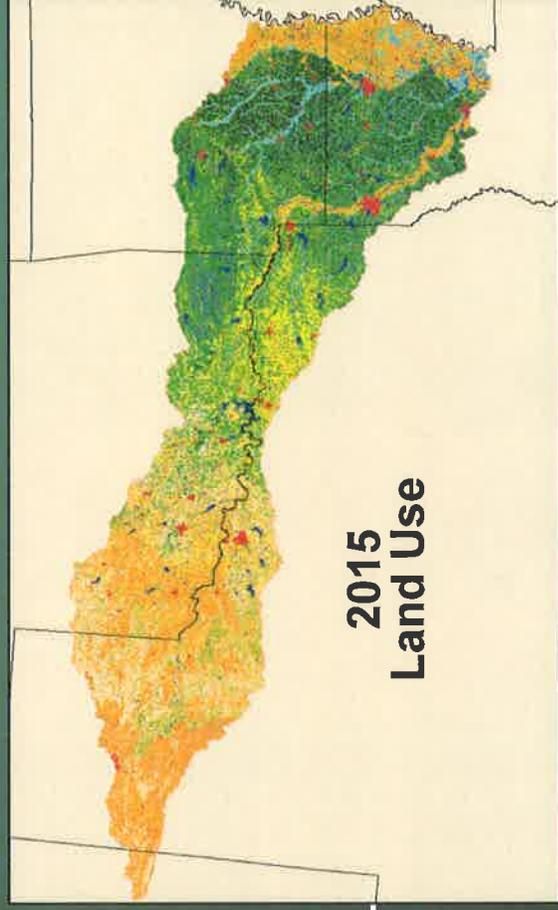
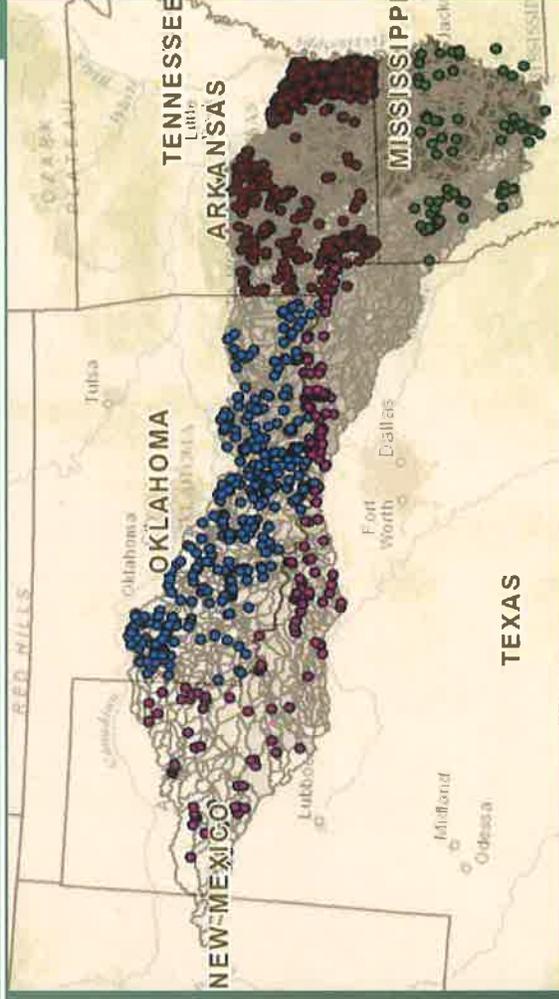
Compiled historical streamflow data from USGS gages

- 131 of 231 gages have more than 5 years of data and used for model calibration



# Surface Water Modeling – Update on Work Completed

- Incorporated surface water withdrawals from water use task
- Incorporated dynamic parameters into model (example shown is recent (2015) land use)

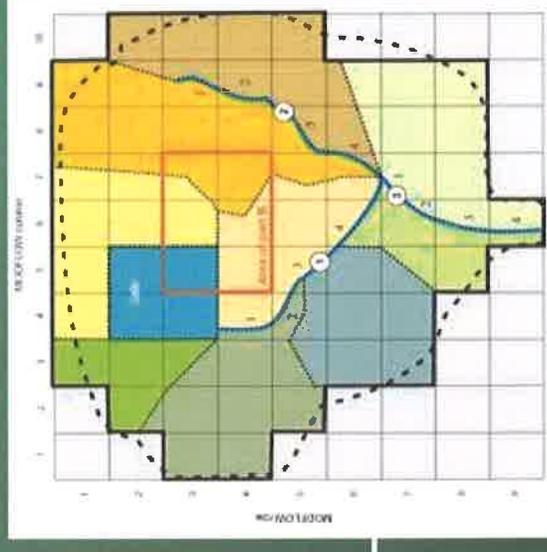


# Surface Water Modeling

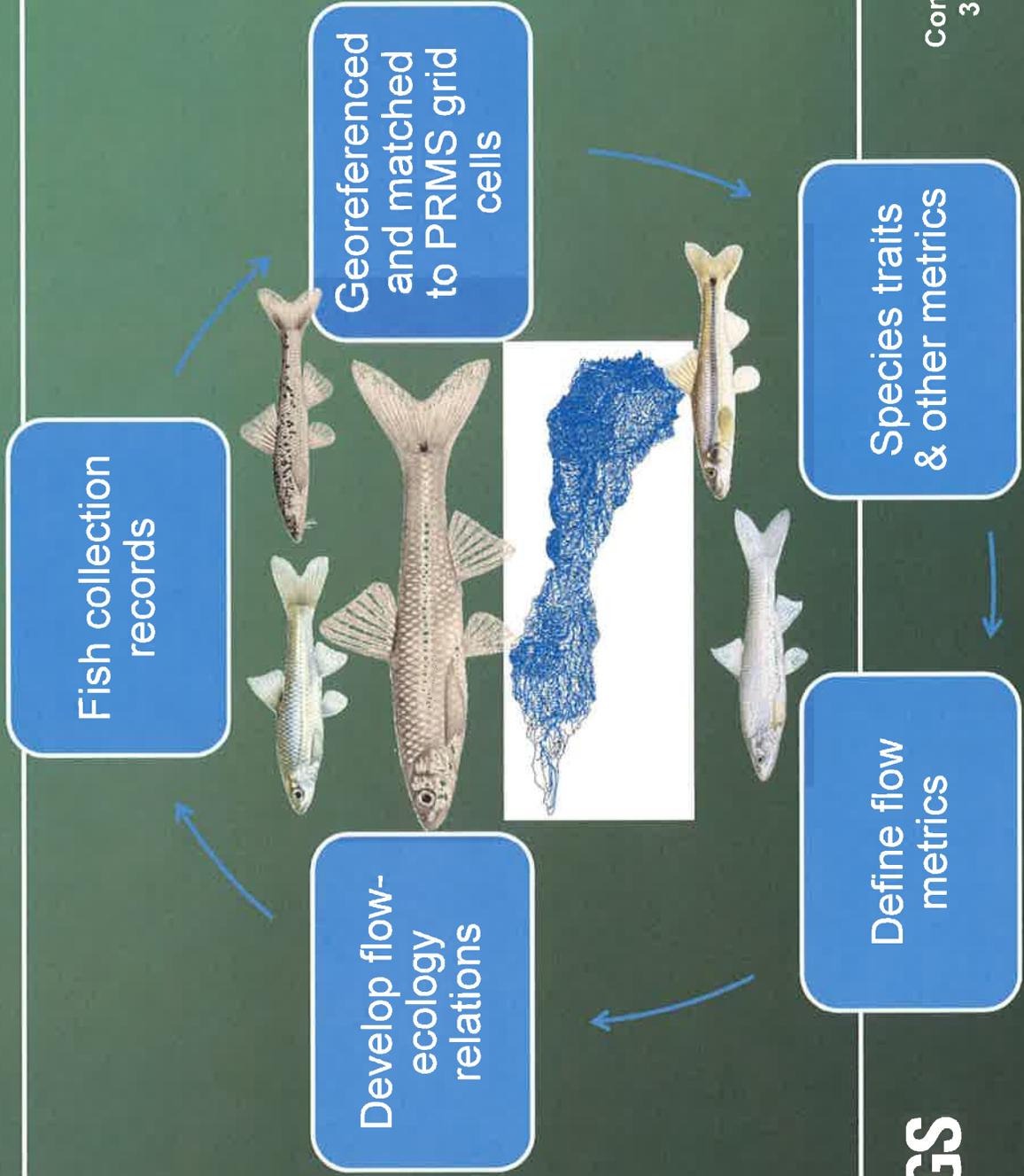
## Objective – Next Up:

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- Finish model calibration
- Provide model streamflows to groundwater modeling and ecological flows teams
- Develop classification metrics of streamflow
- USGS Scientific Investigations Report (SIR)
- Model archive including everything needed to run the model (input and output files, metadata)
- Online data visualization



# Ecological Flows Objective – Tasks Include:



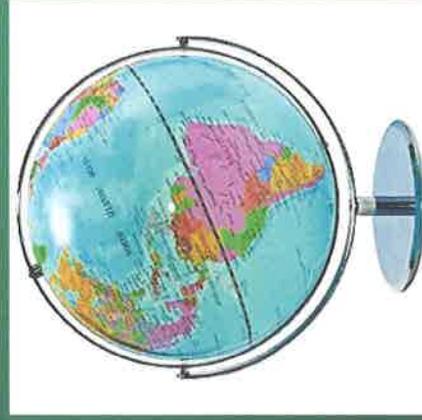
# Ecological Flows – Update on Work Completed

## Data requested from:

- Texas Parks and Wildlife Dept
- Oklahoma Dept of Wildlife Conservation
- Oklahoma Water Resources Board
- Oklahoma Blue Thumb
- Oklahoma Conservation Commission
- Texas Commission of Environmental Quality
- Louisiana Dept of Environmental Quality
- Louisiana Dept of Wildlife and Fisheries
- Arkansas Dept of Environmental Quality
- New Mexico Environmental Dept
- New Mexico Dept of Game and Fish
- Fishes of Texas
- Maris
- VertNET
- iDigBio
- Bill Matthews, Professor Emeritus of Biology, The University of Oklahoma
- Christopher Taylor, The University of Texas Rio Grande Valley
- Sara Cartwright, Sam Noble Museum, The University of Oklahoma
- Jacoby Carter, Wetland and Aquatic Research Center, U.S. Geological Survey

- ## Data georeferenced:
- Added missing survey coordinates
  - Eliminated duplicate records

- Compiled fish species traits from data obtained
- Fish-collection records matched to surface-water model grid cells
- Organized metadata



# Ecological Flows

## Objective – Next Up:

- **Species detection analysis:**
  - Investigate the probability of detecting a species if it's present
  - Examine effect of sampling methods: electrofishing versus seining
- **Analysis of flow-ecology relations**
- **Release data sets in ScienceBase**
- **Publish one or more journal articles**



# New Website – Home Page



[https://webapps.usgs.gov/watercensus/redriver\\_fas](https://webapps.usgs.gov/watercensus/redriver_fas)

## Red River Focus Area Study

- Home
- Real-Time Map
- Methods
- Imeline
- Deliverables
- Staff
- Presentations

The USGS is undertaking a 3-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. The Red River basin covers more than 93,000 square miles in New Mexico, Texas, Oklahoma, Arkansas, and Louisiana with a population of about 4.3 million people. Water resources in the basin are being stressed by increasing water demands and increasingly severe droughts. A comprehensive water-resource assessment of the basin is needed to enable sustainable water use.



Click on map for larger image

Red River Basin FAS Stakeholder Meeting, Texarkana, TX, June 1, 2017. [Click here for more information.](#)

The Red River Focus Area Study (FAS) will compile existing information and add 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 is organized around four important components 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:

- Water Use
- Groundwater Flow Model
- Rainfall-Runoff (Surface Water) Model
- Ecological Flows





# General Timeline

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- Federal fiscal year (FY) 2016:
    - Background research
    - Data compilation and organization
  - FY 2017:
    - Continue data compilation and organization
    - Construct models and incorporate water use data
    - Begin data analyses
  - FY 2018:
    - Complete data compilation and organization
    - Calibrate models
    - Statistical analyses
  - FY 2019:
    - Publication of data releases, USGS Scientific Investigation Reports (SIRs), journal article(s), and model archives
- 



# Next Steps

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- Complete tasks and begin reporting phase
- Communication of results with stakeholders
- Web page updates with data visualization tools and links to data releases, USGS reports, and journal articles



**Wrap it Up!**

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*Questions?*

**Study lead contact information:**

**Jennifer Wilson,  
jenwilso@usgs.gov**



Red River Compact Commission  
38<sup>th</sup> Annual Meeting  
April 24, 2018

# RED RIVER VALLEY ASSOCIATION

April 24, 2018

629 SPRING STREET  
P.O. BOX 709  
SHREVEPORT, LA. 71162-0709  
(318) 221-5233

TO: Red River Compact Commissioners  
FM: Richard Brontoli, Executive Director, [rrva@rrva.org](mailto:rrva@rrva.org)

RE: Red River Valley Association Report to the Red River Compact, April 24, 2018

**1. Appropriations:** The President's FY 2018 budget request, for the civil works program, was \$5.0 B and Congress enacted \$6.8 B for FY 2018. It is obvious the intent of Congress is to fund civil works, waterway projects; however, the President's FY 2019 budget request is only \$4.8 B, a 29% reduction. It is apparent that the Administration may talk about infrastructure projects, but the fourth R, rivers, is not included with the other Rs; roads, rail and runways.

The President's FY 2018 budget, for the J. Bennett Johnston Waterway O&M, had \$12,288,000, \$3,574,000 more than the FY 2017 Budget request. This is the first budget to meet the basic needs, \$11,500,000, for our waterway since FY 2010. The President's FY 2019 Budget has \$11,881,000; \$407,000 less than the FY 2018 Budget request; however, this is adequate to meet the basic annual need.

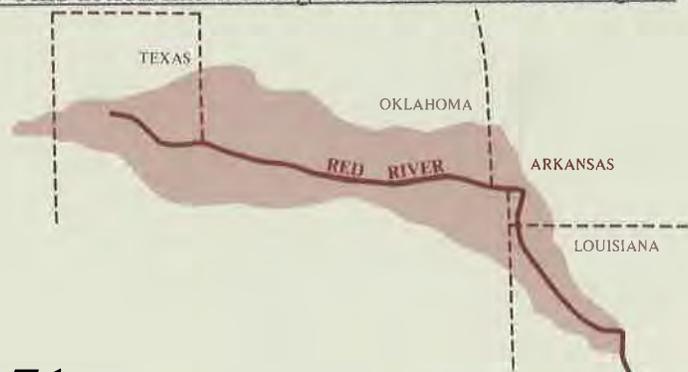
There are no funds in the Construction General (CG) Account for the Waterway. The construction features of the J. Bennett Johnston Waterway project are only 93% complete. In FY 2017 additional funds of \$5,965,000 were added for mitigation. Meeting the project mitigation requirements is important, but so are the navigation structures. Mitigation funds do not advance the projects needed for efficient and safe navigation.

There is also the issue of Continuing Resolutions. When appropriation bills are not enacted until well into the fiscal year, the Corps of Engineers has a difficult time awarding contracts and executing their program. This makes for a very inefficient civil works program.

We encourage our delegation support an Energy & Water Appropriation Bill be completed and enacted by 1 October 2018; the Corps of Engineer budget be at a minimum level of \$7.0 billion; and that the appropriation bill continue to have the 'additional funding' provisions for the GI, CG, and O&M accounts.

**2. Flood Events & Impacts:** It is important to note that the Red River experienced a series of five major flood events from May 2015 through April 2016. From February 2018 to present the Red River is experiencing another major flood event. The 2018 high river levels closed three locks to navigation, with Lock 5 closed to navigation for over two weeks.

The Red River is one of the most high silt carrying rivers in the United States, so when the flood waters subside there will be major silting. Dredging will be required at all lock & dam approaches and below Lock 1, where levels are controlled by the Mississippi River. We want to commend the Vicksburg District for having funds available and initiated an emergency dredge contract. This action had a dredge at Lock 1 before losing the navigation channel.



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 foot channel, thus requiring additional dredge funds each year. Some degraded dikes 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 through a "Channel Improvement" program, similar to what is accomplished annually on the Mississippi River. An annual \$5 million channel improvement program would upgrade our dike and revetment system and over time reduce the level of funding required for annual maintenance dredging.

**3. Hydraulic & Sedimentation Survey/Study:** The historic 2015 flood identified a major issue, which was the difference between the actual crest and the projected crest. What concerned our communities is when compared to the 1990 flood the 2015 flood crest was higher with less flows. An additional item of concern is that the Base Flood Elevations shown on the current Flood Insurance Rate Maps (FIRM) published by FEMA, used to regulate development located in the Special Flood Hazard Areas (SFHA's), are not accurate and must be updated. These issues are the responsibility of input from multiple federal agencies; FEMA, Corps of Engineers and National Weather Service.

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 indicated that it is not possible to determine the reasons for these discrepancies without a Sedimentation Survey and Hydraulic Model. This \$1.5 million study was funded and data collected. The Corps expects to have the results in 2019. FEMA indicated that they cannot determine new BFEs without this information.

**4. IMTS Reduced Lock Operations:** The Corps has implemented a program, IMTS Reduced Lock Service, based on the number of commercial lockages per year. Locks 3, 4 & 5 do not meet the minimum 1,000 commercial lockages per year., however, after an analysis by the Vicksburg staff, Col Derosier, District Commander, decided to allow our five locks to remain operating 24/7/365 for CY 2018. We know there will be a re-evaluation each year and we must show positive trends. Since 1995, when Locks and Dams 4 & 5 were completed, our public ports, State of Louisiana, Red River Waterway Commission, communities and private industries have invested over \$2.8 billion. This is more than the federal investment of \$1.9 billion, a testament to the public and private efforts to make the Waterway a success. As a young Waterway it takes time for economic and industrial development. We want to express our appreciation to Col. Derosier and his staff for considering this and providing the Red River communities the opportunity to succeed.

**5. 12 foot Channel Authorization Initiative:** Currently the J. Bennett Johnston Waterway is authorized and maintained for a 9-foot channel. The RRVA Navigation Committee has made great efforts to make this Waterway safe and reliable. Now it is time to make it efficient. The project local sponsor, Red River Waterway Commission (RRWC), is requesting a modification to the J. Bennett Johnston Waterway to deepen the authorized channel from 9 feet to 12 feet and this Association is in full support of this initiative.

The RRWC and RRVA submitted, to the Corps of Engineers, a request and justification for a project modification for consideration for a 12 foot channel, including community letters of support. The Corps of Engineers did include this proposal in the March 2017 Annual Report to Congress. Congress now has the responsibility to move this initiative by authorizing it in the next WRDA Bill, which is expected in 2018.

Following are the reasons and justifications why we should pursue authorization for a 12' channel.

- Competition: As long as rail rates drop to meet waterborne rates, industry cannot be expected to change the way they conduct business if they are experiencing the benefits. We must continue to do what is necessary to reduce waterborne rates.
- Authorization of Adjacent Systems: **ALL** major Waterways south of Cairo, Illinois, are currently authorized for a 12 foot channel, **except our Waterway**. Waterways authorized to 12' include:

Mississippi River, Arkansas River, Atchafalaya River and Gulf Intracoastal Waterway. Barges destined for our Waterway must be special loaded to 9 foot, creating a great inefficiency for industry and shippers.

- Current Channel Depths: It is estimated that the controlling depth of the Waterway is currently at or exceeds 12 feet for over 90% of the 210-mile system.
- Lock Capability: Each of the five locks on the Waterway is capable of passing 12-foot draft vessels.
- Additional Cargo Capacity: As a 'rule of thumb' one barge carries 1,500 tons of cargo, loaded at 9'. Loading a barge to 12 feet provides an additional 3', 1/3 more capacity, or 500 tons per barge. A typical tow for this Waterway pushes 6 barges. Loading to 12 feet increases the tonnage for a 6-barge tow from 9,000 tons to 12,000 tons; therefore, a 6 barge tow would be carrying the same capacity as 8 barges. The same tow and crew would be used keeping the cost the same, providing a lower cost per ton.
- Ecosystem Benefits: Positive impacts due to 'notched' dikes, fish habitat and Least Tern habitat restoration could be included in this project.

We are certain that the benefits outweigh the costs for our Waterway to be maintained at 12 feet. Minimum maintenance dredging and navigation structures would be required. The savings per ton will enable the public ports to market the Waterway and be competitive to recruit new industries. To compete and realize the full potential, the Waterway must be authorized at 12 feet.

**6. Navigation into Arkansas Feasibility Study:** The Arkansas Legislators took all the funds from the Arkansas Red River Commission trust fund in 2014. The State Legislators then reinstated \$1 million, to the Red River Trust Fund. These funds have been provided to the Corps of Engineers to progress the feasibility study to a decision point to determine if the project should continue or be terminated. The Vicksburg District contracted with GEC to conduct a way bill analysis and industry surveys. A final report is expected in early 2019.

**7. Chloride Control Project:** The Administration will not support this project. Construction on the Wichita River will not resume until the earmark policy is changed. GEM, an alternative energy company, is interested in using waters in Truscott Reservoir for solar ponds to generate electricity. They are identifying buyers for their power, to receive funds from investors to initiate construction. All permits and cooperative agreements have been received from the Corps of Engineers and Red River Authority of Texas.

**8. Index to Denison Dam:** North Texas Council of Governments is willing to invest \$500,000 to conduct a study to determine if navigation is feasible 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 study is positive. The Texas legislators did not pass a bill for this study; therefore there is no action at this time.

**9. Earmarks:** The no earmark policy, in the House and Senate, continues to be an issue. The Administration decides the funding level projects receive. Congress needs to take back their responsibility for the appropriation process. They also need to redefine earmarks for civil works projects that have been through an authorization, vetted process. Corps of Engineer GI, CG & O&M Projects are funded by a line item budget and are NOT earmarks, as long as they have gone through the authorization (WRDA) process. Civil Works projects are too important to leave up to the Administration to prioritize. Congress must keep the ability to determine what projects get funded and be able to represent their constituents.

## **10. 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' (27' flood pool), 235.0' (24.5' flood pool) and 242.5' (17' flood pool). It appears that raising the lake elevation to 232.5' msl would not create more downstream flooding and have no impact on navigation. Any elevations higher than 232.5 ft. msl increases the probability, during an intense rain event, of the occurrence of uncontrolled flows over the emergency spillway at elevation 259.5 ft. msl.



# RECLAMATION

*Managing Water in the West*

## **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.

Four new projects were recently 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

Two projects were awarded in FY 16 totaling \$55,000 in Federal funding:

- **Muscogee Creek Nation**  
Groundwater Study
- **Cherokee Nation**  
Cherokee Rural Water District #8 Hydraulic and Water Loss Assessment

Three projects were initiated in FY 15 (one already completed) totaling \$180,000 in Federal funding:

- **Cherokee Nation**  
Hydraulic and Water Loss Study of Adair County Rural Water District #1
- **Cherokee Nation**  
Viability Assessment for Regionalization of Rural Water Systems in Western Cherokee County, OK
- **Peoria Tribe of Indians of Oklahoma**  
Potential for Utilization of Contaminated Portions of the Boone Aquifer

## **Water Conservation Field Services (WCFS) Program**

One new 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

Two projects were initiated in FY 16 totaling \$432,504 in Federal funding:

- **City of Norman, OK**  
Test-Pilot Hexavalent Chromium (Cr6) Removal Technologies to Address Cr6 Groundwater Occurrence and Potentially Reduce Stress on Lake Thunderbird (COMCD) Water Supply and Improve Drought Resiliency
- **City of Garden City, KS**  
Installation of a Subsurface Drip Irrigation System at Clint Lightner Field  
Subsurface Irrigation to Demonstration Effluent Reuse

Two projects were initiated in FY 15 (both scheduled to be completed by end of September 2017) totaling \$115,433 in Federal Funding

- **City of Wichita Falls, TX**  
Implement Water and Energy Conservation Measures for the Operations, Management, and Use of Water within the District
- **Texas Water Development Board**  
Development of Methodologies to Evaluate the Environmental, Financial and Social Benefits of Water Reuse Projects

# 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

A Basin Study on the Upper Washita Basin in Oklahoma was awarded \$350,000 in FY 12 Federal funds to partner with the Oklahoma Water Resources Board (OWRB) and Fort Cobb and Foss Reservoir Master Conservancy Districts to identify sustainable solutions to infrastructure issues and existing and projected imbalances between water supply and demand. To date, including both Federal and non-Federal cost-share contributions from partners, the total cost is \$1,260,660 and is expected to be completed in late 2018.

OWRB is in the process of completing a groundwater-flow model on the Rush Springs Aquifer and a surface water allocation model (SWAM) on the Washita River. 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. 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

A Basin Study on the Upper Red River Basin in Oklahoma was awarded \$640,000 in FY 14 Federal funds to partner with the OWRB, Lugert-Altus Irrigation District, and Mountain Park Master Conservancy District 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 that help ensure long-term reliability of water supplies during critical drought periods. To date, including

both Federal and non-Federal cost-share contributions from partners, the total cost is approximately \$2,511,762. The study is expected to be completed in late 2018.

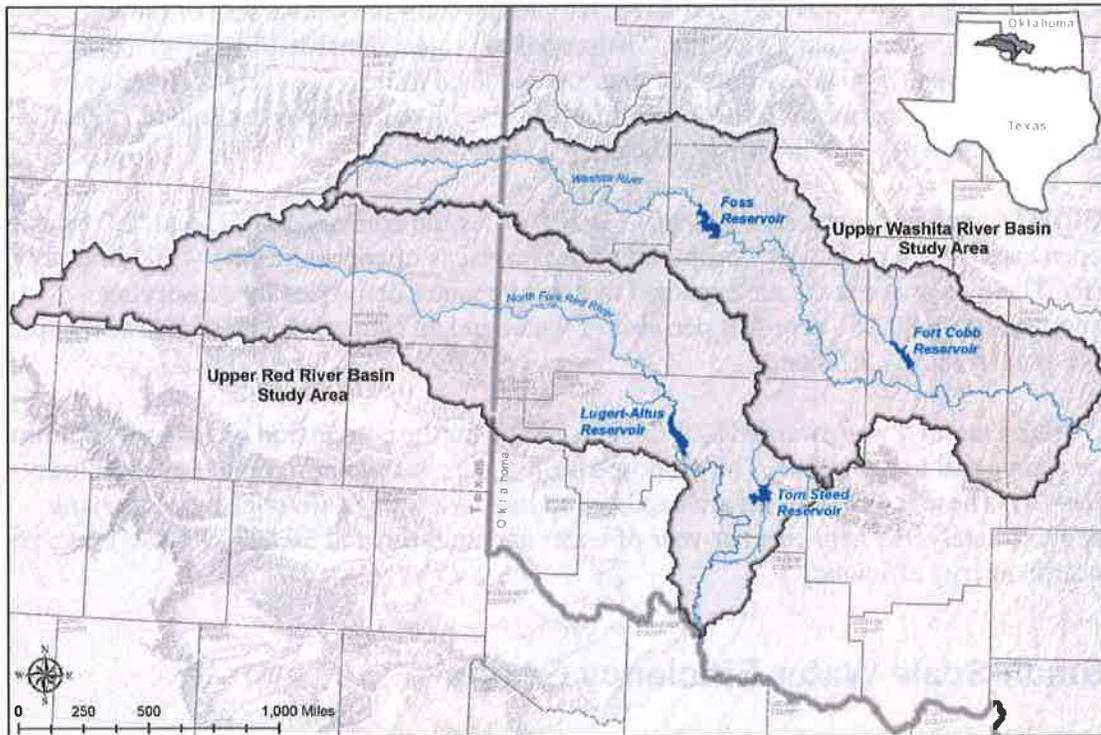


Figure 1: Upper Washita and Upper Red River Basin Study area map.

## 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 \$7.3 million to 32 projects in Texas and Oklahoma with a cumulative project cost of \$25.5 million. The estimated total amount of water saved or better managed is about 26,863 acre-feet per year.

### Cameron County Irrigation District #2 (CCID2)

CCID2 in Texas was awarded a total of \$1,049,999 in FY 17 comprised of four separate projects.

CCID2 Canal F was awarded \$299,973 in FY 17 for the conversion of Lateral “F” from an open canal to a pipeline. The proposed project consists of approximately 7,000 liner feet (lf). These improvements are expected to improve water deliveries by conserving

approximately 542.60 acre-feet per year of water and an estimated 25,865 kilowatt hours per year in energy efficiency.

CCID2 Lateral JN-1 was awarded \$173,311 in FY 17 for the conversion of Lateral “JN-1” from an open canal to a pipeline. The proposed project consists of approximately 3,900 liner feet (lf). These improvements are expected to improve water deliveries by conserving approximately 621.50 acre-feet per year of water and an estimated 25,015 kilowatt hours per year in energy efficiency.

CCID2 Canal E was awarded \$299,674 in FY 17 for the conversion of Canal “E” from an open canal to a pipeline. The proposed project consists of approximately 4,900 liner feet (lf). These improvements are expected to improve water deliveries by conserving approximately 802.81 acre-feet per year of water and an estimated 32,312 kilowatt hours per year in energy efficiency.

CCID2 Lateral 8 was awarded \$299,731 in FY 17 for the conversion of Lateral “8” from an open canal to a pipeline. The proposed project consists of approximately 6,800 liner feet (lf). These improvements are expected to improve water deliveries by conserving approximately 915 acre-feet per year of water and an estimated 36,827 kilowatt hours per year in energy efficiency.

## **Small-Scale Water Efficiency Grants**

In FY 17, new small-scale water efficiency projects funding opportunities for small improvements that have been identified through previous planning efforts were created. 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.

### **Locust Grove Public Works Authority**

Locus Grove Public Works Authority in Oklahoma was awarded \$74,395 in FY 17 for a project to improve approximately 2,175 Linear feet (LF) of inefficient water line comprised of asbestos cement, steel, and schedule 40 PVC to NSF61 recommended C900 pipe in District Metering Area (DMA) #1 to address the 70% water loss as confirmed by the Locust Grove Water Loss Study completion 2017. Estimated water saved (ac-ft/yr) is 705.

### **Thomas Public Works Authority**

Thomas Public Works Authority in Oklahoma was awarded \$75,000 in FY 17 for a project where all of the current mechanical residential and commercial meters will be replaced with electronic smart meters which will provide more accurate readings and more efficient use of public works employee’ time. Estimated water saved (ac-ft/yr) is 625.

### **City of Purcell**

The City of Purcell in Oklahoma was awarded \$59,480 in FY 17 to install a floating pump in the lake and construct a 6" line to supply water to the little league complex.

### **Brownsville Public Utilities Board**

The Brownsville Public Utilities Board was awarded \$74,868 in FY 17 in collaboration with Brownsville Independent School District to install water efficient shower head kits and faucets at Hanna Early College High School and Porter Early College High School. Efforts will result in quantifiable and sustainable water savings by approximately 11.4%.

### **Hidalgo County Irrigation District #2**

Hidalgo County Irrigation District No. 2 was awarded \$74,978 in FY 17 for the automation of the Lateral B and C Canal Gate.

### **Cameron County Irrigation District #6**

Cameron County Irrigation District #6 in Los Fresnos, Texas was awarded \$300,000 in FY 15 for a project that will enclose 3,800 feet of open canal with pipe, replace an existing pump station with a new aerial crossing, and install a solar powered lift pump. The project is expected to result in annual water savings of 275 acre-feet through reduced seepage losses, which will help to alleviate shortages due to drought in the Lower Rio Grande Basin. In addition, the solar powered lift pump is expected to generate 53,000 kilowatt-hours per year. The project also includes the construction of an outlet that will facilitate supplying water to the Lower Rio Grande Valley National Wildlife Refuge. Conserved water will be allocated to District customers and the Wildlife Refuge.

### **Santa Cruz Irrigation District No. 15**

The Santa Cruz Irrigation District No. 15 in southern Texas was awarded \$300,000 in FY 15 to: line 7,265 feet of the existing N-Canal, install a variable frequency drive at the existing Pump-15 Lift Station, and construct a wind powered pump to provide auxiliary power to the Pump-15 Lift Station. Annually, the project is expected to result in water savings of 955 acre-feet by eliminating seepage in the canal and provide wind power generation of 1,733 kilowatt-hours. Conserved water will be left in the system.

## **Title XVI - Water Reclamation & Reuse Program**

Title XVI of P.L. 102-575, as amended (Title XVI), provides authority for Reclamation's water recycling and reuse program, titled "Title XVI." Through the Title XVI program, Reclamation identifies and investigates opportunities to reclaim and reuse wastewaters and naturally impaired ground and surface water in the 17 Western States and Hawaii. Title XVI includes funding for the planning, design, and construction of water recycling and reuse projects, on a project specific basis, in partnership with local governmental entities. In FY 17, Reclamation announced three separate categories of funding opportunities including Authorized Project, Feasibility Studies and Research Studies. In previous years Reclamation has had sufficient funding for two categories: up to \$150,000 for relatively small studies and up to \$450,000 for larger, regional scale studies.

To date, approximately \$2.5 million has been awarded to 17 studies within the Oklahoma-Texas Area Office (OTAO).

In FY 17, six entities from all three states (Kansas, Oklahoma and Texas) within OTAO were awarded federal grants totaling over \$786,000 to conduct both feasibility and research studies.

#### **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)**

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.

### **Projects awarded in FY 15:**

#### **City of Lubbock, Texas – Potable Water Reuse Implementation Feasibility Study**

The City of Lubbock, Texas was awarded a \$150,000 grant for a feasibility study of Potable Water Reuse. The following potable reuse options to be evaluated in this study will focus on the three main categories of potable reuse identified in their 2013 Strategic Water Supply Plan:

1. Indirect potable reuse (IPR) – surface water augmentation;
2. Indirect potable reuse (IPR) – groundwater augmentation; and
3. Direct potable reuse (DPR).

#### **City of Hudson Oaks, Texas – Feasibility of Water Reclamation and Reuse in Hudson Oaks**

City of Hudson Oaks, Texas was awarded \$147,600 to exam the feasibility of three potential alternatives for water reclamation and reuse, including: 1) Constructing a wastewater treatment plant in the City of Hudson Oaks to treat and reuse local effluent; 2) Collecting and utilizing stormwater runoff for reuse and distribution in the community, as well as for an added environmental habitat and recreation amenity; and 3) Pumping treated wastewater from the City of Weatherford Wastewater Treatment Plant to Hudson Oaks for reuse.

#### **City of McAllen, Texas – Water Reuse Study**

The City of McAllen, Texas was awarded \$150,000 to perform a comprehensive feasibility evaluation of brackish and wastewater to develop a strategic plan that provides the best and highest use of the available water sources for McAllen Public Utility. The study will build on previous efforts and will consider indirect potable reuse via surface water and groundwater augmentation, direct potable reuse, and use of brackish groundwater. As appropriate, this study would coordinate with regional water supply studies and initiatives.

### **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. Over the last three fiscal cycles, over \$3.1 million in funding was provided to support four drought contingency plans and eight drought resiliency projects in Oklahoma and Texas.

## **Drought Resiliency**

### **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.

### **Projects awarded in FY 15:**

#### **City of Duncan, Clear Creek Lake Improvements Project**

The City of Duncan, Oklahoma was awarded \$300,000 to install 1,520 linear feet of pipeline to allow the City to access up to 1,596 acre-feet per year from Clear Creek Lake to prevent water shortages during drought. The City will also upgrade the existing pump station with pumps having variable frequency drives and a Supervisory Control and Data Acquisition System. The City, which provides treated water to approximately 30,000 people, experienced severe drought conditions in 2015 and is in one of 12 basins identified in the Oklahoma Comprehensive Water Plan as having the most significant water challenges over the next 50 years. The City has reduced water consumption by 40% from 2011 to 2014 through mandatory and voluntary conservation measures. This project is supported by the City's drought plan and was identified by the City Council as a top priority to build resiliency to future droughts.

### **Waurika Lake Master Conservancy District, Waurika Lake Water Intake Channel Improvement Project**

The Waurika Lake Master Conservancy District in southwestern Oklahoma was awarded \$300,000 to install an extension intake pipe to the lowest point in Waurika Lake and add a floating intake to access water at more points, including the lake's lowest elevations. It will also improve its intake gates to reduce entry of debris and protect fish. The lower intake will enable the District to access an additional 25,000 acre-feet during drought conditions. The District provides water to 6 cities and 250,000 people in an area that had been in drought for 5 years prior to 2015.

### **Southmost Regional Water Authority, Well Field Monitoring Project**

Southmost Regional Water Authority, a consortium of six water conservation and reclamation entities in Brownsville, Texas, was awarded \$300,000 to develop a monitoring and management program for brackish groundwater wells that are part of a desalination treatment facility which provides a reliable supply of water for approximately 50,000 people, decreasing dependence on the Rio Grande River. This project will: (1) implement a system for monitoring water levels and water quality in the local aquifer; (2) develop a groundwater flow model to forecast responses and changes in the aquifer; and (3) upgrade the pump in one well within the existing brackish wellfield. This project will build drought resiliency by increasing the reliability of water production during stress periods, monitoring aquifer health, and increasing production capacity in an area that is drought-prone and where brackish groundwater provides an important alternative to fluctuating surface water supplies. This project is supported by the Lower Rio Grande Basin Study that identified brackish groundwater desalination as the best option for meeting long-term water needs and deficits exacerbated by climate change.

### **Texas Water Development Board, Early Warning Drought Tool**

The Texas Water Development Board was awarded \$144,763 to modify their existing drought prediction tool to provide more accurate probabilistic forecasts of average May-July rainfall, reservoir levels, and reservoir storage, by county, for the State of Texas. Water user groups in Texas are required to have a strategy for reducing Final Draft water use when water sources reach certain drought response trigger levels. By providing early warning of drought probability, early response measures may be taken to mitigate the impacts of drought and to reduce the need for more severe use restrictions. The forecasts will be updated on a bi-weekly basis and made accessible to water managers across the state through the Water Data for Texas website. Texas has recently come out of a four-year drought, which is described as the second worst on record.

### **Drought Contingency Plans**

#### **Projects awarded in FY 16:**

#### **Gulf Coast Water Authority Drought Contingency Plan Update**

The Gulf Coast Water Authority was awarded \$148,250 in FY 16 to prepare a Drought Contingency Plan.

#### **Projects awarded in FY 15:**

### **Chickasaw and Choctaw Nations, Regional Drought Contingency Plan for the Arbuckle Simpson Aquifer Region**

The Choctaw and Chickasaw Nations were awarded \$187,081 to prepare a Regional Drought Contingency Plan for their homeland in south-central Oklahoma. The Arbuckle Simpson Aquifer covers approximately 500 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 and generate approximately \$100 million in tourism revenues per year. The area experienced an exceptional drought from 2010 until the spring 2015, causing significant economic hardship and requiring emergency actions, such as hauling water and drilling emergency wells. A wide range of regional stakeholders, representing numerous sectors supported the drought planning process that wrapped up in the fall of 2017 with the completion of the Plan that the plan identified mitigation and response actions to be implemented at the local and regional levels.

### **Foss Reservoir Master Conservancy District, Drought Contingency Plan**

The Foss Reservoir Master Conservancy District was awarded \$200,000, to develop and implement a drought contingency plan for west-central Oklahoma that focuses on the water supply needs of communities that rely upon the Foss Reservoir Master Conservancy District, a Bureau of Reclamation project. Reclamation's Foss and Fort Cobb Reservoirs provide 90-percent of the surface water supplies for the region, including municipal water to 40,000 people and two power generation facilities. The Drought Contingency Plan that was completed in the fall of 2017 built on the existing Upper Washita Basin Study and evaluated several additional sources of water supply not evaluated in the Basin Study to address drought. The area recently came out of experiencing a five-year extended drought, with Foss Reservoir being declared "effectively out of water". Recent climate studies predict future droughts will be longer-lasting and more severe.

### **McLennan County, McLennan County Drought Contingency and Water Supply Resiliency Plan**

McLennan County, Texas was awarded \$75,000 to prepare a regional drought contingency plan that addressed drought impacts to the Trinity Aquifer, including intensified arsenic contamination in the aquifer and problems created by zebra mussels in certain surface waters. The County partnered with the McLennan County Water Resources Group (Group) to conduct the plan. The Group included cities, water supply corporations, the Brazos River Authority, a groundwater conservation district, and local citizen and business interests. The Trinity Aquifer is the primary source of water for many of the towns and cities in the planning area, and also provides water for industrial, agricultural, manufacturing, and mining operations. Recent drought conditions resulted in historically low water levels in the aquifer. As a result, pumping costs increased, water supplies declined, and the demand on surface sources expanded. The drought plan incorporated a "conjunctive use" approach to improve the efficient use of both groundwater and surface water sources.

# 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**

External research is funded under Reclamation's Desalination and Water Purification Research Program (DWPR). 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. Over the past three fiscal cycles (FY 15-17), six new research projects totaling nearly \$500,000 dollars were funded.

#### **Pilot Testing a Fixed-Bed Biological Treatment System for Efficient Hexavalent Chromium Removal**

Carollo Engineers, Inc. in partnership with City of Norman to pilot tested a fixed-bed biological treatment system for efficient hexavalent chromium removal. A potential also exists for this method to be cost-effective in removing arsenic and other metals.

#### **Advanced Pretreatment for Nanofiltration of Brackish Surface Water: Fouling Control and Water Quality Improvements**

Texas A&M University in partnership with Foss Reservoir Master Conservancy District performed a research/laboratory study evaluating the use of electrocoagulation as an advanced pretreatment method for nanofiltration of brackish surface water for fouling control and water quality improvements. This technology may help the District reduce high TDS levels at Foss Reservoir.

#### **Fouling-Resistant, Self-Decontaminating Membranes for Effective Desalination of Oily Saline Wastewater**

The University of Kansas Center for Research will be conducting the research.

#### **Thermoplasmonic Membrane Desalination**

The University of Tulsa will be conducting the research.

**Development of Inorganic Membrane Systems for Treatment of Produced Water**

Oklahoma State University will be conducting the research.

**Emerging Ion Concentration Polarization for Brackish Desalination**

Texas Tech University will be conducting the research.

# 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/>

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

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

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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**RECLAMATION**  
*Managing Water in the West*



**RED RIVER COMPACT**

**ARKANSAS-LOUISIANA-OKLAHOMA-TEXAS**

**MAY 12, 1978**



## PREAMBLE

The States of Arkansas, Louisiana, Oklahoma, and Texas, pursuant to the acts of their respective Governors or Legislatures, or both, being moved by considerations of interstate comity, have resolved to compact with respect to the water of the Red River and its tributaries. By Act of Congress, Public Law No. 346 (84th Congress, First Session), the consent of the United States has been granted for said states to negotiate and enter into a compact providing for an equitable apportionment of such water; and pursuant to that Act the President has designated the representative of the United States.

Further, the consent of Congress has been given for two or more states to negotiate and enter into agreements relating to water pollution control by the provisions of the Federal Water Pollution Control Act (P.L. 92-500, 33 U.S.C. §§ 1251 et seq.).

The Signatory States acting through their duly authorized Compact Commissioners, after several years of negotiations, have agreed to an equitable apportionment of the water of the Red River and its tributaries and do hereby submit and recommend that this Compact be adopted by the respective Legislatures and approved by Congress as hereinafter set forth:



## **RED RIVER COMPACT**

### **ARTICLE I Purposes**

**SECTION 1.01.** The principal purposes of this Compact are:

- (a) To promote interstate comity and remove causes of controversy between each of the affected states by governing the use, control and distribution of the interstate water of the Red River and its tributaries;
- (b) To provide an equitable apportionment among the Signatory States of the water of the Red River and its tributaries;
- (c) To promote an active program for the control and alleviation of natural deterioration and pollution of the water of the Red River Basin and to provide for enforcement of the laws related thereto;
- (d) To provide the means for an active program for the conservation of water, protection of lives and property from floods, improvement of water quality, development of navigation and regulation of flows in the Red River Basin; and
- (e) To provide a basis for state or joint state planning and action by ascertaining and identifying each state's share in the interstate water of the Red River Basin and the apportionment thereof.

### **ARTICLE II General Provisions**

**SECTION 2.01.** Each Signatory State may use the water allocated to it by this Compact in any manner deemed beneficial by that state. Each state may freely administer water rights and uses in accordance with the laws of that state, but such uses shall be subject to the availability of water in accordance with the apportionments made by this Compact.

**SECTION 2.02.** The use of water by the United States in connection with any individual Federal project shall be in accordance with the Act of Congress authorizing the project and the water shall be charged to the state or states receiving the benefit therefrom.

**SECTION 2.03.** Any Signatory State using the channel of Red River or its tributaries to convey stored water shall be subject to an appropriate reduction in the amount which may be withdrawn at the point of removal to account for transmission losses.

**SECTION 2.04.** The failure of any state to use any portion of the water allocated to it shall not constitute relinquishment or forfeiture of the right to such use.

**SECTION 2.05.** Each Signatory State shall have the right to:

- (a) Construct conservation storage capacity for the impoundment of water allocated by this Compact;
- (b) Replace within the same area any storage capacity recognized or authorized by this Compact made unusable by any cause, including losses due to sediment storage;

(c) Construct reservoir storage capacity for the purposes of flood and sediment control as well as storage of water which is either imported or is to be exported if such storage does not adversely affect the delivery of water apportioned to any other Signatory State; and

(d) Use the bed and banks of the Red River and its tributaries to convey stored water, imported or exported water, and water apportioned according to this Compact.

**SECTION 2.06.** Signatory States may cooperate to obtain construction of facilities of joint benefits to such states.

**SECTION 2.07.** Nothing in this Compact shall be deemed to impair or affect the powers, rights, or obligations of the United States, or those claiming under its authority, in, over and to water of the Red River Basin.

**SECTION 2.08.** Nothing in this Compact shall be construed to include within the water apportioned by this Compact any water consumed in each state by livestock or for domestic purposes; provided, however, the storage of such water is in accordance with the laws of the respective states but any such impoundment shall not exceed two hundred acre-feet, or such smaller quantity as may be provided for by the laws of each state.

**SECTION 2.09.** In the event any state shall import water into the Red River Basin from any other river basin, the Signatory State making the importation shall have the use of such imported water.

**SECTION 2.10.** Nothing in this Compact shall be deemed to:

(a) Interfere with or impair the right or power of any Signatory State to regulate within its boundaries the appropriation, use, and control of water, or quality of water, not inconsistent with its obligations under this Compact;

(b) Repeal or prevent the enactment of any legislation or the enforcement of any requirement by any Signatory State imposing any additional conditions or restrictions to further lessen or prevent the pollution or natural deterioration of water within its jurisdiction; provided nothing contained in this paragraph shall alter any provision of this Compact dealing with the apportionment of water or the rights thereto; or

(c) Waive any state's immunity under the Eleventh Amendment of the Constitution of the United States, or as constituting the consent of any state to be sued by its own citizens.

**SECTION 2.11.** Accounting for apportionment purposes on interstate streams shall not be mandatory under the terms of the Compact until one or more affected states deem the accounting necessary.

**SECTION 2.12.** For the purposes of apportionment of the water among the Signatory States, the Red River is hereby divided into the following major subdivisions:

(a) Reach I -- the Red River and tributaries from the New Mexico-Texas State boundary to Denison Dam;

(b) Reach II -- the Red River from Denison Dam to the point where it crosses the Arkansas-Louisiana state boundary and all tributaries which contribute to the flow of the River within this reach;

(c) Reach III -- the tributaries west of the Red River which cross the Texas-Louisiana state boundary, the Arkansas-Louisiana state boundary, and those which cross both the Texas-Arkansas state boundary and the Arkansas-Louisiana state boundary;

(d) Reach IV -- the tributaries east of the Red River in Arkansas which cross the Arkansas-Louisiana state boundary; and

(e) Reach V -- that portion of the Red River and tributaries in Louisiana not included in Reach III or in Reach IV.

**SECTION 2.13.** If any part or application of this Compact shall be declared invalid by a court of competent jurisdiction, all other severable provisions and applications of this Compact shall remain in full force and effect.

**SECTION 2.14.** Subject to the availability of water in accordance with this Compact, nothing in this Compact shall be held or construed to alter, impair or increase, validate, or prejudice any existing water right or right of water use that is legally recognized on the effective date of this Compact by either statutes or courts of the Signatory State within which it is located.

### **ARTICLE III Definitions**

**SECTION 3.01.** In this Compact:

(a) The States of Arkansas, Louisiana, Oklahoma, and Texas are referred to as "Arkansas," "Louisiana," "Oklahoma," and "Texas," respectively, or individually as "State" or "Signatory State," or collectively as "States" or "Signatory States."

(b) The term "Red River" means the stream below the crossing of the Texas-Oklahoma state boundary at longitude 100 degrees west.

(c) The term "Red River Basin" means all of the natural drainage area of the Red River and its tributaries east of the New Mexico-Texas state boundary and above its junction with Atchafalaya and Old Rivers.

(d) The term "water of the Red River Basin" means the water originating in any part of the Red River Basin and flowing to or in the Red River or any of its tributaries.

(e) The term "tributary" means any stream which contributes to the flow of the Red River.

(f) The term "interstate tributary" means a tributary of the Red River, the drainage area of which includes portions of two or more Signatory States.

(g) The term "intrastate tributary" means a tributary of the Red River, the drainage area of which is entirely within a single Signatory State.

(h) The term "Commission" means the agency created by Article IX of this Compact for the administration thereof.

(i) The term "pollution" means the alteration of the physical, chemical, or biological characteristics of water by the acts or instrumentalities of man which create or are likely to result in a material and adverse effect upon human beings, domestic or wild animals, fish and other aquatic life, or adversely affect any other lawful use of such water; provided, that for the purposes of this Compact, "pollution" shall not mean or include "natural deterioration."

(j) The term "natural deterioration" means the material reduction in the quality of water resulting from the leaching of solubles from the soils and rocks through or over which the water flows naturally.

(k) The term "designated water" means water released from storage, paid for by non-Federal interests, for delivery to a specific point of use or diversion.

(l) The term "undesignated water" means all water released from storage other than "designated water."

(m) The term "conservation storage capacity" means that portion of the active capacity of reservoirs available for the storage of water for subsequent beneficial use, and it excludes any portion of the capacity of reservoirs allocated solely to flood control and sediment control, or either of them.

(n) The term "runoff" means both the portion of precipitation which runs off the surface of a drainage area and that portion of the precipitation that enters the streams after passing through the portions of the earth.

#### **ARTICLE IV Apportionment of Water -- Reach I Oklahoma -- Texas Subdivision of Reach I and apportionment of water therein.**

Reach I of the Red River is divided into topographical subbasins, with the water therein allocated as follows:

##### **SECTION 4.01. Subbasin 1 -- Interstate streams -- Texas.**

(a) This includes the Texas portion of Buck Creek, Sand (Lebos) Creek, Salt Fork Red River, Elm Creek, North Fork Red River, Sweetwater Creek, and Washita River, together with all their tributaries in Texas which lie west of the 100th Meridian.

(b) The annual flow within this subbasin is hereby apportioned sixty (60) percent to Texas and forty (40) percent to Oklahoma.

##### **SECTION 4.02. Subbasin 2 -- Intrastate and interstate streams -- Oklahoma.**

(a) This subbasin is composed of all tributaries of the Red River in Oklahoma and portions thereof upstream to the Texas-Oklahoma state boundary at longitude 100 degrees west, beginning from Denison Dam and upstream to and including Buck Creek.

(b) The State of Oklahoma shall have free and unrestricted use of the water of this subbasin.

##### **SECTION 4.03. Subbasin 3 -- Intrastate streams -- Texas.**

(a) This includes the tributaries of the Red River in Texas, beginning from Denison Dam and upstream to and including Prairie Dog Town Fork Red River.

(b) The State of Texas shall have free and unrestricted use of the water in this subbasin.

##### **SECTION 4.04. Subbasin 4 -- Mainstem of the Red River and Lake Texoma.**

(a) This subbasin includes all of Lake Texoma and the Red River beginning at Denison Dam and continuing upstream to the Texas-Oklahoma state boundary at longitude 100 degrees west.

(b) The storage of Lake Texoma and flow from the main stem of the Red River into Lake Texoma is apportioned as follows:

(1) Oklahoma 200,000 acre-feet and Texas 200,000 acre-feet, which quantities shall include existing allocations and uses; and

(2) Additional quantities in a ratio of fifty (50) percent to Oklahoma and fifty (50) percent to Texas.

**SECTION 4.05. Special provisions.**

(a) Texas and Oklahoma may construct, jointly or in cooperation with the United States, storage or other facilities for the conservation and use of water; provided that any facilities constructed on the Red River boundary between the two states shall not be inconsistent with the Federal legislation authorizing Denison Dam and Reservoir project.

(b) Texas shall not accept for filing, or grant a permit, for the construction of a dam to impound water solely for irrigation, flood control, soil conservation, mining and recovery of minerals, hydroelectric power, navigation, recreation and pleasure, or for any other purpose other than for domestic, municipal, and industrial water supply, on the main stem of the North Fork Red River or any of its tributaries within Texas above Lugert-Altus Reservoir until the date that imported water, sufficient to meet the municipal and irrigation needs of Western Oklahoma is provided, or until January 1, 2000, whichever occurs first.

**ARTICLE V Apportionment of Water -- Reach II Arkansas, Oklahoma, Texas and Louisiana.**

Subdivision of Reach II and allocation of water therein. Reach II of the Red River is divided into topographic subbasins, and the water therein is allocated as follows:

**SECTION 5.01. Subbasin 1 -- Intrastate streams -- Oklahoma.**

(a) This subbasin includes those streams and their tributaries above existing, authorized or proposed last downstream major damsites, wholly in Oklahoma and flowing into Red River below Denison Dam and above the Oklahoma-Arkansas state boundary. These streams and their tributaries with existing, authorized or proposed last downstream major damsites are as follows:

| <u>Stream</u>  | <u>Site</u> | <u>Ac-ft</u> | <u>Location</u><br><u>Latitude</u> | <u>Longitude</u> |
|----------------|-------------|--------------|------------------------------------|------------------|
| Island-Bayou   | Albany      | 85,200       | 33°51.5'N                          | 96°11.4'W        |
| Blue River     | Durant      | 147,000      | 33°55.5'N                          | 96°04.2'W        |
| Boggy River    | Boswell     | 1,243,800    | 34°01.6'N                          | 95°45.0'W        |
| Kiamichi River | Hugo        | 240,700      | 34°01.0'N                          | 95°22.6'W        |

(b) Oklahoma is apportioned the water of this subbasin and shall have unrestricted use thereof.

**SECTION 5.02. Subbasin 2 -- Intrastate streams -- Texas.**

(a) This subbasin includes those streams and their tributaries above existing authorized or proposed last downstream major damsites, wholly in Texas and flowing into Red River below Denison Dam and above the Texas-Arkansas state boundary. These streams and their tributaries with existing, authorized or proposed last downstream major damsites are as follows:

| <u>Stream</u>     | <u>Site</u>          | <u>Ac-ft</u> | <u>Location<br/>Latitude</u> | <u>Longitude</u> |
|-------------------|----------------------|--------------|------------------------------|------------------|
| Shawnee Creek     | Randall Lake         | 5,400        | 33°48.1'N                    | 96°34.8'W        |
| Brushy Creek      | Valley Lake          | 15,000       | 33°38.7'N                    | 96°21.5'W        |
| Bois d' Arc Creek | New Bonham Reservoir | 130,600      | 33°42.9'N                    | 95°58.2'W        |
| Coffee Mill Creek | Coffee Mill Lake     | 8,000        | 33°44.1'N                    | 95°58.0'W        |
| Sandy Creek       | Lake Crockett        | 3,900        | 33°44.5'N                    | 95°55.5'W        |
| Sanders Creek     | Pat Mayse            | 124,500      | 33°51.2'N                    | 95°32.9'W        |
| Pine Creek        | Lake Crook           | 11,011       | 33°43.7'N                    | 95°34.0'W        |
| Big Pine Creek    | Big Pine Lake        | 138,600      | 33°52.0'N                    | 95°11.7'W        |
| Pecan Bayou       | Pecan Bayou          | 625,000      | 33°41.1'N                    | 94°58.7'W        |
| Mud Creek         | Liberty Hill         | 97,700       | 33°33.0'N                    | 94°29.3'W        |
| Mud Creek         | KVW RanchLakes       | 3,440        | 33°34.8'N                    | 94°27.3'W        |

(b) Texas is apportioned the water of this subbasin and shall have unrestricted use thereof.

**SECTION 5.03.** Subbasin 3 -- Interstate streams -- Oklahoma and Arkansas.

(a) This subbasin includes Little River and its tributaries above Millwood Dam.

(b) The States of Oklahoma and Arkansas shall have free and unrestricted use of the water of this subbasin within their respective states, subject, however, to the limitation that Oklahoma shall allow a quantity of water equal to 40 percent of the total runoff originating below the following existing, authorized or proposed last downstream major damsites in Oklahoma to flow into Arkansas:

| <u>Stream</u>      | <u>Site</u> | <u>Ac-ft</u> | <u>Location<br/>Latitude</u> | <u>Longitude</u> |
|--------------------|-------------|--------------|------------------------------|------------------|
| Little River       | Pine Creek  | 70,500       | 34°06.8'N                    | 95°04.9'W        |
| Glover Creek       | Lukfata     | 258,600      | 34°08.5'N                    | 94°55.4'W        |
| Mountain ForkRiver | Broken Bow  | 470,100      | 34°08.9'N                    | 94°41.2'W        |

(c) Accounting will be on an annual basis unless otherwise deemed necessary by the States of Arkansas and Oklahoma.

**SECTION 5.04.** Subbasin 4 -- Interstate streams -- Texas and Arkansas.

(a) This subbasin shall consist of those streams and their tributaries above existing, authorized or proposed last downstream major damsites, originating in Texas and crossing the Texas-Arkansas state boundary before flowing into the Red River in Arkansas. These streams

and their tributaries with existing, authorized or proposed last downstream major damsites are as follows:

| <u>Stream</u>        | <u>Site</u>       | <u>Ac-ft</u> | <u>Location<br/>Latitude</u> | <u>Longitude</u> |
|----------------------|-------------------|--------------|------------------------------|------------------|
| McKinney Bayou Trib. | Bringle Lake      | 3,052        | 33°30.6'N                    |                  |
|                      | 94°06.2'W         |              |                              |                  |
| Barkman Creek        | Barkman Reservoir | 15,900       | 33°29.7'N                    | 94°10.3'W        |
| Sulphur River        | Texarkana         | 386,900      | 33°18.3'N                    |                  |
|                      | 94°09.6'W         |              |                              |                  |

(b) The State of Texas shall have the free and unrestricted use of the water of this subbasin.

**SECTION 5.05.** Subbasin 5 -- Mainstem of the Red River and tributaries.

(a) This subbasin includes that portion of the Red River, together with its tributaries, from Denison Dam down to the Arkansas-Louisiana state boundary, excluding all tributaries included in the other four subbasins of Reach II.

(b) Water within this subbasin is allocated as follows:

(1) The Signatory States shall have equal rights to the use of runoff originating in subbasin 5 and undesignated water flowing into subbasin 5, so long as the flow of the Red River at the Arkansas-Louisiana state boundary is 3,000 cubic feet per second or more, provided no state is entitled to more than 25 percent of the water in excess of 3,000 cubic feet per second.

(2) Whenever the flow of the Red River at the Arkansas-Louisiana state boundary is less than 3,000 cubic feet per second, but more than 1,000 cubic feet per second, the States of Arkansas, Oklahoma, and Texas shall allow to flow into the Red River for delivery to the State of Louisiana a quantity of water equal to 40 percent of the total weekly runoff originating in subbasin 5 and 40 percent of undesignated water flowing into subbasin; provided, however, that this requirement shall not be interpreted to require any state to release stored water.

(3) Whenever the flow of the Red River at the Arkansas-Louisiana state boundary falls below 1,000 cubic feet per second, the States of Arkansas, Oklahoma, and Texas shall allow a quantity of water equal to all the weekly runoff originating in subbasin 5 and all undesignated water flowing into subbasin 5 within their respective states to flow into the Red River as required to maintain a 1,000 cubic foot per second flow at the Arkansas-Louisiana state boundary.

(c) Whenever the flow at Index, Arkansas, is less than 526 c.f.s., the states of Oklahoma and Texas shall each allow a quantity of water equal to 40 percent of the total weekly runoff originating in subbasin 5 within their respective states to flow into the Red River; provided however, this provision shall be invoked only at the request of Arkansas, only after Arkansas has ceased all diversions from the Red River itself in Arkansas above Index, and only if the provisions of Sub-sections 5.05 (b) (2) and (3) have not caused a limitation of diversions in subbasin 5.

(d) No state guarantees to maintain a minimum low flow to a downstream state.

**SECTION 5.06.** Special Provisions.

(a) Reservoirs within the limits of Reach II, subbasin 5, with a conservation storage capacity of 1,000 acre feet or less in existence or authorized on the date of the Compact pursuant to the rights and privileges granted by a Signatory State authorizing such reservoirs, shall be

exempt from the provisions of Section 5.05; provided, if any right to store water in, or use water from, an existing exempt reservoir expires or is cancelled after the effective date of the Compact the exemption for such rights provided by this section shall be lost.

(b) A Signatory State may authorize a change in the purpose or place of use of water from a reservoir exempted by subparagraph (a) of this section without losing that exemption, if the quantity of authorized use and storage is not increased.

(c) Additionally, exemptions from the provisions of Section 5.05 shall not apply to direct diversions from Red River to off-channel reservoirs or lands.

## **ARTICLE VI Apportionment of Water -- Reach III Arkansas, Louisiana, and Texas**

Subdivision of Reach III and allocation of water therein. Reach III of the Red River is divided into topographic subbasins, and the water therein allocated, as follows:

### **SECTION 6.01. Subbasin 1 -- Interstate streams -- Arkansas and Texas.**

(a) This subbasin includes the Texas portion of those streams crossing the Arkansas-Texas state boundary one or more times and flowing through Arkansas into Cypress Creek-Twelve Mile Bayou watershed in Louisiana.

(b) Texas is apportioned sixty (60) percent of the run-off of this subbasin and shall have unrestricted use thereof; Arkansas is entitled to forty (40) percent of the runoff of this subbasin.

### **SECTION 6.02. Subbasin 2 -- Interstate streams -- Arkansas and Louisiana.**

(a) This subbasin includes the Arkansas portion of those streams flowing from Subbasin 1 into Arkansas, as well as other streams in Arkansas which cross the Arkansas-Louisiana state boundary one or more times and flow into Cypress Creek-Twelve Mile Bayou watershed in Louisiana.

(b) Arkansas is apportioned sixty (60) percent of the runoff of this subbasin and shall have unrestricted use thereof; Louisiana is entitled to forty (40) percent of the runoff of this subbasin.

### **SECTION 6.03. Subbasin 3 -- Interstate streams -- Texas and Louisiana.**

(a) This subbasin includes the Texas portion of all tributaries crossing the Texas-Louisiana state boundary one or more times and flowing into Caddo Lake, Cypress Creek-Twelve Mile Bayou, or Cross Lake, as well as the Louisiana portion of such tributaries.

(b) Texas and Louisiana within their respective boundaries shall each have the unrestricted use of the water of this subbasin subject to the following allocation:

(1) Texas shall have the unrestricted right to all water above Marshall, Lake O' the Pines, and Black Cypress damsites; however, Texas shall not cause runoff to be depleted to a quantity less than that which would have occurred with the full operation of Franklin County, Titus County, Ellison Creek, Johnson Creek, Lake O' the Pines, Marshall, and Black Cypress Reservoirs constructed, and those other impoundments and diversions existing on the effective date of this Compact. Any depletions of runoff in excess of the depletions described above shall be charged against Texas' apportionment of the water in Caddo Reservoir.

(2) Texas and Louisiana shall each have the unrestricted right to use fifty (50) percent of the conservation storage capacity in the present Caddo Lake for the impoundment of water for

state use, subject to the provision that supplies for existing uses of water from Caddo Lake, on date of Compact, are not reduced.

(3) Texas and Louisiana shall each have the unrestricted right to fifty (50) percent of the conservation storage capacity of any future enlargement of Caddo Lake, provided, the two states may negotiate for the release of each state's share of the storage space on terms mutually agreed upon by the two states after the effective date of this Compact.

(4) Inflow to Caddo Lake from its drainage area downstream from Marshall, Lake O' the Pines, and Black Cypress damsites and downstream from other last downstream dams in existence on the date of the signing of the Compact document by the Compact Commissioners, will be allowed to continue flowing into Caddo Lake except that any man-made depletions to this inflow by Texas will be subtracted from the Texas share of the water in Caddo Lake.

(c) In regard to the water of interstate streams which do not contribute to the inflow to Cross Lake or Caddo Lake, Texas shall have the unrestricted right to divert and use this water on the basis of a division of runoff above the state boundary of sixty (60) percent to Texas and forty (40) percent to Louisiana.

(d) Texas and Louisiana will not construct improvements on the Cross Lake watershed in either state that will affect the yield of Cross Lake; provided, however, this subsection shall be subject to the provisions of Section 2.08.

**SECTION 6.04. Subbasin 4 -- Intrastate streams -- Louisiana.**

(a) This subbasin includes that area of Louisiana in Reach III not included within any other subbasin.

(b) Louisiana shall have free and unrestricted use of the water of this subbasin.

**ARTICLE VII Apportionment of Water -- Reach IV Arkansas and Louisiana**

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

**SECTION 7.01. Subbasin 1 -- Intrastate streams -- Arkansas.**

(a) This subbasin includes those streams and their tributaries above last downstream major damsites originating in Arkansas and crossing the Arkansas-Louisiana state boundary before flowing into the Red River in Louisiana. Those major last downstream damsites are as follows:

| <u>Stream</u>           | <u>Site</u>   | <u>Ac-ft</u> | <u>Location<br/>Latitude</u> | <u>Longitude</u> |
|-------------------------|---------------|--------------|------------------------------|------------------|
| Ouachita River          | LakeCatherine | 19,000       | 34°26.6'N                    | 93°01.6'W        |
| Caddo River             | DeGray Lake   | 1,377,000    | 34°13.2'N                    | 93°06.6'W        |
| Little Missouri River   | Lake Greeson  | 600,000      | 34°08.9'N                    | 93°42.9'W        |
| Alum Fork, Saline River | Lake Winona   | 63,264       | 32°47.8'N                    | 92°51.0'W        |

(b) Arkansas is apportioned the waters of this subbasin and shall have unrestricted use thereof.

**SECTION 7.02.** Subbasin 2 -- Interstate streams -- Arkansas and Louisiana.

(a) This subbasin shall consist of Reach IV less subbasin 1 as defined in Section 7.01 (a) above.

(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 damsites to flow into Louisiana. Where there are no designated last downstream damsites, 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 does 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 -- 780 cfs
- (2) Bayou Bartholomew -- 80 cfs
- (3) Boeuf River -- 40 cfs
- (4) Bayou Macon -- 40 cfs

the State of Arkansas pledges to take affirmative steps to regulate the diversions of runoff originating or flowing into Reach IV in such a manner as to permit an equitable apportionment of the runoff as set out herein to flow into the State of Louisiana. In its control and regulation of the water of Reach IV any adjudication or order rendered by the State of Arkansas or any of its instrumentalities or agencies affecting the terms of this Compact shall not be effective against the State of Louisiana nor any of its citizens or inhabitants until approved by the Commission.

**ARTICLE VIII Apportionment of Water -- Reach V**

**SECTION 8.01.** Reach V of the Red River consists of the main stem Red River and all of its tributaries lying wholly within the State of Louisiana. The State of Louisiana shall have free and unrestricted use of the water of this subbasin.

**ARTICLE IX Administration of the Compact**

**SECTION 9.01.** There is hereby created an interstate administrative agency to be known as the "Red River Compact Commission," hereinafter called the "Commission." The Commission shall be composed of two representatives from each Signatory State who shall be designated or appointed in accordance with the laws of each state, and one Commissioner representing the United States, who shall be appointed by the President. The Federal Commissioner shall be the Chairman of the Commission but shall not have the right to vote. The failure of the President to appoint a Federal Commissioner will not prevent the operation or effect of this Compact, and the eight representatives from the Signatory States will elect a Chairman for the Commission.

**SECTION 9.02.** The Commission shall meet and organize within 60 days after the effective date of this Compact. Thereafter, meetings shall be held at such times and places as the Commission shall decide.

**SECTION 9.03.** Each of the two Commissioners from each state shall have one vote; provided, however, that if only one representative from a state attends he is authorized to vote on behalf of the absent Commissioner from that state. Representatives from three states shall constitute a quorum. Any action concerned with administration of this Compact or any action requiring compliance with specific terms of this Compact shall require six concurring votes. If a proposed action of the Commission affects existing water rights in a state, and that action is not expressly provided for in this Compact, eight concurring votes shall be required.

**SECTION 9.04. (a)** The salaries and personal expenses of each state's representative shall be paid by the government that it represents, and the salaries and personal expenses of the Federal Commissioner will be paid for by the United States.

**(b)** The Commission's expenses for any additional stream flow gauging stations shall be equitably apportioned among the states involved in the reach in which the stream flow gauging stations are located.

**(c)** All other expenses incurred by the Commission shall be borne equally by the Signatory States and shall be paid by the Commission out of the "Red River Compact Commission Fund." Such fund shall be initiated and maintained by equal payments of each state into the fund. Disbursement shall be made from the fund in such manner as may be authorized by the Commission. Such fund shall not be subject to audit and accounting procedures of the state; however, all receipts and disbursements of the fund by the Commission shall be audited by a qualified independent public accountant at regular intervals, and the report of such audits shall be included in and become a part of the annual report of the Commission. Each state shall have the right to make its own audit of the accounts of the Commission at any reasonable time.

## **ARTICLE X Powers and Duties of the Commission**

**SECTION 10.01.** The Commission shall have the power to:

**(a)** Adopt rules and regulations governing its operation and enforcement of the terms of the Compact;

**(b)** Establish and maintain an office for the conduct of its affairs and, if desirable, from time to time, change its location;

(c) Employ or contract with such engineering, legal, clerical and other personnel as it may determine necessary for the exercise of its functions under this Compact without regard to the Civil Service Laws of any Signatory State; provided that such employees shall be paid by and be responsible to the Commission and shall not be considered employees of any Signatory State;

(d) Acquire, use and dispose of such real and personal property as it may consider necessary;

(e) Enter into contracts with appropriate State or Federal agencies for the collection, correlation and presentation of factual data, for the maintenance of records and for the preparation of reports;

(f) Secure from the head of any department or agency of the Federal or State government such information as it may need or deem to be useful for carrying out its functions and as may be available to or procurable by the department or agency to which the request is addressed; provided such information is not privileged and the department or agency is not precluded by law from releasing same;

(g) Make findings, recommendations or reports in connection with carrying out the purposes of this Compact, including, but not limited to, a finding that a Signatory State is or is not in violation of any of the provisions of this Compact. The Commission is authorized to make such investigations and studies, and to hold such hearings as it may deem necessary for said purposes. It is authorized to make and file official certified copies of any of its findings, recommendations or reports with such officers or agencies of any Signatory State, or the United States, as may have any interest in or jurisdiction over the subject matter. The making of findings, recommendations, or reports by the Commission shall not be a condition precedent to the instituting or maintaining of any action or proceeding of any kind by a Signatory State in any court or tribunal, or before any agency or officer, for the protection of any right under this Compact or for the enforcement of any of its provisions; and

(h) Print or otherwise reproduce and distribute its proceedings and reports.

**SECTION 10.02.** The Commission shall:

(a) Cause to be established, maintained, and operated such stream, reservoir and other gauging stations as are necessary for the proper administration of the Compact;

(b) Cause to be collected, analyzed and reported such information on stream flows, water quality, water storage and such other data as are necessary for the proper administration of the Compact;

(c) Perform all other functions required of it by the Compact and do all things necessary, proper and convenient in the performance of its duties thereunder;

(d) Prepare and submit to the governor of each of the Signatory States a budget covering the anticipated expenses of the Commission for the following fiscal biennium;

(e) Prepare and submit an annual report to the governor of each Signatory State and to the President of the United States covering the activities of the Commission for the preceding fiscal year, together with an accounting of all funds received and expended by it in the conduct of its work;

(f) Make available to the governor or to any official agency of a Signatory State or to any authorized representative of the United States, upon request, any information within its possession;

(g) Not incur any obligation in excess of the unencumbered balance of its funds, nor pledge the credit of any of the Signatory States; and

(h) Make available to a Signatory State or the United States in any action arising under this Compact, without subpoena, the testimony of any officer or employee of the Commission having knowledge of any relevant facts.

## **ARTICLE XI Pollution**

**SECTION 11.01.** The Signatory States recognize that the increase in population and the growth of industrial, agricultural, mining and other activities combined with natural pollution sources may lead to a diminution of the quality of water in the Red River Basin which may render the water harmful or injurious to the health and welfare of the people and impair the usefulness or public enjoyment of the water for beneficial purposes, thereby resulting in adverse social, economic, and environmental impacts.

**SECTION 11.02.** Although affirming the primary duty and responsibility of each Signatory State to take appropriate action under its own laws to prevent, diminish, and regulate all pollution sources within its boundaries which adversely affect the water of the Red River Basin, the states recognize that the control and abatement of the naturally-occurring salinity sources as well as, under certain circumstances, the maintenance and enhancement of the quality of water in the Red River Basin may require the cooperative action of all states.

**SECTION 11.03.** The Signatory States agree to cooperate with agencies of the United States to devise and effectuate means of alleviating the natural deterioration of the water of the Red River Basin.

**SECTION 11.04.** The Commission shall have the power to cooperate with the United States, the Signatory States and other entities in programs for abating and controlling pollution and natural deterioration of the water of the Red River Basin, and to recommend reasonable water quality objectives to the states.

**SECTION 11.05.** Each Signatory State agrees to maintain current records of waste discharges into the Red River Basin and the type and quality of such discharges, which records shall be furnished to the Commission upon request.

**SECTION 11.06.** Upon receipt of a complaint from the governor of a Signatory State that the interstate waters of the Red River Basin in which it has an interest are being materially and adversely affected by pollution and that the state in which the pollution originates has failed after reasonable notice to take appropriate abatement measures, the Commission shall make such findings as are appropriate and thereafter provide such findings to the governor of the state in which such pollution originates and request appropriate corrective action. The Commission, however, shall not take any action with respect to pollution which adversely affects only the state in which such pollution originates.

**SECTION 11.07.** In addition to its other powers set forth under this Article, the Commission shall have the authority, upon receipt of six concurring votes, to utilize applicable Federal

statutes to institute legal action in its own name against the person or entity responsible for interstate pollution problems; provided, however, sixty (60) days before initiating legal action the Commission shall notify the Governor of the state in which the pollution source is located to allow that state an opportunity to initiate action in its own name.

**SECTION 11.08.** Without prejudice to any other remedy available to the Commission, or any Signatory State, any state which is materially and adversely affected by the pollution of the water of the Red River Basin by pollution originating in another Signatory State may institute a suit against any individual, corporation, partnership, or association, or against any Signatory State or political or governmental subdivision thereof, or against any officer, agency, department, bureau, district, or instrumentality of or in any Signatory State contributing to such pollution in accordance with applicable Federal statutes. Nothing herein shall be construed as depriving any persons of any rights of action relating to pollution which such person would have if this Compact had not been made.

## **ARTICLE XII Termination and Amendment of Compact**

**SECTION 12.01.** This Compact may be terminated at any time by appropriate action of the legislatures of all of the four Signatory States. In the event of such termination, all rights established under it shall continue unimpaired.

**SECTION 12.02.** This Compact may be amended at any time by appropriate action of the legislatures of all Signatory States that are affected by such amendment. The consent of the United States Congress must be obtained before any such amendment is effective.

## **ARTICLE XIII Ratification and Effective Date of Compact**

**SECTION 13.01.** Notice of ratification of this Compact by the legislature of each Signatory State shall be given by the governor thereof to the governors of each of the other Signatory States and to the President of the United States. The President is hereby requested to give notice to the governors of each of the Signatory States of the consent to this Compact by the Congress of the United States.

**SECTION 13.02.** This Compact shall become effective, binding and obligatory when, and only when:

(a) It has been duly ratified by each of the Signatory States; and

(b) It has been consented to by an Act of the Congress of the United States, which Act provides that:

Any other statute of the United States to the contrary notwithstanding, in any case or controversy:

which involves the construction or application of this Compact;

in which one or more of the Signatory States to this Compact is a plaintiff or plaintiffs; and which is within the judicial power of the United States as set forth in the Constitution of the United States;

and without any requirement, limitation or regard as to the sum or value of the matter in controversy, or of the place of residence or citizenship of, or of the nature, character or legal status of, any of the other proper parties plaintiff or defendant in such case or controversy;

The consent of Congress is given to name and join the United States as a party defendant or otherwise in any such case or controversy in the Supreme Court of the United States if the United States is an indispensable party thereto.

**SECTION 13.03.** The United States District Courts shall have original jurisdiction (concurrent with that of the Supreme Court of the United States, and concurrent with that of any other Federal or state court, in matters in which the Supreme Court, or other court has original jurisdiction) of any case or controversy involving the application or construction of this Compact; that said jurisdiction shall include, but not be limited to, suits between Signatory States; and that the venue of such case or controversy may be brought in any judicial district in which the acts complained of (or any portion thereof) occur."



**RULES FOR THE INTERNAL ORGANIZATION**  
**of the**  
**RED RIVER COMPACT COMMISSION**

(As Amended April 25, 1984, April 30, 1991, May 4, 1993, March 24, 1994, April 29, 2003, and April 13, 2006<sup>1</sup>)

**ARTICLE I**  
**THE COMMISSION**

1.1 The Commission is the “Red River Compact Commission,” which is referred to in Article X of the Red River Compact.

1.2 The credentials of each Commissioner shall be filed with both the Chair and the Secretary of the Commission. When the credentials of a new Commissioner are received, the Secretary shall promptly notify each of the other Commissioners of the name and address of the new Commissioner.

1.3 Each Commissioner shall advise in writing the office of the Commission as to the address at which all official notices and other communications of the Commission shall be sent. Any change of address shall be promptly communicated in writing to the office of the Commission.

1.4 Persons designated to substitute for duly appointed Commissioners at meetings of the Compact Commission shall present the Commission with credentials of authority by letter, or other form of appointment acceptable to the Commission, which states the scope or limitations of the appointment together with a copy of the state or federal law or Attorney General’s opinion which authorizes the appointment.

**ARTICLE II**  
**OFFICERS**

2.1 The officers of the Commission shall be a Chair, a Vice-Chair, Secretary and a Treasurer.

2.2 The Commissioner representing the United States shall be the Chair of the Commission. The Chair or the designated representative of the Chair, shall preside at meetings of the Commission. The duties of the Chair shall be those usually imposed upon such officers and as may be assigned by these rules or by the Commission from time to time.

2.3 The Vice-Chair shall be elected at the annual meeting from the Commissioners of the host state for the coming year as reflected by the minutes, and shall hold office for a term of one year, beginning on July 1 following the election, or until a successor is elected. The Vice-Chair shall serve as Chair in the event the President of the United States fails to appoint a Federal

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<sup>1</sup> In 2015, the Red River Compact Legal Committee presented this version of the rules as a comprehensive version containing all known amendments to the Internal Rules for Internal Organization adopted by the Commission. The Commission last amended these rules on April 13, 2006.

Commissioner, or in the absence of the Federal Commissioner or the designated representative of the Federal Commissioner.

2.4 The Secretary shall be selected at the annual meeting by the Commission from the state designated to host the next annual meeting as reflected in the minutes. The Secretary shall serve for the term of one year, beginning on July 1 following the selection, and perform the duties as the Commission shall direct. In case of a vacancy in the office of the Secretary, the Commission shall select a new Secretary as expeditiously as possible.

2.5 The Treasurer shall be selected by the Commission for a term of one year, beginning on July 1 following the selection. The Treasurer shall furnish a fidelity bond, the cost of which shall be paid by the Commission. The Treasurer shall receive, hold and disburse all funds which come into the hands of the Treasurer.

2.6 The Secretary and Treasurer may be members of the Commission, and their offices may be combined by the Commission. Any one person may hold both offices.

### **ARTICLE III** **PRINCIPAL OFFICE**

3.1 The principal office the Commission shall be either the office of the Chair or the Secretary, as the Commission shall direct.

3.2 Official books and records of the Commission shall be kept at the principal office.

### **ARTICLE IV** **MEETINGS**

4.1 The annual meeting of the Commission shall be held on the last Tuesday of April of each year.

4.2 (a) Special meetings of the Commission may be called by the Chair at any time. Upon the written request of each of the Commissioners of two states setting forth the matters to be considered at such meeting, the Chair shall call a special meeting.

(b) Individual members of the Commission, consistent with laws of the respective signatory state that may apply to the individual members, may participate in special meetings of the Commission by any means of electronic or telephonic communication through which all members and other participants may simultaneously hear one another during the meeting. Members who participate in a special meeting by such means shall be considered present for all purposes, including the presence of a quorum. Such meeting shall constitute a valid special meeting of the Commission even though members participate through electronic or telephonic means, provided:

(1) The Commission complies with other applicable provisions of these rules, including quorum and voting requirements.

(2) Arrangements are made so that any member of the public desiring to attend the meeting may attend at the same location as any Commission member attending the meeting by electronic or telephonic means, and the meeting notice informs the public of the arrangements.

(3) Arrangements are made so that a member of the public attending the meeting as set forth in subparagraph (2) above may simultaneously hear the members and other participants.

(4) The Commission may not meet in executive session by electronic or telephonic means.

4.3 Reasonable notice of all special meetings of the Commission shall be sent by the Chair, to all members of the Commission by ordinary mail at least ten days in advance of each meeting and notice shall state the purpose thereof.

4.4 Emergency meetings of the Commission may be called by the Chair at any time upon the concurrence of at least two states and such meetings may be conducted by long-distance telephone conference call or other electronic means. Any such long-distance telephone conference call or other electronic communication shall be recorded and made available for public inspection in accordance with the laws of the respective signatory states. Each of the signatory states shall be represented by at least one Commissioner during such an emergency conference and each state concur in any emergency action taken during an emergency meeting. An emergency is defined as a situation involving an eminent threat of injury to persons or damage to property or eminent financial loss when the time requirements for public notice and travel to a special meeting would make such procedure and travel impractical and increase the likelihood of injury or damage or eminent financial loss.

4.5 Notice to the public shall be given of all Commission meetings. Except as otherwise provided, the Chair shall furnish notice of all meetings to the Commissioners of each signatory state, whose responsibility it shall be to give said notice to the public in accordance with the laws of their respective states. In the event of an emergency meeting held by telephone or other electronic communication, no advance notice is required. All meetings of the Commission shall be held at the principal office unless another place shall be agreed upon by the Commissioners.

4.6 Minutes of the Commission shall be preserved in suitable manner. Minutes, until approved, shall not be official and shall be furnished only to members of the Commission, its employees and committees.

4.7 Commissioners from three of the signatory states shall constitute a quorum. However, if an emergency meeting is conducted as provided for in rule 4.4, or if a proposed action of the Commission affects existing water rights in a state, and that action is not expressly provided for in the Compact, eight concurring votes shall be required. Any other actions concerned with the administration of the Compact or requiring compliance with specific terms of the Compact shall require six concurring votes.

4.8 At each regular or annual meeting of the Commission, the order of business, unless agreed otherwise, shall be as follows:

Call to Order,  
Approval of Agenda,  
Approval of the minutes,  
Report of Chairman,  
Report of Secretary,  
Report of the Treasurer,  
Report of the Commissioners,  
Report of Committees,  
Unfinished business,  
New business,  
Adjournment.

4.9 All meetings of the Commission, except executive sessions and except as otherwise provided by law in each Signatory State as it may apply to the individual members, shall be open to the public. Executive sessions shall be open only to members of the Commission and such advisers as may be designated by each member and employees as permitted by the Commission; provided, however, that the Commission may call witnesses before it when in such sessions. The Commission may hold executive sessions only for the purposes of discussing:

- (a) The employment, appointment, promotion, demotion, disciplining or resignation of a Commission employee or employees, members, advisers, or committee members;
- (b) Pending or contemplated litigation, settlement offers, and matters where the duty of the Commission's counsel, pursuant to the Code of Professional Responsibility, clearly conflicts with the public's right to know; or
- (c) The report, development, or course of action regarding security, personnel, plans, or devices.

No executive session may be held except on a vote, taken in public by a majority of a quorum of the members present. At least one Commissioner from each of the signatory states must agree to the holding of an executive session. Any motion or other decision considered or arrived at in executive session shall be voidable unless, following the executive session, the Commission reconvenes in public session and presents and votes on such motion or other decision.

4.10 In the absence of a Chair and Vice-Chair, all of the Commissioners from any two (2) states may call an emergency or a special meeting of the Compact Commission.

## **ARTICLE V** **COMMITTEES**

5.1 There may be the following standing committees:

- (a) Budget Committee,
- (b) Engineering Committee,
- (c) Environmental and Natural Resources Committee, and
- (d) Legal Committee.

5.2 The committees shall have the following duties:

- (a) The Budget Committee shall prepare the annual budget and shall advise the Commission on all fiscal matters that may be referred to it.
- (b) The Engineering Committee shall advise the Commission all engineering matters that may be referred to it.
- (c) The Environmental and Natural Resources Committee shall advise the Commission on all environmental and natural resource matters that may be referred to it.
- (d) The Legal Committee shall advise the Commission on all legal matters that may be referred to it.

5.3 Commissioners may be members of committees. The number of members of each committee shall be determined from time to time by the Commission. The Commissioners of each state shall designate the member or members on each committee representing the State, and each State shall have one vote.

5.4 The Chair may appoint a non-voting member of each committee.

5.5 The Chair of each committee shall be designated by the Commission from members of the committee; however, in the event a Chair is unable to perform assigned duties, the committee shall appoint an Interim Chair.

5.6 The Commission may from time to time create special committees and assign it tasks. The Commission may also determine the composition of the special committees.

5.7 Formal committee reports shall be made in writing and filed with the Commission.

**ARTICLE VI**  
**RULES AND REGULATIONS**

6.1 So far as is consistent with the Compact, the Commission may adopt rules and regulations and amend them from time to time. Rules and regulations to be adopted shall be presented by resolution and approved by a quorum as set out in Rule 4.7. Copies of the proposed resolutions for rule adoption shall be presented in writing to each of the Commissioners at least thirty days before the meeting upon which they are to be voted. However, at its meeting, by unanimous vote, the Commission may waive this notice requirement.

6.2 Rules and regulations of the Commission may be compiled and copies may be prepared for distribution to the public under such terms and conditions as the Commission may prescribe.

**ARTICLE VII**  
**FISCAL**

7.1 All funds of the Commission shall be deposited in a depository or depositories designated by the Commission under the name of the "Red River Compact Commission Fund".

7.2 Disbursement of funds in the hands of the Treasurer, for items included in the approved budget, shall be made by check signed by the Treasurer and the Vice-Chair or by such person as may be designated by the Commission. Disbursement of funds for non-budgeted items shall be made by check signed by the Treasurer and Vice-Chair upon voucher approved by at least six of the Commissioners, four of whom shall be from different signatory states.

7.3 At the annual meeting of each year, the Commission shall adopt a budget covering an estimate of its expenses for the following two fiscal years.

7.4 The payment of expenses of the Commission and of its employees shall not be subject to the audit and accounting procedures of the states.

7.5 All receipts and disbursements of the Commission shall be audited periodically as determined by the Commission by a qualified independent public accountant to be selected by the Commission and the report of the audit shall be included in and become a part of the annual report of the Commission.

7.6 The fiscal year of the Commission shall begin July 1 of each year and end June 30 of the next succeeding year.

**ARTICLE VIII**  
**ANNUAL REPORT**

8.1 The Commission shall make an annual report and transmit it on or before the last day of May to the governors of the signatory states to the Red River Compact and to the President of the United States.

8.2 The annual report shall contain:

- (a) Minutes of all regular, special or emergency meetings held during the year;
- (b) All findings of facts made by the Commission during the preceding year;
- (c) Recommendations for actions by the signatory states;
- (d) Statements as to any cooperative studies made during the preceding year;
- (e) All data which the Commission deems pertinent;
- (f) The budget for current and future years;
- (g) The most recent audit report or current financial statement of the Red River Compact Fund;
- (h) Name, address and phone number of each Commissioner and each member of all standing committees; and
- (i) Such other pertinent matters as the Commission may require.

**HISTORICAL NOTES**  
**RULES FOR THE INTERNAL ORGANIZATION OF THE**  
**RED RIVER COMPACT COMMISSION**

**April 13, 2006 amendments:**

Section 4.2 amended:

“4.2 (a) Special meetings of the Commission may be called by the Chairman at any time. Upon the written request of each the Commissions of two states setting forth the matters to be considered at such meeting, the chairman shall call a special meeting.

(b) Individual members of the Commission, consistent with laws of the respective signatory state that may apply to the individual members, may participate in special meetings of the Commission by any means of electronic or telephonic communication through which all members and other participants may simultaneously hear one another during the meeting. Members who participate in a special meeting by such means shall be considered present for all purposes, including the presence of a quorum. Such meeting shall constitute a valid special meeting of the Commission even though members participate through electronic or telephonic means, provided:

(1) The Commission complies with other applicable provisions of these rules, including quorum and voting requirements.

(2) Arrangements are made so that any member of the public desiring to attend the meeting may attend at the same location as any Commission member attending the meeting by electronic or telephonic means, and the meeting notice informs the public of the arrangements.

(3) Arrangements are made so that a member of the public attending the meeting as set forth in subparagraph (2) above may simultaneously hear the members and other participants.

(4) The Commission may not meet in executive session by electronic or telephonic means.”

**April 29, 2003 amendments:**

Section 2.7 deleted.

**March 24, 1994 amendments:**

Section 5.1 amended:

“5.1 There may be the following standing committees:

(a) Budget Committee.

(b) Engineering Committee.

(c) Environmental and Natural Resources Committee.

(d) Legal Committee”

Section 5.2 amended:

“5.2 The committees shall have the following duties:

(e) (a) The Budget Committee shall prepare the annual budget and shall advise the Commission on all fiscal matters that may be referred to it.

(a) (b) The Engineering Committee shall advise the Commission all engineering matters that may be referred to it.

(c) The Environmental and Natural Resources Committee shall advise the Commission on all environmental and natural resource matters that may be referred to it.

(b) (d) The Legal Committee shall advise the Commission on all legal matters that may be referred to it.”

Section 8.2 amended:

“8.2 The annual report shall ~~cover activities of the commission for the preceding year, and include, among other things, the following:~~ contain:

(a) ~~The estimated budget;~~ Minutes of all regular, special or emergency meetings held during the year;

(b) ~~Report of the last audit of Red River Compact Fund;~~ All findings of fact made by the Commission during the preceding year;

(c) ~~All hydrologic data which the commission deems pertinent;~~ Recommendations for actions by the signatory states;

(d) Statements as to cooperative studies of water supplies made during the preceding year;

(e) All data which the Commission deems pertinent;

(f) The budget for current and future years;

(g) The most recent audit report or current financial statement of the Red River Compact Fund;

(h) Name, address and phone number of each Commissioner and each member of all standing committees;

(e) (i) Such other pertinent matters as the Commission may require.”

**May 4, 1993 amendments:**

Section 1.4 amended:

“1.4 Persons designated to substitute for duly appointed Commissioners at meetings of the Compact Commission shall present the Commission with credentials of authority by letter, or other form of appointment acceptable to the Commission, which states the scope or limitations of the appointment together with a copy of the state or federal law or Attorney General’s opinion which authorizes the appointment.”

Section 2.2 amended:

“2.2 The Commissioner representing the United States shall be the Chairman of the Commission. The Chairman or the designated representative of the Chairman, shall preside at the meetings of the Commission. His duties shall be those usually imposed upon such officers as may be assigned by these rules or by the Commission from time to time.”

Section 2.3 amended:

“2.3 The Vice-Chairman shall be elected at the annual meeting from the Commissioners of the host state for the coming year as reflected by the minutes, and shall hold office for a term of one year, beginning on July 1 following the election, or until a successor is elected. The Vice-Chairman shall serve as Chairman in the event the President of the United States fails to appoint a Federal Commissioner, or in the absence of the Federal Commissioner or the designated representative of the Federal Commissioner.”

Section 2.4 amended:

“2.4 The Secretary shall be selected at the annual meeting by the Commission from the state designated to host the next annual meeting as reflected in the minutes. The Secretary shall serve for the term of one year, beginning on July 1 following the selection, and perform the duties as the Commission shall direct. In case of a vacancy in the office of the Secretary, the Commission shall select a new Secretary as expeditiously as possible.”

Section 2.5 amended:

“2.5 The Treasurer shall be selected by the Commission for a term of one year, beginning on July 1 following the selection. The Treasurer shall furnish a fidelity bond, the cost of which shall be paid by the Commission. The Treasurer shall receive, hold and disburse all funds which come into his the hands of the Treasurer.”

Section 2.7 added:

“2.7 Whenever there is a permanent change in the Commander of the Lower Mississippi Valley Division, Department of the Army Corps of Engineers, or its counterpart in any future reorganization of the Corps, the Vice-Chairman shall immediately request the President to appoint the new Commander as the U.S. Commissioner to the Compact Commission.”

**April 30, 1991 amendments:**

Section 1.4 added:

“1.4 Persons designated to substitute for duly appointed Commissioners at meetings of the Compact Commission shall present the Commission with credentials of authority by letter, or other form of appointment acceptable to the Commission, which states the scope or limitations of the appointment together with a copy of the state law or Attorney General’s opinion which authorizes the appointment.”

Section 2.3 amended:

“2.3 The Vice-Chairman shall be elected at the annual meeting from ~~among~~ the Commissioners of the host state for the coming year as reflected by the minutes, and ~~—~~He shall hold office for a term of one year, ~~but shall continue to serve or~~ until his a successor is elected. The Vice-Chairman shall serve as Chairman in the event the President of the United States fails to appoint a Federal Commissioner, or in the absence of the Federal Commissioner.”

Section 2.4 amended:

“2.4 The Secretary shall be selected at the annual meeting by the Commission from the state designated to host the next annual meeting as reflected in the minutes. ~~He~~ The Secretary shall serve for a the term and perform the duties as the Commission shall direct. In case of a vacancy in the office of the Secretary, the Commission shall select a new Secretary as expeditiously as possible.”

Section 4.10 added:

“4.10 In the absence of a Chairman and Vice-Chairman, all of the Commissioners from any two (2) states may call an emergency or a special meeting of the Compact Commission.”

**April 25, 1984 amendments:**

Section 4.4 amended:

“4.4 4.5 Notice to the public shall be given of all Commission meetings. Except as otherwise provided, the Chairman shall furnish notice of all meetings to the Commissioners of each signatory state, whose responsibility it shall be to give said notice to the public in accordance with the laws of their respective states. In the event of an emergency meeting held by telephone or other electronic communication, no advance notice is required.

“All meetings of the Commission shall be held at the principal office unless another place shall be agreed upon by the Commissioners.”

Section 4.5 amended:

~~“4.5~~ 4.4 Emergency meetings of the Commission may be called by the Chairman at any time upon the concurrence of at least two states and such meetings may be conducted by long-distance telephone conference call or other electronic means. Any such long-distance telephone conference call or other electronic communication shall be recorded and made available for public inspection in accordance with the laws of the respective signatory states. Each of the signatory states shall be represented by at least one Commissioner during such an emergency conference and concur in the action.

“An emergency is defined as a situation involving an ~~imminent~~ eminent threat of injury to persons or damage to property or ~~imminent~~ eminent financial loss when the time requirements for public notice and travel to a special meeting would make such procedure and travel impractical and increase the likelihood of injury or damage or ~~imminent~~ eminent financial loss.”

Section 4.6 is deleted (and added to new Section 4.5):

~~“4.6~~ All meetings of the Commission shall be held at the principal office unless another place be agreed upon by the Commissioners.”

Section 4.7 is amended:

~~“4.7~~ 4.6 Minutes of the Commission shall be preserved in suitable manner. Minutes, until approved, shall not be official and shall be furnished only to members of the Commission, its employees and committees.”

Section 4.8 is amended:

~~“4.8~~ 4.7 Commissioners from three of the signatory states shall constitute a quorum. However, if an emergency meeting is conducted as provided for in rule ~~4.5~~ 4.4, or if a proposed action of the Commission affects existing water rights in a state, and that action is not expressly provided for in the Compact, eight concurring votes shall be required. Any other action concerned with the administration of the Compact or requiring compliance with specific terms of the Compact shall require six concurring votes.”

Section 4.9 is amended:

~~“4.9~~ 4.8 At each regular or annual meeting of the Commission, the order of business, unless agreed otherwise, shall be as follows:

Call to order;  
Approval of Agenda;  
Approval of the minutes;  
Report of Chairman;  
Report of Secretary;  
Report of Treasurer;  
Report of Commissioners;  
Report of Committees;

Unfinished business;  
New business;  
Adjournment;

Section 4.10 is amended:

~~“4.10~~ 4.9 All meetings of the Commission, except executive sessions and ~~meetings called under rule 4.5~~ except as otherwise provided, shall be open to the public. Executive sessions shall be open only to members of the Commission and such advisers as may be designated by each member and employees as permitted by the Commission; provided, however, that the Commission may call witnesses before it when in such sessions.

“The Commission may hold executive sessions only for the purposes of discussing;

(a) The employment, appointment, promotion, demotion, disciplining or resignation of a Commission employee or employees, members, advisers, or committee members.

(b) Pending or contemplated litigation, settlement offers, and matters where the duty of the Commission’s counsel to his client, pursuant to the Code of Professional Responsibility, clearly conflicts with the public’s right to know.

(c) The report, development or course of action regarding security, personnel, plans, or devices.

“No executive session may be held except on a vote, taken in public, by a majority of a quorum of the members present. At least one Commissioner from each of the signatory states must agree to the holding of an executive session.

“Any motion or other decision considered or arrived at in executive session shall be voidable unless, following the executive session, the Commission reconvenes in public session and presents and votes on such motion or other decision.”

Section 6.1 is amended:

“6.1 So far as is consistent with the Compact, the Commission may adopt rules and regulations and amend them from time to time. Rules and regulations to be adopted shall be presented by resolution and approved by a quorum as set out in Rule ~~4.8~~ 4.7. Copies of the proposed resolutions for rule adoption shall be presented in writing to each of the Commissioners at least thirty days before the meeting upon which they are to be voted. However, at its meeting, by unanimous vote, the Commission may waive this notice requirement.”

**RED RIVER COMPACT RULES AND REGULATIONS  
To Compute and Enforce Compact Compliance  
REACH I, SUBBASIN 1**

**(Adopted 4/30/87)**

1. **General.** These rules and regulations to be used to compute and enforce Compact compliance within Subbasin I of Reach 1, Red River Compact, are adopted subject to the following conditions and assumptions.
  - a. It is fully understood that these rules and regulations should be modified as new or improved gaging stations are constructed, whenever experience or detailed studies demonstrate the need for modification, and if the Commission should modify its interpretation of Compact provisions relating to this Subbasin.
  
2. **Management of Compact Compliance Computations.**
  - a. **Management Using State Centers:**
    - (1) Texas and Oklahoma representatives will establish State Computation and Control Centers.
      - (a) State representatives will gather data, exchange data and meet prior to the annual Commission meeting to check on computation results.
      - (b) The EAC will determine compliance with Compact.
  - b. **Management Period for Compact Compliance Computations:**
    - (1) Computation will be on the calendar year basis.
    - (2) Water data for a calendar year should be exchanged prior to March 15 of the following year.
    - (3) Compact Compliance Computation for a calendar year should be completed by April 15 of the following year.
  
3. **Enforcement of Compact Compliance Requirements.** Texas will be responsible for insuring that the sum of Texas uses does not exceed the total Texas water use authorized by the Red River Compact, and Texas will be responsible for establishing clear legal authority within Texas for enforcing the restrictions imposed by the Red River Compact.
  
4. **Data Reporting Procedures.**
  - a. **Streamflow Gaging Station Records:** The EAC will make arrangements with federal and State agencies, as required, to collect calendar year data as needed, and forward to the Texas and Oklahoma Computation Control Centers.

b. **Archived Records:** Records will be archived by the Commission Chairman.

5. **General Compliance Requirements of Section 4.01 Red River Compact.**

a. **SECTION 4.01. Subbasin 1 - Interstate Streams - Texas:**

(1) **The Compact prescribes:**

- "(a) This includes the Texas portion of Buck Creek, Sand (Lebos) Creek, Salt Fork Red River, Elm Creek, North Fork Red River, Sweetwater Creek and Washita River, together with all their tributaries in Texas which lie west of the 100th Meridian."  
 "(b) The annual flow within this subbasin is hereby apportioned sixty (60) percent to Texas and forty (40) percent to Oklahoma."

**SECTION 4.01 is modified in part by SECTION 4.05. Special Provisions, as follows:**

- "(b) Texas shall not accept for filing, or grant a permit, for the construction of a dam to impound water solely for irrigation, flood control, soil conservation, mining and recovery of minerals, hydroelectric power, navigation, recreation and pleasure, or for any other purpose other than for domestic, municipal, and industrial water supply, on the mainstem of the North Fork Red River or any of its tributaries within Texas about Lugert-Altus Reservoir until the date that imported water, sufficient to meet the municipal and irrigation needs of Western Oklahoma is provided, or until January 1, 2000, which ever occurs first."

- (2) Pertinent extracts from the Supplemental Interpretive Comments of Legal Advisory Committee, as approved by the Red River Compact Commission on the 19th day of September 1978, are as follows:

Pages 9 and 10 " \* \* \* \* \* The flow of interstate tributaries is generally divided 60 percent to the upstream State and 40 percent to the downstream State. Because flows in Reach I are primarily from flood flows, an annual basis of accounting was adopted"

\* \* \* \* \*

"Section 4.05(b) reflects the compromise of a long-standing dispute between Oklahoma and Texas over the water of the North Fork of the Red River and Sweetwater Creek. \* \* \* \* \*"

"Under the Compromise Texas will limit development on North Fork and Sweetwater Creek to projects justified on the basis of municipal, industrial,

and domestic needs until the year 2000. However, if sufficient imported water becomes available in Western Oklahoma before 2000, Texas will be free to pursue full development of its 60% of these interstate tributaries. \* \* \* \*"

- (3) Until January 1, 2000 (assuming that imported water is not provided prior to that date in sufficient amounts to meet municipal and irrigation needs of Western Oklahoma) special restrictions apply to Texas water use in its North Fork Red River watershed upstream from the Lugert-Altus Reservoir. Therefore, some of the Compact compliance rules for the North Fork Red River watershed upstream from the Lugert-Altus Reservoir (para 5.f.(3) & (4) and g.(3) & (4) below) expire on January 1, 2000, if still in effect at that time.
- b. **Buck Creek Watershed in Texas:** Buck Creek watershed covers about 300 square miles in Texas. There are no existing gaging stations on Buck Creek in Texas or in Oklahoma. Since neither the Texas nor Oklahoma use of flow from Buck Creek is significant at this time, it is not required to make an annual accounting of the flow in Buck Creek. It also appears that establishing gaging stations and channel loss values so that future annual accountings could be made is not economically justified at this time. Annual accounting procedures for this watershed should be developed to provide a 60:40 apportionment whenever requested by either Oklahoma or Texas.
- c. **Sand (Lebos) Creek Watershed in Texas:** Sand Creek watershed covers about 65 square miles in Texas. There are no gaging stations on Sand Creek in Texas or in Oklahoma. Since neither Texas nor Oklahoma makes significant use of flow from Sand Creek, it is not necessary to make an annual accounting of the flow in Sand Creek, and it does not seem to be economically justified **at this time** to establish gaging stations and determine channel loss values so that future annual accountings could be made. Annual accounting procedures for this watershed should be developed to provide a 60:40 apportionment whenever requested by either Oklahoma or Texas.
- d. **Salt Fork Red River Watershed in Texas:** Salt Fork Red River watershed in Texas covers about 1,380 square miles, of which 209 are non-contributing.

The USGS streamflow gage number 07300000, Salt Fork Red River near Wellington, Texas, is about 16 miles upstream from the Oklahoma-Texas State line and measures flow from a 1,222 sq. mi. drainage area, of which 209 is probably non-contributing. The average annual discharge (1953-1966) was 52,600 AF/yr, and the average annual discharge since Greenbelt Reservoir was completed (1967-1977) has been 33,250 AF/yr.

The USGS streamflow gage 07300500, Salt Fork Red River at Mangum, Oklahoma, is about 29 miles downstream from the Oklahoma-Texas State line and measures flow from a 1,566 sq. mile drainage area, of which 209 is probably non-contributing. The average annual discharge (1937-1977) has been 62,450 AF/yr.

- (1) The actual annual delivery at the Oklahoma State line is computed as follows:
  - (a) The annual flow at the Wellington gage,
  - (b) Minus channel losses to Wellington gage flows between gage and State line (until this specific channel loss value is available, the Compact compliance calculations will be made ignoring this channel loss adjustment),
  - (c) Plus Texas' flow between Wellington gage and the State line. (This flow will be computed based on intervening drainage area between Wellington and Mangum gages adjusted for both Texas and Oklahoma man-made depletions.), and
  - (d) Minus Texas' man-made depletions downstream from the Wellington gage.
  
- (2) The scheduled annual delivery at the Oklahoma State line is 40 percent of the natural flow at State line without diversions or impoundments, and would be computed as 40 percent of the following:
  - (a) The actual annual delivery (para 5.d.(1) above),
  - (b) Plus all man-made depletions in Texas, and
  - (c) Minus the increased channel losses in Texas which would have incurred had Texas depletions not occurred (until this specific channel loss value is available, the Compact compliance calculations will be made ignoring this channel loss adjustment).
  
- (3) Compact compliance is achieved as long as actual delivery exceeds scheduled delivery.

**e. Elm Creek Watershed in Texas:** Elm Creek watershed covers about 360 square miles in Texas which includes the North Elm Creek tributary. There is no streamflow gage on Elm Creek in Texas. The USGS gage number 07303400, Elm Fork of North Fork Red River near Carl, Oklahoma, is about 6 miles downstream from the Oklahoma-Texas State line, and was used to measure flow from a 416 square mile drainage area but discharge measurements at this site were discontinued in 1980. The average annual discharge (20 years) was 30,280 AF/yr. No Compact compliance accounts can be made until the Gage near Carl has been reestablished.

- (1) The actual annual delivery at State line is computed as follows:

- (a) Flow at the State line. (This flow will be computed based on the drainage area and on the flow measured at Carl gage, adjusted for both Texas and Oklahoma depletions.), and Minus Texas' man-made depletions.
- (2) The scheduled annual delivery at State line is 40 percent of the natural flow at State line without diversions or impoundments and would be computed as 40 percent of the following:
  - (a) The actual annual delivery (para 5.e.(1) above),
  - (b) Plus man-made depletions in Texas, and
  - (c) Minus the increased channel losses in Texas which would have been incurred if Texas had not depleted the flow (until this specific channel loss value is available, the Compact compliance calculations will be made ignoring this channel loss adjustment).
- (3) Compact compliance is achieved as long as the actual delivery exceeds the scheduled delivery.

**h. Washita River Watershed in Texas:** There is no streamflow gage on the Washita River in Texas. The USGS streamflow gage number 07316500, Washita River near Cheyenne, Oklahoma, is over 21 miles downstream from the Oklahoma-Texas State line, and measures flow from a 794 square mile drainage area, of which about 441 square miles are in Texas. The average annual discharge at the Cheyenne gage (44 years) has been 20,720 AF/yr.

- (1) The actual annual delivery at Oklahoma State line is computed as follows:
  - (a) The annual flow at the Cheyenne gage,
  - (b) Plus channel losses to the State line flow between the State line and the gage (until this specific channel loss value is available, the Compact compliance calculations will be made ignoring this channel loss adjustment),
  - (c) Minus Oklahoma's flow between the State line and Cheyenne gage. (This flow will be computed based on the drainage area upstream from the Cheyenne gage, adjusted for both Texas and Oklahoma man-made depletions.), and
  - (d) Minus Texas' man-made depletions.
- (2) The annual scheduled delivery at State line is 40 percent of the natural flow at State line without diversions or impoundments, and would be computed as 40 percent of the following:
  - (a) The actual annual delivery at State line para 5.h.(1) above),
  - (b) Plus man-made depletions in Texas, and
  - (c) Minus the increased channel losses which would have occurred if Texas had not made any diversions (until this specific channel loss value is available, the Compact compliance

calculations will be made ignoring this channel loss adjustment).

- (3) Compact compliance is achieved as long as the actual delivery exceeds the scheduled delivery.

**RED RIVER COMPACT INTERIM RULES AND REGULATIONS**  
**To Compute and Enforce Compact Compliance**  
**REACH II, SUBBASIN 5**

**(Adopted 4/30/87)**

1. These rules and regulations to be used to compute and enforce Compact compliance within Subbasin 5 of Reach II, Red River Compact, are adopted subject to the following conditions and assumptions.
  - a. It is fully understood that these rules and regulations should be modified as new or improved gaging stations are constructed, whenever experience or detailed studies demonstrate the need for modification, and if the Commission should modify its interpretation of Compact provisions relating to this Subbasin.
  - b. Definitions:
    - (1) "Diversion" as used in these rules and regulations, is the net loss to a water source from use by a diverter, and is computed as the diversion from the water source minus the part of the diversion which is returned to the water source. Normally, return flows must be measured to be considered; however, the EAC may consider and recommend exceptions. As used herein, "diversion" is equivalent to "net diversion" from a water source and to "depletion" or "consumptive use" of a water source.
2. **Management of Compact Compliance Computations**
  - a. **Management Using State Centers**
    - (1) State EAC representatives will establish State Computation Control Center
      - (a) State representatives will gather data, exchange data and meet via conference call to check on computation results, if necessary.
      - (b) EAC will determine compliance with Compact.
  - b. **Management Period for Weekly Flow and Diversions:**
    - (1) Next week's State diversions will be allocated based on last week's compliance computations.
    - (2) It is each State's responsibility to limit its total State diversion allocation among its State diverters.
    - (3) The weekly period for use and flow data will start and end at 8:00 a.m. on Tuesday of each week.
    - (4) Data collection and dissemination will be completed on Tuesday of each week.
    - (5) Computation of Compliance will be completed on Wednesday of week.
    - (6) Each State can request an update at any time.

**c. Management Improvement Studies:** The EAC will monitor the effect on accounting management of the following factors and will report thereon to the Commission whenever procedure changes appears desirable.

- (1) Errors caused by travel time.
- (2) Future restrictions computed from past week's data.
- (3) Failure to consider channel loss.
- (4) Failure to consider ungaged return flows.
- (5) Failure to consider flow trends.
- (6) Addition of needed gages.

**3. Enforcement of Compact Compliance Requirements.** Each State will be responsible for insuring that the sum of the diversions by State users does not exceed the total State diversion authorized by the Red River Compact. In this regard, each State will be responsible for establishing clear legal authority within its State for enforcing the restrictions imposed by the Red River Compact.

**4. Data Reporting Procedures.**

**a. Streamflow Gaging Station Records:** The EAC will make arrangements with the Corps of Engineers, the U.S. Geological Survey and with States as required to collect daily and/or weekly data, as needed, and forward to the State Computation and Control Centers.

**b. Diversion Records:** Each State will be responsible to collect daily and/or weekly data, as needed, and forward to the State Computation and Control Centers.

**c. Archived Records:** Records will be archived by Commission Chairman.

**5. General Compliance Requirements of Section 5.05, Red River Compact.**

**a. Section 5.05 (b) (1):**

- (1) **Compact prescribes:** "The Signatory States shall have equal rights to the use of the runoff originating in subbasin 5 and undesignated water flowing into subbasin 5, so long as the flow of the Red River at the Arkansas-Louisiana state boundary is 3,000 cubic feet per second or more, provided no state is entitled to more than 25 percent of the water in excess of 3,000 cubic feet per second."
- (2) In computing the Subbasin 5 water allocation, when the flow of the Red River at the Arkansas-Louisiana State Boundary is 3,000 cfs or more and the total runoff and undesignated flow of Subbasin 5 is greater than or equal to 7,500 cfs but less than or equal to 12,000 cfs, Louisiana's allocation shall be 3,000 cfs and each of the three upstream states will equally share the runoff and undesignated flow in excess of 3,000 cfs.
- (3) When the total runoff and undesignated flow of Subbasin 5 is 12,000 cfs or more, each of the signatory states shall be entitled to 25% of the total runoff and undesignated flow.

- (4) State compliance with Section 5.05 (b) (1) does not need to be determined except when specifically requested by a Compact State.

**b. Section 5.05 (b) (2) :**

- (1) **The Compact states:** "Whenever the flow of the Red River at the Arkansas-Louisiana state boundary is less than 3,000 cubic feet per second, but more than 1,000 cubic feet per second, the States of Arkansas, Oklahoma, and Texas shall allow to flow into the Red River for delivery to the State of Louisiana a quantity of water equal to 40 percent of the total weekly runoff originating in subbasin 5 and 40 percent of undesignated water flowing into subbasin 5; provided, however, that this requirement shall not be interpreted to require any state to release stored water"
- (2) In computing the Subbasin 5 water allocation to Louisiana when flow of Red River at the Arkansas-Louisiana State boundary is less than 3,000 cfs but more than 1,000 cfs, the Subbasin 5 runoff for each of the three upstream States and the undesignated water flowing into Subbasin 5 from each upstream State totalled, and the three upstream States should allow to pass to Louisiana 40 percent of the total, or 1,000 cfs, whichever is greater.
- (3) When the Subbasin 5 runoff plus undesignated water totals at least 2,500 cfs and not more than 7,500 cfs, each of the three upstream States are allocated 60 percent of its runoff plus undesignated inflow and the other 40 percent is to be allowed to flow into the Red River for delivery to Louisiana.
- (4) When the Subbasin 5 runoff plus undesignated water totals at least 1,000 cfs but less than 2,500 cfs, the allocation to Louisiana is 1,000 cfs because of Compact Section 5.05 (b) (3). The total Subbasin 5 runoff plus undesignated water is compared to the Louisiana allocation of 1,000 cfs and a percentage is established. Each of the three upstream States will be entitled to divert and use a quantity computed using (100 percent minus the established percentage) times (the total of runoff from its Subbasin 5 areas plus undesignated water flowing into its Subbasin 5 areas).
- (5) This Compact compliance determination should be made whenever the flow of the Red River at the Arkansas-Louisiana State boundary falls below 3,000 cfs and is more than 1,000 cfs.

**c. Section 5.05 (b) (3) :**

- (1) **The Compact states:** "Whenever the flow of the Red River at the Arkansas-Louisiana state boundary falls below 1,000 cubic feet per second, the States of Arkansas, Oklahoma, and Texas shall allow a quantity of water equal to all the weekly runoff originating in subbasin 5 and all undesignated

- water flowing into subbasin 5 within their respective states to flow into the Red River as required to maintain a 1,000 cubic foot per second flow at the Arkansas-Louisiana state boundary."
- (2) In computing the Subbasin 5 allocation when the flow of the Red River at the Arkansas-Louisiana State boundary falls below 1,000 cfs, and when the Subbasin 5 runoff and undesignated water flowing into Subbasin 5 total 1,000 cfs or less, all flow must be passed to Louisiana.
  - (3) When the Subbasin 5 runoff and undesignated water flowing into Subbasin 5 total more than 1,000 cfs but less than 2,500 cfs, Louisiana is allocated 1,000 cfs. This 1,000 cfs Louisiana entitlement is compared to the total runoff plus undesignated water and a percentage is established. Each of the three upstream States will be entitled to divert and use a quantity computed using (100 percent minus the established percentage) times (its total State runoff and undesignated water inflow).
  - (4) See rules for Compact Section 5.05 (b)(2) when the Subbasin 5 runoff and undesignated water flowing into Subbasin 5 total 2,500 cfs or more up to 7,500 cfs.
  - (5) This Compact compliance determination should be made whenever the flow of the Red River at the Arkansas-Louisiana State boundary falls below 1,000 cfs.

**d. Section 5.05 (c):**

- (1) **The Compact states:** "Whenever the flow at Index, Arkansas, is less than 526 c.f.s., the states of Oklahoma and Texas shall each allow a quantity of water equal to 40 percent of the total weekly runoff originating in subbasin 5 within their respective states to flow into the Red River; provided however, this provision shall be invoked only at the request of Arkansas, only after Arkansas has ceased all diversions from the Red River itself in Arkansas above Index, and only if the provisions of Sub-sections 5.05 (b)(2) and (3) have not caused a limitation of diversions in subbasin 5."
- (2) In computing the Subbasin 5 allocation when flow of Red River at Index Arkansas is less than 256 cfs, the States of Oklahoma and Texas are to pass 40 percent of weekly runoff from respective Subbasin 5 areas.
- (3) This Compact compliance determination will be made only when requested by Arkansas, only after Arkansas has ceased all diversions from the Red River, and only if the provisions of subsections 5.05 (b)(2) and (3) have not caused a limitation of diversions in Subbasin 5.

**6. Procedures (Disregarding Designated Flows) to Compute State Runoff, Runoff plus Undesignated Inflows, and Flow of Red River at Arkansas-Louisiana State Boundary.**

**a. Oklahoma.**

- (1) **Runoff plus Undesignated Inflows of Denison Dam to DeKalb Gage:**
  - (a) Kiamichi River near Hugo, OK, Gage flow, plus Muddy Boggy Creek near Unger, OK, Gage flow plus Blue River near Blue, OK Gage flow, plus
  - (b) Fifty percent of (DeKalb Gage flow, plus Texas and Oklahoma diversions, minus gaged flows at Kiamichi River near Hugo, Ok, Muddy Boggy Creek near Unger, OK, Blue River near Blue, OK, and Sanders Creek near Chicota, Texas, streamflow Gages).
- (2) **Runoff plus Undesignated Inflows, DeKalb Gage to Oklahoma-Arkansas State line:** Fifteen and one-half (15.5) percent of (Index Gage flow, minus DeKalb Gage flow, plus Oklahoma, Texas and Arkansas diversions downstream from DeKalb Gage).
- (3) **Runoff only, Denison Dam to Oklahoma-Arkansas State line.**
  - (a) Fifty percent of (DeKalb Gage flow, minus Red River at Denison Dam Gage flow, plus Texas and Oklahoma diversions upstream from DeKalb Gage, minus Blue River near Blue, OK, Gage flow, minus Muddy Boggy Creek near Unger-Okla. Gage flow, minus Kiamichi River near Hugo-Okla. Gage flow minus Gage flow), plus
  - (b) Fifteen and one-half (15.5) percent of (Index Gage flow, minus DeKalb Gage flow, plus Oklahoma, Texas and Arkansas diversions between DeKalb and Index Gages).

**b. Texas.**

- (1) **Runoff plus Undesignated Inflows, DeKalb Gage to Index Gage:**
  - (a) Sanders Creek near Chicota Gage flow, plus
  - (b) Fifty percent of: (DeKalb Gage flow, plus Texas and Oklahoma diversions, minus gaged flows at Kiamichi River near Hugo, OK, Muddy Boggy Creek near Unger, OK, Blue River near Blue, OK, and Sanders Creek near Chicota, TX, streamflow Gages).
- (2) **Runoff plus Undesignated Inflows, DeKalb Gage to Index Gage:** Fifty (50) percent of (Index Gage flow, minus DeKalb Gage flow, plus Oklahoma, Texas and Arkansas diversions downstream from DeKalb Gage).

- (3) **Runoff plus Undesignated Inflows, Sulphur River Gage:** One hundred percent of (Sulphur River near Texarkana Gage flow) minus (Texas diversions from river below gage) plus (Texas diversions below Texarkana Dam).
- (4) **Runoff Only, Denison Dam to Index Gage:** Fifty percent of (Index Gage flow, minus Red River at Denison Dam Gage flow, plus Oklahoma and Texas and Arkansas diversions upstream from the Index Gage, minus Blue River near Blue, OK, Gage flow, minus Muddy Boggy Creek near Unger-Okla. Gage flow, minus Kiamichi River near Hugo-Okla. flow, minus Sanders Creek near Chicota-Texas Gage flow).

**c. Arkansas Runoff plus Undesignated Inflows.**

- (1) **Oklahoma-Arkansas State Line to Index Gage:** Thirty-four and one-half (34.5) percent of (Index Gage flow, minus DeKalb Gage flow, plus Oklahoma and Texas and Arkansas diversions between DeKalb and Index Gages).
- (2) **Index Gage to Hosston Gage:**
- (a) Hosston Gage flow, plus Louisiana diversions above Hosston Gage, minus Index Gage flow, minus (Sulphur River near Texarkana Gage flow less Texas diversions from river below gage), plus Arkansas diversions downstream from Index Gage.

**d. Louisiana Streamflow at Arkansas-Louisiana State Boundary.**

- (1) **Red River flow at Arkansas-Louisiana State boundary** equals (Gage flow) plus (Louisiana diversions from Red River downstream from the State boundary and upstream from gage).
- (2) **Data needed to make interim Louisiana calculations**
- (a) **For Red River flows up to 5,000 cfs -** Hosston Gage flow, plus Louisiana diversions from Red River upstream from Hosston Gage.
- (b) **For Red River flows of 5,000 cfs or larger -** Shreveport Gage flow, plus Louisiana diversions from Red River upstream from Shreveport Gage, minus Twelvemile Bayou near Dixie-La Gage flow, plus Louisiana diversions from Twelvemile Bayou below Twelvemile Bayou near Dixie-La Gage.
- (3) **Effect of Flow Trends, Scheduled Change of Reservoir Releases and Other Events Certain to Significantly Change Flow at Arkansas-Louisiana State Boundary During Coming Week.**  
In addition to the Arkansas-Louisiana State boundary flow estimated based on subparagraph (2) (a) or (b) above, the EAC will also advise the

Commission of probable significant changes in State boundary flow which should result from flow trends, scheduled change of reservoir releases, and other such known events.

7. **Procedures (Using Designated Flow Data) to Compute State Runoff plus Undesignated Inflows and Flow of Red River at Arkansas-Louisiana State boundary.** Procedures outlined in paragraph 6 above will be followed except that designated inflows, designated outflows and diversion of designated flows will be accounted for whenever appropriate.



**RED RIVER COMPACT RULES AND REGULATIONS  
To Compute and Enforce Compact Compliance  
REACH III, SUBBASIN 3**

**(as amended 4/25/89)**

1. These rules and regulations to be used to compute and enforce Compact compliance within Subbasin 3 of Reach III, Red River Compact, are adopted subject to the following conditions and assumptions.
  - a. It is fully understood that these rules and regulations should be modified whenever experience or detailed studies demonstrate the need for modification, and if the Commission should modify its interpretation of Compact provisions relating to this Subbasin.
  - b. **Definitions:**
    - (1) "Diversion", as used in these rules and regulations, is the net loss to a water source from use by a diverter, and is computed as the diversion from the water source minus the part of the diversion which is returned to the water source. Normally, return flows must be measured to be considered; however, the Engineering Committee may consider and recommend exceptions. As used herein, "diversion" is equivalent to "net diversion" from a water source and to "depletion" or "consumptive use" of a water source.
    - (2) "Drawdown", as used in these rules and regulations, means that period commencing on the first day water ceases spilling over the existing Caddo Lake spillway (or the raised spillway, if Caddo Lake is enlarged), and continuing so long as the Caddo Lake surface elevation continues to fall, until the day when appreciable inflow reaches Caddo Lake, causing the Caddo Lake surface elevation to rise leading to a spill from Caddo Lake.
  
2. **Management of Compact Compliance Computations.**
  - a. **Management Using State Centers:**
    - (1) State Engineering Committee representatives will establish State Computation Control Centers.
      - (a) State representatives will gather data, exchange data and meet via conference call to check on computation results, if necessary.
      - (b) The Engineering Committee will compute compliance with Compact.
  - b. **Management Period for Compact Compliance Computations:**
    - (1) Next week's State diversions will be allocated based on last week's compliance computations.

- (2) It is each State's responsibility to limit its total State diversion allocation among its State diverters.
- (3) The weekly period for use and flow data will start and end at 8:00 a.m. on Tuesday of each week.
- (4) Data collection and dissemination will be completed on Tuesday of each week.
- (5) Computation of Compliance will be completed on Wednesday of each week.
- (6) Each State can request an update at any time.

**c. Management Improvements Studies:** The Engineering Committee will monitor the effect on accounting management of the following factors and will report thereon to the Commission whenever procedure changes appear desirable.

- (1) Errors caused by travel time.
- (2) Future restrictions computed from past week's data.
- (3) Failure to consider channel loss.
- (4) Failure to consider ungaged return flows.
- (5) Failure to consider flow trends.
- (6) Addition of needed gages.

**3. Enforcement of Compact Compliance Requirements.** Each State will be responsible for insuring that the sum of the diversions by State users does not exceed the total State diversion authorized by the Red River Compact Commission. In this regard, each State will be responsible for establishing clear legal authority within its State for enforcing the restrictions imposed by the Red River Compact.

**4. Data Reporting Procedures.**

- a. Streamflow Gaging Station Records:** The Engineering Committee will make arrangements with Corps of Engineers, the U.S. Geological Survey and with States as required to collect daily and/or weekly data, as needed, and forward to the State Computation and Control Centers.
- b. Diversion Records:** Each State will be responsible to collect weekly data, as needed, and forward to the State Computation and Control Centers.
- c. Archived Records:** Records will be archived by the Commission Chairman.

**5. General Compliance Requirements of Section 6.03 Red River Compact.**

**a. Section 6.03 (b) (1):**

- (1) **The Compact states:** "Texas shall have the unrestricted right to all water above Marshall, Lake O' the Pines, and Black Cypress damsites; however, Texas shall not cause runoff to be depleted to a quantity less than that which would have occurred with the full operation of Franklin County, Titus County, Ellison Creek, Johnson Creek, Lake O' the Pines, Marshall, and Black Cypress Reservoirs constructed, and those other

impoundments and diversions existing on the effective date of this Compact. Any depletions of runoff in excess of the depletions described above shall be charged against Texas' apportionment of the water in Caddo Reservoir."

- (2) Texas may use the bed and banks of the streams or tributaries available within this Subbasin to convey its developed water downstream from the aforesaid dam sites to specified authorized users. Such water would retain its identity and would not be subject to the Caddo Lake drawdown provisions of Section 5.b. of these rules until passing the designated point of diversion. Appropriate transportation losses will be approved by the Red River Compact Commission.
- (3) Until both Marshall Reservoir (with an estimated capacity of 782,300 acre-feet and yield of 325,000 acre-feet annually) and Black Cypress Reservoir (with estimated capacity of 824,400 acre-feet and yield and 220,000 acre-feed annually) have been constructed, it will be virtually impossible for Texas to deplete runoff in excess of that authorized. In the future, whenever potential Texas depletions above Marshall, Lake O' the Pines, and Black Cypress damsites become a concern to Louisiana, procedures to compute Texas depletion of runoff in excess of that authorized by Section 6.03 (b)(1) of the Compact should be developed by the Engineering Committee and presented for Commission consideration.

**b. Section 6.03 (b) (2):**

- (1) **The Compact states:** "Texas and Louisiana shall each have the unrestricted right to use fifty (50) percent of the conservation storage capacity in the present Caddo Lake for the impoundment of water for state use, subject to the provision that supplies for existing uses of water from Caddo Lake, on date of Compact, are not reduced."
- (2) Whenever water is spilling over the existing spillway at 168.5 feet above mean sea level, each state may withdraw or divert water from Caddo Lake without restriction.
- (3) Whenever Caddo Lake is not spilling over the existing spillway at 168.5 feet above mean sea level, the total consumptive use by each state shall not exceed 8,400 acre-feet during the drawdown period, provided that neither state shall divert more than 3,600 acre-feet during any one month or 4,800 acre-feet during any two consecutive months.

**c. Section 6.03 (b) (3):**

- (1) **The Compact states:** "Texas and Louisiana shall each have the unrestricted right to fifty (50) percent of the conservation storage capacity of any future enlargement of Caddo Lake, provided the two states may negotiate for the release of each

state's share of the storage space on terms mutually agreed upon by the two states after the effective date of this Compact."

- (2) This Compact provision requires no separate computation procedures but other rules may be changed if enlargement of Caddo Lake occurs. If enlargement of Caddo Lake is authorized in the future, the Engineering Committee should review and modify as necessary Rule 5 (b) and Rule 6.

**d. Section 6.03 (b) (4) :**

- (1) **The Compact states:** "Inflow to Caddo Lake from its drainage area downstream from Marshall, Lake O' the Pines, and Black Cypress damsites and downstream from other last downstream dams in existence on the date of the signing of the Compact document by the Compact Commissioners, will be allowed to continue flowing into Caddo Lake except that any manmade depletions to this inflow by Texas will be subtracted from the Texas share of the water in Caddo Lake."
- (2) As indicated in paragraph 5 a. (2) above, it is virtually impossible for Texas at the present time to reduce inflow to Caddo Lake below that which would occur with both Marshall and Black Cypress Reservoirs constructed and operating. However potential Texas depletions become a concern to Louisiana, procedures to compute excess depletion by Texas of inflow to Caddo Lake should be developed by the Engineering Committee and presented for Commission Consideration.

**e. Section 6.03 (c) :**

- (1) **The Compact states:** "In regard to the water of interstate streams which do not contribute to the inflow to Cross Lake or Caddo Lake, Texas shall have the unrestricted right to Divert and use this water on the basis of a division of runoff above the state boundary of sixty (60) percent to Texas and forty (40) percent to Louisiana."
- (2) The Engineering Committee will review known Texas diversion data for the previous year and report to the Commission any Texas non-compliance with Compact Section 6.03 (c).

**f. Section 6.03 (d) :**

- (1) **The Compact states:** "Texas and Louisiana will not construct improvements on the Cross Lake watershed in either state that will affect the yield of Cross Lake; provided, however, this subsection shall be subject to the provisions of Section 2.08."
- (2) The Engineering Committee will renew any known improvements on the Cross Lake watershed and report to the Commission any non-compliance with Compact Section 6.03 (d).

**6. Caddo Lake Content Accounting Procedure During Drawdown Periods.**

a. Whenever water is spilled from Caddo Lake, both state's accounts are full and no accounting is necessary. Accounting shall start the first day of no-spill following each period of spilling and shall continue until the first day of spill in the next period of spilling. The accounting procedure for computing the quantity of water in Caddo Lake during periods of drawdown belonging to the States of Louisiana and Texas shall be as follows:

- (1) At the beginning of the drawdown, the Caddo Lake contents belong 50 percent to each state. Otherwise, begin with water ownership on Caddo Lake as shown in the most recent previous report.
- (2) Each State shall be credited with one-half of the inflow to Caddo Lake since the previous report.
- (3) Each State's account shall be reduced by its share of Caddo Lake evaporation losses during the period since the previous report.
- (4) Each State's account shall be reduced by its diversions from Caddo Lake since the previous report.
- (5) A State's account shall not exceed 50 percent of the capacity of Caddo Lake. If these accounting procedures result in a greater State content than 50 percent of the total capacity of Caddo Lake, the excess computed quantity shall be "spilled" into the other State's account as needed to bring the other State's account up, but in no case shall either State's account exceed 50 percent of the total capacity of Caddo Lake.

b. Using a stage-area-capacity relationship concurred in by both States, the content of Caddo Lake at the end of each accounting period shall be determined and inflow for that period shall be computed as follows:

- (1) From the present content, as determined above, subtract the content determined at the end of the previous period.
- (2) Add to the figure resulting from Step (1) the total Texas and Louisiana diversions since the end of the previous period.
- (3) Add to the figure resulting from Step (2) the computed gross evaporation since the end of the previous period as determined in c. (2) below. This results in total inflow.

**c. Evaporation will be computed as follows:**

- (1) The Weather Bureau's pan evaporation data shall be used to compute gross lake evaporation using a standard conversion coefficient agreed to by the engineer advisors of each State.

(2) The average lake surface area for the accounting period shall be determined from the stage-area-capacity relationship concurred in by both States and multiplied by the gross lake evaporation as determined in Step (1) to determine the volume of evaporation for the period.

7. **Availability of Diversion Records.** Arrangements shall be made for all Texas and Louisiana diverters, during "drawdown" of Caddo Lake, to maintain daily diversion records open for inspection, and to provide weekly use data as required by Rule 2 b. (3).