

Canadian River Basin Highlights Report

Introduction: For more than a decade most of the basin reaches in the Canadian River have not received their normal annual rainfall amounts, causing an ever increasing deficit. Reservoir levels are well below capacity due to the lack of rainfall and high evaporation rates caused by very high temperatures and low humidity. Average annual rainfall amounts vary from 25 inches in the mountainous upper reaches, 22 inches near the Texas-Oklahoma border, and 15 inches in eastern New Mexico. Please refer to the Vicinity Map on page 4.

The Canadian River Basin encompasses all or parts of 15 counties in the Texas Panhandle. With its beginnings in northeastern New Mexico, the Canadian River crosses the Panhandle covering a drainage area of 12,616 square miles, eventually flowing into the Mississippi River. From the northeastern slopes of

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the Sangre de Cristo Mountains in New Mexico, the Canadian River drops in elevation from 9,000 feet to 3,660 feet. It crosses a relatively flat prairie with a gradual slope to an elevation of 2,870 feet at the Oklahoma border intersecting two ecoregions: the Western High Plains and Southwestern Tablelands. The basin contains three major reservoirs and is underlain by the Ogallala Aquifer plus three other major aquifers that provide water to approximately 167,000 people in the Canadian River Basin of Texas.



Lake Meredith at Sunset

Water Quality Issues: Conditions caused by the ongoing drought and highly saline water continue to be the two onerous issues that plague the Canadian River Basin. Conservation has always been a way of life for the people in this unique region. However, the ongoing drought has caused the people to become even more conservative of this precious resource. While regional activities impact the local watersheds, site specific problems are intensified by the larger scale influences of

naturally occurring and anthropogenic pollution to receiving waters. Elevated levels of chlorides in the Canadian River Basin originate from an underlying shallow brine aquifer near Logan, New Mexico. This aquifer is under artesian pressure and contains water almost as salty as seawater. This brine is leaking upwards to the Canadian River. *The Lake Meredith Salinity Control Project* is designed to intercept the flow with wells drilled along the river, and then dispose the brine by deep well injection or other means. This project would decrease the undesirable elevated concentrations of chlorides in Lake Meredith, which is the primary surface water supply for the Texas Panhandle. The effectiveness of the Salinity Control Project is a means of reclaiming full benefit of the resource. Treated discharges are monitored closely to insure the impact to receiving waters is compatible with the ecosystem and maintains balance with natural habitats. Watershed runoffs from urban and agricultural activities are also major contributors of pollution and effective control programs are being implemented to reduce adverse impacts resulting from agricultural and livestock practices. The collection, management, and analysis of sufficient water quality data are key elements in determining reasonable scientific solutions to maintaining and improving the quality and availability of natural resources – the goal of the Clean Rivers Program.

The Assessment Process: The Texas Natural Resource Conservation Commission (TNRCC) assesses the state's water bodies periodically under the Clean Water Act Section 305(b). The resulting listing, or Water Quality Inventory, comprises all *Concerns* and *Impairments* within the state. The Clean Water Act (CWA) requires the inventory to be updated biennially utilizing the preceding five years of data. The 2002 Water Quality Inventory provides an assessment of the water quality samples collected between March 1, 1996 through February 28, 2001.

An *Impairment* is assigned to a portion of a water body when certain water quality constituents reach specific concentrations in excess of the Texas Surface Water Quality Standards (TSWQS) during a five-year period. This designation indicates that the uses of the water body, such as drinking, recreation, fishing, or aquatic life, have been reduced. Streams that indicate an impairment for one or more constituents are included in the TNRCC's CWA 303(d) list, which is a compilation of the state's impaired water bodies.

The inclusion of a water body on this list triggers a series of possible actions by the TNRCC, which may include denial of increases in wastewater permit effluent limits, a Total Maximum Daily Load (TMDL) project to allocate pollutant loads to certain sources, or the institution of a strategy for reducing loads from all sources.

Concerns are assigned by TNRCC to portions of water bodies under less rigorous requirements for frequency and concentration of the constituent. This designation is usually attributable to a small amount of available data or an unsubstantial number of samples not meeting the TSWQS. Without adequate evidence to be listed as an *Impaired* water body, it is designated as a *Concern* requiring more information.

Clean Water Act

303(d) – List of Impaired Water Bodies – 2000
305(b) – Water Quality Inventory Report – 2002

Water quality *Concerns* are also identified for constituents, such as nutrients, that are not linked to the TSWQS. Water bodies with water quality concerns are identified in the 305(b) Report, but not included on the 303(d) List of Impaired Water Bodies.



Beautiful Lake Meredith in Winter

Overview of Water Quality Monitoring:

To expedite planning, monitoring, geographical analysis, and dissemination of data, the Canadian River Basin is divided into five sub-basins or reaches, then further divided into subwatersheds. Definitive procedures have been implemented to assess the basin comprehensively for the ultimate goal of conserving, reclaiming, and protecting the water resources of the Canadian River Basin.

Selected water quality monitoring sites have been designated for collection of chemical, physical, and biological data, coordinated with other agencies, including the Texas Natural Resource Conservation Commission (TNRCC), the Canadian River Municipal Water Authority (CRMWA) and the United States Geological Survey (USGS) to produce the Coordinated Monitoring Schedule, thereby virtually eliminating duplication of effort. Refer to **Table 1** for details of the monitoring sites, sampling constituents, and frequency.

Refer to the vicinity map of the Canadian River Basin on the following page, as well as the individual maps at the end of the report delineating factors influencing water quality in each reach and the CWA 305(b) inventory of water quality concerns.

Field parameters, such as dissolved oxygen, temperature, and pH are analyzed in the field, while other parameters, such as nutrient and mineral samples, are analyzed at Red River 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 31 monitoring stations, are then screened and quality assured utilizing methodologies and criteria approved by the TNRCC with respect to surface water quality standards. Data entered into the database are 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.

With respect to stream standards, the condition of the water resources within the basin is generally good and supports aquatic life and uses.

Water Quality Data Review: Reach I is an area about 90 miles long and 40 miles wide located on the main stem of the Canadian River. It represents a watershed from the Texas-Oklahoma state line upstream to the Sanford Dam on the Canadian River encompassing the northern portion of Hemphill County and the southernmost section of Lipscomb County to Hutchinson County and the northern portion of Carson County. Reach I contains two subwatersheds totaling 4,790 square miles of contributing drainage in Texas and Oklahoma and involves one classified stream segment (0101). Included in this reach are 36 permitted municipal and industrial discharges, 12 permitted solid waste disposal sites, four concentrated animal feeding operations (CAFOs), and approximately 46,000 persons within the basin reach.

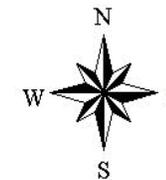
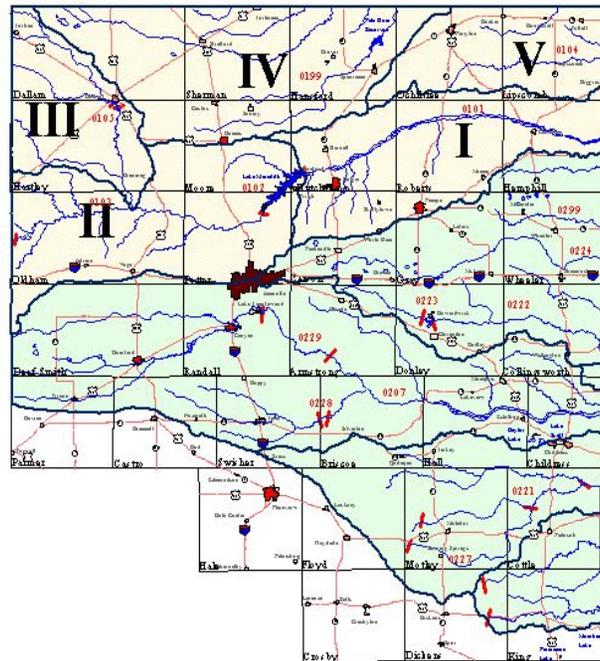
Reach I is a sparsely populated region with only about 1½ persons per square mile, which is typical of the entire region. Agribusiness, oil and gas production, and a chemical plant are located in this reach. Pampa is the largest city with a population of 17,887, followed by Borger, which contains 14,302 people. There are about 11 towns with populations less than 10,000 and include Canadian, Stinnett, and Miami to list a few.



Dixon Creek in Hutchinson County

One unclassified segment in this reach is Dixon Creek (Segment 0101A), a tributary of the Canadian River near Borger. The creek is in the center of the Borger oilfield, where many of the early strikes that touched off the Panhandle boom of the late 1920s took place. It is listed on the CWA 303(d) list of impaired water bodies for bacteria and depressed dissolved oxygen. Refer to **Table 2, Review of Concerns and Impairments** for details of sites listed on the CWA 303(d) list. Additionally, recent review has shown some nutrient enrichment concerns. Dixon Creek receives most of its water from an industrial discharger, and is heavily utilized by local cattle ranchers as a source of water for their range livestock. Conceivably these problems will continue because of the use of the creek. The depressed dissolved oxygen in the water body

CANADIAN RIVER BASIN



- Reach Boundaries
- Population
- 0 - 2826
- 2827 - 10875
- 10876 - 34395
- 34396 - 101986
- 101987 - 172289
- Highways
- Canadian River Basin Hydrology
- Red River Basin Hydrology
- Counties
- Canadian River Basin Segments
- Red River Basin Segments
- Reservoirs
- Canadian River Basin
- Red River Basin



presumably occurs since most of the flowing water in the creek comes from a local industrial discharger. An Aquatic Life Assessment (ALA) has been planned to ascertain the levels of impairment.



Rock Creek

Another unclassified perennial creek in this reach is Rock Creek. It runs through flat land and rolling to steep slopes surfaced by clay and sandy loams that support cacti, brush, and grasses that drain to the center of an oilfield near the community of Bunavista.

Like Dixon Creek, Rock Creek (Segment 0101B) receives an effluent discharge. Although based on limited data, recent screening indicates a concern for elevated bacteria. In most cases, the peak bacterial values observed appear to be originating from animal waste, as well as runoff from pasture lands.

The portion of Segment 0101 located in Hutchinson County has concerns for elevated ammonia concentrations. Primarily rural in nature, the area is utilized for livestock and oil field production. Moderate to low flow combined with drought-like conditions that have plagued the area are contributing factors to the high ammonia levels. Future monitoring events should provide a better assessment of this issue. Refer to the **Maps** by reach in the Appendix located in the back of the report.

Reach II represents the Canadian River main stem watershed from the Sanford Dam at Lake Meredith in Moore and Potter Counties upstream about 85 miles to the Texas-New Mexico state line to Oldham and Hartley Counties. The width of the area is about 45 miles. Two classified stream segments (0102 and 0103) are located in Reach II. It includes two subwatersheds with 3,760 square miles of contributing drainage in Texas and New Mexico, 3,108 square miles in Texas. It contains 18 permitted municipal and industrial discharges, six permitted solid waste disposal sites, three CAFOs, and 2,422 petroleum storage tanks. Approximately 75,000 persons populate this reach.

Amarillo is the largest city in the Canadian River Basin with a total population of 173,627. Dissected by both the Red and Canadian River Basins, Reach II encompasses about a fourth of the northwestern portion of the city. Six other small towns are within the reach including Vega and Bishop Hills. The economics of the majority of the reach consist of agribusiness and oil and gas production. However, since Amarillo is the largest city in the Panhandle, it is diversified as any other city its size would be. As well as the natural hub for all agribusiness and oil and gas production, more than 9,500 businesses provide jobs to its inhabitants.



Lake Meredith

Red River Authority of Texas would like to acknowledge and thank the Canadian River Municipal Water Authority for their assistance and expertise in water quality issues within the Canadian River Basin.

The largest reservoir in the Canadian River Basin is situated in this reach. Lake Meredith has a total storage capacity of 1,407,600 acre-feet and a surface area of 21,640 acres at an elevation of 2,965 feet above mean sea level. Water is diverted, filtered, treated, and pumped to area cities from Borger to Amarillo to Lubbock and several other smaller cities within parts of three river basins. Lake Meredith (Segment 0102) has a concern related to public water supply due to elevated levels of total dissolved solids (TDS), chlorides, and sulfates. This concern originates from the inflow of the Canadian River to the lake that is naturally contaminated with salts. Data from the *Lake Meredith Salinity Control Project* has determined that a major contributor of saline water to the river system is a shallow brine aquifer under artesian pressure that filters into the river channel.

Approximately 70% of the chlorides in Lake Meredith originate at this location downstream of the Ute Dam near Logan, New Mexico. Deep well injection of the highly saline water is considered to be the most effective solution to this problem, however, since the salt is stored in the river channel sand, it will most likely continue to exude into the river for an indefinite amount of time.

Additionally, a concern for contact recreation has been observed above Lake Meredith in the upper reaches of Segment 0103 because of bacteria. The sparsely populated, rural area consists of pasture and grazing lands for livestock and other wildlife. Due to the nature of the river, significant rainfall events cause bacterial levels to increase considerably.

East Amarillo Creek (Segment 0103A) is also contained in Reach II. Except for the uppermost reach, East Amarillo Creek is in a very rural area of the basin. For most of the stream's length, the flat terrain is surfaced by leveled sand dunes, with some low-rolling to flat, locally dissected areas surfaced by clay and sandy loam. At the stream's mouth the soil is loose sand, and vegetation along the creek bed

includes scrub brush and grasses. It has experienced elevated bacterial concentrations creating a use concern. In addition, nutrient enrichment concerns have been identified due to elevated levels of nitrate-nitrite-N. East Amarillo Creek is a perennial stream that receives effluent from a municipal discharger. In hot, dry periods of the year, the creek may be dry for several weeks. If not for the treated effluent, this would be an intermittent or dry creek. Due to the creek usage, significant rainfall events affecting stormwater runoff cause bacterial levels to rise sharply and decrease during drier periods.

Reach III represents the Rita Blanca Creek watershed upstream to the Texas-New Mexico state line encompassing Hartley and Dallam Counties. The three subwatersheds contained in this reach have 3,554 square miles of contributing drainage. It encompasses one classified stream segment (0105). There are 16 permitted solid waste disposal sites, 16 CAFO permits, about 131 petroleum storage tanks, and a population of approximately 6,800 in this reach.

Dalhart is the largest city in Reach III with a population of 7,237. There are five other small towns including Texline and Channing. The economy of the reach is basically agribusiness, oil and gas production, and hunting.

Rita Blanca Lake located in Reach III, has a capacity of 12,100 acre-feet and a surface area of 524 acres at an elevation of 3,860 feet above mean sea level. The drainage area above the dam is 1,062 square miles. It was listed on the CWA 303(d) list for bacteria, pH, and TDS, and has been designated for use as a high quality waterfowl habitat. Rita Blanca Lake does not have any freshwater contribution other than one wastewater discharger, along with normal rainfall within the area. During the spring and fall migrations, Rita Blanca Lake hosts countless numbers of migrating waterfowl. It is more comparable to that of a wetland than a free water body. This lake is not used for recreational use and is clearly marked by signs around the lake. Reclassification should be considered to adjust the water quality standards to match its natural characteristics, and removing it from the CWA 303(d) list.

Reach IV includes the Palo Duro Creek watershed, Segment 0199, from Hansford to Dallam Counties at the northern Texas-Oklahoma state line upstream to its headwaters and portions of Coldwater Creek, Frisco Creek, and Lower Beaver River. The reach covers an area approximately 100 miles in length and 50 miles in width. It contains three subwatersheds with 6,520 square miles of contributing drainage. There are 26 permitted municipal and industrial dischargers, eight permitted solid waste disposal sites, 26 concentrated animal feeding operations, about 530 petroleum storage tanks, and an approximate population of 27,000 in this reach.

Palo Duro Reservoir (Segment 0199A), located in Reach IV, has a total storage capacity of 60,900 acre feet with a drainage area of about 614 square miles. It was listed on the CWA 303(d) for depressed dissolved oxygen. Concerns have been identified for ammonia, nitrate plus nitrite, orthophosphorous, and total phosphorous. Since it is a relatively new reservoir, drought conditions added to the naturally dry nature of this region, have delayed its filling. Palo Duro Reservoir is not very deep and like Rita Blanca, is visited by migratory waterfowl. Continued sampling of this reservoir is recommended to adequately determine the cause of the naturally occurring phenomena.

Reach V represents the Wolf, Mammoth, and Kiowa Creek watersheds from the Texas-Oklahoma state line upstream to the headwaters of each. It encompasses the upper eastern section of the Panhandle in Lipscomb and Ochiltree Counties about 65 miles long by 35 miles wide. It includes three subwatersheds with 3,589 square miles of contributing drainage. Reach V contains one classified stream segment (0104), ten permitted municipal and industrial dischargers, six permitted solid waste disposal sites, 13 CAFOs, about 380 petroleum storage tanks, and approximately 12,000 people.

Perryton is the largest city with a population of 7,774, followed by Booker and Higgins. There are about nine towns in the reach. The economy is largely

based on agribusiness, oil and gas production, and hunting.



Wolf Creek

Wolf Creek (Segment 0104) in Reach V is surrounded by typically flat terrain with local escarpments. Brush and grasses grow in the mostly deep, fine sandy loam along its banks. Contact recreation use is fully supporting, although bacteria occasionally exceeds standards, generating a use concern. The creek is spring-fed and flows year round. With the continuing drought conditions that have permeated the Panhandle of Texas, local ranchers make the most of this valuable resource for livestock watering. Consequently, any significant rainfall event causes the bacterial levels to rise sharply, but decrease during drier periods.

Water Quality Success Stories in the Canadian River Basin: Since its inception in 1991 by the Texas Legislature, the Clean Rivers Program has persistently attained many of the goals originally set forth. Red River Authority of Texas has shared in these accomplishments, bearing in mind the myriad obstacles still ahead. However, recognizing that it will continue to be an ongoing process, acknowledging the success stories spurs the project on to bigger and better accomplishments for mankind and the environment.

A three-year project initiated in August 2001 between the TNRCC and the Railroad Commission of Texas (RRC) with the objective of eliminating one of the potential sources of the high salinity content in the Canadian River Basin is now a reality. The ultimate goal is to physically plug five inactive noncompliant oil and gas wells in the basin. Additionally, the Pampa District of the RRC is researching a total of 119 abandoned wells located in Hutchinson County along the banks of the Canadian River. These wells could be considered as candidates for plugging if additional funds are made available. The goal for 2002 is to plug three wells in the Pampa District.

An underlying achievement is the interagency cooperation of several governmental agencies working cooperatively to attain a better environment for the people of Texas.

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, USGS, and CRMWA 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.

The Authority is fully aware that feasible solutions can only be identified through continual strategic water quality monitoring, analysis, and planning with support of the people. Water quality data collected in the Canadian Basin utilize stringent quality assurance protocols to provide vital information necessary for the development of appropriate water quality standards, prepare an inventory of water quality, develop a list of impaired water bodies, and scrutinize wastewater discharge permits. Our charge is to continue to be good stewards of the resources available in the basin now

and for future generations.

An underlying achievement is the interagency cooperation of several governmental agencies working cooperatively to attain a better environment for the people of Texas.

Public Participation and Education:

An integral component of the successful Clean Rivers Program is the emphasis placed on public participation and education. This forum enables the people to broaden their awareness of water quality conditions, utilize the knowledge and expertise of many, and cooperatively pursue avenues to rectify problems. The Authority portrays an image of service to its constituents with an emphasis on good science, partly attributable to the Clean Rivers Program.

The Basin Advisory Committee (BAC) evolved through the years to a diverse group of interested individuals from all sectors including agricultural, environmental, industrial, municipal, governmental, and the general public. The benefits of open discussion between a county judge, farmer, public works director, and businessperson to come together and straightforwardly discuss the needs of their own specific area are immeasurable. The Canadian River Basin is about 500 miles from Austin, yet these BAC meetings have allowed our voices to be heard and needs considered. A Basin Advisory Committee meeting was held on June 24, 2001 in Amarillo to discuss the special needs of the basin with an attendance of about 25 people.

The annual Coordinated Monitoring Meeting was held in Wichita Falls last year on March 29, 2001 and provided a workable system that avoided duplication of effort. The monitoring schedule for 2003 was recently discussed at a meeting held on April 4, 2002. All TNRCC field offices, the USGS, and CRMWA participated in these meetings.

Authority personnel regularly attend and provide presentations to various organizations, clubs, and civic groups to peak interest and awareness of natural resource issues, and particularly to give assistance and provide expertise concerning water conservation.

Educational materials are provided on a first come first serve basis and as they are available to any

Remember:
**The water you are using today is only
 on loan from your grandchildren.**

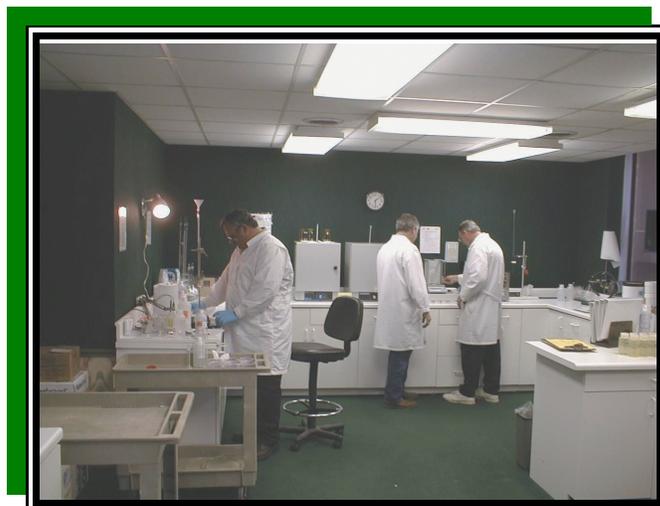
schools in the basin that request them. Without a doubt, education about water quality, knowledge of the water cycle, and similar curriculum taught to children beginning at an early age is the key to solving the water needs of the future.

Active involvement in the Clean Rivers Program is encouraged and opened to all interested citizens. The Authority maintains a mailing list of all cities, towns, counties, governmental agencies, water supply corporations, stakeholders, and concerned citizens in the Canadian River Basin. At least one Basin Advisory Committee Meeting is held annually in the Spring or Summer, usually in Amarillo. Anyone interested in participating in the Clean Rivers Program or the Basin Advisory Committee may do so by contacting the Red River Authority of Texas by e-mail, telephone, letter, or fax.

www.rra.dst.tx.us A virtual encyclopedia of information is available on the Authority's website. Inventories of facts, data, and information about the basin, its counties, population, and etc. are available. Additionally, a public information repository link will guide you to numerous sites, some of which contain digital mapping, legislation, other environmental sites, regional weather, significant reservoir inventory, maps, water glossary and terminology, water use efficiency calculator, and general information. Some of the environmental links include the TNRCC Clean Rivers Program, U.S. Environmental Protection Agency, and U.S. Army Corps of Engineers to name a few. A publication's library is also available that lists reports and studies prepared by the Authority. Please take advantage of this valuable resource. The Authority is pleased to be able to provide it to you.

RRR's Commitment: Red River Authority of Texas was created by the legislature 43 years ago. From the beginning the Authority has endeavored to be of beneficial service to its public concerning water conservation, reclamation, protection, and the development of water resources. The Clean Rivers Program reflects the same goals which have permitted the Authority and TNRCC to utilize this expertise concurrently to assist the public.

Staying focused, listening to the stakeholders, and keeping abreast of regulatory issues will enable the Authority through the CRP to reach the goals established in the beginning.



*Analyzing Samples at the
 Red River Authority Lab*

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2001 Coordinated Monitoring Schedule for the Canadian River Basin
Table 1

Reach	Segment	Station ID	Mon Resp	Mon Type	Long Description	Cont Flow	24 Hr DO	Mtls Wtr	Org Wtr	Mtls Sed	Org Sed	Conv	Bact	Inst Flow	Fish Tissue	Field
I	101	10016	RR/RR	IS	Dixon Creek near Canadian River NE Borger		1	2		2	2	4	12	12		12
I	101	10025	RR/RR	IS	Rock Creek at Hwy 136 downstream of Lake Weatherly		1	2		2	2	4	12	12		12
I	101	10032	RR/GS	RT	Canadian River Bridge at US 60-38 at Canadian	365										
I	101	10032	WC/FO	RT	Canadian River Bridge at US 60-83 at Canadian							4	4	4		4
I	101	10033	RR/RR	IS	Canadian River Bridge on SH 70 N Pampa		1	2		2	2	4	12	12		12
I	101	10034	WC/FO	RT	Canadian River Bridge at Plemons Road, S of Plemons			4	2			4	4	4		4
I	102	17045	RR/RR	RT	Dixon Creek at SH 152 W of RR 2171 E of Borger			2		2	2	4	12	12		12
II	102	10036	RR/CR	IS	Lake Meredith near intake tower at dam NW of Sanford								12			
II	102	10036	WC/FO	RT	Lake Meredith near intake tower at dam NW of Sanford			1	1	1		2	2			2
II	103	10018	RR/RR	IS	E Amarillo Creek at US 287 N of Amarillo			2		2	2	4	12	12		12
II	103	17056	RR/RR	RT	Unnamed Tributary of W Amarillo Creek at Loop 335			2		2	2	4	12	12		12
II	102	10037	RR/CR	RT	Lake Meredith N Canyon Arm								12			
II	102	10038	RR/CR	RT	Lake Meredith Mid-Lake between Blue E and Fritch Fortress								12			
II	102	10039	RR/CR	RT	Lake Meredith Mid-Lake SE of Martin's Canyon								12			
II	102	10040	RR/CR	RT	Lake Meredith Evans Canyon								12			
II	102	10041	WC/FO	RT	Lake Meredith Mid-Lake W of Turkey Creek			1		1		2	2			2
II	102	10043	RR/CR	RT	Lake Meredith Bugbee Canyon at Buoy Line								12			
II	102	10044	RR/CR	RT	Lake Meredith N Turkey Creek Canyon Arm								12			
II	102	10045	RR/CR	RT	Lake Meredith Big Blue Canyon								12			
II	102	10046	RR/CR	RT	Lake Meredith Turkey Creek Canyon Arm								12			
II	102	10047	RR/CR	RT	Lake Meredith Short Creek Canyon Arm								12			
II	102	10048	RR/CR	RT	Lake Meredith Harbor Bay								12			
II	102	10049	RR/CR	RT	Lake Meredith Fritch Canyon Arm								12			
II	102	10050	RR/CR	RT	Lake Meredith, Meredith Harbor								12			
II	102	10051	RR/CR	RT	Lake Meredith Cedar Canyon Arm								12			
II	102	10052	RR/CR	RT	Lake Meredith S Canyon Arm							12	12			
II	103	10054	RR/GS	RT	Canadian River Bridge at US 87-287 N of Amarillo	365						6				365
II	103	10054	WC/FO	RT	Canadian River Bridge at US 87-287 N of Amarillo			1				4	4			4
II	103	10056	WC/FO	RT	Canadian River Bridge on US 385 N of Tascosa			2	2			4	4	4		4
II	102	15270	RR/RR	IS	Big Blue Creek upstream of FM 1913, SE of Dumas							4	4	4		4
II	103	16344	WC/FO	RT	Canadian River at Texas/New Mexico State Line N of IH 39			1				4	4	4		4
IV	199	10005	WC/FO	RT	Palo Duro Reservoir at Boat Launch near Dam N Spearman			1	1	1		2	2			2
V	104	10058	RR/GS	RT	Wolf Creek Bridge at SH 305 N of Lipscomb	365										
V	104	10058	RR/RR	RT	Wolf Creek Bridge at SH 305 N of Lipscomb		1	2		2	2	4	12	12		12

► See the bottom of Table 2 for a description of these columns.

Canadian River Basin – Review of Concerns and Impairments

Table 2

Segment	Water Body	Cause(s) of Concern and / or Impairment	TMDL Priority / Level of Support	# Samples	# Samples Exceeding Criteria	
0101	Canadian River, Portion of River in Hutchinson County	Nutrient Enrichment Concern for Ammonia	Concern	26	20	
	This portion of the Canadian River is primarily in a rural area and the primary uses of this watershed are cattle ranching and oil field production. Moderate to low flow in the Canadian River combined with the drought-like conditions that are being experienced in this area, invites free ranging cattle to congregate around these perennial water sources. Two perennial creeks, Dixon Creek and Rock Creek, are significant contributors to the flow of this section of the river and their contribution to this concern should be investigated.					
	* Dixon Creek, Entire Length	Nutrient Enrichment Concerns	Concern	10	3	
		* Elevated Bacteria	Low / Not Supporting	29	11	
0101A		* Depressed Dissolved Oxygen	Low / Partially Supporting	32	4	
	Dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life. An Aquatic Life Assessment (ALA) is planned to ascertain the levels of impairment. Bacteria levels are sometimes higher than the criterion established to assure the safety of contact recreation. Dixon Creek is a perennial stream below a NPDES permitted discharge and above is intermittent with perennial pools. The watershed of this creek is located outside the City of Borger. The main land usages in this watershed are oil field exploration, transportation, production, and ranching activities, which highly restrict access to this creek by members of the general public. Because of this type of usage, any time there is a significant rainfall event, bacterial levels rise sharply and deplete during drier periods.					
	Rock Creek, Entire Length	Elevated Bacteria	Use Concern Limited Data	9	4	
0101B	Rock Creek is located downstream of a nitrogen producing plant in an area restricted by geography and land use. The topography of the area is very rough and access is restricted to ranchers and oil field personnel. Cattle tend to congregate near the creek, as it is presumably the sole water source in the area. The City of Borger uses Rock Creek to receive its treated wastewater effluent. The effluent is discharged into Rock Creek downstream of one of the locations where problems have occurred. Because of this type of usage, any time there is a significant rainfall event, bacterial levels rise sharply and decrease during drier periods.					
0102	Lake Meredith	Average levels of Chlorides, Sulfates, and Total Dissolved Solids That Exceed Drinking Water Standards	Concern	N/A	N/A	
	Flow from the Canadian River fills Lake Meredith. The flow from this river is naturally contaminated with salts, chlorides, and elevated levels of total dissolved solids from the river's upper reaches and causes problems in Lake Meredith. The Canadian River Salinity Control Project is working on this problem.					
0103	Canadian River, above Lake Meredith, Upper Half of Segment	Elevated Bacteria	Use Concern	22	6	
	This portion of the Canadian River is in a very rural area. Population densities are extremely low. Because of the arid nature of this region, pasture and grazing lands make up the largest percentage of land use. The river, being a viable water source, attracts not just cattle, but other wildlife as well. Because of the nature of usage of the river, any time there is a significant rainfall event, bacterial levels rise sharply.					
0103A	East Amarillo Creek, Entire Length	Elevated Bacteria	Use Concern	16	4	
		Overall Nutrient Enrichment Concern	Concern	16	5	
	Except for the uppermost reaches, East Amarillo Creek is located in a very rural area and access is restricted to ranchers, oil field personnel, and cattle. The creek receives treated wastewater from a municipal discharger. In hot dry periods of the year, the creek may be dry for weeks at a time. If not for the treated effluent, this would be an intermittent or dry creek. Because of this type of usage, any time there is a significant rainfall event, bacterial levels rise sharply on the creek and fall back during drier periods.					
0104	Wolf Creek, Cottonwood Creek to State Highway 23	Elevated Bacteria	Use Concern Limited Data	8	N/A	
Wolf Creek is located in a highly rural area. The creek is spring fed and flows year round. Local ranchers utilize the creek as a source of drinking water for their cattle. Because of this type of usage, any time there is a significant rainfall event, bacterial levels rise sharply then decrease during drier periods.						

Canadian River Basin – Review of Concerns and Impairments

Table 2

Segment	Water Body	Cause(s) of Concern and / or Impairment	TMDL Priority / Level of Support	# Samples	# Samples Exceeding Criteria
0105	* Rita Blanca Lake	* Elevated Bacteria, * Total Dissolved Solids, and * pH	Low / Not Supporting	N/A	N/A
Rita Blanca Lake is a small impoundment that generally receives its only inflow from the few rainfall events and a treated wastewater effluent plant. The lake at its deepest is only a couple of feet deep and is recognized by vast numbers of migratory waterfowl as a safe place to rest. This lake is not used for recreational use and is clearly marked with signs around the lake.					
0199A	* Palo Duro Reservoir	Nutrient Enrichment Concerns for Ammonia, Nitrate + Nitrite, Orthophosphorous, and Total Phosphorous	Concern Concern Concern Concern	10 10 10 10	4 4 4 5
Palo Duro Reservoir is a newer impounded lake located in the upper Panhandle of Texas. Two small creeks feed and supply the Palo Duro Reservoir. Because of the dry nature of the region, this lake is slow in filling. It is recognized by vast numbers of migratory waterfowl as a safe place to rest.					
* Depressed Dissolved Oxygen					
Low / Not Supporting					
N/A					
N/A					

* Indicates that the stream / water body and parameter were listed on the 2000 Clean Water Act's 303(d) list.

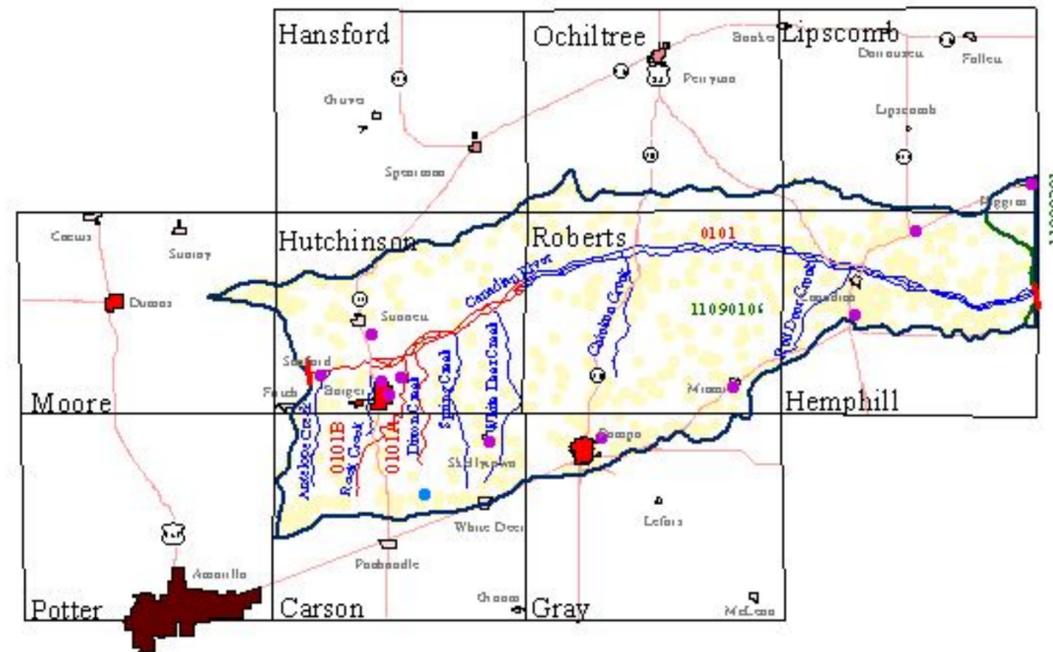
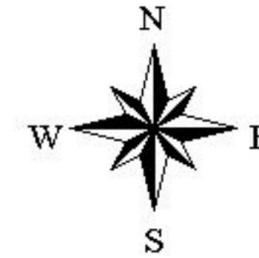


Table 1 Description

Reach:	Hydrologic Subdivision of Basin	SC1 Entity Responsible for Sampling:	Cont Flow:	Stream flow measurements taken continuously by USGS
Segment:	Section of River Sampling Site is Located	(RR) Red River Authority of Texas	24 Hr DO:	Used to conduct productivity in the waterbody
Station ID:	TNRCC ID Numbers	(WC) TNRCC	MtIs Wtr:	Dissolved and total metals in water
Mon Resp:	Monitoring Responsibility	SC2 Entity Conducting Sampling:	Org Wtr:	Organics in water (TNRCC is doing MTBE)
Mon Type:	Type of Sampling Event	(RR) Red River Authority of Texas	MtIs Sed:	Total metals in sediment
	(IS) Intensive / Systematic – subwatershed monitoring on a cyclical basis	(FO) TNRCC Regional Office	Org Sed:	Chlorinated pesticides (method in water), sampling events
	(RT) Routine Water Sampling / Baseline – long term monitoring	(GS) United States Geological Survey	Conv:	Nutrient and mineral sampling events
Long Description:	Description of Sampling Site	(CR) Canadian River Municipal Water Authority	Bact:	Fecal coliform and E. coli sampling events
			Inst Flow:	Instantaneous flow measurements at time of sampling
			Fish Tissue:	TNRCC analysis on fish tissue
			Field:	Field measured sampling events – DO, temperature, pH, etc.

CANADIAN RIVER BASIN

FACTORS INFLUENCING WATER QUALITY



Reach I



305(b) SCREENING CONCERNS

SEGMENT	CONCERN
0101	Ammonia
*0101A	Nutrient, *Bacteria, *Depressed Dissolved Oxygen
0101B	Bacteria

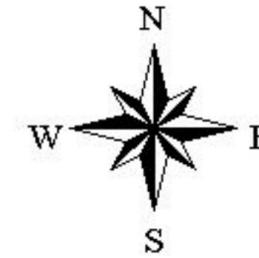
*Also on the 303(d) list

- Solid Waste Disposal Facilities
- Concentrated Animal Feeding Operations
- ▬ Segments
- ▭ Boundary
- Population
- 0 - 2826
- 2827 - 10875
- 10876 - 34395
- 34396 - 101986
- 101987 - 172289
- ▭ Hydrologic Unit Boundaries
- ▭ Counties
- ▬ Highways
- ▬ 2002 305(b)/303(d) List
- ▬ Hydrology
- ▭ Concentrated Septic Tanks Area
- Groundwater Wells

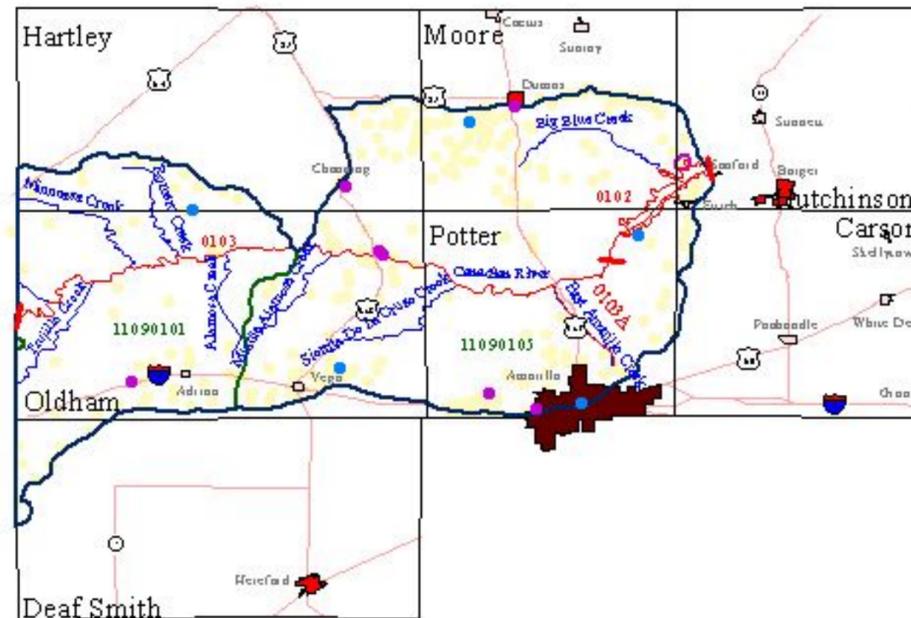
Figure 1

CANADIAN RIVER BASIN

FACTORS INFLUENCING WATER QUALITY



Reach II



305(b) SCREENING CONCERNS

SEGMENT CONCERN

- 0102 Chlorides, Sulfates, Total Dissolved Solids (As compared to DW standard)
- 0103 Bacteria
- 0103A Bacteria, Nutrient

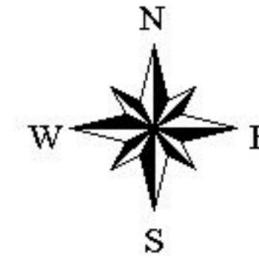
* Also on the 303(d) list

- Solid Waste Disposal Facilities
- Concentrated Animal Feeding Operations
- ⚡ Segments
- Boundary
- Population
- 0 - 2826
- 2827 - 10875
- 10876 - 34395
- 34396 - 101986
- 101987 - 172289
- ▭ Hydrologic Unit Boundaries
- ▭ Counties
- ▭ Highways
- ▭ 2002 305(b)/303(d) List
- ▭ Hydrology
- ▭ Concentrated Septic Tanks Area
- Groundwater Wells

Figure 2

CANADIAN RIVER BASIN

FACTORS INFLUENCING WATER QUALITY



Reach III



305(b) SCREENING CONCERNS

SEGMENT	CONCERN
*0105	*Bacteria, Total Dissolved Solids, pH

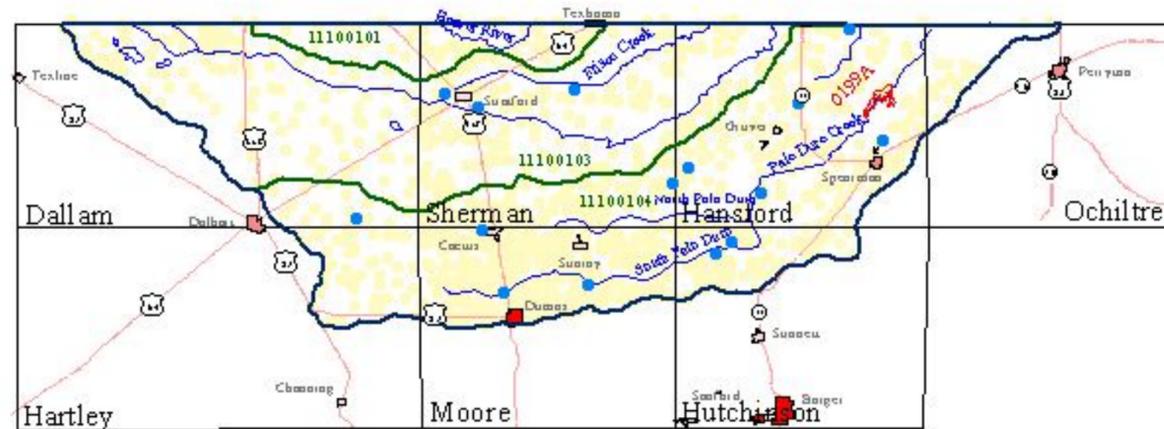
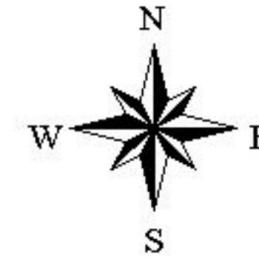
* Also on the 303(d) list

- Solid Waste Disposal Facilities
- Concentrated Animal Feeding Operations
- ▬ Segments
- ▭ Boundary
- Population
- 0 - 2826
- 2827 - 10875
- 10876 - 34395
- 34396 - 101986
- 101987 - 172289
- ▭ Hydrologic Unit Boundaries
- ▭ Counties
- ▬ Highways
- ▬ 2002 305(b)/303(d) List
- ▬ Hydrology
- ▭ Concentrated Septic Tanks Area
- Groundwater Wells

Figure 3

CANADIAN RIVER BASIN

FACTORS INFLUENCING WATER QUALITY



Reach IV



305(b) SCREENING CONCERNS

SEGMENT	CONCERN
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*0199A	Ammonia, Nitrate+Nitrite, Orthophosphorous, Total Phosphorous, *Depressed Dissolved Oxygen
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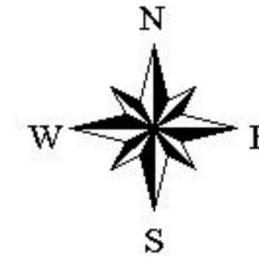
* Also on the 303(d) list

- Solid Waste Disposal Facilities
- Concentrated Animal Feeding Operations
- ⚡ Segments
- Boundary
- Population
- 0 - 2826
- 2827 - 10875
- 10876 - 34395
- 34396 - 101986
- 101987 - 172289
- ▭ Hydrologic Unit Boundary
- ▭ Counties
- ▭ Highways
- ▭ 2002 305(b)/303(d) List
- ▭ Hydrology
- ▭ Concentrated Septic Tanks Area
- Groundwater Wells

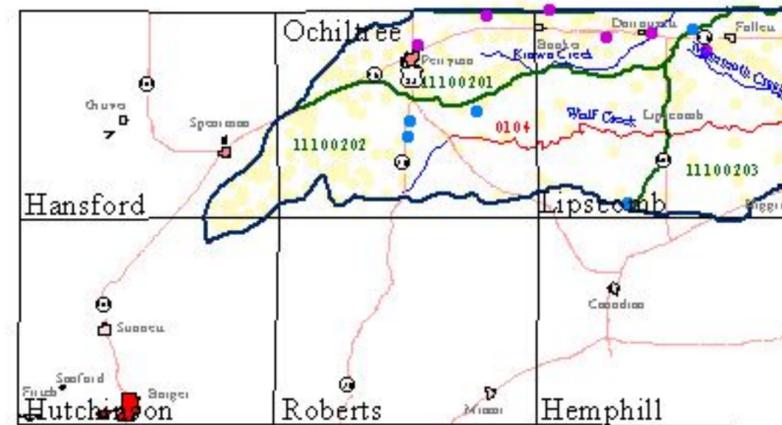
Figure 4

CANADIAN RIVER BASIN

FACTORS INFLUENCING WATER QUALITY



Reach V



305(b) SCREENING CONCERNS

SEGMENT	CONCERN
0104	Bacteria

* Also on the 303(d) list

- Solid Waste Disposal Facilities
- Concentrated Animal Feeding Operations
- ▬ Segments
- ▭ Boundary
- Population
- 0 - 2826
- 2827 - 10875
- 10876 - 34395
- 34396 - 101986
- 101987 - 172289
- ▭ Hydrologic Unit Boundaries
- ▭ Counties
- ▬ Highways
- ▬ 2002 305(b)/303(d) List
- ▬ Hydrology
- ▭ Concentrated Septic Tanks Area
- Groundwater Wells

Figure 5