



Sulphur River Basin Highlights Report 2008



Sulphur River Basin Authority

*Prepared in Cooperation with the
Texas Commission on Environmental Quality
Under the Authorization of the Texas Clean Rivers Act*

Sulphur River Basin Clean Rivers Program Highlights 2007

Introduction

The Clean Rivers Program (CRP) is a water quality monitoring, assessment, and public outreach program administered by the Texas Commission on Environmental Quality (TCEQ) which is funded by state-collected fees. The Sulphur River Basin Authority (SRBA) coordinates the Clean Rivers Program for the Sulphur River Basin. Utilizing a watershed management approach, SRBA and TCEQ are working together to identify and evaluate water quality issues and establish priorities for any needed actions. Assisting the Sulphur River Basin Authority with the FY2007 planning, data collection, analysis, and reporting of water quality data were the SRBA Steering Committee members, Texarkana College, TCEQ, and the United States Geological Survey (USGS). The goal of these cooperative efforts is to achieve continuing evaluation and supervision of water quality in the basin by providing appropriate, accurate, and up-to-date data. Monitoring efforts represent a large component of the CRP, providing the raw data and information required to address any concerns regarding water quality issues in the basin. The Sulphur River Basin is divided into six watersheds or areas: North Sulphur River Watershed, Sulphur River Watershed, Wright Patman Lake Watershed, Lower Sulphur River Watershed, White Oak Creek Watershed, and South Sulphur River Watershed. A map showing the location of each of these watersheds can be found within this report on page 4. The streams within the basin are broken down into connected portions referred to as “segments”. Each of these segments is in one or occasionally two watersheds. A map showing the location of each segment can be found within this report on page 5. A detailed discussion of each of these watersheds and maps showing the FY2007 and FY 2008 sampling locations and the watershed location within the Basin are provided in the Water Quality Data Review section of this report.

2007 Sulphur River Basin Highlights

Drought is over:

Drought conditions and resulting low lake levels within the Sulphur River Basin no longer exist in 2007. In contrast, abundant rainfall in the spring and early summer produced flooding conditions that persisted in some areas until late in the summer. In general, lake levels within the Sulphur River Basin were on a decline early in 2007. They rose significantly during the spring and summer, and recently regained their normal levels. Jim Chapman Lake (Cooper Lake) has recovered to normal elevations of about 440.0 feet. The 2007 calendar year started with Cooper Lake holding approximately 110,000 thousand acre-feet of water and ended with a sizable storage increase of 302,074 thousand acre-feet. The 49.94 inches of rain recorded for 2007 has restored the lake to near normal conditions. Wright Patman Lake has recovered to normal elevations of 240.0 feet where it maintains an approximate storage of 200,000 thousand acre-feet of water. Flooding conditions that peaked in the summer saw a maximum volume of over 561,000 thousand acre-feet, but the average storage for the year was 284,000 thousand acre-feet.

Regional Water Plan:

The regional water plan for the Sulphur River Basin area (Region D) was approved on May 16, 2006, by the Texas Water Development Board (TWDB). This action cleared the way for the TWDB to prepare the State Water Plan. After three years of data analysis and public comments, the Northeast Texas (Region D) planning group decided to exclude the proposed Marvin Nichols Reservoir from the approved regional plan. This was due in part to the negative impact of the reservoir project on the timber industry, including the destruction of tens of thousands of acres of bottomland hardwood forests. Texas regional water plans are mandated by law to protect the state's agricultural, natural, and water resources. Region D is now researching additional ways to supply water to other regions of the state that will not include the huge economic impact of building a new dam. One possible alternative studied by the United States Corps of Engineers is to increase the yield of Wright Patman Reservoir within the Sulphur River Basin. Increasing the lake level is supported by the Texarkana Water Department, and their interest was detailed by Mr. Bill King at the steering committee meeting.

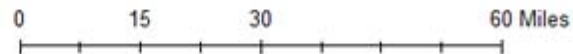
The 2007 State Water Plan was adopted on November 4, 2006. The Region D planning group recommended that Marvin Nichols Reservoir not be included in the state water plan and that new reservoirs should be pursued only after all other viable alternatives had been exhausted. However, in Chapter 10 of the State Water Plan, Marvin Nichols Reservoir is included as a recommended major reservoir needed to meet regional water needs ([http://www.twdb.state.tx.us/publications/reports/State Water Plan/2007/2007StateWaterPlan/2007StateWaterPlan.htm](http://www.twdb.state.tx.us/publications/reports/State%20Water%20Plan/2007/2007StateWaterPlan/2007StateWaterPlan.htm)).

Water Quality Modeling: Planning is underway by the TCEQ for a study to address the issues causing the listing of Wright Patman Lake on the draft 2006 Texas §303(d) List for low dissolved oxygen (DO) and high pH in various portions of the lake. The TCEQ TMDL program recommends development of a hydrodynamic and water quality model of Wright Patman Lake with emphasis on DO and pH dynamics. The study will also identify and quantify anthropogenic sources of pollutants in the watershed, estimate the total loading of pollutants to the reservoir, and calculate the lake's pollutant loading capacity. Phosphorus is considered to be the limiting nutrient for the eutrophication of Wright Patman Lake. However, physical factors related to reservoir aging are also suspected as contributors to poor water quality in the lake. Wright Patman Lake has been listed on every Texas §303(d) list since 1996.

Personnel Changes:

Ms. Nancy Rose has taken charge of the Clean Rivers Program for the Sulphur River Basin Authority, and Ms. Jennifer Delk is the project manager for the TCEQ. TCEQ Region 5 staff member Mr. Rob Cook has been responsible for conducting routine monitoring in the Sulphur River Basin. Mr. Cook has recently transferred to Region 4, and Mr. Mike VanBuskirk will be taking over his monitoring responsibilities in the basin. The role of Texarkana College personnel in the various tasks required by the CRP program has been increased.

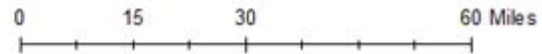
Sulphur River Basin Watersheds



Sulphur River Basin Segments



- | | |
|--|--|
| Segment 0301 Lower Sulphur River | Segment 307A Middle Sulphur River |
| Segment 0302 Wright Patman Lake | Lake |
| Segment 0303 Sulphur River | Stream |
| Segment 0303B White Oak Creek | State Hwy |
| Segment 0304 Days Creek | US Hwy |
| Segment 0305 North Sulphur River | Interstate Hwy |
| Segment 0306 South Sulphur River | |



Water Quality Monitoring

Monitoring, data collection, and analysis are the basis for maintaining good water quality within the Sulphur River Basin. These activities are an integral part of the Clean Rivers Program (CRP), a cooperative program administered by the Texas Commission on Environmental Quality (TCEQ), and directed by the Sulphur River Basin Authority (SRBA). Other entities participating in monitoring within the Basin are Texarkana College and the United States Geological Survey (USGS).

There are five basic types of monitoring which occur in our basin: 1) Routine, 2) Systematic, 3) Flow, 4) Diel (24-hour studies), and 5) Special Studies. Each type of monitoring includes specific sets of parameters or measurements that are recorded or analyzed.

Routine monitoring is used to expand and maintain the water quality database. Its focus is to improve our ability to follow trends and to identify water quality changes in the major watersheds.

Systematic monitoring is used to investigate known concerns and detect potential concerns. Systematic monitoring stations are typically placed on the smaller, unclassified streams that would not normally be evaluated during routine monitoring. Biological monitoring is a key factor used in the selection of systematic sampling sites.

Flow monitoring is utilized to support permitted discharger actions.

Diel sampling involves multiple field measurements conducted over a 24-hour period, using an electronic multi-parameter probe. This type of sampling usually records dissolved oxygen, temperature, conductivity, and pH measurements. Diel sampling is frequently scheduled for areas where dissolved oxygen levels are a concern.

Special studies are additional water monitoring projects designed to address a specific concern or to provide additional information as a result of a previous monitoring effort or a current issue. The focus of these studies has been the improvement of water quality within the Basin, and documentation of both current and historical watershed conditions.

In addition to the standard station monitoring, biological and habitat evaluations are performed twice a year at specific stream stations. These measurements are used to evaluate the stream's aquatic community composition, integrity, and appropriate aquatic life use. A narrative rating system is used to evaluate stream biology and habitat. The categories are "exceptional", "high", "intermediate", and "limited".

Water Quality Parameters by Group

Field Parameters generally include: dissolved oxygen, conductivity, pH, temperature, stream flow, flow severity, Secchi disc depth, and field observations. These measurements provide information about the physical and chemical water quality characteristics at the sample site.

Dissolved Oxygen (DO) is usually sampled individually. This value indicates the amount of oxygen available in the water body. Factors such as high water temperatures and the presence of organic materials can reduce the DO level. All aquatic life has certain minimum concentrations that are necessary for its support.

Conventional Parameters are chemical and biological components found in water that typically require laboratory analysis. These parameters generally include several forms of nitrogen, phosphorus, bacteria, chlorophyll-a, total dissolved solids, and total suspended solids. Within this grouping high chlorophyll-a, nitrate-nitrogen, orthophosphate-phosphorus, and total phosphorus levels are considered as nutrient values. High levels of nutrients can cause excessive plant growth, which can lead to lower levels of dissolved oxygen in the water body and reduce the ability of aquatic organisms to survive. At higher levels nutrients are a threat to human health and can result in taste and odor problems in drinking water.

Metal Parameters generally include: aluminum, arsenic, chromium, copper, nickel, silver, zinc, barium, molybdenum, calcium, selenium, iron, and manganese. These are measured to evaluate the potential for exposure to toxic concentrations of metals.

CRP Coordinated Monitoring in FY2007

Coordinated monitoring meetings are held once a year to bring all the monitoring agencies and entities together to discuss streamlining and coordinating monitoring efforts within the Basin. These meetings are one of the key events of the Clean Rivers Program.

On March 29, 2007, a meeting was held to discuss and develop a coordinated basin-wide monitoring schedule for the Sulphur River Basin Fiscal Year 2008 Clean Rivers Program. The meeting was held at the Northeast Texas Municipal Water District Executive Offices in Hughes Springs, Texas, and participants included TCEQ, SRBA, HDR, Inc., and USGS. Issues detailed in the report, *Monitoring Priorities for Concerns and Non Supporting Parameters Based on the DRAFT 2006 Texas Water Quality Inventory*, produced by the TCEQ, were used as a guide for addressing sampling and water quality issues in the Basin.

A detailed monitoring schedule for fiscal year 2008 is available at <http://cms.lcra.org/schedule.asp?basin=3&FY=2008>, as part of the interactive

database for statewide coordinated monitoring schedules. A link to this schedule can be found on the SRBA website at <http://www.sulphurr.org>. A table and maps showing the location and monitoring entity of all scheduled FY2007 and FY 2008 sampling stations are presented on pages 9 through 11 of this report. In some instances two entities will monitor the same site. This usually represents differences in time of year or the type of monitoring. Occasionally SRBA and TCEQ personnel will do the same monitoring at a site for quality assurance purposes.



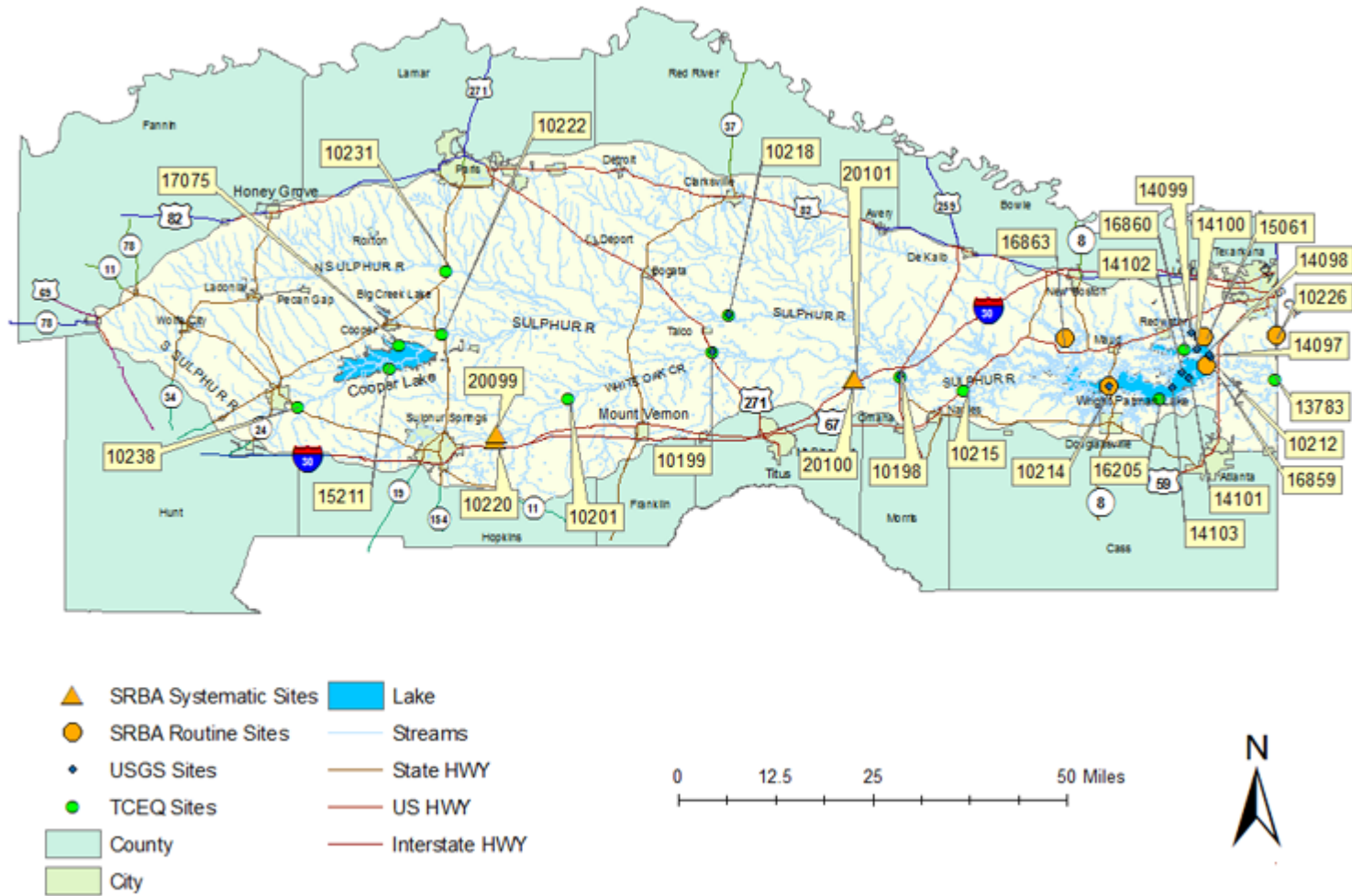
Wright Patman Lake at Rocky Point Campground



North Sulphur River at Highway 34

Sulphur River Basin Monitoring Sites							
FY 2007		FY 2007		FY 2008		FY 2008	
Site ID	Site Description	Site ID	Site Description	Site ID	Site Description	Site ID	Site Description
10197	AUDS CREEK S AT FM 1184	14101	WRIGHT PATMAN LAKE SITE DR	10198	WHITE OAK CREEK AT US 259	14101	WRIGHT PATMAN LAKE SITE DR
10198	WHITE OAK CREEK AT US 259	14102	WRIGHT PATMAN LAKE SITE DC	10199	WHITE OAK CREEK AT US 271	14102	WRIGHT PATMAN LAKE SITE DC
10199	WHITE OAK CREEK AT US 271	14103	WRIGHT PATMAN LAKE SITE EC	10201	WHITE OAK CREEK AT FM 900	14103	WRIGHT PATMAN LAKE SITE EC
10201	WHITE OAK CREEK AT FM 900	15061	WRIGHT PATMAN LAKE AT N SHORE	10212	SULPHUR RIVER BRIDGE ON US 59	15061	WRIGHT PATMAN LAKE AT N SHORE
10212	SULPHUR RIVER BRIDGE ON US 59	15211	COOPER LAKE MID LAKE	10214	WRIGHT PATMAN LAKE AT SH 8	15211	COOPER LAKE MID LAKE
10214	WRIGHT PATMAN LAKE AT SH 8	16205	WRIGHT PATMAN LAKE AT ATLANTA	10215	SULPHUR RIVER AT US 67	16205	WRIGHT PATMAN LAKE AT ATLANTA
10215	SULPHUR RIVER AT US 67	16857	WRIGHT PATMAN LAKE EAST OF SH8	10218	SULPHUR RIVER AT CR NW 39	16859	WRIGHT PATMAN LK AT IP INTAKE
10218	SULPHUR RIVER AT CR NW 39	16859	WRIGHT PATMAN LK AT IP INTAKE	10220	ROCK CREEK AT FM 69	16860	WRIGHT PATMAN LK IN BIG CREEK
10222	S SULPHUR R AT SH 19	16860	WRIGHT PATMAN LK IN BIG CREEK	10222	S SULPHUR R AT SH 19	16863	ANDERSON CREEK AT CR4126
10226	DAYS CREEK AT STATELINE RD	16863	ANDERSON CREEK AT CR4126	10226	DAYS CREEK AT STATELINE RD	17075	COOPER LAKE IN DOCTORS CK ARM
10231	NORTH SULPHUR R AT SH 24/19	17075	COOPER LAKE IN DOCTORS CK ARM	10231	NORTH SULPHUR R AT SH 24/19	20099	WHITE OAK CREEK AT FM 69
10238	SOUTH SULPHUR RIVER AT SH 11	17510	SOUTH SULPHUR R AT SH 24	10238	SOUTH SULPHUR RIVER AT SH 11	20100	HORSE CREEK AT TITUS CR 3445
13783	SULPHUR RIVER AT KCS RAILROAD	17613	NORTH SULPHUR RIVER AT FM 38	13783	SULPHUR RIVER AT KCS RAILROAD	20101	SMACKOVER CREEK AT TITUS CR 34
14097	WRIGHT PATMAN LAKE SITE AC	18824	TRIB OF ELLIOT CREEK AT FM 991	14097	WRIGHT PATMAN LAKE SITE AC		
14098	WRIGHT PATMAN LAKE SITE AL	18844	NORTH SULPHUR RIVER AT FM 3735	14098	WRIGHT PATMAN LAKE SITE AL		
14099	WRIGHT PATMAN LAKE SITE BC	18845	DAVIS CREEK AT FM 2990	14099	WRIGHT PATMAN LAKE SITE BC		
14100	WRIGHT PATMAN LAKE SITE CC	18846	NORTH SULPHUR RIVER AT SH 34	14100	WRIGHT PATMAN LAKE SITE CC		

Sulphur River Basin Sites FY 2008



Sulphur River Basin Water Quality Conditions

Every two years, the state must assess the quality of their water and submit a report to the Environmental Protection Agency (EPA) detailing the extent to which each water body in the state meets water quality standards. The TCEQ publishes this assessment as the *Texas Water Quality Inventory*. This document has three main parts: the *Texas Water Quality Inventory*, which gives the status of all the waters in the state, the *§303(d) List* that identifies waters that do not meet one or more of the standards set for their use and the *Texas §305(b) List* that identifies waters where concerns exist. The technical process is described by the following:

Classified Segments-To access and manage surface waters, TCEQ subdivides significant water bodies into classified segments. Most perennial streams, rivers, lakes, and bays in the state are classified segments and are individually defined in the *Texas Surface Water Quality Standards*. Each segment is intended to have relatively homogeneous chemical and hydrological characteristics. Classified segments are assigned four-digit numbers. The first two digits correspond to the river basin in which they are located. The last two digits distinguish individual segments within the particular basin. The Sulphur River and its tributaries have been designated as basin 03 and segment 0304 is Days Creek. There are seven distinct river and lake segments in the Sulphur River Basin.

Water Quality Standards-The *Texas Surface Water Quality Standards* are made up of two components: designated uses and criteria. A designated use describes what a water body may be used for; they include general use, aquatic life use, contact recreation use, and public water supply use. Criteria are usually numeric but are sometimes narrative. Benchmarks are used to evaluate water quality data or conditions.

Designated uses:

General Use-Temperature, pH, chloride, sulfate and total dissolved solids measurements are used to gauge support for this use. As mentioned above, each of these constituents has an associated criterion. For example, the pH criterion in the Sulphur River is a range between 6.5 and 8.5 standard units as outlined in the *Texas Surface Water Quality Standards*. The chloride, sulfate, and TDS criteria for Sulphur River (Segment 0303) are 80 parts per million (ppm), 180 ppm, and 600 ppm, respectively. When parameters are outside the pH criterion or exceed the chloride, sulfate or TDS criterion, the water is less than ideal for general use. The water tends to leave substantial residue when it evaporates, causes metals to corrode, be of limited use in irrigation, and require expensive treatment for many other uses.

Aquatic Life Use- Several criteria have been established to determine support for aquatic life use. Biological monitoring, the measurement of fish and bug populations and their habitat, offers the most accurate account of the health of an aquatic ecosystem. Narrative criteria for biological monitoring are exceptional, high, intermediate, and limited. Because biological monitoring is resource intensive, cost prohibitive, and flow dependent, dissolved oxygen (DO) is the criteria most frequently used to determine if a water body meets its aquatic life use. The DO criterion is usually listed as the minimum 24-hour average at any site within the segment. The DO criterion for Sulphur River is 5.0 ppm. Fish and other biological organisms do not necessarily die when DO levels are low, but they generally do not reproduce

or compete successfully over time.

Contact Recreation-This use refers to the ability of a water body to safely support activities that involve physical contact with water such as swimming. The applicable water quality criterion for contact recreation is a measure of bacteria levels. In freshwater bodies, E. coli is the preferred indicator organism. For the Sulphur River the criteria is 126 organisms per 100 mL of water. A high level of E. coli bacteria indicates that other pathogenic organisms are likely in the water and swimming and other forms of contact should be avoided.

Public Water Supply-A public water supply (PWS) is a water body used to supply water to a public water system. The raw surface and technical summary of finished water of a PWS may be assessed against human health criteria (metals, organics) or against secondary criteria (total dissolved solids, chloride, and sulfate). While human health criteria may be used to list a water body as impaired, secondary criteria may only be used to designate a concern. Water that does not meet the general use criterion or contains high levels of toxic metals or organic compounds may not be a good candidate for drinking water due to the high cost of treatment to achieve human health standards.

If a water body (or portion thereof) is found not to meet one of its designated uses, it will be considered to be *Impaired* and placed on the *Texas §303(d) List of Impaired Waters*. The criteria and conditions necessary for listing of a water body are included in the following table.

Criteria:

The criteria and conditions necessary for listing of a water body are included in the following table.

Constituent	Criteria	Calculation Used for <i>Impairment</i>
Total Dissolved Solids (TDS) Chloride Sulfate	Water body (segment) specific	Average of samples in the segment are above the criteria
Dissolved Oxygen (for High Aquatic Life Use)	3.0 grab sample 5.0 24-hr average	10% of samples are below the criteria 10% of samples are below the criteria
pH	6.5 minimum 9 maximum	10% of samples are above or below the criteria
E. coli	126 394	Geometric mean is greater than the criteria 25% of samples are above the criteria
Enterococci	35 89	Geometric mean is greater than the criteria 25% of samples are above the criteria

A number of Texas streams and water bodies are impacted by eutrophication, a process fueled by excess nutrients. These water bodies are characterized by excessive plant and algae growth and large swings in DO and pH. No numerical criteria are available to use as benchmarks for the levels of nutrients or the impact of eutrophication. The State of Texas is using a set of narratives that simply express the parameter of interest by name. Associated with each parameter is an arbitrary screening level that is calculated based on the 85th percentile level of the nutrient in state waters. When the screening level is exceeded (the parameter exceeds the 85th percentile or is in the poorest 15 percent for water quality), the parameter is said to be of *Concern*. Screening levels are used to determine if there is a water quality *Concern* and does not indicate an *Impairment*. The following table has the applicable narratives and the screening levels.

Constituent (Narrative)	Screening Levels			Calculation Used for <i>Concern</i>
	Stream	Reservoir	Tidal Stream	
Ammonia-Nitrogen	0.33	0.11	0.46	20% of samples are above the screening level
Nitrate-Nitrogen	1.95	0.37	1.10	
OrthoPhosphate-Phosphorus	0.37	0.05	0.46	
Total Phosphorus	0.69	0.20	0.66	
Chlorophyll a	14.1	26.7	21.0	

Six bodies of water in the Sulphur River Basin are currently listed in the *2006 Texas §303(d) List* (June 27, 2007) for non-support of a variety of standards. These segments include:

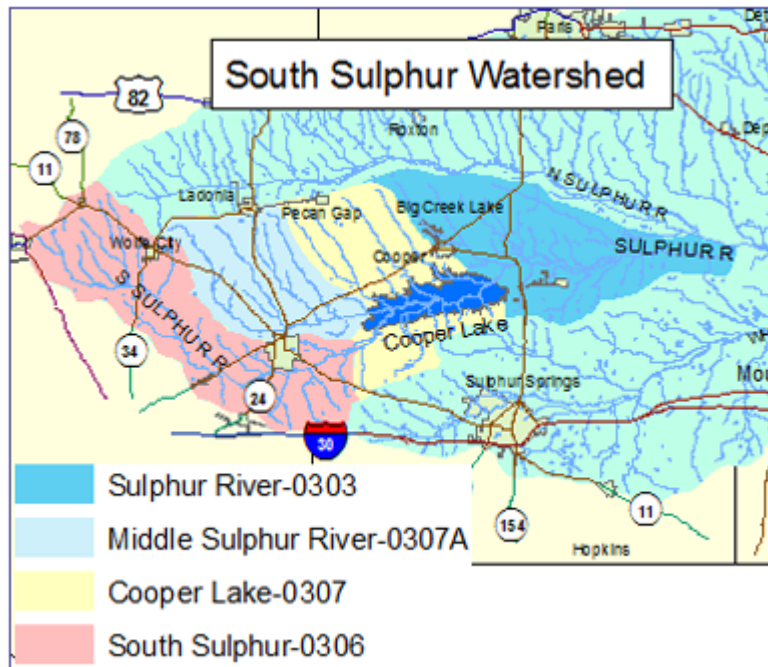
- Wright Patman Lake (Segment 0302) - non-supporting of dissolved oxygen and pH
- White Oak Creek (Segment 0303B) - non-supporting of dissolved oxygen and bacteria
- Swampoodle Creek (Segment 0304A)- impaired fish and macrobenthic communities
- Cowhorn Creek (Segment 0304B)- impaired fish and macrobenthic communities
- North Sulphur River (Segment 0305)- impaired habitat, fish and macrobenthic communities
- Cooper Lake (Segment 0307)- non-supporting due to high pH

The Upper South Sulphur River (Segment 0306) was on the *2004 §303(d) List* but was delisted for pH and depressed dissolved oxygen when a statistically-based method to determine use support status was applied to the original dataset. The three sites that are new to the list are Swampoodle Creek, Cowhorn Creek, and the North Sulphur River. White Oak Creek had bacteria added to the existing depressed dissolved oxygen impairment.

South Sulphur River Watershed

The South Sulphur River Watershed has an approximate area of 676 square miles and is located in the northern reaches of the Texas Blackland Prairies Ecoregion. The streams in the upper portions of the watershed form the South Sulphur River, which flows into Cooper Lake. These streams have low or intermittent flow during dry summer periods. A number of small intermittent streams flow directly into Cooper Lake. The South Sulphur River below Cooper Lake is fed by a number of small intermittent streams, but its base flow is controlled by releases from Cooper Lake. The vegetation of this watershed is generally marked by extensive agricultural clearing. The areas surrounding the South Sulphur River contain stands of water oak; elm, and hackberry, while the south shore of Cooper lake is composed primarily of post oak forest.

Segments: 0303—Sulphur/South Sulphur River, 0303A—Big Creek Lake (unclassified water body), 0306—Upper South Sulphur River, 0307—Cooper Lake, and 0307A—Middle Sulphur River (unclassified water body).



Water Bodies: Cooper Lake and Big Creek Lake.

Cities: Commerce (pop. 7,669), Cooper (pop. 2,150), Wolfe City (pop. 1,566), and Ladonia (Pop. 667).

Counties: Portions of Fannin, Hunt, Delta, and Hopkins Counties.

Land Use: Land use in the South Sulphur River Watershed is dominated by agricultural lands that occupy the majority of the watershed. Agriculture in this watershed is focused on cattle, rangeland, and crops. There are limited areas surrounding the South Sulphur River and the south shore of Cooper Lake which contain remnants of the original riparian forests of this area.

Soils: Soils of the South Sulphur River floodplain are primarily clayey Trinity, Kaufman, and Tinn soils. Soils adjacent to the Sulphur River floodplain are typically loamy Wilson and Crockett soils. Upland soils of the watershed are usually clayey Houston Black and Leson soils.

Permitted Discharges: There are six municipal wastewater treatment facilities, two industrial permits, and one confined animal feeding operation (CAFO) permit in this watershed. (see map on page 25)

Water Quality Issues:

Segment 0303—South Sulphur River below Cooper Lake

The South Sulphur River generally exhibits a slightly alkaline pH. Conductivity and dissolved solids levels are generally moderate in this segment. Tributaries of the South Sulphur River below Cooper Lake (upper reaches of Segment 0303) include Big Creek, Brushy Creek, and Lake Creek. Big Creek Reservoir is the only water body of significant size in this segment. There are no permitted dischargers in this segment.

Segment 0306—Upper South Sulphur River above Cooper Lake

The water quality problems identified in this segment are consistent with the development of excessive levels of photosynthesis and respiration initiated by large nutrient loads. This segment is on the *2006 Water Quality Inventory* with concerns for screening levels for orthophosphorus, nitrate, chlorophyll-a, and total phosphorus, but was removed from the *§303(d) List* for both pH and depressed dissolved oxygen. Permitted dischargers in this segment are four municipal waste dischargers.

Segment 0307—Cooper Lake

Cooper Lake (Segment 0307) is the largest body of water in the South Sulphur River Watershed. The lake covers about 19,000 acres and is surrounded by thousands of acres devoted to parks and wildlife management. The South Sulphur River, the Middle Sulphur River, and Pecan Creek among others flow directly into Cooper Lake. The water of Cooper Lake has average conductivity and moderate levels of alkalinity, total dissolved solids (TDS), chloride, and sulfate. The Middle Sulphur River (Segment 0307A) exhibits similar pH, conductivity, and dissolved solids levels. This segment includes two municipal waste permits and two industrial permits.

In 2006, impairments and drought related changes taking place at Cooper Lake near Sulphur Springs were a topic of concern. Water quality impairments in Texas are required to be assessed every two years, and as of 2007, Cooper Lake is listed as having an impairment of high pH in all four areas of the lake. Although the pH level of waters within the region containing Cooper Lake are expected to range between 6 and 8.5, those in Cooper Lake have been recorded at higher values. However, this higher pH level may actually be the normal condition for this body of water. A map of Northeast Texas detailing its ecological regions shows Cooper Lake to be in a different ecological region than it is currently listed. A change in the designated ecological region for Cooper Lake would adjust the common lake pH value to 9. If the EPA accepts the proposal of Cooper Lake ecological region relocation, pH will no longer be considered an impairment for this water body.

Cooper Lake is on the 2006 list of Texas for removal of parameters from the *Texas §303(d) List*. The lake is being delisted for low dissolved oxygen. A statistically-based method to determine use support status was used with the original dataset and the findings resulted in the delisting

of Cooper Lake for this parameter.

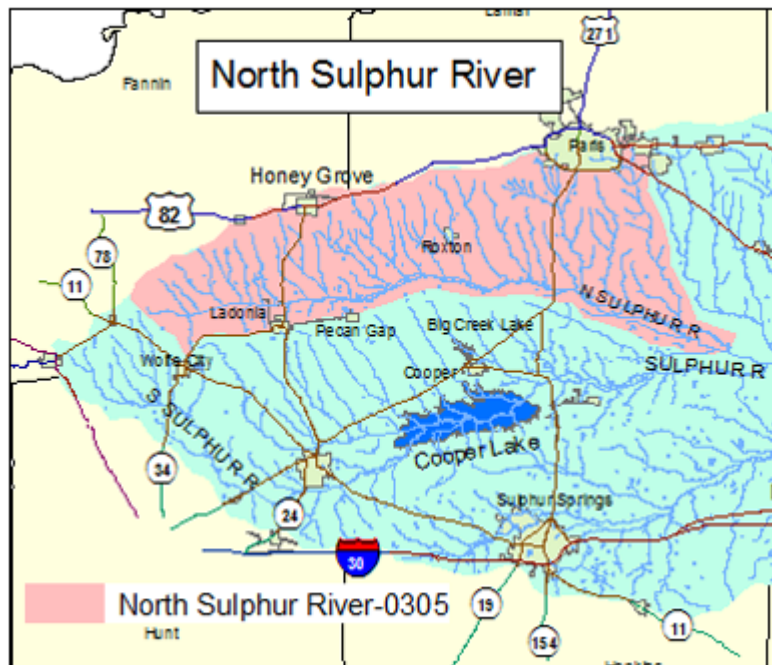
Cooper Lake (Segment 0307) is included on the *Texas §303(d) List* for high pH in all areas. However, the *2006 Water Quality Inventory* no longer lists Cooper Lake (Segment 0307) with any concerns for use attainment or screening levels.

Sampling within this basin during fiscal year 2007 included two routine stations monitored by TCEQ.

North Sulphur River Watershed

The North Sulphur River Watershed has an approximate area of 476 square miles and extends from the extreme northwestern end of the basin to the confluence of the North and South Sulphur Rivers. Flows in the upper reaches of the North Sulphur River (Segment 0305) are intermittent. The lower segment is intermittent with perennial pools during the dry season. A USGS stream flow gage station (USGS 07343000) is located on the North Sulphur River near the City of Cooper. This watershed is located in the northern reaches of the Texas Blackland Prairies Ecoregion. The vegetation of the watershed is marked by a transition from the extensive agricultural clearing of the western portion of the basin to the more forested eastern portion.

Segment: 0305—North Sulphur River



Water Bodies: No large water bodies are found in this watershed.

Cities: Paris (pop. 25,898), Honey Grove (pop. 1,746), and Ladonia (pop. 667)

Counties: Fannin, Delta, and Lamar Counties

Land Use: Land use in the North Sulphur River Watershed is dominated by agribusiness. Over ninety percent of the land in this watershed is devoted to agricultural purposes.

Soils: Soils of the North Sulphur River floodplain are primarily clayey Trinity and Kaufman soils. Upland soils of the watershed are typically clayey Houston Black, Leson, and Heiden soils.

Permitted Discharges: Permitted dischargers in the North Sulphur River

Water Bodies: Although there are several small impoundments near the City of Clarksville, the largest body of water in the Sulphur River Watershed is River Crest Lake adjacent to the Sulphur River south of the City of Bogata.

Cities: Clarksville (pop. 3,883), Blossom (pop. 1,439), Bogata (pop. 1,396), Detroit (Pop. 776), Deport (pop. 718), and Talco (pop. 570).

Counties: Portions of Lamar, Red River, Cass, Morris, and Bowie Counties.

Land Use: Vegetation of the watershed can be described as Post Oak Woods with a mosaic of crops in the west, native/introduced grasslands in the east, and a Water Oak - Elm - Hackberry Forest vegetation region on the Sulphur River floodplain and surrounding vicinity.

Soils: Soils of the bottomlands of the Sulphur River floodplain are primarily of the somewhat poorly drained, clayey Kaufman - Gladewater association. Upland soils of the watershed are typically, loamy Woodtell-Wrightsville-Annona association.

Permitted Discharges: Permitted dischargers in the Sulphur River Watershed include seven municipal discharge permits, six industrial permits and one CAFO permit. (see map on page 25)

Water Quality Issues:

Segment 0303--Sulphur/South Sulphur River

The Sulphur River exhibits moderate conductivity and dissolved solids levels. Average concentrations of chloride and sulfate increase from upstream to downstream stations, and pH values tend to be alkaline.

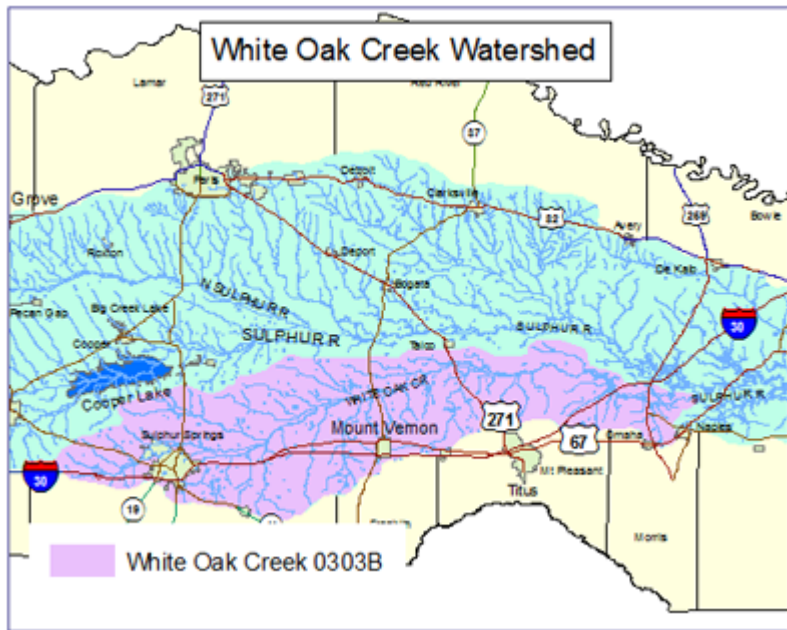
The aquatic life, contact recreation, fish consumption and general use are all fully supported in this segment.

The sampling in this watershed during fiscal year 2007 included two stations monitored by TCEQ and one by USGS.

White Oak Creek Watershed

The White Oak Creek Watershed is an unclassified tributary of Segment 0303. The watershed has an approximate area of 776 square miles and occupies much of the south central basin. Smaller streams of the watershed are drained by White Oak Creek, which is perennial from its origin

near Lake Sulphur Springs to its confluence with the Sulphur River (Segment 0303). Major tributaries of White Oak Creek include North and East Caney Creek, Wolfpen Creek, Mitchell Creek, Stouts Creek, Big Creek, Ripley Creek, Piney Creek, Stinking Creek, Snake Creek, Lacy Creek, and House Creek. A USGS stream flow gage station (USGS 07343500) is located on White Oak Creek near the City of Talco. The White Oak Creek Watershed spans three ecoregions. The eastern third lies in the south central plains; the central third is in the northernmost reach of the East Central Texas Plains; and the western third lies in the Texas Blackland Prairies. Texas Parks and Wildlife classifies the vegetation of the watershed as primarily a mosaic of Post Oak Woods and native/introduced grasses. The central portion, northwest of Mount Pleasant, is considered a Pine-Hardwood forest vegetational region. The bottomlands of the White Oak Creek floodplain lie in a Water Oak - Elm - Hackberry Forest vegetation region.



Segment: 0303B (White Oak Creek—unclassified water body)

Water Bodies: Lake Sulphur Springs and Century Lake are impoundments of White Oak Creek, northwest of Sulphur Springs.

Cities: Sulphur Springs (pop. 14,551), Mount Vernon (pop. 2,286), and Naples (pop. 1,410).

Counties: Portions of Hopkins, Franklin, Titus, Morris, and Cass Counties.

Land Use: Agricultural land uses occupy over one half of the area, while forest occupies almost another third.

Soils: Soils of the floodplain and bottomlands of White Oak Creek and its tributaries are primarily poorly drained, loamy, Nahatche and Estes soils. Upland soils in the eastern half of the watershed are typically moderately well drained and slowly permeable loamy Woodtell-Freestone soil associations. Upland soils of the upper western portion of the watershed are moderately well drained and

very slowly permeable, loamy Crockett soils.

Permitted Discharges: The White Oak Creek Watershed contains twenty eight permits for CAFOs, two industrial discharge permits, and three municipal discharge permits (see map on page 25).

Water Quality Issues:

Segment 0303B—White Oak Creek

White Oak Creek (Segment 0303B), is included on the *2006 Texas §303(d) List* as a result of depressed dissolved oxygen concentrations along its entire length and bacterial contamination in the upper 25 miles of the segment (Segment 303B_03) due to high concentrations of E. coli. The *2006 Water Quality Inventory* lists this creek as non-supporting for aquatic life use due to depressed dissolved oxygen, and Segment 0303B_03 non-supporting for E. coli with concerns for nutrient screening levels for nitrate, orthophosphate, and total phosphorus.

The sampling in this segment during fiscal year 2007 included three TCEQ sites and two USGS stations.

Wright Patman Lake Watershed

The Wright Patman Lake Watershed has an approximate area of 478 square miles and occupies much of the middle eastern third of the basin. It includes Wright Patman Lake (Segment 0302) and its direct tributaries. Major tributaries of the Wright Patman Lake Watershed include a small part of Segment 0303 of the Sulphur River, Anderson Creek, Big Creek, and Elliot Creek. A USGS stream flow gage station, (USGS 07344000), is located below Wright Patman Lake near Darden. The Wright Patman Lake Watershed is located in the South Central Plains Ecoregion. The watershed is composed of small cattle farms, timber farms, a large federal arsenal, and Corp of Engineers lands associated with Wright Patman Lake.

Segments: 0302—Wright Patman Lake, and a small portion of 0303—Sulphur/South Sulphur River.

Water Bodies: Wright Patman Lake

Cities: New Boston (pop. 4,808), DeKalb (pop. 1,769), Maud (pop. 1,028), Redwater (Pop. 872), and Douglassville (pop. 175).

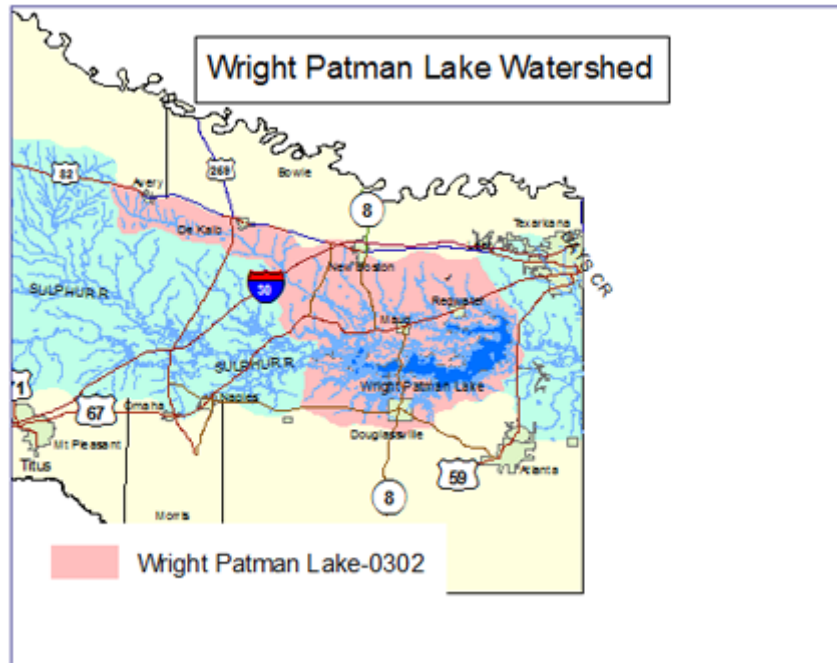
Counties: Bowie, Cass, and Red River Counties.

Land Use: Land use in the Wright Patman Lake Watershed is dominated by forest, with agricultural land uses occupying only a third of the area. Vegetation of the watershed includes a pine-hardwood region in the east and a native/introduced grasses region in the west. The Anderson Creek and Sulphur River bottomlands upstream of Wright Patman Lake contain portions of willow and water oak forest.

Soils: Soils of the bottomlands of the major tributaries and Sulphur River floodplains are primarily clayey Gladewater-Kaufman soils. Upland

soils are typically loamy Sawyer-Eylan-Woodtell soils.

Permitted Discharges: There are six industrial permits, four municipal permits and one CAFO permit in this watershed. There is a federal superfund site, Lone Star Army Ammunition Plant, located near Elliott Creek in the northeast portion of the watershed. (see map on page 25)



Water Quality Issues:

Segment 0302—Wright Patman Lake

Wright Patman Lake was initially constructed for flood control. Additional benefits include its use as a water supply by Texarkana and surrounding communities, and lake recreation which has increasingly become a major component. Although development has occurred along the lake shore in many areas, some portions of the upper reaches of Wright Patman Lake are considered swamp-like. Urban concentrations in the watershed are primarily located in the cities of New Boston, DeKalb, Douglasville, Maud, and Redwater.

Wright Patman Lake is included in the *2006 Water Quality Inventory* due to non-support of aquatic life use in the 800 acres near the dam, the 300 acres at the International Paper intake, and the 4000 acres in the upper portion of the lake as a result of low dissolved oxygen concentrations. High pH levels result in non-support of general uses in 5 regions of the lake (the northeast

corner of the reservoir, the 200 acres in the northwestern tip of lake, the Big Creek arm, the 4000 acres mid-lake, and the 1600 acres in the upper mid-lake). Wright Patman Lake is included on the *Draft 2006 §303(d) List* for these same problems. In addition, concerns with screening levels for ammonia at three sites (the International Paper intake, the northeast corner of the lake, and the upper portion of the lake) and nutrient screening levels for chlorophyll-a at three sites (the International Paper intake, the northeast corner, and the Big Creek arm) are expressed in the *2006 Water Quality Inventory*.

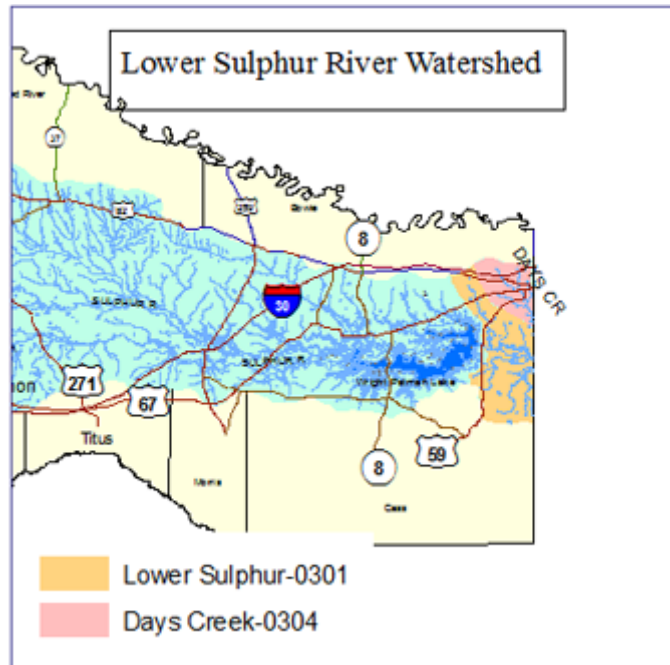
Segment 0303—Sulphur/South Sulphur River

A small portion of the South Sulphur River is impounded by Wright Patman Lake. There are no concerns listed in either the *2006 §303(d) or Water Quality Inventory Lists* for this portion of the river.

Sampling in the Wright Patman Lake Watershed in fiscal year 2007 included eight sites monitored by USGS, four by TCEQ, and four by SRBA.

Lower Sulphur River Watershed

The Lower Sulphur River Watershed has an approximate area of 164 square miles and is composed of the Sulphur River from Wright Patman Lake to the Arkansas border (Segment 0301), its tributaries, and the Texas portion of



Days Creek (Segment 0304). The proportion of urban land is substantially higher in the Lower Sulphur River drainage area than in the other portions of the Sulphur River Basin. The Lower Sulphur River drainage is located in the South Central Plains Ecoregion, which Texas Parks and Wildlife classifies as primarily a Pine-Hardwood Forest vegetation region. A large urban zone is centered on the City of Texarkana and surrounding communities. There are no USGS gage stations in this watershed.

Segments: 0301-Sulphur River below Wright Patman Lake, 0304-Days Creek, 0304B-Cowhorn Creek (unclassified water body).

Water Bodies: Although there are numerous small impoundments on Days Creek and its tributaries, there are no large reservoirs in the Lower Sulphur River Watershed.

Cities: Texarkana (pop. 34,782), Queen City (pop. 1,613).

Counties: Portions of Bowie and Cass Counties.

Land Use: Land use is dominated by rural land uses except in the vicinity of Texarkana.

Soils: Soils of the watershed are the moderately well drained, having moderate to low permeability, and of the loamy Sawyer-Eylan-Woodtall soil association.

Permitted Discharges: The Lower Sulphur River Watershed contains five permitted industrial dischargers, and three municipal dischargers (see map page 25). In addition, there are two federal superfund sites located in this watershed near the City of Texarkana, Texarkana Wood Preservers and Koppers. These superfund sites are site of past wood treatment facilities.

Water Quality Issues

Segment 0301—Sulphur River below Wright Patman Lake

The reach of the Sulphur River from Wright Patman Lake to the Arkansas border (Segment 0301) and its tributaries constitute this drainage area.

The *2006 Texas Water Quality Inventory* lists segment 0301 having a concern for screening levels for chlorophyll-a. The aquatic life and general use in this segment are fully supported.

Segment 0304—Days Creek

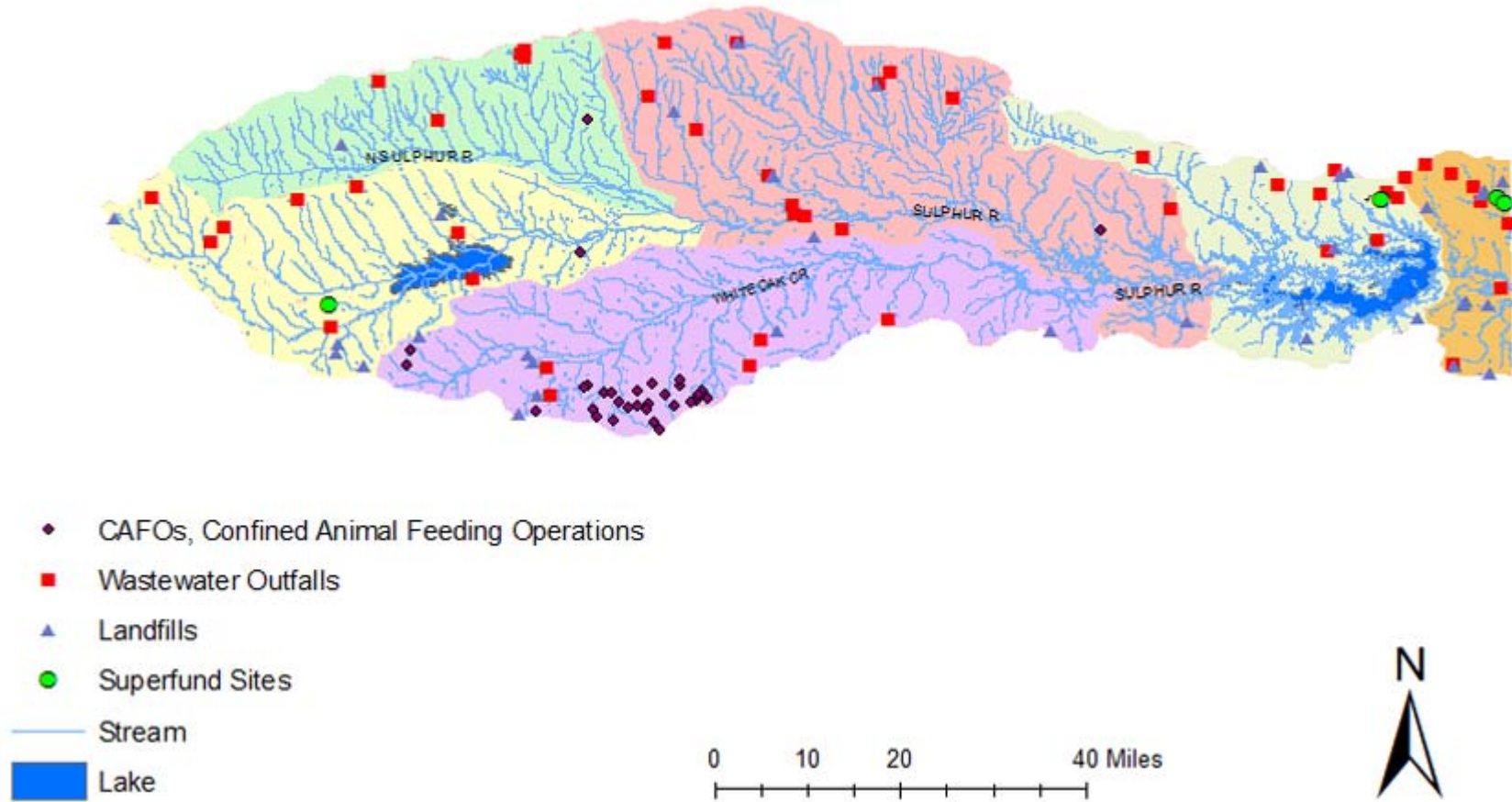
Days Creek (Segment 0304) is the largest tributary of the Lower Sulphur River, intersecting with the main portion of the river in Lafayette County, Arkansas. The Days Creek drainage occupies the far northeastern corner of the Basin in the area surrounding the City of Texarkana. Days Creek has a substrate primarily composed of sand and silt. Days Creek is on the *2006 Texas Water Quality Inventory* for use concerns due to high concentrations of a variety of polycyclic aromatic hydrocarbons (PAHs) in the sediment. This contamination is believed to be the result of creosote discharges from three closed wood treatment plants located upstream of sampling sites. Disturbance of the stream bottom often results in the release of an oily sheen, which has initiated concern regarding sediment contamination in this area. The urbanized area of Texarkana occupies approximately half the Lower Sulphur River watershed, which also drains the communities of Wake Village and Nash.

Swampoodle Creek (Segment 0304A) and Cowhorn Creek (Segment 0304B), both unclassified water bodies, are listed on the *2006 §303(d) List* for impaired fish and macrobenthic communities, but are not included in the *2006 Texas Water Quality Inventory* for any additional concerns.

Waggoner Creek (Segment 0304C) is in the *2006 Texas Water Quality Inventory* for concerns for screening levels regarding ammonia and depressed dissolved oxygen.

The sampling in fiscal year 2007 within the Lower Sulphur River Watershed included one site monitored by TCEQ and one site by SRBA.

Potential Point Sources Based on State Permits



Overview of Monitoring by the SRBA during FY2007

SRBA monitored five routine sites and four systematic sites in FY2007. The site locations are detailed in a map on page 10. Three of the routine sites are on Wright Patman Lake (Segment 0302). These sites were monitored six times during the year. Four of the monitoring events were part of a regular quarterly rotation plus two additional events to make a total of four events in the summer months (May-August). Each of the quarterly monitoring events included field parameters, depth profiles, and conventional water chemistry. Diel studies, 24-hour monitoring, were conducted four times during the summer months. Multiprobe units were deployed to collect 24-hour sets of data for dissolved oxygen, pH, conductivity, and temperature. Several locations on the lake are on the *Draft 2006 §303(d) List* for depressed dissolved oxygen and high pH. Additional summer monitoring of the lake sites was designed to further investigate the identified problem conditions of depressed dissolved oxygen and high pH. The low level of dissolved oxygen and high pH values are associated with eutrophication in older lakes like Wright Patman Lake. The dissolved oxygen level and pH tend to soar during the day and fall at night in response to the changing cycle of photosynthesis (day-produces oxygen) and respiration (night-utilizes oxygen). This phenomenon is most pronounced when a large amount of algae is present and adequate nutrients are available to allow growth. Wright Patman Lake is also on the *2006 Water Quality Inventory* for high levels of ammonia and chlorophyll at multiple sites. Ammonia is a nutrient that supports algae growth, and chlorophyll is a good indicator of the amount of algae present. The water chemistry results from the summer monitoring show only non-detect analyses for the ammonia parameter. The chlorophyll values at the International Paper Intake Site and North Shore Site exceeded the *criteria* in the July monitoring, but were within *criteria* for chlorophyll in all other events. The North Shore Site exceeded the pH *criteria* in July and August. The Wright Patman Lake Site at Hwy 8 failed to meet minimum dissolved oxygen *criteria* all summer.

The two other routine sites are on streams, Days Creek (Segment 0304) and Anderson Creek (Segment 0302). The Days Creek Site has been monitored by SRBA for a number of years. It is important because it is downstream from Texarkana and the Texarkana Waste Water Treatment Plant. The Anderson Creek Site was selected because it drains a large portion of the northern basin into Wright Patman Lake and has not been regularly monitored in the past. Each of the quarterly monitoring events included field parameters, and conventional water chemistry. Biological monitoring, including 24-hour dissolved oxygen studies were conducted at the two routine stream sites twice during the summer of FY2007. The results of habitat and biological monitoring of Days Creek yielded *intermediate* rankings for the macrobenthic community and *high* aquatic life use scores for the fish community for both events. The habitat quality was deemed to be *intermediate*. Anderson Creek had *intermediate* ratings at both events for the macrobenthic community. The fish community for the first event in May had a rating of *intermediate* with 16 identified species. The August monitoring at this creek found a much higher fish count with an increased number of species (27) which resulted in a much better ranking of *exceptional*. The Habitat Quality Index rating for Anderson Creek was *intermediate* for both events.

Four systematic sites on Segment 0305 of the Sulphur River were studied. Quarterly monitoring events at all sites occurred in November of 2006, and February, May, and August of 2007. The sites are North Sulphur River at FM 38, North Sulphur River at FM 3735, North Sulphur River at SH 34, and Davis Creek. Field data and flow measurements were made and water samples collected four times at each site. During

May and August, biological monitoring and Diel studies were conducted. All four sites are located in Segment 0305. These include three different locations on the river and one stream site considered “off segment”. These sites are located in a different ecoregion than the two routine stream sites located near Texarkana and are scored using a different system. All sites had flow during the early summer monitoring event, but by the late summer event, most sites had no flow or low flow.

The North Sulphur River site at FM 38 had *intermediate* ratings for the fish communities for both events. The macrobenthic community was *limited* for the first event with only 10 species identified. Twenty-one benthic species were found during the second event. The rating was changed to *intermediate*. The Habitat Quality Index for this site was *high* due in part to the number of riffles, stability of substrate, and amount of available in stream cover (mainly gravel).

The North Sulphur River site at FM 3735 is the furthestmost west of the sites, near the headwaters of the river. The macrobenthic community was ranked *limited* for both summer events. The first monitoring event in May found large numbers of fish (11 species) with lots of minnows, earning a *high* aquatic life use score. The second event found a reduced fish community with only 6 species and was rated *intermediate*. The Habitat Quality Index for this site was *high* due in part to the number of riffles, stability of substrate, and amount of available in stream cover.

The North Sulphur River site at SH 34 was determined to have a *limited* macrobenthic community at both events. The fish community had an *intermediate* score for each of the summer events as well. Although the number of benthic and fish species increased for the second event, this was not sufficient to change the ranking. The Habitat Quality Index for this site was *intermediate* due in part to the instability of banks and straight channel due to channelization.

Davis Creek at FM 2990 started the summer with a *limited* macrobenthic community with only 12 identified species found in the first event. Later in the summer, the number of species increased to 18, resulting in an improved ranking of *intermediate*. Like the FM 38 site, the first monitoring event in May found large numbers of fish (10 species) with lots of minnows, earning a *high* aquatic life use score. The second event found a reduced fish community with only 6 species and was rated *intermediate*. The Habitat Quality Index for this site in May was *high* due in part to the number of riffles and moderate flow. The habitat quality changed to *intermediate* in August due to no flow, no riffles, and instability of bank and substrate.

Segment 0305 is on the 2006 *Texas §303(d) List* for impaired habitat, impaired macrobenthic community, and impaired fish community. The *December 2007 Draft 2008 Texas §303(d) List* has delisted this segment for impaired habitat.

Public Outreach and Webpage

The main focus of the Sulphur River Basin public outreach effort is the encouragement of public involvement concerning the Clean Rivers Program (CRP) and other Basin activities. This involvement is important to the development of support for the program as a means of gathering recommendations and concerns from the public. The public can get involved through either the steering committee meetings or volunteer activities.

Website:

The website, www.sulphurr.org, provides the citizens of our Basin and other interested parties with a useful tool to summarize water quality information. The SRBA main webpage contains links to information concerning the CRP and specifics concerning activities within the Basin. Some of the links available include:

- Basin Monitoring Schedules
- Monitoring Stations Maps
- Reports
- Steering Committee Members, Schedules, and Meeting Minutes
- Program Partners
- Contact Information
- Quality Assurance Project Plan (QAPP)
- Work Plan and Special Study Information

Our goal is to provide a readily available source of information about local environmental issues to the public, which we hope will encourage citizens of our Basin to get involved. Questions or comments concerning any information found on the website are always welcome.

Public Outreach:

Volunteer monitoring activities, events, newsletters, special studies activities, and meeting dates with agendas are posted regularly on the public outreach webpage. Increased public involvement can result in more public awareness and a larger sense of community responsibility. Several Texarkana College students initially involved in the monitoring efforts in the Sulphur River Basin have continued to be active in research within the Basin. The data collected by students has been used to develop a number of research projects that produced posters and presentations submitted by these students at national conventions and regional meetings. More public involvement in our basin is another important goal. Organizations such as Texas Stream Team (formerly Texas Watch) host statewide and regional meetings, partner certification training, and special events and projects that are designed to aid in increasing public awareness and involvement. Contact information for these events is found on the www.sulphurr.org site map.

Ms. Delores McCright of the Texarkana College Biology Department is a trainer and quality assurance officer for the Texas Stream Team Program. She holds training at TC twice a year and quality assurance sessions as necessary. This year Delores has trained more than twenty volunteers that are active in the Texarkana area. The Sulphur River Basin Authority and the Ark-Tex Council of Governments support the Stream Team in the Basin. Members of the Texarkana College Chemistry Club are currently active in the monitoring for SRBA. They have and are continuing to present posters at national meetings of the American Chemical Society. This year, the posters are detailing the pH and dissolved oxygen problems of Lake Wright Patman and how they relate to the listing of the lake on the Texas §303(d) List. Texarkana College is currently offering a course to support the development of Geographic Information Systems, GIS. The SRBA through its working relationship with the College is supporting four students in this activity by supplying tuition and books.



Delores McCright (center) with new Stream Team Trainers



Texarkana College students are finishing their Stream Team Training

Sulphur River Basin
Authority
911 N. Bishop Street
Suite C-104
Wake Village, Texas
75501

Phone: (903) 223-7887

