



BASIN HIGHLIGHTS REPORT of the Red River Basin



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BASIN HIGHLIGHTS REPORT of the Red River Basin



April 2001

1. INTRODUCTION

Drought has continued to pose a threat to all of the natural resources within the Red River Basin, especially the water supplies throughout the region. Since its inception more than ten years ago the Clean Rivers Program has successfully embedded the goals of the Clean Rivers Act, as envisioned by the 71st Legislature, into the environmental community. As springtime renews the promise of showers, the region anxiously awaits the possibility of emerging from yet another dry year, and the Clean Rivers Program continues to triumph over this adversity and persevere toward meeting its goals.

The Red River Basin encompasses 43 counties in North Texas. Originating in eastern New Mexico, the river flows across the Panhandle where it becomes the Texas-Oklahoma boundary, then continues its course across Texas into southwest Arkansas to Louisiana and the Mississippi River, covering a drainage area of 94,450 square miles and 1,616 stream miles. Six major ecoregions and contrasting elevations from 4,835 feet to 495 feet with average rainfall amounts of 15 to 55 inches shape this diverse area. The basin contains 32 major reservoirs in Texas that provide water to more than a million people who live and work in the Red River Basin of Texas.

2. CLEAN RIVERS PROGRAM GOALS

In an effort to facilitate improved planning, monitoring, geographical analysis and dissemination of information, the Red River Basin was divided into five sub-basins or reaches, then further divided into subwatersheds. The following goals are targeted to comprehensively assess the basin and implement positive procedures to conserve, reclaim and protect the water resources of the Red River Basin:

2.1 IDENTIFY WATER QUALITY CONDITIONS

Selected water quality monitoring sites have been designated for collection of chemical, physical and biological data. Collected samples are analyzed in the field, at the Authority's Environmental Laboratory or sent to a contract laboratory. Within days of collection, the results of the analyses are entered into the data repository, which contains more than ten years of quality-assured water resource information of the basin. The data, obtained from 75 monitoring stations, are then screened and quality assured utilizing methodologies and criteria approved by the Texas Natural Resource Conservation Commission (TNRCC) with respect to surface water quality standards. Data entered into the database are immediately available for use by the public via the Authority's website at www.rra.dst.tx.us/CRP, and assist local communities who are facing stricter permitting requirements to make informed decisions about their water resource management practices, based on good science.

The overall condition of the water resources within the basin is classified as good with respect to stream standards, it and supports aquatic life and uses. However, only 12 of the 30 classified stream segments have been designated for public water supply use because of naturally high concentrations of salt. Chlorides and sulfates are the main constituents contributing to the high levels of dissolved solids found in the waters of the Pease River, Prairie Dog Town Fork of the Red River and the Wichita River. These rivers are highly saline and contribute more than 65% of the dissolved solids load into the main stem of the Red River. Salinity in these streams during low-flow periods matches or exceeds the salinity of sea water. For more details on the monitoring results, access our website at www.rra.dst.tx.us/CRP.

2.2 IDENTIFIED REGIONAL CONCERNS

Prompted by severe drought and poor drinking water quality conditions, several water supply entities within the basin actively pursued the improvement of their infrastructure, supplies, distribution lines, and alternate sources. Very few sites remain in the Red River Basin that could accommodate acceptable reservoirs. Most are infeasible for economic reasons, predominately environmental impact studies or poor water quality. Some of the possible sites within the Red River Basin include the Lower Bois d’Arc Reservoir in Fannin County, Marvin Nichols Reservoir in Red River County,

Lake Ringgold in Clay County and Sweetwater Creek Reservoir in Wheeler County.



Pecan Bayou - September 2000

Fifty cities within the Red River Basin are experiencing varying water needs now or will be in the near future, with the majority located in Reach I. The diversity of Reach I is characterized as rural with several small communities in the easternmost part to an area in the western part considered as one of the fastest growing areas in the state. Thirty cities and communities in Reach I have voiced concerns associated with inadequate sources and/or poor quality. Reach II’s principal concern is the reduction of

chlorides in two large reservoirs. Wichita Falls, the largest city in the reach, is currently blending good quality water from Lakes Arrowhead and Kickapoo with the highly saline water from Lakes Diversion and

Kemp. Reverse osmosis, although very expensive, is being implemented by the City of Wichita Falls, as well as several other smaller cities and communities including Vernon, Seymour and Electra.

Reach II is also concerned with the high levels of nitrate in its groundwater supplies, and believe that the standards set by the US Environmental Protection Agency (USEPA) are not based on good science. Two entities within Reach II have concerns dealing with insufficient supply and/or poor quality. Reach III and IV contain eight cities with immediate and long range concerns associated with water quantity and quality sources. Predominately rural in nature, various conservation methods have been implemented to prevent waste, especially in agricultural irrigation. Reach V has ten cities voicing concerns about immediate and future needs for water. This area is predominately groundwater users, therefore, their concerns include conservation of groundwater sources, protecting its high quality, and not allowing their groundwater supply to be exported to other areas of Texas.

The concerns voiced by entities throughout the basin encompass a multitude of issues. Summarily they include meeting agricultural needs in harmony with environmental concerns, encouraging water conservation measures, increasing data collection on water use and water quality management, responding to the need for water education for all ages, availability modeling projects and computer models to quantify aquifer resources, evaluating reuse of wastewater effluent, increasing state participation in watershed protection planning, and encouraging consistency between state agencies for public drinking water systems regarding the minimum requirements for water supply.

2.3 FINDING FEASIBLE SOLUTIONS

Feasible solutions will only be identified through continual strategic water quality monitoring, analysis and planning. Water quality data collected in the Red Basin utilize stringent quality assurance protocols to provide vital information necessary for the development of appropriate water quality standards, to prepare an inventory of water quality, to develop a list of impaired water bodies, and to scrutinize wastewater discharge permits for the establishment of Total Maximum Daily Loads (TMDL) within classified stream segments.



Pecan Bayou - October 2000

Pecan Bayou - November 2000



In 2000 the Authority initiated annual coordinated monitoring meetings with all monitoring entities within the basin. The coordinated monitoring meeting for 2001 was held on March 29, 2001 in Wichita Falls. These coordinated meetings ensure monitoring coverage of the entire basin, avoid duplication of effort and allow the monitoring partners to share information.

The coordinated collection, analysis and management of water quality data provide vital scientific solutions for maintaining the availability and quality of natural resources for all intended uses. Red River Authority of Texas and the US Geological Survey (USGS) unitedly conduct water quality monitoring throughout the basin under a single TNRCC approved Quality Assurance Project Plan (QAPP). The TNRCC Regional Offices also conduct water quality monitoring in the basin using the same protocols. The coordinated monitoring with entities throughout the basin has proven to be beneficial from the standpoint of preventing duplication of effort, networking with entities to resolve problems before they become a crisis, conserving resources and expanding geographical coverage

of the knowledge-base for improved water quality management practices.



Pecan Bayou - December 2000

Since the Red River Basin is a part of Group A in the state's five-year watershed planning cycle, the focus for FY 2001 is continued strategy development and implementation. Strategy development and/or a Priority Watershed Summary outline the steps necessary to reduce pollutant loads in a certain body of water to restore and maintain human uses or aquatic life support. Both the TNRCC and the Basin Advisory Committee agree on the sites considered as priority. The following table depicts the Priority Watershed Summary as it relates to the Red River Basin:

Pecan Bayou - January 2001
After Ice Storm



PRIORITY WATERSHED SUMMARY
TABLE I

Reach	Segment Location	Impaired Use	Cause	Source	Action Taken	Recommended Action	Rank	Funding Source	Active Participants
I	201 Mud Creek	Aquatic Life	Dissolved Oxygen, pH	Nonpoint Sources Natural Occurrences	Monitoring by RRA	Continued monitoring	L	CRP TNRCC	RRA TNRCC
	203 Lake Texoma	Water Quality Aquatic Life	Chromium, Nickel, and Manganese in Sediments	Nonpoint Sources Natural Occurrences	Monitoring by TNRCC	Future study when standards are developed	L	N/A	N/A
II	211 Little Wichita River	Water Quality Aquatic Life	Chlorophyll-a, Dissolved Oxygen	Point Sources Nonpoint Sources Natural Occurrences	§303(d) listing, Monitoring by TNRCC/RRA	Continued monitoring with relationship determined with lake releases	L	CRP TNRCC	RRA TNRCC USGS
	214 Wichita River Below Lake Diversion	Water Quality Aquatic Life Water Supply	Chlorophyll-a Chloride, Barium, Nickel and Manganese in Sediments	Point Sources Nonpoint Sources Natural Occurrences	Monitoring by TNRCC/ RRA	Special study on chlorides; future study on metals when standards are developed	L	CRP TNRCC	RRA TNRCC USGS
	214 Beaver Creek	Aquatic Life Water Supply	Chloride, Dissolved Oxygen	Point Sources Nonpoint Sources Natural Occurrences	Monitoring by RRA	Special study and continued monitoring by TNRCC/RRA; complete CCP	L	CRP TNRCC	RRA TNRCC USGS USCOE
	218 North Fork of Wichita River	Wildlife	Selenium	Natural Occurrences	Monitoring by RRA/ USACE	Continued monitoring by TNRCC/ USGS	M	CRP TNRCC	RRA TNRCC USGS USCOE
III	205 Red River Below Pease River	Recreation Aquatic Life	Fecal Coliform, Cadmium	Point Sources Nonpoint Sources Natural Occurrences	§303(d) Listing Monitoring by TNRCC/ RRA	Continued monitoring on FC, metals; study later	L	CRP TNRCC	RRA TNRCC USGS

Reach	Segment Location	Impaired Use	Cause	Source	Action Taken	Recommended Action	Rank	Funding Source	Active Participants
III	221 Middle Fork of Pease River	Aquatic Life Water Supply	Temperature, Chloride, Sulfate, Total Dissolved Solids	Nonpoint Sources Natural Occurrences	§303(d) Listing Monitoring by TNRCC/ RRA	TNRCC continued monitoring; drop from list based on recent screenings	L	TNRCC	TNRCC
IV	207 Lower Prairie Dog Town Fork	Recreation	Fecal Coliform	Nonpoint Sources Natural Occurrences	§303(d) Listing Monitoring by TNRCC/ RRA	Continued monitoring by TNRCC RRA	L	CRP TNRCC	RRA TNRCC
	228 Lake Mackenzie	Water Quality Aquatic Life Water Supply	Chloride, Sulfate, Total Dissolved Solids, Manganese in Sediments	Nonpoint Sources Natural Occurrences	§303(d) Listing Monitoring by TNRCC/ RRA	Continued monitoring; problem is natural	L	TNRCC	TNRCC
	229 Upper Prairie Dog Town Fork	Water Quality Aquatic Life Water Supply	Chloride, Sulfate, Total Dissolved Solids, Barium in Sediments, Dissolved Oxygen	Nonpoint Sources Natural Occurrences Point Sources	§303(d) Listing, Draft Wasteload Allocation, WWTP Upgrade Monitoring by TNRCC/ RRA	Continued monitoring by TNRCC RRA	L	TNRCC	TNRCC CRP
V	222 Salt Fork of Red River	Aquatic Life Water Supply	Sulfate	Nonpoint Sources Natural Occurrences	Monitoring by TNRCC/ RRA/ USGS	Continued monitoring for possible standards revision	L	CRP	RRA
	223 Greenbelt Lake	Water Quality Aquatic Life	Barium and Manganese in Sediments	Nonpoint Sources Natural Occurrences	Monitoring by TNRCC	Continued monitoring while metal standards are developed	L	TNRCC	TNRCC
	224 North Fork of Red River	Aquatic Life	Temperature	Natural Occurrences	Monitoring by TNRCC	Continue monitoring to change standards	L	RRA	RRA

The development of TMDLs and watershed action plans are considered to be the best method to address water quality concerns. A TMDL is the maximum amount of a pollutant that a lake, river or stream can receive without seriously harming its beneficial uses.

TMDLs are designed for impaired water bodies contained in the Clean Water Act's (CWA) §303(d) list for 2000. The following table delineates the water bodies in the Red River Basin:

RED RIVER BASIN §303(d) LIST FOR 2000

TABLE 2

Segment Number	Segment Name	Overall Priority	Parameters of Concern	Segment Summary
0202D	Pine Creek (unclassified water body N of Paris in Lamar County)	L	Pathogens	Bacteria levels sometime exceed the criterion established to assure the safety of contact recreation
0203A	Big Mineral Creek (unclassified water body N of Whitesboro in Grayson County)	L	Pathogens	Bacteria levels sometime exceed the criterion established to assure the safety of contact recreation
0204	Red River above Lake Texoma	M	Pathogens	In the lower 25 miles, bacteria levels sometime exceed the criterion established to assure the safety of contact recreation
0205	Red River below Pease River	L	Pathogens	In the lower 28 miles, bacteria levels sometime exceed the criterion established to assure the safety of contact recreation
0207A	Buck Creek (unclassified water body NE of Childress in Childress County)	L	Pathogens	Bacteria levels sometime exceed the criterion established to assure the safety of contact recreation
0211	Little Wichita River	L	Depressed Dissolved Oxygen, Total Dissolved Solids	In the upper 25 miles of the segment, dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life. The average dissolved solids concentration exceeds the criterion established to safeguard general water quality uses
0214A	Beaver Creek (unclassified water body SE of Vernon in Wilbarger County)	L	Depressed Dissolved Oxygen	Dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life
0218	Wichita/North Fork Wichita River	M	Selenium (Chronic)	In the upper 29 miles, the average concentration of selenium in water exceeds the criterion established to protect aquatic life from chronic exposure
0221	Middle Fork Pease River	L	Thermal Modifications	Water temperatures are occasionally higher than the criterion established to safeguard general water quality uses
0228	Mackenzie Reservoir	L	Total Dissolved Solids	The average concentration of total dissolved solids exceeds the criterion established to safeguard general water quality uses

All of these listings indicate a *low priority*, except the Red River above Lake Texoma and Wichita/North Fork Wichita River, which are both considered a *medium priority*. Strategies necessary to improve their rating are significant components of the coordinated monitoring plan. Initiation of TMDL monitoring of water bodies on the §303(d) list for this basin is scheduled for FY 2002.

One of the primary goals within the Red River Basin is the completion of the Red River Chloride Control Project. This federal project under the direction of the US Army Corps of Engineers (USCOE) has been ongoing since the 1950s. As the state sponsor of this project, the Authority continues its vigil to complete it. Effectively the project will reduce the naturally occurring chlorides going downstream, thereby allowing for the use of the water more economically. The reduction of the chlorides in the Red River and its tributaries would significantly increase the quality and quantity of potable water in the basin, especially the western to central areas. It would also reduce the high cost of treatment for such processes as reverse osmosis or blending with other sources.

The USCOE is in the process of preparing the *Wichita River Basin Project Reevaluation*, originally due November 2000, now scheduled for Winter 2001 or 2002. Its goal is to evaluate the overall effectiveness of the implemented control features and the environmental impact of reducing chloride levels in the watershed. The studies completed by the USCOE indicate a benefit to cost ratio of more than 2:1. A selenium study entitled *Summarized Evaluation of the Potential for Selenium-Related Impacts on Wildlife* indicated that selenium does not pose a threat to water fowl at Truscott Lake as the natural resource agencies once believed. This positive report indicates through good science that the reduction in chlorides does not adversely affect wildlife at Truscott Lake, which favorably supports the continuation of the Chloride Control Project.

The Authority recently completed a special study project entitled an *Assessment of Brush Management/Water Yield Feasibility for the Wichita River Watershed above Lake Kemp* in cooperation with the Texas State Soil and Water Conservation Board, Texas Agriculture Extension Service, Texas A&M University and the Natural Resource Conservation Service. The study delineated the watershed to establish baseline criteria for determining the feasibility of implementing a brush control and management program to increase watershed yield. The scope of the study focused on general hydrology and geology of the watershed, changes in general land use and cover characteristics, quantifying the availability of surface and groundwater, possible impacts to water quality, the environment and ecosystem, and benefits that may be gained as a result of implementation. The results of the study revealed that implementation of the proposed brush control program may be expected to provide a net increase in overall watershed yield at Lake Kemp from a minimum of 27.6% to a maximum of 38.9% with a defined improvement in water quality. Additional information on the brush study may be obtained from our website at www.rra.dst.tx.us.

Leveraging funds by utilizing information and preparing studies that complement several other projects associated with water, fauna and flora have been practiced by the Authority for several years. Because of the diversity and size of the Red River Basin, the Authority prudently utilizes any project available to maintain our mission to conserve, reclaim, protect, and develop the water resources within the basin. The knowledge base obtained through the CRP enabled more accurate predictions regarding implementation of a brush control program based on good science rather than speculation. Conversely, the brush study provided additional environmental and water quality data that could not feasibly be obtained otherwise. And the public stakeholders ultimately received the benefit from the CRP results and the special studies without cost to the CRP.

2.4 PUBLIC EDUCATION AND INVOLVEMENT

An integral component contributing to the success of the Clean Rivers Program is its emphasis on public participation and education. Through this forum the people of the Red River Basin have been able to broaden their awareness of water quality conditions, utilize the knowledge and expertise of many and work together to rectify identified problems. It has provided an opportunity for the regulating agencies to receive a more favorable image, thereby allowing the Authority, cities, counties, industries, agriculture, and the general public to meet on common ground and collectively resolve issues to secure a higher quality of life without the regulating agency retaliation of earlier periods. It has given the people of the basin an opportunity to provide their experience, expertise and understanding of this area of the state to the people who set the standards. This process gives the people an opportunity to qualify the need for any changes.

Public participation provides for effective watershed planning and management by ensuring that local concerns are accurately addressed and the people are well represented. The Authority relies upon the guidance and counsel of the Basin Advisory Committee to maintain focus on the programs that are consistent with the priorities and issues facing the local communities.

Basin Advisory Committee Meetings open to the public were held in Amarillo on March 28, 2000 and Wichita Falls on March 30, 2000, thus allowing the people to voice their concerns and learn more about the water quality and other natural resource issues within the basin. Approximately fifty dedicated members and concerned citizens attended these meetings, some of whom have served since the inception of the Clean Rivers Program in 1991. The Authority presented the Draft Basin Highlights Report, the Draft 2000 Clean Water Act §303(d) list, and the Coordinated Monitoring Plan for review, discussion and approval. The next Basin Advisory Committee Meeting is currently being planned for June 2001.

Because of the severity of the drought in the basin, the public became acutely aware of the possibility of not having an adequate water supply and a diminished quality of remaining supplies. Many entities were required to implement stringent conservation measures, while some were required to invoke mandatory water rationing. This crisis prompted an intense search for supplemental water and the development of new water supplies. Diminished surface supplies heightened the public's awareness of water quality conditions. Several entities were compelled to employ advanced treatment processes to maintain drinking water quality standards.

Recognizing the critical nature of the drought, the Authority hosted several meetings and presentations to emphasize the importance of water conservation, as well as water quality. Although basinwide an adequate supply of water was available, the diminished water supplies adversely affected the quality of the water that was available. Several hundred educational pamphlets and brochures were provided to concerned citizens throughout the basin.

Additionally, the local media (newspapers, television) has dedicated many articles and several hours of time to coverage of the impacts of the drought and poor water quality. The average citizen is now much more knowledgeable of the many facets of water quality and water supply because it directly affects them financially. The rising costs of building reservoirs, infrastructure involved and purifying the available water resources provide a unique opportunity for the Authority to reach out to a more receptive public.

Although people who live in the western and central regions of the Red River Basin are quite familiar with the devastation caused by drought, in 1996 the state legislators became cognizant of the implications of severe drought conditions throughout the entire State of Texas. At this point they were keenly aware that the state was especially vulnerable to drought, and that existing water supplies could not meet current demands for water or the demands of a growing population. This led to the passage of Senate Bill 1 by the 75th Legislature in 1997 which impacted the Red River Basin as it did other regions of the state. The rules adopted by the Texas Water Development Board (TWDB) for the development of a state water plan complemented those of the Clean Rivers Program promulgated by the Texas Natural Resource Conservation Commission (TNRCC). Both programs recognized the value of allowing the populace to make rational choices under the guidance of the TWDB, TNRCC and good science. The accent of the CRP is the quality of the water within the state, while the TWDB's function is to assist in the inventory of the water supply in the state. Both programs have proven to be successful because of public participation and awareness of the issues facing the governing bodies of cities, counties, regions and the state as a whole.

The Authority is the administrative agency for the Regional Water Planning Group for Area B and is represented in Region A, C, D and O. Other participating agencies include the TNRCC, Texas Parks and Wildlife Department, Texas Department of Agriculture and the USCOE, and as a result of the CRP public outreach, many CRP stakeholders.

Approximately 70 area independent school districts were contacted and participated in the educational programs entitled *Major Rivers* and *Think Earth* from kindergarten through sixth grade. The program curriculum for these materials encompasses all facets of natural resources. Additionally, the Texas Rivers Project volunteer monitoring program for high school students is celebrating its ninth year; two schools have monitored their original sites continuously from its initiation. The only obstacle encountered by the Texas Rivers Project is the lack of staff and time constraints to properly manage the project. The opportunities and hands-on experience for the students are immeasurable.

The Authority's website contains a myriad of information easily accessible by anyone at www.rra.dst.tx.us/CRP. Educational programs for public and private schools are available from kindergarten to the high school level. Opportunities for internships with other resource agencies are available for students entering college.

Additionally, presentations on several water resource subjects are available for interested entities and civic groups, all of which are sponsored by the CRP. These groups called upon the Authority for assistance in dealing with water resource problems caused by the extreme drought conditions experienced in the latter part of 2000. The Authority was able to respond in a timely manner and provided a formal Drought Contingency Plan for 38 entities who otherwise had none or needed revisions to their existing plans to cope with emergency conditions.

Earth Day was celebrated in Wichita Falls on April 10 and 11, 2001 at River Bend Nature Works. Two separate presentations were given by the Environmental Service Division of the Authority at 15-minute intervals on conservation of the water resources of the area and the basics of monitoring for water quality to over 700 students in kindergarten through sixth grade. Sacks containing informational brochures on water quality and water conservation, as well as informative coloring books, pencils, maps of Texas rivers, bumper stickers and bluebonnet seeds were provided to all the attendees. The teachers were also supplied with various projects to be demonstrated in the classroom regarding the need for water conservation and knowledge of the water cycle.

2.5 PROVIDE ADMINISTRATIVE AND TECHNICAL ASSISTANCE TO LOCAL ENTITIES

During its 41-year history, the Authority's mission has been one of beneficial service to the public concerning water conservation, reclamation, protection and development of water resources. The Clean Rivers Program mirrors this goal and has allowed the Authority and TNRCC to use their expertise concurrently to assist the public. Through continuous critique by stakeholders and the steering committees, the assistance that the program provides parallels the basin's needs. Coordination of permitting and provisions for quality assured data enable both the regulator and the regulated community to work together to find reasonable solutions toward improved management practices for protecting the water resources.

The development of a common QAPP is an example of local entities working together toward a common goal quality assured data. The central clearinghouse for current inventories of water quality, water resource and socioeconomic data related geographically is rapidly becoming a dependable resource for everyone.

The Authority is committed to the people of the basin, as well as the goals of the Clean Rivers Program. Together we can achieve our ultimate goals, from the smallest community to the largest city.

The Authority's mission is the orderly conservation, reclamation, protection, and development of the water resources throughout the Red River Basin for the benefit of the public.

3. WATER QUALITY SUMMARY OF THE FIVE REACHES

For the assessment to be comprehensive in nature and useful as a resource management tool, a methodical watershed approach was followed for proper identification and isolation of individual factors or elements having an influence on the quality of the water resources obtained from large geographical areas. Each primary area of study was hydrologically divided into five basin reaches containing approximately 7,000 square miles. Each basin reach contains from five to six hydrologic unit areas or subwatersheds and represents approximately 4,500 square miles of drainage area.

To adequately screen for field parameters (dissolved oxygen, pH, temperature) and conventional parameters (nutrients, chlorophyll-*a*, dissolved solids), at least nine samples were required over the most recent five year period (1995 through 2000). If ten percent of the data for a specific parameter at a station exceeded the screening criterion, that parameter was designated as requiring further evaluation. Data that exceeded the screening criterion in 25% of the total samples collected were designated as an exceedance or concern. The data were screened consistently with the TNRCC methodology which is outlined in the Guidance for Screening and Assessing Texas Surface and Finished Drinking Water Quality Data, 2000.

Water quality data were collected and analyzed from 75 active monitoring stations located throughout the basin over the period 1995 through 2000. Quality assured data are screened against the State's Surface Water Quality Standards or an appropriate numerical value as established by the TNRCC, to determine whether instream conditions are supporting the segment's designated uses.

Screening levels are intended to provide a basis for comparison and to help identify the influences of point and nonpoint sources of pollution within a watershed. The results of the parameter screening are characterized as *Fully Supporting*, *Partially Supporting* or *Not Supporting* the stream segment's designated uses. Each parameter that exceeded the screening criteria was subject to further evaluation to assist in determining factors influencing the water quality. Statistical, spatial and/or trend analyses were performed and plotted on those parameters showing a concern. Each of the parameters identified as having a concern or needing further investigation is shown and discussed in the following section.



Vernon Middle School Students
Monitoring in the Pease River



RED RIVER BASIN
STATISTICAL SUMMARY OF PARAMETERS SCREENED THIS PERIOD
TABLE 3

Reach	Seg	Station	Description	Storet	Parameter	N	Mean	Max	Min	Std Dev	Crit	N>Cri	%>Cri
I	201	10123	Red River at Index, Arkansas	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	23	229.3	1,600.0	6.0	380.3	#/200	7.0	30%
	201	15319	Mud Creek North of DeKalb	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	15	406.6	2,315.0	<2.0	666.9	#/200	6.0	40%
	202	10125	Red River North of DeKalb	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	12	277.3	2,100.0	7.0	595.6	#/200	2.0	17%
	202	10126	Red River at Arthur City	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	24	206.1	1,900.0	4.0	411.4	#/200	4.0	17%
	202	10115	Post Oak Creek SE Sherman	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	11	177.4	600.0	13.0	184.4	#/200	4.0	36%
	202D	10118	Pine Creek at FM 2648	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	13	645.8	>4,000.0	<1.0	1,052.7	#/200	7.0	54%
	202	10120	Pine Creek at US 271	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	14	293.0	752.0	30.0	219.6	#/200	9.0	64%
	202	10127	Red River N of Bonham	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	12	108.8	300.0	13.0	91.0	#/200	2.0	17%
	202	15318	Bois d'Arc Cr N Honey Grove	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	13	198.7	400.0	3.0	139.2	#/200	6.0	46%
	202	16001	Pecan Bayou NE Clarksville	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	3	154.0	190.0	87.0	58.1	#/200	0.0	0%
	202	16123	Choctaw Creek SE Denison	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	11	154.3	>600.0	<1.0	181.1	#/200	3.0	27%
	202	17044	Smith Creek at US 271	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	3	1,033.3	1,300.0	600.0	378.6	#/200	3.0	100%
	203A	15320	Big Mineral Creek at FM 901	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	14	334.4	956.0	<1.0	318.0	#/200	7.0	50%
	204	10132	Red River at IH 35	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	16	3,594.6	50,000.0	<2.0	12,412.5	#/200	8.0	50%
	204	10133	Red River at US 81	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	19	111.2	318.0	0.0	98.2	#/200	4.0	21%
	211	10141	Little Wichita River NE Henrietta	00300	Total Dissolved Solids (Conductivity)	19	805.1	5,310.0	1,52.0	1,250.0	500.0	2.0	11%
	211	10141	Little Wichita River NE Henrietta	00300	Dissolved Oxygen (mg/L)	20	7.0	11.5	2.5	3.1	5.0	8.0	40%
	211	10141	Little Wichita River NE Henrietta	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	18	110.4	273.0	1.0	92.8	#/200	6.0	33%
214A	15121	Beaver Creek US 283 S Vernon	00300	Dissolved Oxygen (mg/L)	56	7.0	14.2	3.2	2.6	5.0	13.0	23%	
II	218	10162	N Wichita River S of Crowell	01147	Selenium, Total (ug/L as SE)	23	6.3	11.0	1.9	3.1	5.0	14.0	61%
	219	15122	Holliday Creek at Sisk Road	00010	Temperature (F)	10	73.9	91.2	36.9	16.7	90.0	2.0	20%
III	205	10134	Red River NE of Burkburnett	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	25	397.2	2,300.0	10.0	575.7	#/200	11.0	44%

Reach	Seg	Station	Description	Storet	Parameter	N	Mean	Max	Min	Std Dev	Crit	N>Cri	%>Cri
	206	10135	Red River North of Childress	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	11	55.8	272.0	1.0	91.6	#/200	2.0	18%
	221	10170	Mid Fork Pease River US 62-83	00010	Temperature (F)	12	69.5	92.0	36.5	20.3	91.0	2.0	17%
IV	207	10136	PDTF Red North of Quanah	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	23	66.6	600.0	<.02	160.5	#/200	2.0	9%
	207	13637	LPDTF Red South of Claude	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	3	91.3	227.0	7.0	118.6	#/200	1.0	33%
	207A	15811	Buck Creek at US 83	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	18	430.5	1,385.0	38.0	397.7	#/200	11.0	61%
	207	16037	LPDTF Red North of Turkey	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	7	708.7	4,800.0	2.0	1,804.3	#/200	1.0	14%
	228	10188	Mackenzie Reservoir	00300	Dissolved Oxygen (mg/L)	12	6.6	11.0	2.3	4.0	5.0	6.0	50%
	228	10188	Mackenzie Reservoir	00094	Total Dissolved Solids (Conductivity)	12	469.4	523.9	406.9	29.1	500	1.0	8%
	229	10063	UPDTF Red Upstream Amarillo	31648	E. Coli, MF, # /100 ml	2	15.0	25.0	5.0	14.1	#/126	0.0	0%
	229	10191	UPDTF at Palo Duro State Park	31648	E. Coli, MF, # /100 ml	9	363.4	1,000.0	60.0	302.8	#/126	8.0	89%
	229	13773	UPDTF Red Upstream Amarillo	31648	E. Coli, MF, # /100 ml	10	172.8	1,000.0	0.0	326.6	#/126	2.0	20%
	229	10192	Lake Tanglewood	00300	Dissolved Oxygen (mg/L)	16	6.1	14.3	1.8	3.1	5.0	7.0	44%
	229	10192	Lake Tanglewood	00400	pH	16	8.7	9.3	7.7	0.4	6.5-9.0	2.0	13%
	V	223	10173	Greenbelt Reservoir	00300	Dissolved Oxygen (mg/L)	12	7.6	11.6	3.7	3.6	5.0	5.0
299		10069	Sweetwater Creek at FM 3182	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	11	393.9	1,600.0	34.0	486.3	#/200	6.0	55%
299		10072	Sweetwater Creek N of Wheeler	31616	Fecal Coliform, MF, M-FC, (# /100 ml)	12	317.5	1,200.0	26.0	377.5	#/200	4.0	33%

Exceeded Screening Criteria

Exceeded Screening Criteria and is Listed on CWA 303(d) List

Listed on CWA 303(d) List, But Did Not Exceed Screening Criteria

N = Number of Samples

RED RIVER BASIN

