2011 BASIN HIGHLIGHTS REPORT

AN OVERVIEW OF WATER QUALITY ISSUES THROUGHOUT THE CANADIAN AND RED RIVER BASINS

Wichita River at FM 810

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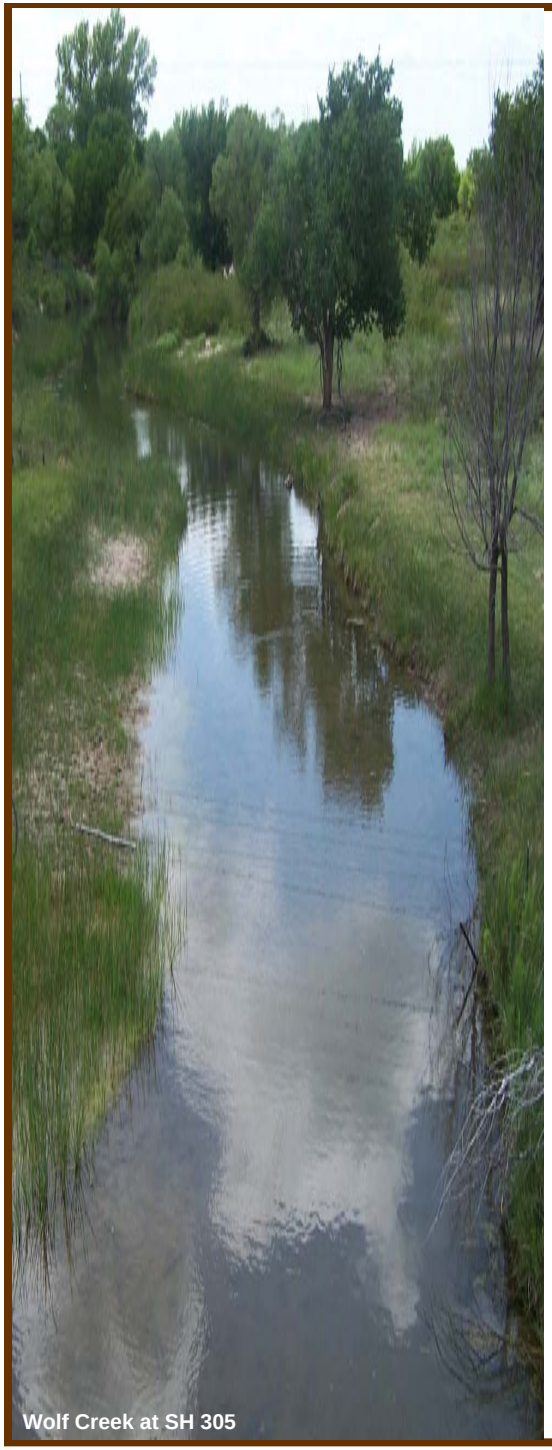
Wolf Creek at SH 305

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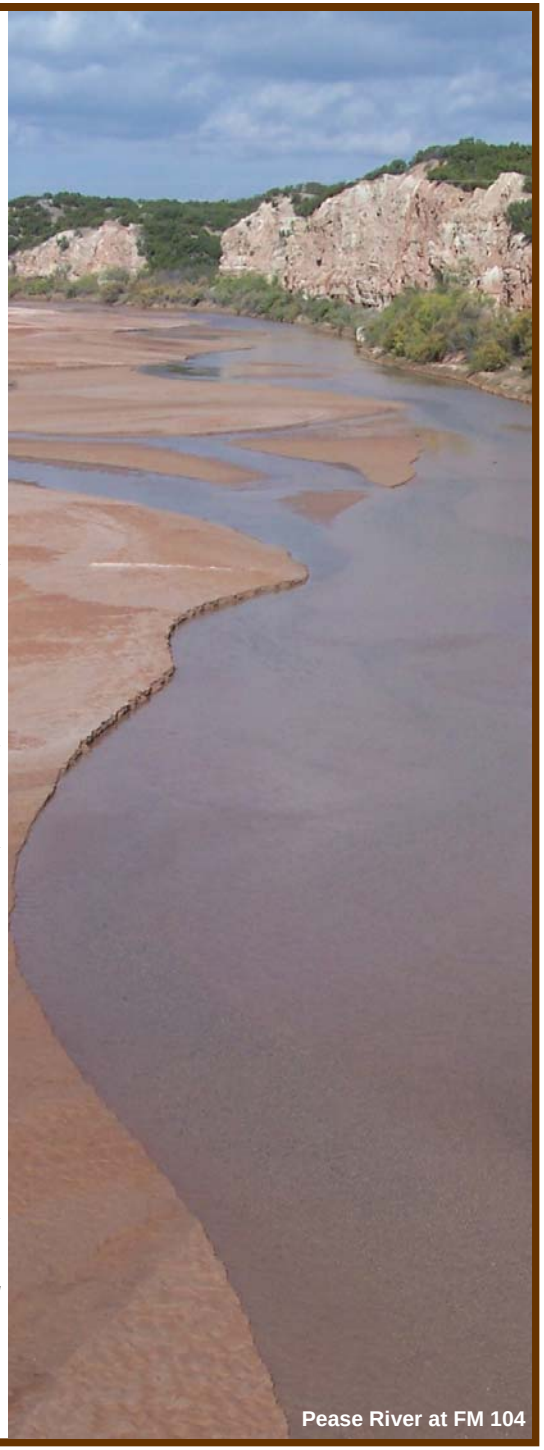
PREFACE

The Texas Legislature, in 1991, enacted the Texas Clean Rivers Act (Senate Bill 818) in order to assess water quality for each river basin in the state. From this, the Clean Rivers Program (CRP) was created and has become one of the most successful cooperative efforts between federal, state, and local agencies and the citizens of the State of Texas. It is implemented by the Texas Commission on Environmental Quality (TCEQ) through local partner agencies to achieve the CRP's primary goal of maintaining and improving the water quality in each river basin. The Red River Authority of Texas (Authority) is the partner agency for both the Red and Canadian River Basins.

A watershed management approach was selected as the best method to manage the State's diverse surface water resources. In order to achieve this, the Authority subdivided each basin into five reaches, or sub-watersheds, divided by natural hydrology and composed of classified and unclassified water body segments. The TCEQ identifies each of these classified segments in the Texas Surface Water Quality Standards (TSWQS). Data resulting from the collection and analysis of water samples is used in the development of and compliance with these standards.

An integral part of the CRP is the Basin Highlights Report (BHR). The reports are based on quality assured data as utilized in the Texas Water Quality Inventory (TWQI) and 303(d) List. The TWQI is an assessment of the water quality data and is composed by the TCEQ every two years, as required under the Federal Clean Waters Act (CWA), Sections 305(b) and 303(d), as administered by the Environmental Protection Agency. The 303(d) List identifies waters from the TWQI not meeting the uses designated in the TSWQS. The most recent TWQI may be accessed on the TCEQ's website at: **www.tceq.texas.gov/compliance/monitoring/water/quality/data/08twqi.**

This year's BHR differs from those written in years past. In 2009, the Authority produced the Basin Summary Report, which included extensive technical data analyses based on the final 2008 TWQI. This report utilizes the same information; however, the time frame is from September 2009 through August 2010. The final 2010 TWQI or CWA Sections 305(b) and 303(d) Integrated Report is still in draft format. This BHR is brief in its extent and focuses mainly on water body impairments and concerns. Therefore, it is suggested that the reader view the *2009 Summary Report of the Canadian and Red River Basins* for more in depth information. It may be found on the Authority's website at: **www.rra.dst.tx.us**.


Pease River at FM 104

INTRODUCTION

HOW IS WATER QUALITY MONITORED?

Water quality can be evaluated using physical characteristics, chemical characteristics, or a combination of the two. Parameters, such as, dissolved oxygen, bacteria, suspended solids, and chlorides, are just a few examples of how water quality can be measured. Throughout the Canadian and Red River Basins there are several entities who participate in routine water quality monitoring efforts:

- Red River Authority of Texas
- City of Sherman
- Texas Commission on Environmental Quality (TCEQ)
- United States Geological Survey (USGS)

Joint efforts and adherence to Quality Assurance Project Plans (QAPPs) enable data collected from various organizations statewide to be used in collaborative efforts to assess the water quality and develop water quality standards for streams, rivers, and lakes.

This in mind, there are several ways we can monitor water quality. Field technicians will sample the chemical condition of water, sediments, and even fish tissue to determine levels of key constituents such as dissolved oxygen, nutrients, metals, and more. They will also monitor physical condition such as temperature, flow, erosion potential of stream banks and lake shores. Periodically, biological measurements determining the abundance/variety of aquatic plant and animal life are used to evaluate how habitable a water body is.

These monitoring events can be long term in nature, occurring at fixed stations for long periods of time, or may be temporary, being used to evaluate a new discharge or point source into a water body.

Monitoring events can also vary in extensiveness. Depending on what information is desired, water bodies may be monitored quarterly, monthly, continuously, or at any frequency in between. Typically, extensive monitoring is performed short-term to determine how to correct a water quality issue, then at less frequent intervals to monitor the corrective actions effectiveness. On the other hand, long-term monitoring is used to build a baseline allowing for the detection of seasonal or rapid changes.

WE HAVE THE DATA, NOW WHAT DO WE DO WITH IT?

The State of Texas has designated five water use categories including: aquatic life, contact recreation, fish consumption, public water supply, and general use.

As of June 30, 2010, the TCEQ received approval on the new 2010 Texas Water Quality Standards (TWQS). One of the major changes in this document was the expansion of the contact recreation category to include: primary contact recreation, secondary contact recreation 1, secondary contact recreation 2, and non-contact recreation. Under the previous Water Quality Standards (WQS), most water bodies in Texas, even those with intermittent flow which are often too shallow for swimming or other recreational activities, were forced to adhere to the strict contact recreation criteria. For most water bodies these criteria were inappropriate, making it hard to protect them. The new criteria will allow TCEQ to specify more accurate criteria for these types of water bodies.

Each category has numerical criteria associated with it, depending on its designated use. For example, water designated for public water supply will have more stringent requirements compared to a water body designated for general use.

All available data collected during monitoring events are used to develop appropriate water quality standards (WQS) for water bodies across Texas. A period of record data, many years if available, is used to develop these standards. The Texas Water Quality Inventory differs from this by using a seven-year assessment window that progressively moves every two years. Current datasets are then compared to these standards to evaluate water quality. Data may either support, or not support the designated use. If data do not show good water quality to support the use, the water body is said to be "impaired." Water bodies may also have "concerns" if short-term data show elevated levels. A "concern" can also indicate a potential water quality issue where there is either an insufficient amount of data to compare to or no numeric criteria (limits) have been established.

Some examples of water quality parameters commonly used to evaluate water quality are listed in the table on page 6.

Pecan Bayou at FM 1159

WATER QUALITY PARAMETERS

Water quality is a combination of the physical, chemical, and biological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and/or to any human need or purpose. It is most frequently used as a comparator to a set of standards of which compliance can be monitored and assessed, the most common being those regulations governing the quality of drinking water.

Industrial dischargers, including wastewater treatment plants, must seek permission from the Texas Commission on Environmental Quality (TCEQ) prior to discharging any treated effluent into a surface water body. These entities are regulated through National Pollution Discharge Elimination System (NPDES) permits that set limits for various water quality parameters. Not all dischargers are similar; there are countless systems and treatment methods that vary depending on a number of different factors. This being said, the requirements and stringency of a NPDES also vary depending on such factors. When setting permitting requirements and limitations, it is also important to consider the use of the water body accepting the discharge. If, for example, a water body was classified as a drinking water source, the NPDES requirements would be much more stringent compared to a non-drinking water source.

Below is a brief list of parameters that are collected on a regular basis to help assess water quality, and a brief explanation as to what their presence means from a water quality aspect.

WATER QUALITY PARAMETERS

FIELD PARAMETERS

Collected and processed in the field laboratory. Results are expressed in mg/L except where noted.

PARAMETER	DEFINITION
Conductivity	A measure of the ability of a solution to carry an electrical current.
Dissolved Oxygen	Dissolved Oxygen (DO) - the oxygen that is freely available in water. DO is vital to fish and other aquatic life and the prevention of odors. Traditionally, adequate ranges of dissolved oxygen levels have been accepted as the single most important indicator of a water body's ability to support desirable aquatic life.
pH	The hydrogen-ion activity of water caused by the breakdown of water molecules and the presence of dissolved acids and bases. pH determines whether a water body is acidic, neutral, or basic. The pH of the water can affect the toxicity of many substances.
Secchi Depth	A relatively crude measurement of the turbidity (cloudiness) of surface water. The depth at which a *Secchi Disc* (Disk), which is about 10-12 inches in diameter and on which is a black and white pattern, can no longer be seen.
Temperature	The degree of hotness or coldness. Also, a measure of the average energy of the molecular motion in a body or substance at a certain point.

WATER QUALITY PARAMETERS CONTINUED

CONVENTIONAL PARAMETERS

Collected in the field but processed in the laboratory. Results are expressed in mg/L except where noted.

PARAMETER	DEFINITION
Ammonia	Naturally occurring in surface and wastewater, and is produced by the breakdown of compounds containing organic nitrogen. Elevated ammonia levels are a good indicator of organic pollution.
Chloride	One of the major inorganic ions in water and wastewater. Concentrations can be increased by industrial processes. High chloride concentrations can affect metallic objects, growing plants, and make water unsuitable for drinking. Chloride compounds, often known as salts, can be an indicator of natural or manmade pollution, as in the case of oil field brines.
Chlorophyll-*a*	A photosynthetic pigment which is found in all green plants. The concentration of chlorophyll-*a* is used to estimate phytoplankton biomass in surface water. Results are expressed in micrograms per liter.
Nitrate	Nitrate salts are used as fertilizers to supply a nitrogen source for plant growth. Nitrate additions to surface waters can lead to excessive growth of aquatic plants. The presence of nitrates in groundwater occurs from the conversion of nitrogenous matter into nitrates by bacteria and represents the process whereby ammonia in wastewater.
Orthophosphorus	Is a soluble form of phosphorus (PO_4) that is applied to urban and agricultural land as fertilizers and is often found in storm water runoff.
Phosphate	General term used to describe phosphorus-containing derivatives of phosphoric acid. The chemical containing the phosphate group can be either organic or inorganic and either particulate or dissolved. Phosphates constitute and important plant nutrient. Important parameter to determine *Carlson's Trophic State Index.*
Sulfate	Usually dissolved into waters from rocks and soils containing gypsum, iron sulfides, and other sulfur compounds. Sulfides are widely distributed in nature and in high concentration, sulfate can affect drinking water.
Total Dissolved Solids	TDS - A measure of the amount of material dissolved in water (mostly inorganic salts). Typically aggregates of carbonates, bicarbonates, chlorides, sulfates, phosphates, nitrates, etc. of calcium, magnesium, manganese, sodium, potassium, and other cations which form salts. These are measured by filtering a water sample to remove any suspended particulate material, evaporating the water, and weighing the solids that remain.
Total Suspended Solids	TSS - A measure of solids found in waste water or in a stream, which can be removed by filtration. The origin of suspend matter may be man-made wastes or natural sources such as silt.

BACTERIOLOGICAL PARAMETERS

Collected in the field but processed in the laboratory. Results are expressed in MPN except where noted.

PARAMETER	DEFINITION
E. coli	The current indicator bacteria to determine if the water body is suitable for contact recreation. It is expressed in MPN (most probable number) per 100 mL of water. High results on the *E. coli* test can indicate a potential pollution problem. *E. coli* is used as an indicator because it can be potentially harmful to people.
Enterococcus	Bacteria commonly found in the feces of humans and other warm-blooded animals. Their presence in water is considered to verify fecal pollution. This bacteria has shown to be more hearty in water bodies with high conductivity and salinity. Their concentration can be expressed quantitatively using an MPN (Most Probable Number) method.
Fecal Coliforms	A group of bacteria normally present in large numbers in the intestinal tracts of humans and other warm-blooded animals. The presence of this type of a bacteria in water, beverages, or food is usually taken to indicate that the material is contaminated with solid human waste. Their concentrations are expressed as number of colonies per 100 mL of sample.

NUTRIENT CRITERIA DEVELOPMENT IN TEXAS

In 1998 the Environmental Protection Agency (EPA) mandated that all states develop numeric nutrient criteria for reservoirs, streams, and estuaries. The EPA had originally allotted states a six year period to gather data, develop, and submit plans for approval. However, considering that it is now 2011 and the Texas Commission on Environmental Quality (TCEQ) just recently (June, 2010) adopted numeric nutrient criteria for only seventy-five reservoirs, it is easy to see that the EPA has extended the original six year window.

Evaluating the process that TCEQ utilized to develop this criteria explains why some thirteen years later only 75 water bodies throughout the entire state currently have numeric nutrient criteria

In both 2001 and 2006 the TCEQ submitted plans to the EPA outlining their approach to numeric nutrient criteria development. From the beginning, the goal was to evaluate and develop a stand-alone criteria for chlorophyll-*a* for some ninety-three reservoirs throughout Texas. The main setback that TCEQ Water Quality Standards (WQS) Staff encountered was the lack of data for reservoirs. A dataset consisting of a minimum 30 separate sampling events is required to create a water quality standard. This eliminated several reservoirs including:

Reservoirs in the State of Texas With Limited Datasets and/or No Recent Data

0208	Lake Crook	1224	Leon Reservoir
0209	Pat Mayse Reservoir	1228	Pat Cleburne Reservoir
0210	Farmers Creek Reservoir	1230	Lake Palo Pinto
0212	Lake Arrowhead	1231	Lake Graham
0213	Lake Kickapoo	1233	Hubbard Creek Reservoir
0215	Lake Diversion	1234	Lake Cisco
0217	Lake Kemp	1235	Lake Stamford
0219	Lake Wichita	1236	Lake Fort Phantom Hill
0302	Wright Patman Lake	1237	Lake Sweetwater
0510	Lake Cherokee	1241C	Buffalo Springs Lake
0823	Lewisville Lake	1411	E.V. Spence Reservoir
0826	Grapevine Lake	1412A	Lake Colorado City
0827	White Rock Lake	1418	Lake Brownwood
0828	Lake Arlington	1419	Lake Coleman
0830	Benbrook Lake	1426A	Oak Creek Reservoir
0832	Lake Weatherford	1904	Medina Lake
0834	Lake Amon G. Carter	2116	Choke Canyon Reservoir
1208A	Millers Creek Reservoir	2305	Amistad Reservoir

Lake Texoma

PROBLEMS DEVELOPING NUMERIC NUTRIENT CRITERIA

As you can see from the previous list, there are several water bodies throughout the state that are lacking the necessary data to create a stand-alone nutrient criteria based on chlorophyll-*a*. The answer may appear to be simple, simply designate a river authority or TCEQ Regional Office to collect routine samples. However, most water quality monitoring is done on a quarterly basis. This means that it could take up to eight years to gather the required data, pending no setbacks or sampling events where data could not be collected.

The other aspect to consider is the analytical side or the actual analysis of the sample at a NELAC accredited laboratory. This in itself has created a problem over the past few years. Prior to its inception, laboratories throughout the United States operated without accreditation through a national program. One simply did not exist. With the inception of NELAC and the TCEQ taking on the role of the accrediting body for Texas, things began to change. The era of NELAC accreditation ushered in a host of stringent quality control standards and quality control objectives. With these new requirements came an increase in the detection limits laboratories were once able to achieve. This lead to more "censored" data being reported to the TCEQ. By censored data, we are referring to any value that is below the reporting limit for that particular analyte analyzed, using a particular method. For example, the reporting limit for total phosphorus is 0.06 parts per million (ppm). You analyze the sample and find it to contain only 0.04 ppm. Since the actual value is below the TCEQ reporting limit, this value is reported as <0.06 ppm. When performing statistical analyses and attempting to determine correlations between multiple parameters, these values become very troublesome to work with.

Sweetwater Creek at US 83

TCEQ is working with laboratories throughout Texas to determine methodologies to help lower detection limits and reduce the percentage of data reported as "less than" values. While this may not seem to be a legitimate set-back, consider that well over 50% of all data currently in the Surface Water Quality Monitoring Information System (SWQMIS) for nutrient parameters such as nitrate, nitrite, orthophosphorus, total phosphorus, nitrate plus nitrite, and total kjeldahl nitrogen are "less than" values.

The future development of numeric nutrient criteria for other reservoirs, estuaries, and streams will greatly depend on the ability of TCEQ staff to resolve the analytical issues they currently face.

AN INTRODUCTION TO THE CANADIAN RIVER BASIN

The Canadian River Basin includes all or parts of 15 counties in the Texas Panhandle. Beginning at the northeastern slopes of the Sangre de Cristo Mountains in New Mexico as a tributary to the Arkansas River, the Canadian River eventually flows into the Mississippi River. As the Canadian River flows from New Mexico into Texas, it descends from 9,000 feet above mean sea level to 3,600 feet above mean sea level. Its drainage area encompasses approximately 12,616 square miles in Texas.

In Texas, the Canadian River crosses a relatively flat prairie with a gradual slope to an elevation of 2,870 feet above mean sea level at the Oklahoma border. The Canadian River courses through a relatively flat prairie that gives rise to two eco-regions: the High Plains and the Rolling Plains.

There is a total of three major reservoirs and four major aquifers in the Texas portion of the Canadian River Basin. The average annual precipitation varies from 25 inches in the mountainous upper reaches to 15 inches in eastern New Mexico, and 22 inches near the Texas-Oklahoma border.

To design the most effective sampling plan, the basin is divided into five reaches, which include five classified stream segments and six unclassified stream segments. Maps of the basin reaches showing the monitoring sites for fiscal year 2010 can be found beginning on page 21.

The waters of the Canadian River Basin are generally good in quality. The majority of the water bodies throughout the basin support aquatic life and recreational uses. However, there are two major issues that have long affected the Canadian River Basin. One is the ongoing drought that has been a problem since the mid 1990's. This has caused water conservation to become a normal way of life for the people that live within the Canadian River Basin. With this concern, the development of water resources for public water supply has become even more important.

One of the major water supplies for the Texas Panhandle is Lake Meredith. Lake Meredith is an artificial reservoir created by the Sanford Dam on the Canadian River. It was created to provide drinking water and irrigation for this moderately dry area of the High Plains. However, recent drought effects on Lake Meredith has caused record low levels, requiring the region to develop groundwater from the Ogallala Aquifer for providing drinking water to its citizens.

In an effort to supply more water for public use, we encounter the second major issue that affects the water quality within the Canadian River Basin, the high levels of chloride. The excessive chloride levels are caused by Permian salt deposits that flow from a shallow artesian "brine aquifer" near Logan, New Mexico. As previously mentioned, Lake Meredith was created to supply a large area of the panhandle with drinking water. In an effort to reduce the concentration of chloride entering the lake, the Lake Meredith Salinity Control Project was implemented in 2001. Once more normal levels return, this project should reduce chloride levels, improving the water quality entering Lake Meredith over time. In order to continue to keep up with the demand for quality drinking water, more projects like this will be necessary.

CANADIAN RIVER BASIN - 2008 TEXAS WATER QUALITY INVENTORY				
Reach	**Segment**	**Water Body**	**303(d) List**	**Concerns**
1	0101	Canadian River Below Lake Meredith	-	Ammonia
1	0101A	Dixon Creek	Bacteria, Low Dissolved Oxygen	Bacteria, Orthophosphorus, Chlorophyll-*a*, Nitrate
1	0101B	Rock Creek	Bacteria	Nitrate
2	0102	Lake Meredith	Chloride, Mercury in Edible Fish Tissue, Sulfate, TDS	Mercury in Fish Tissue
2	0103	Canadian River Above Lake Meredith	Chloride	-
2	0103A	East Amarillo Creek	-	Chlorophyll-*a*, Nitrate
3	0105	Rita Blanca Lake	pH	Chlorophyll-*a*, Orthophosphorus, Ammonia, Total Phosphorus
4	0199A	Palo Duro Reservoir	Low Dissolved Oxygen	Ammonia
5	0104	Wolf Creek	-	Chlorophyll-*a*

AN INTRODUCTION TO THE RED RIVER BASIN

With the Red River being the second longest river in the State of Texas, the Red River Basin encompasses all or parts of 43 counties across North Texas. The Red River is an interstate water body that originates in Curry County, New Mexico, as Tierra Blanca Creek. Tierra Blanca and Palo Duro Creeks merge to form the Prairie Dog Town Fork, which flows across the Texas Panhandle carving the spectacular Palo Duro Canyon of the High Plains. As the Prairie Dog Town Fork crosses the 100th meridian in Childress County, the south bank becomes the state boundary between Texas and Oklahoma. The Prairie Dog Town Fork joins with the North Fork of the Red River northeast of Vernon to become the Red River proper. From this point, the Red River continues its southeasterly direction across Texas into southwestern Arkansas, then turns south into Louisiana, where it discharges into the Mississippi River near Simmesport, Louisiana.

The main stem of the Red River has a total length of 1,217 river miles and covers a total drainage area of 30,700 square miles in Texas. The basin contains one of the largest capacity reservoirs in Texas, Lake Texoma, along with 31 other reservoirs impounding approximately 238,165 surface acres that provide water to a growing population of more than 900,000 people.

The watershed receives an average annual precipitation varying from 15 inches in eastern New Mexico to 55 inches near the Texas-Arkansas border. The average annual runoff in the basin is about 159 acre-feet per square mile of contributing drainage area. Stream flow at the Texas-Arkansas state line averages 11,490 cubic feet per second (CFS) or 8.3 million acre-feet per year.

To design the most effective sampling plan, as with the Canadian River Basin, the Red River Basin is divided into five reaches, which include 30 classified stream segments and 36 unclassified stream segments. Maps of the Red River Basin Reaches showing the fiscal year 2010 monitoring sites can be found beginning on page 26.

The water quality within the Red River Basin is good and supports aquatic life and recreational use. However, due to the high concentrations of naturally occurring salts, only 12 of the 30 classified stream segments have been designated as useable for public water supply. Water bodies such as the Wichita River, the Pease River and the Red River are plagued with excessive concentrations of chloride and sulfate. Through ongoing efforts by federal, state, local agencies and the public stakeholders these issues are being addressed. As the State Sponsor of the Red River Chloride Control Project, the Authority will continue to back the Chloride Control Project to improve the quality of water in the Red River and its tributaries. For additional information on the Wichita River Basin portion of the Red River Chloride Control Project, please review the Water Resource Section of the Authority's website at **www.rra.dst.tx.us**. Public involvement is vital in locating concerns, setting priorities and seeking solutions to water quality within the Red River Basin.

RED RIVER BASIN - 2008 TEXAS WATER QUALITY INVENTORY				
Reach	**Segment**	**Water Body**	**303(d) List**	**Concerns**
1L	0201	Lower Red River	-	Chlorophyll-*a*
1L	0201A	Mud Creek	Bacteria, Low Dissolved Oxygen	Chlorophyll-*a*, Low Dissolved Oxygen
1L	0202	Red River Below Lake Texoma	-	Chlorophyll-*a*
1L	0202C	Pecan Bayou	-	Chlorophyll-*a*
1L	0202D	Pine Creek	-	Orthophosphorus, Chlorophyll-*a*
1L	0202G	Smith Creek	Bacteria	Low Dissolved Oxygen, Ammonia, Ortho-phosphorus, Total Phosphorus
1L	0209	Pat Mayse Lake	-	Manganese in Sediment
1U	0202E	Post Oak Creek	-	Orthophosphorus, Chlorophyll-*a*
1U	0202F	Choctaw Creek	-	Nitrate, Orthophosphorus
1U	0203	Lake Texoma	-	Chlorophyll-*a*, Orthophosphorus, TDS and Chloride in Finished Drinking Water
1U	0203A	Big Mineral Creek	-	Ammonia, Orthophosphorus
1U	0204	Red River Above Lake Texoma	-	Bacteria, Chlorophyll-*a*
2	0211	Little Wichita River	Low Dissolved Oxygen	Chlorophyll-*a*
2	0212	Lake Arrowhead	-	Total Phosphorus, Orthophosphorus
2	0214	Wichita River Below Lake Diversion Dam	Bacteria	Bacteria, Chlorophyll-*a*, Nitrate, Ortho-phosphorus, Total Phosphorus
2	0214A	Beaver Creek	Bacteria	Chlorophyll-*a*, Low Dissolved Oxygen
2	0218	Wichita/North Fork Wichita River	-	*4c - Selenium in Water
2	0218A	Middle Fork Wichita River	-	*4c - Selenium in Water
2	0219	Lake Wichita	-	Orthophosphorus, Total Phosphorus, Chlorophyll-*a*
2	0226	South Fork Wichita River	Chloride	Ammonia
3	0205	Red River Below Pease River	-	Bacteria, Chlorophyll-*a*
3	0206B	South Groesbeck Creek	Bacteria	Bacteria, Nitrate
3	0230A	Paradise Creek	Bacteria	Chlorophyll-*a*, Nitrate
4	0207	Lower Prairie Dog Town Fork Red River	Bacteria	Chlorophyll-*a*, Orthophosphorus
4	0207A	Buck Creek	Bacteria	Nitrate
4	0229	Upper Prairie Dog Town Fork Red River	pH	Chlorophyll-*a*, Nitrate, Total Phosphorus, Orthophosphorus
4	0229A	Lake Tanglewood	-	Chlorophyll-*a*, Nitrate, Total Phosphorus, Orthophosphorus
5	0299A	Sweetwater Creek	Bacteria	-

*Category 4c - Nonsupport of the water quality standard is not caused by a pollutant.

OUTREACH & INVOLVEMENT

Pine Creek at US 271

BASIN ADVISORY COMMITTEE

The Basin Advisory Committee (BAC), also known as the Steering Committee, is the driving force that assists in determining the water quality priorities of the CRP in the Canadian and Red River Basins. Representatives from the public, municipal, county, state and federal government, industry, business, agriculture, fee payers, environmental, education, civic organizations, and others comprise the membership of the BAC. Annual meetings are held in Amarillo and Wichita Falls and are open, friendly, casual, and informative. Individuals interested in attending or participating in the BAC can contact the Authority for more information at (940) 723-8697.

RED RIVER VALLEY WATER RESOURCE CONFERENCE

The Red River Valley Water Resource Conference is hosted by the Authority in cooperation with the Red River Valley Association and comprises representatives from Texas, Oklahoma, Arkansas and Louisiana. The focus of the conference is water quality and quantity issues that affect everyone within the Red River Basin, in all four states. More information on the Red River Valley Water Resource Conference can be found at **www.rrva.org**.

EDUCATION

An important program sponsored by the Authority is the distribution of the *Major Rivers* educational program to schools within both basins. *Major Rivers* is a water education curriculum designed by the Texas Water Development Board and the Lower Colorado River Authority and teaches students about Texas' major water resources. Since 2004, the Authority has provided this curriculum to over 8,000 students in the Canadian and Red River Basins.

In 2009, RRA's Environmental Services Division assisted in judging entries in the Red River Regional Science and Engineering Fair held at Midwestern State University. In addition, presentations were given for Earth Day programs for elementary age students.

In both 2010 and 2011 Midwestern State University Students enrolled in environmental science courses were invited to the Authority's Environmental Services Laboratory for a tour and to witness real-world

application topics they had covered in both lecture and labs. This is a good opportunity to promote interest in the environmental sciences and to get the word out about the Clean Rivers Program. We have had so much interest that we are currently in the process of partnering with the Texas Stream Team (see last paragraph) and creating a local citizen monitoring group.

The Environmental Services Division has also taken on four interns since the Fall of 2008, all of which have pursued careers in the environmental field.

COORDINATION & COOPERATION WITH OTHER BASIN ENTITIES

The Authority coordinates collection and monitoring efforts with other basin entities by holding annual Coordinated Monitoring Meetings (CMM). Entities that have been included in these meetings are the TCEQ, USGS, CRMWA, City of Sherman, Texas Parks and Wildlife Department, Texas State Soil and Water Conservation Board, and the U.S. Army Corps of Engineers. Goals of this meeting are to coordinate sites, parameters of concern, and data collection frequency. The CMM solicits input from all entities involved in monitoring in order to create monitoring schedules that reduce duplicative efforts. This, in turn, maximizes the funds available for the program.

ENVIRONMENTAL SERVICES LABORATORY

The Authority's laboratory achieved official NELAC accreditation in 2008. This insures that all samples tested will comply with national standards of acceptance. NELAC quality assured data is used by the TCEQ in developing and revising water quality standards. The Authority's laboratory participated in an Extended Holding Time Study for *E. coli* Bacteria in the spring and summer of 2009. At this time results of this study are still pending.

TEXAS STREAM TEAM CITIZEN MONITORING

The Texas Stream Team is an organization which promotes citizen involvement in the water quality process. Volunteer monitors are put through a training program and retrained periodically as new methods are implemented into the program. The Authority is currently working with the Texas Stream Team to become a partner agency. This would provide citizens in North Texas with an opportunity to become part of a vast network with several other volunteers monitors across the state. More information about the Texas Stream Team, its goals, partner agencies, and the steps on how to become a citizen monitor can be found at:

www.txstreamteam.rivers.txstate.edu

Wichita River at FM 368

RECOMMENDATIONS

Buffalo Creek at FM 1814

RECOMMENDATIONS

The following recommendations are based upon the evaluations presented in this report and the *2009 Basin Summary Report of the Canadian and Red River Basins* and the *2011 Basin Highlights Report of the Canadian and Red River Basins*. Comments received through public participation have also influenced these recommendations and conclusions. They are as follows:

Coordination/Sponsorship

- Continue with the successful annual Coordinated Monitoring Meeting to develop strategic monitoring plans for both basins. This reduces duplication of efforts, ensures the efficient use of available financial resources and increases the number of sites to be monitored. In addition, it enables the impairments and concerns, as defined in the Texas Water Quality Inventory, to be adequately addressed, so that all segments and water quality uses can be assessed.
- Support the development of an economical source of bacterial genotyping. This methodology would greatly aid in identifying bacterial sources on affected segments, which in turn would aid in the resolution of those concerns.
- Continue to work with the agriculture and ranching industry and municipal entities toward the improvement of water quality through effective planning strategies and the implementation of Best Management Practices (BMPs).
- Continue to encourage the State of Oklahoma environmental and water quality agencies to attend the Coordinated Monitoring and Basin Advisory Committee Meetings in order to further a cooperative effort in the improvement of water quality for both basins.
- Continue as the State Sponsor of the Red River Chloride Control Project, pressing for the project's completion and funding so that previously unusable water sources can be utilized without excessive treatment costs.

Education

- Continue educating students and other interested citizens in regards to the importance of water quality monitoring

through partnerships with citizen monitoring organizations such as the Texas Stream Team, Texas Master Naturalists, etc.

- Continue to publicly present new information regarding invasive plant and animal species, such as Salt Cedar and the Zebra Mussel. Through continued education efforts, we can take strides to reduce the transfer of these invasive plants and animals throughout Texas.

Analytical

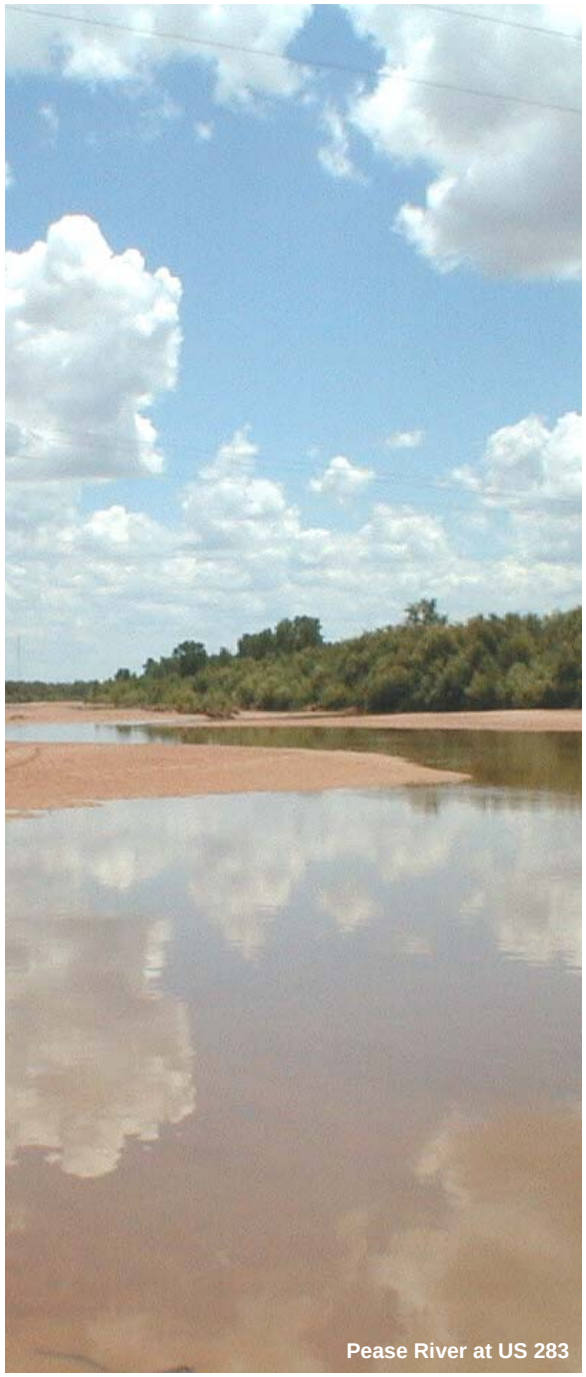
- Continue research of new and alternative conservation measures, such as land management and implement field trials.
- Continue to work with TCEQ and other CRP partners to develop methodologies that support reducing the percentages of "censored" data submitted to SWQMIS.
- Continue to support TCEQ in its efforts to expand conventional monitoring through the analyses of additional parameters, especially those pertinent to the development of numeric nutrient criteria.
- Continue to support lowering Ambient Water Reporting Limits (AWRLs) in an effort to reduce "censored" data.

Standards

- Continue to support the development of new standards, such as those seen in the new 2010 TWQS that more accurately define criteria for contact recreation.
- Continue to support the development of numeric nutrient criteria for all surface water bodies throughout Texas.

Monitoring

- Increase the number of monitoring partners in order for non-monitored locations to receive additional coverage, thereby increasing the amount of data available for future water quality inventories. Increased coverage will allow for more reliable data in determining the cause(s) for impairments and concerns.
- Increase the number of monitoring locations throughout the Canadian and Red River Basins to provide TCEQ with more data to aid in the evaluation of watersheds throughout both basins.
- Continue to support the installation and maintenance of real-time monitoring coverage to allow for quicker responses to abnormal occurrences.


Pease River at US 283

CONCLUSIONS

CONCLUSIONS

Continued monitoring efforts over the past two years have provided TCEQ with enough data to complete their most recent survey of surface water bodies throughout the State of Texas, the *Draft 2010 Integrated Report (IR)*. The following charts show potential changes, both additions as well as removals, pending the Environmental Protection Agency's (EPA) approval of the *Draft 2010 IR*. While the additions may outnumber the total number of impairments and concerns removed in number, it is important to recognize the hard work, long hours, and tremendous efforts river authorities, TCEQ staff, and stakeholders alike put forth that fosters these successes.

Continued success of the reclamation process leading to the attainable use of Texas lakes, rivers, streams, and creeks depends not only on programs like the CRP, but active stakeholder involvement and participation.

For more information on how you can make a difference contact:

www.rra.dst.tx.us

or

www.tceq.state.tx.us

PROPOSED CHANGES TO WATER QUALITY ISSUES IN THE CANADIAN RIVER BASIN

Segment ID Number	Water Body Name	Pending *Draft 2010 303(d) List* Approval by EPA	
		Impairments	Concerns
CANADIAN RIVER BASIN REACH I			
0101	Canadian River Below Lake Meredith		**Chlorophyll-*a***
0101A	Dixon Creek	**Selenium**	**Orthophosphorus**
0101B	Rock Creek		**Orthophosphorus, Chlorophyll-*a***
CANADIAN RIVER BASIN REACH II			
0103A	East Amarillo Creek		**Bacteria**
0103C	Unnamed Tributary to West Amarillo Creek		**Chlorophyll-*a***
CANADIAN RIVER BASIN REACH III			
0105	Rita Blanca Lake		**Nitrate**
CANADIAN RIVER BASIN REACH IV			
0199A	Palo Duro Reservoir	**Low Dissolved Oxygen**	**Total Phosphorus, Orthophosphorus**

PARAMETERS IN **RED** ARE POSSIBLE ADDITIONS TO IMPAIRMENTS/CONCERNS PREVIOUSLY LISTED IN 2008 PENDING THE EPA'S APPROVAL OF THE *Draft 2010 Integrated Report*.

PARAMETERS IN **GREEN** ARE POSSIBLE DELETIONS TO IMPAIRMENTS/CONCERNS PREVIOUSLY LISTED IN 2008 PENDING THE EPA'S APPROVAL OF THE *Draft 2010 Integrated Report*.

PROPOSED CHANGES TO WATER QUALITY ISSUES IN THE RED RIVER BASIN

Segment ID Number	Water Body Name	Pending *Draft 2010 303(d) List* Approval by EPA	
		Impairments	Concerns
RED RIVER BASIN LOWER REACH I			
0202A	**Bois D'Arc Creek**	**Bacteria**	-
0202C	**Pecan Bayou**	-	**Chlorophyll-*a***
0202D	Pine Creek	-	**Orthophosphorus**
0202E	Post Oak Creek	-	**Chlorophyll-*a*, Orthophosphorus**
0202G	Smith Creek	-	**Low Dissolved Oxygen**
0202I	**Little Pine Creek**	-	**Chlorophyll-*a*, Low Dissolved Oxygen**
0209	Pat Mayse Lake	-	**Chlorophyll-*a***
RED RIVER BASIN UPPER REACH I			
0202F	Choctaw Creek	**Bacteria**	**Bacteria, Total Phosphorus**
0202K	**Iron Ore Creek**	**Bacteria**	**Bacteria**
0203	Lake Texoma	-	**TDS and Chloride in Finished Drinking Water**
0204	Red River Above Lake Texoma	-	**Bacteria**
RED RIVER BASIN REACH II			
0211	Little Wichita River	**TDS, Sulfate**	-
0212	Lake Arrowhead	-	**Total Phosphorus**
0214	Wichita River Below Lake Diversion Dam	-	**Bacteria**
0214B	**Buffalo Creek**	**Bacteria**	**Total Phosphorus, Nitrate, Ammonia, Chlorophyll-*a*, Orthophosphorus**
0214E	**Wichita Valley Irrigation Project**	-	**Chlorophyll-*a***
0219	Lake Wichita	-	**Orthophosphorus**
RED RIVER BASIN REACH III			
0206B	South Groesbeck Creek	-	**Chlorophyll-*a***
RED RIVER BASIN REACH IV			
0207	Lower Prairie Dog Town Fork Red River	-	**Bacteria**, **Orthophosphorus**
0207A	Buck Creek	**Bacteria**	-
0229A	Lake Tanglewood	-	**Ammonia, Low Dissolved Oxygen**
RED RIVER BASIN REACH V			
0222	**Salt Fork Red River**	**Bacteria**	

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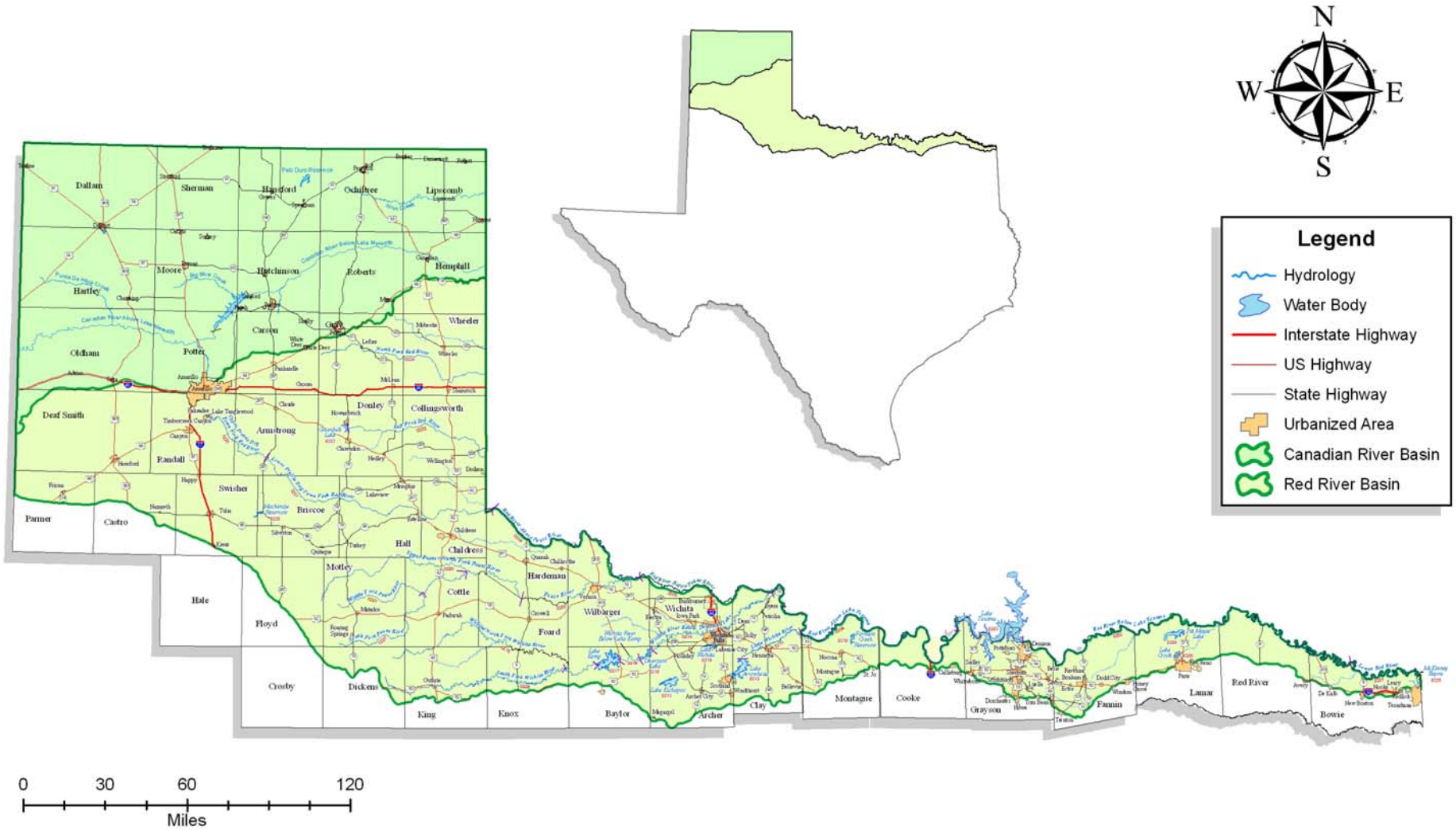
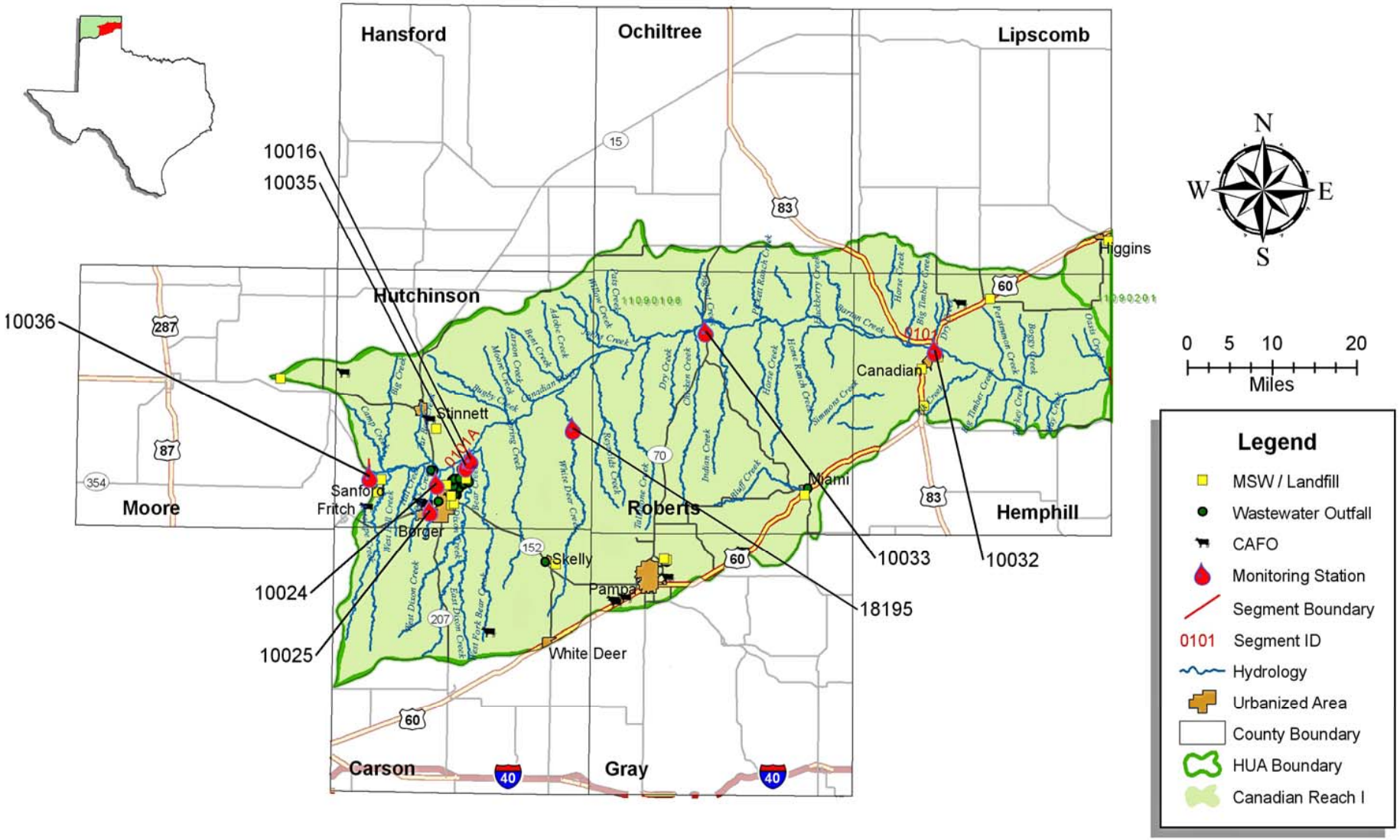
PARAMETERS IN **GREEN** ARE POSSIBLE DELETIONS TO IMPAIRMENTS/CONCERNS PREVIOUSLY LISTED IN 2008 PENDING THE EPA'S APPROVAL OF THE *Draft 2010 Integrated Report*.

Red and Canadian River Basins
Vicinity Map

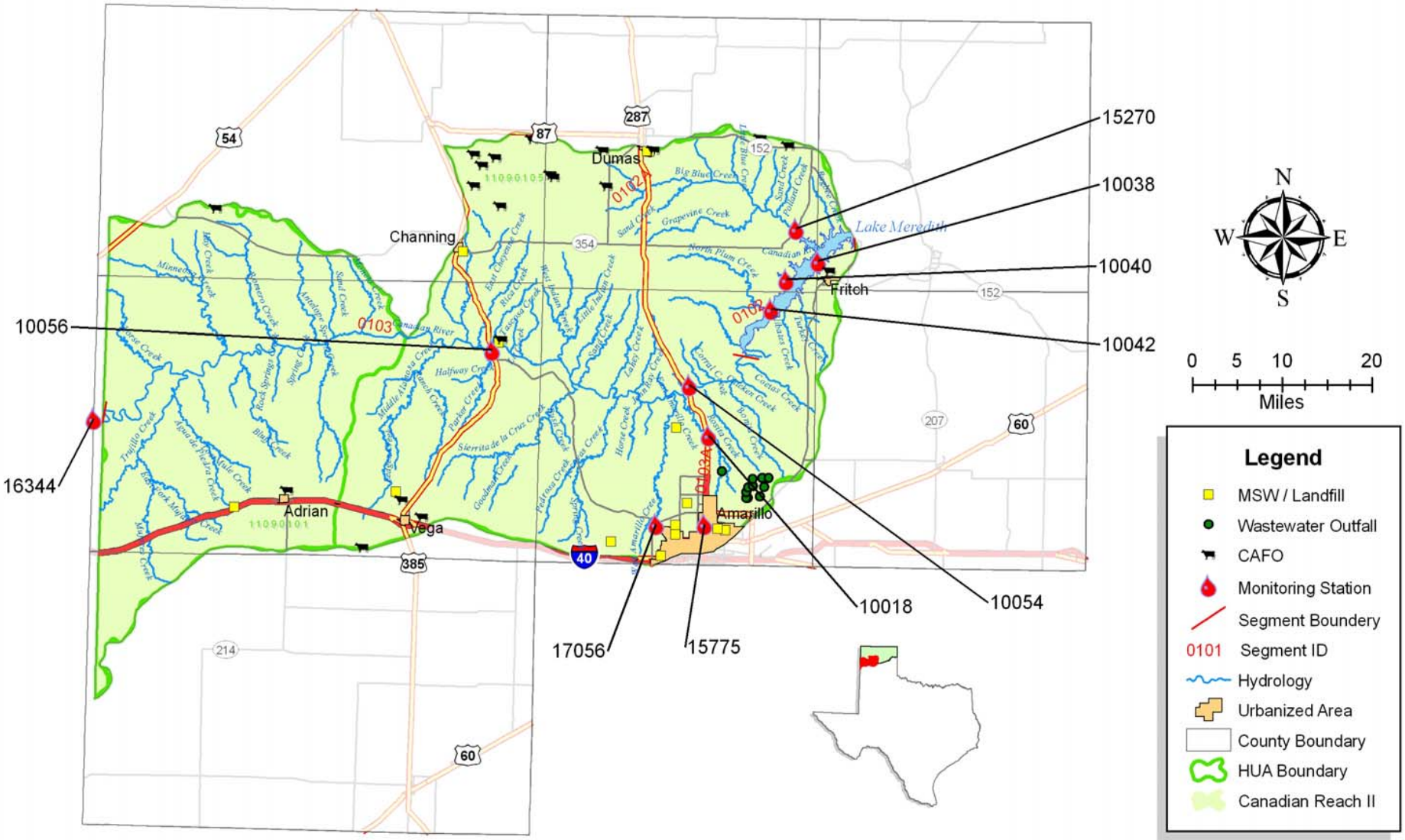


Canadian River Basin
Reach I



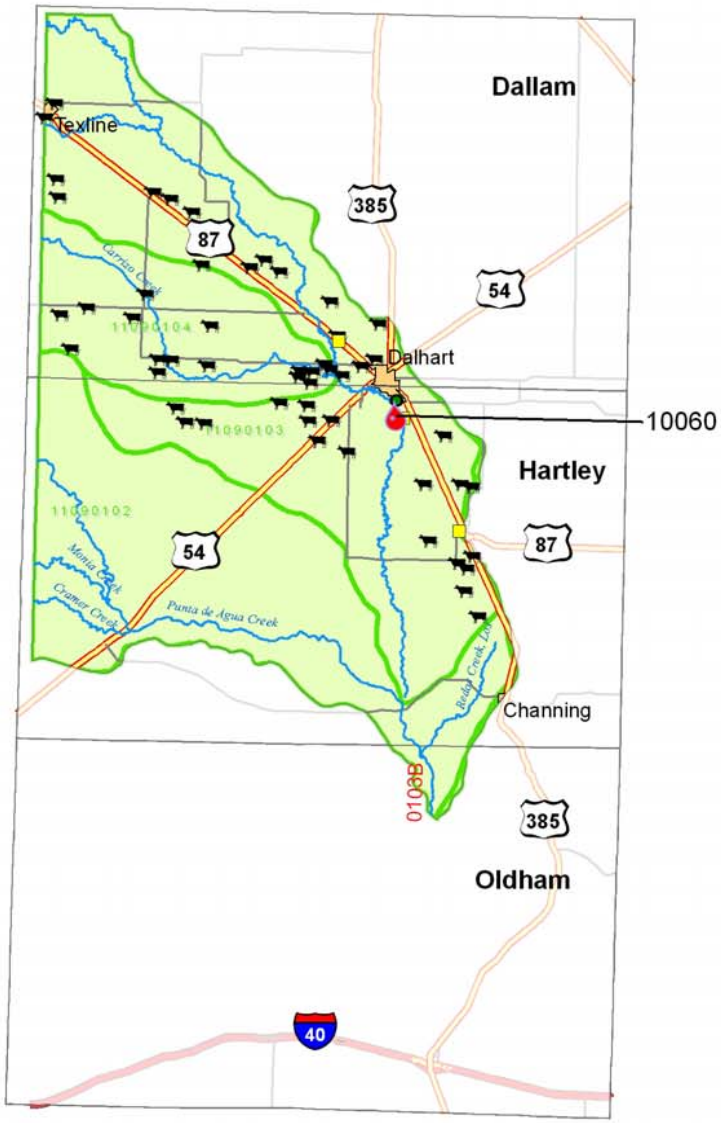
Canadian River Basin

Reach II



Canadian River Basin

Reach III

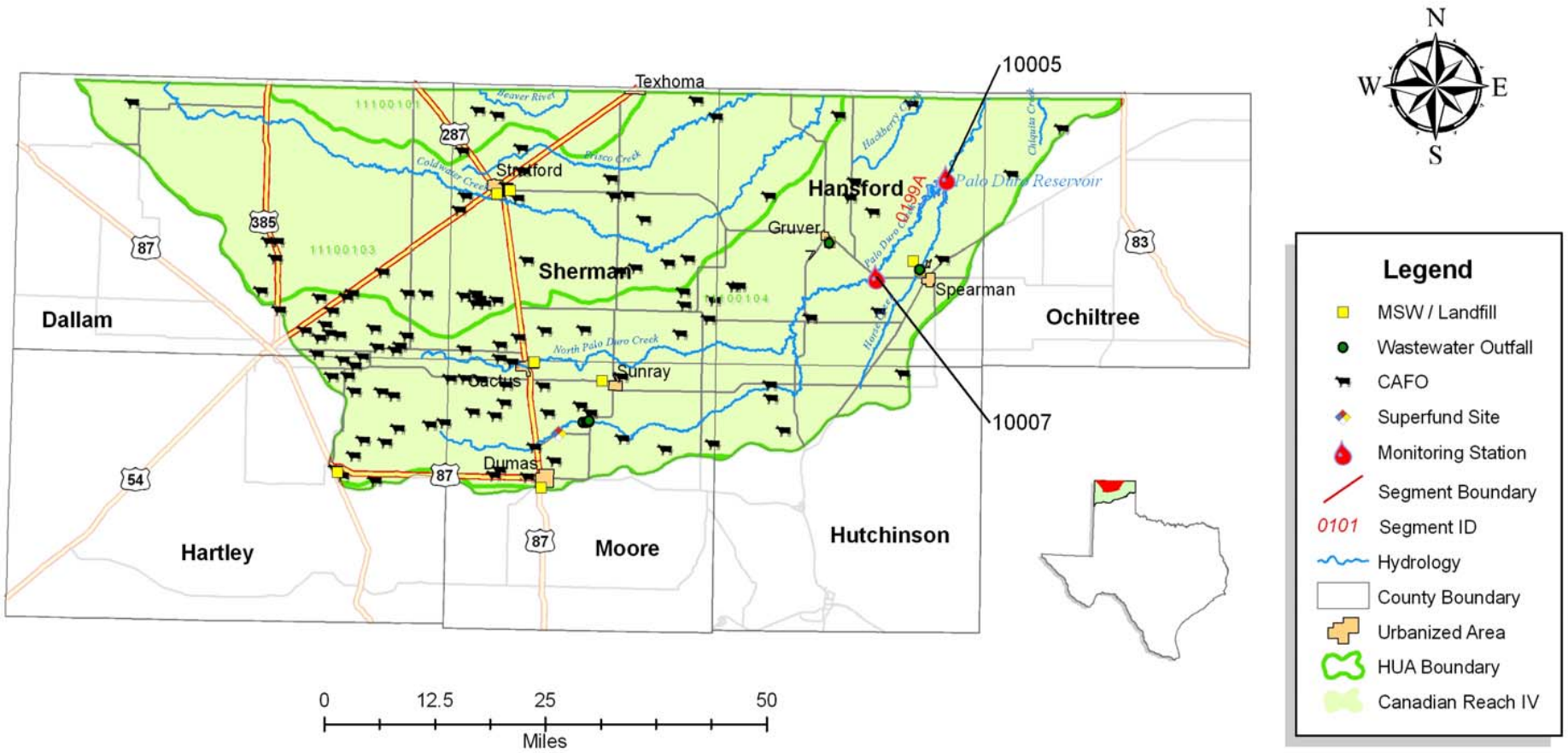


0 5 10 20
Miles

Legend

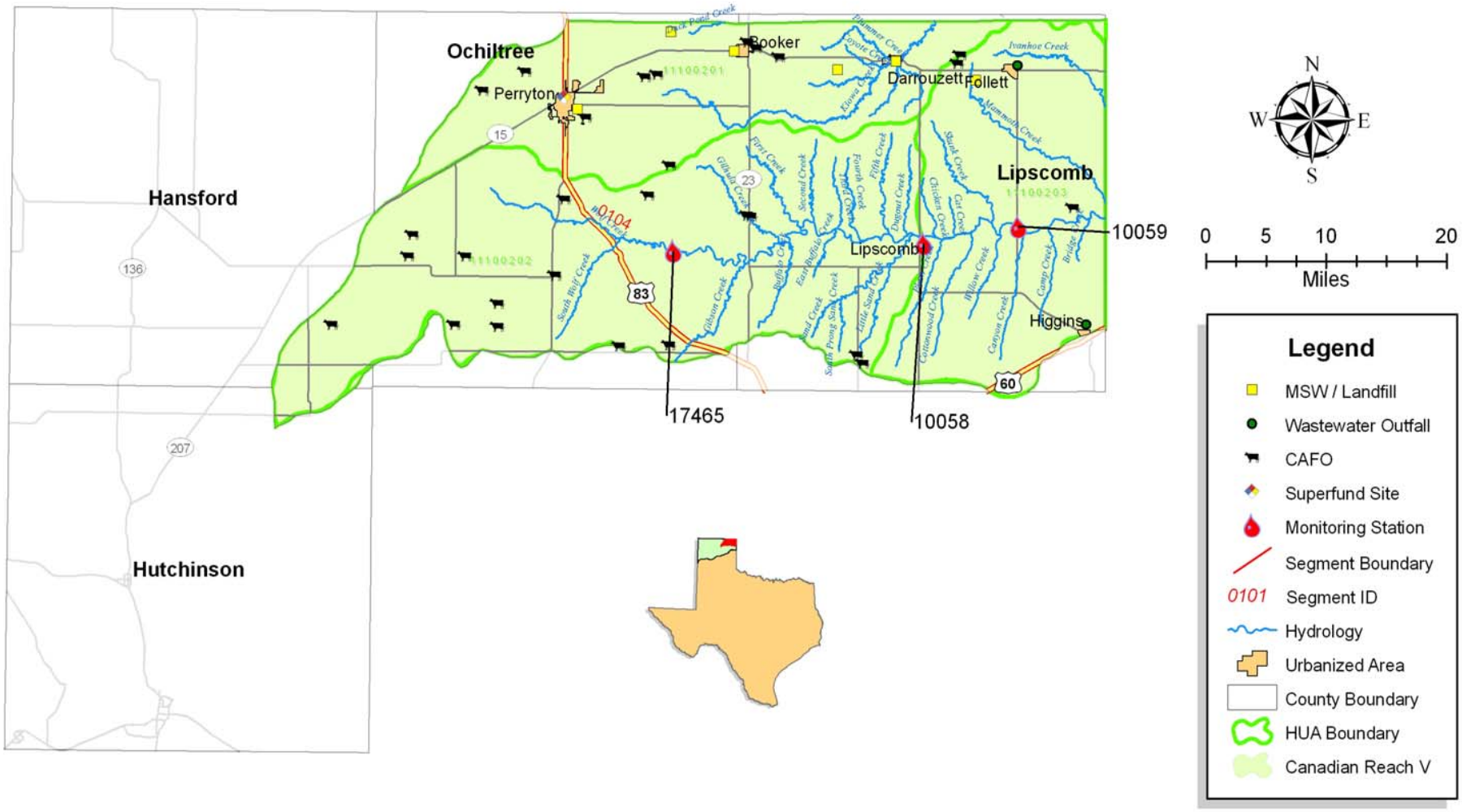
- MSW / Landfill
- Wastewater Outfall
- CAFO
- Monitoring Station
- 0101 Segment ID
- Hydrology
- County Boundary
- Urbanized Area
- HUA Boundary
- Canadian Reach III

Canadian River Basin
Reach IV

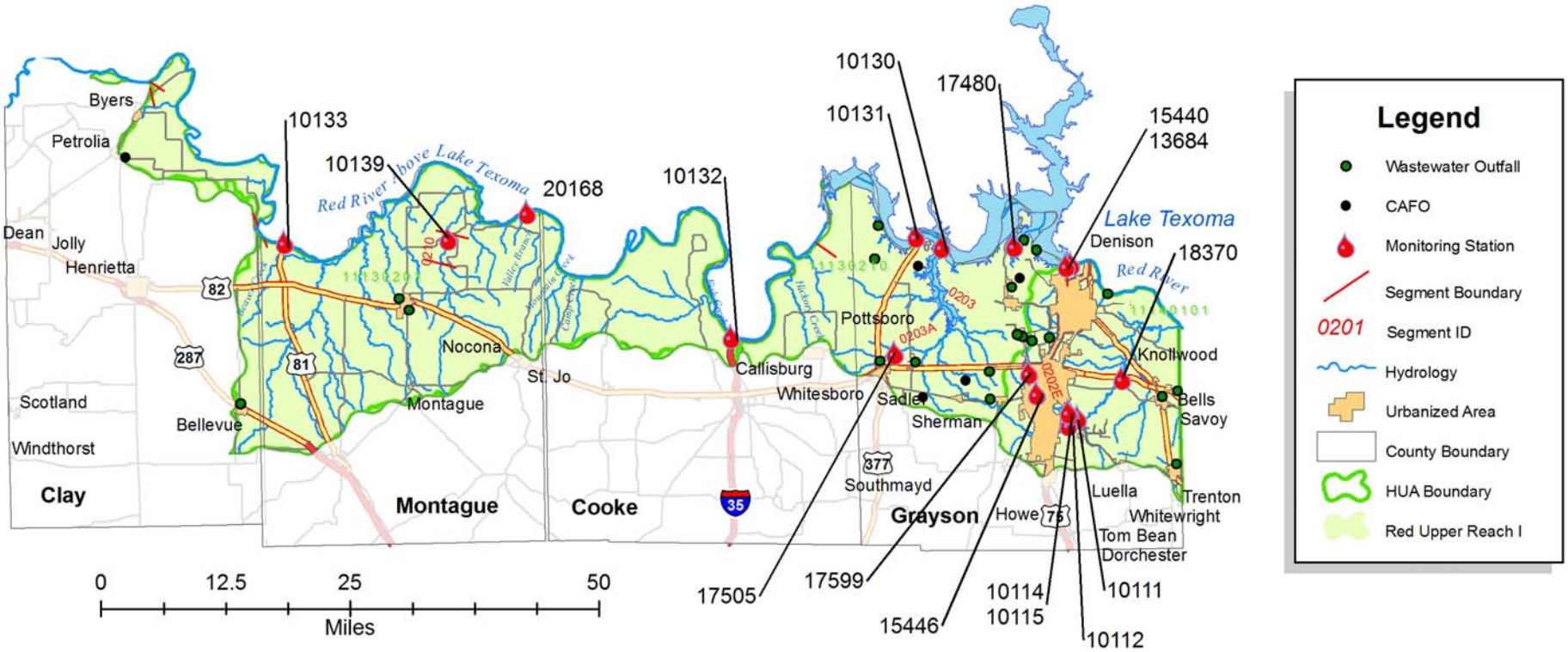


Canadian River Basin

Reach V

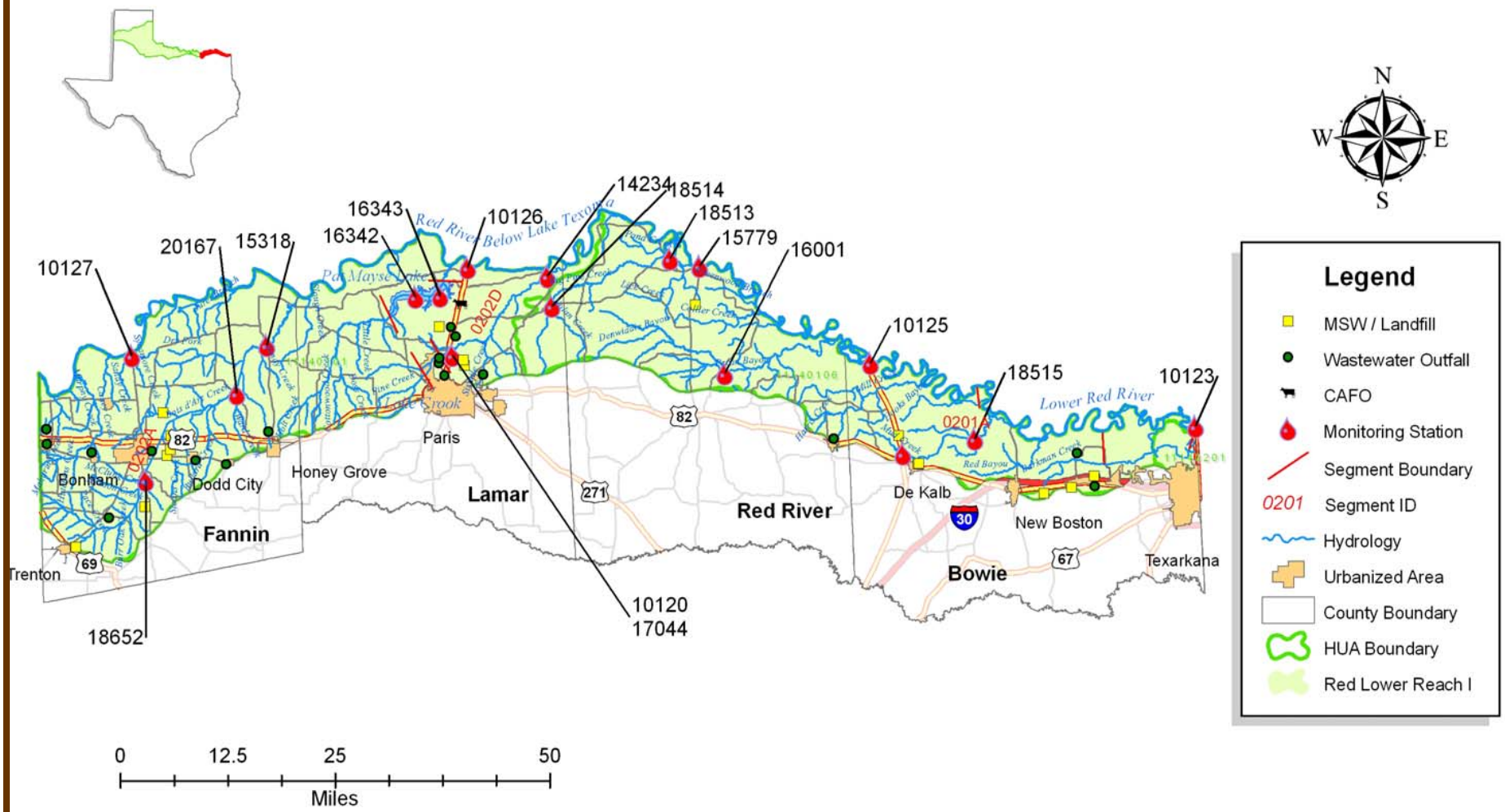


Red River Basin
Upper Reach I



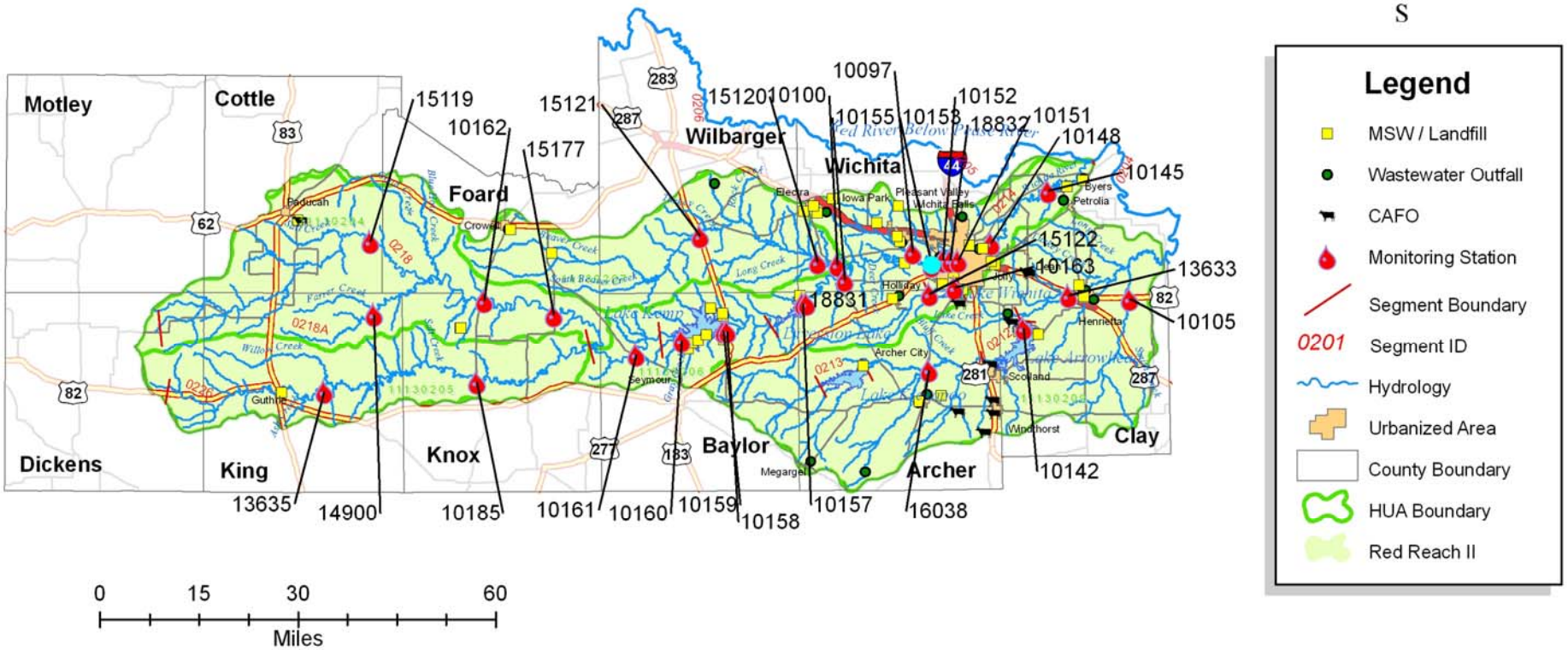
Red River Basin

Lower Reach I



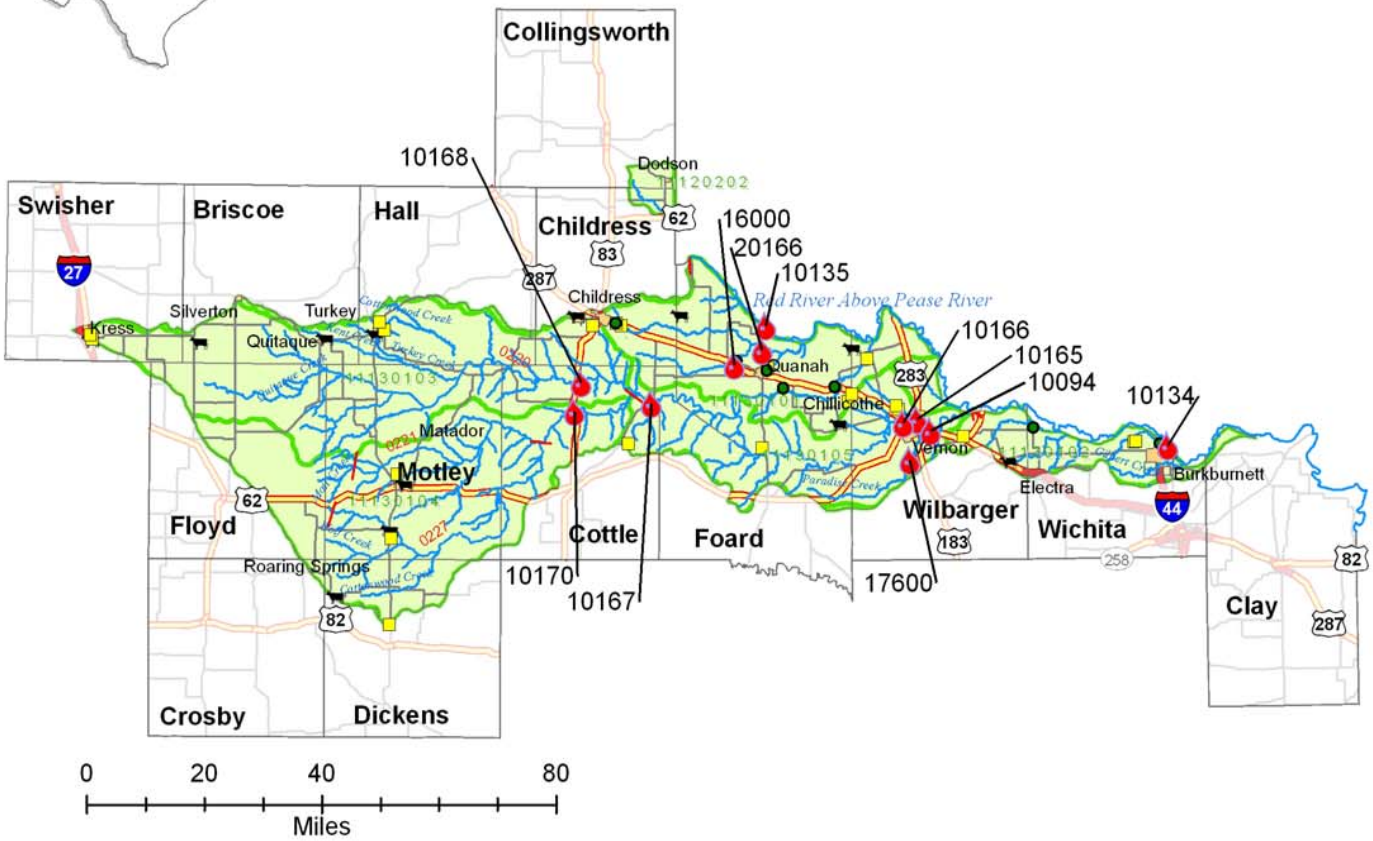
Red River Basin

Reach II



Red River Basin

Reach III



Legend

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- Wastewater Outfall
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- Monitoring Station
- Segment Boundary
- 0201 Segment ID
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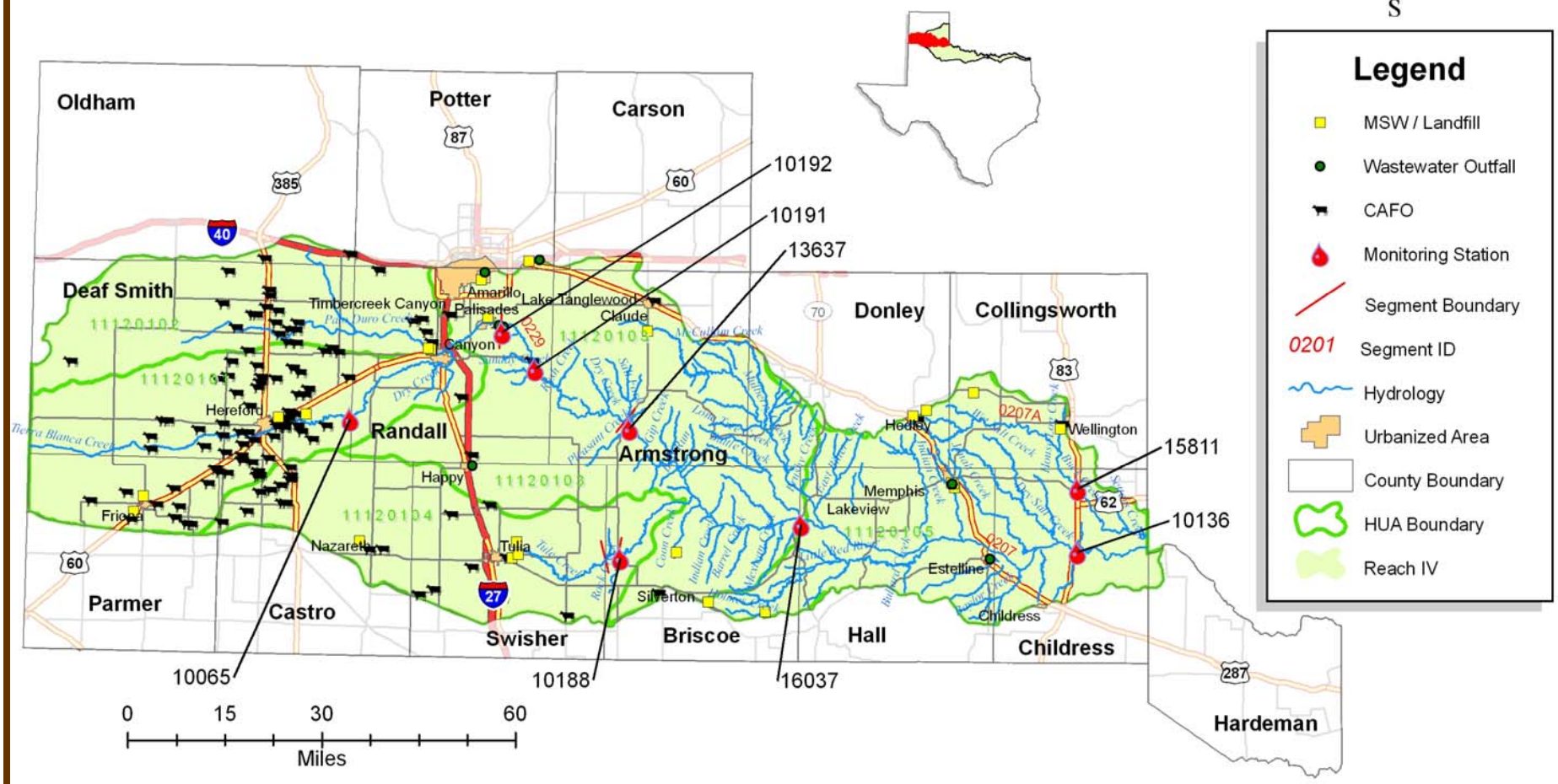
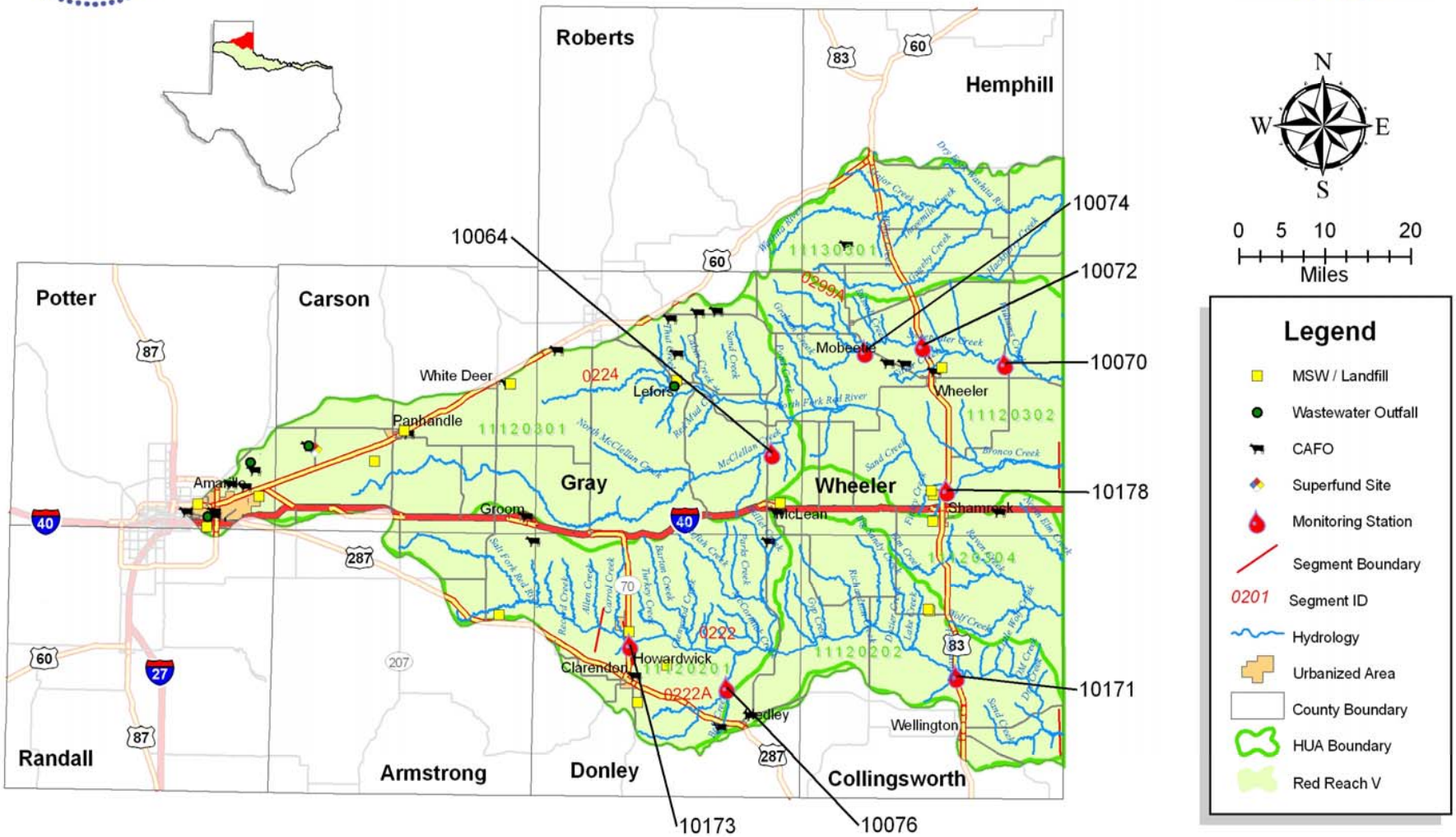
Red River Basin
Reach IV



Red River Basin

Reach V



FOR MORE INFORMATION

The Authority maintains a commitment to provide up-to-date scientifically correct information on its website at **www.rra.dst.tx.us**. The website provides information covering all aspects of the Authority's operations. An entire section of the website, accessible via the Water Resource Management tab, is devoted to the Texas Clean Rivers Program. This section provides quick and easy access to all publications, data and information relating to the Authority's participation in the project.

RED RIVER AUTHORITY OF TEXAS
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Canadian River at US 287