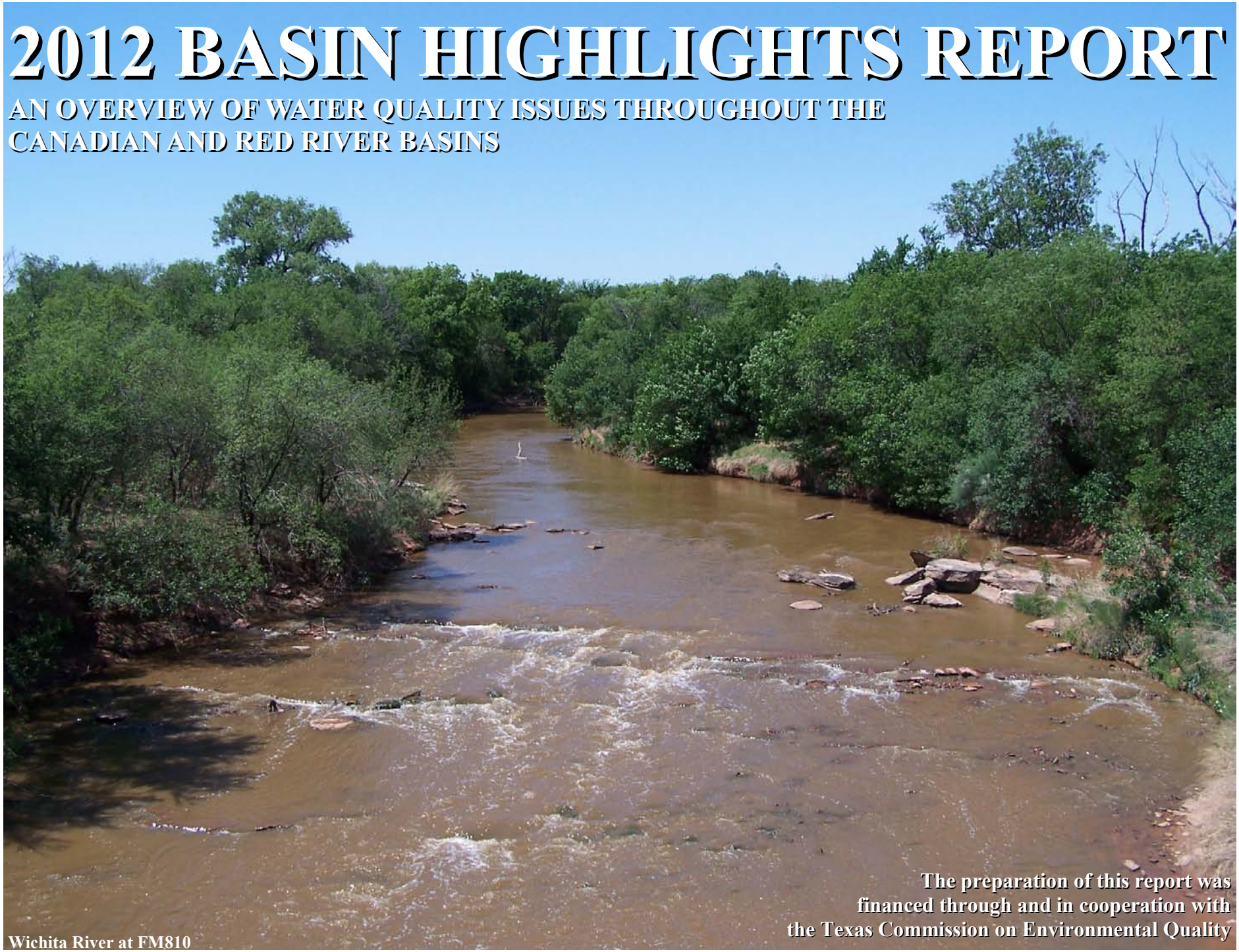
# 2012 BASIN HIGHLIGHTS REPORT

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



Wichita River at FM810

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Canadian River at SH70

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## INTRODUCTION

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 waterbody 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 report is 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.**

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 2010 through August 2011. The final 2010 TWQI or CWA Sections 305(b) and 303(d) Integrated Report has just recently been approved by the EPA and therefore was not applicable during this review period. This BHR is brief in its extent and focuses on waterbody 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**.

**Pecan Bayou at FM1159**

## WHAT IS WATER QUALITY AND HOW IS IT EVALUTED?

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 and municipal dischargers must seek permission from the TCEQ prior to discharging any treated effluent into a surface waterbody. 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 waterbody accepting the discharge. If, for example, a waterbody was classified as a drinking water source, the NPDES requirements would be much more stringent compared to a non-drinking water source.

The TCEQ evaluates the water quality of the state's water resources on a regular basis under provisions outlined in the CWA Section 305(b). These results are compiled and published by TCEQ through the TWQI 303(d) list. This publication has undergone several name changes over the years and is currently referred to as the TCEQ Integrated Report (IR), the most recent publication submitted to the Environmental Protection Agency (EPA) for approval in 2010. Under the CWA, the information within the IR is reassessed and resubmitted to the EPA for approval. Waterbodies that do not meet the criteria determined by TCEQ are identified with one of three classifications: impaired, having a concern for near non-attainment of standards, or concern for screening level violations. The following describes the classifications.

**Impaired (NS)** - parameter has exceeded water quality standard set by TCEQ. Once listed, this waterbody is scheduled for additional monitoring or a special study.

**Concern for Near Non-Attainment of Standards (CN)** - parameter is close to exceeding the water quality standard set by TCEQ. These sites require additional monitoring.

**Concern for Screening Level Violations (CS)** - Not all parameters have water quality standards, for example nutrients in streams. Instead, a narrative criteria exists. In cases where there is no segment-specific numeric criteria, TCEQ developed screening levels based on the 85th percentile of nutrient values in the Surface Water Quality Monitoring (SWQM) database. If a nutrient parameter exceeds this screening criteria more than 25% of the time, it is considered as having a CS.

LPDTF Red River at SH207

## DESCRIPTIONS OF WATER QUALITY PARAMETERS

### Field Parameters

Collected and processed in the field.

Conductivity (µS/cm) - A measure of the ability of a solution to carry an electrical current.

Dissolved Oxygen (mg/L) - or DO is 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 waterbody's ability to support desirable aquatic life.

Flow ($ft^3$/Sec)- the measure of the amount of water moving through a stream. This is one of the most important water quality parameters, as low flows can negatively impact biological systems and alter how point source inputs impact streams and subsequently, water quality.

pH (SU) - 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 waterbody is acidic, neutral, or basic. The pH of the water can affect the toxicity of many substances

Secchi Depth (ft) - 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 (°C) - The degree of hotness or coldness. Also, a measure of the average energy of the molecular motion in a water body or substance at a certain point.

### Conventional Parameters

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

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* (µg/L) - 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.

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 important plant nutrient.

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 concentrations, sulfate can affect drinking water quality.

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. and 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 Organic Carbon (TOC) - The amount of carbon bound in an organic compound and is often used as a non-specific indicator of water quality. TOC became a popular alternative to the traditional Biochemical Oxygen Demand (BOD) test since TOC measurements could be made much sooner than the five day incubation period required for BOD determinations.

Total Suspended Solids (TSS) - A measure of solids found in wastewater or in a stream, which can be removed by filtration. The origin of suspended matter may be manmade wastes or naturally occurring.

Volatile Suspended Solids (VSS) - The fraction of suspended solids (TSS) including volatile matter comprised of organic material and inorganic salts, that will ignite and burn away when heated. This provides an estimate of the organic matter within a waterbody.

**Bacteriological Parameters**

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

*E. coli* - The current indicator bacteria to determine if a waterbody is suitable for contact recreation. It is expressed in MPN (most probable number) per 100 mL of water. High results can indicate a potential pollution problem.

*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 waterbodies with high conductivity and salinity.

Fecal Coliforms (CFU) - 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 bacteria in water, beverages, or food is usually taken to indicate that the material is contaminated with solid human waste. Fecal coliform concentrations are expressed as number of colonies per 100 mL of sample.

## CHLORIDE CONTROL PROJECT

The Red River Chloride Control Project (CCP) is an ongoing project through the United States Army Corps of Engineers aimed at identifying and implementing preventative measures to reduce naturally occurring brine emissions into several watersheds within the Red River Basin. It has been estimated that roughly 3,450 tons of chlorides entered the Red River prior to the CCP, making the annual chloride load within the Red River greater than the amount of salt consumed by humans and animals within the United States annually. Successful removal of brine contaminants improves water quality for various uses including municipal, industrial and agricultural. Since its approval, the CCP has implemented various preventative structures at strategic project areas. Notable accomplishments include:

**Area V, Estelline Springs –** has prevented approximately 240 tons of brine per day from entering the Red River since January of 1964 bringing the year-to-date total to an estimated 4,292,400 tons.

**Area VIII, Bateman Pump Station –** has stopped approximately 165 tons per day from entering the Wichita River and subsequently the Red River since May of 1987, bringing the year-to-date total to an estimated 1,475,512 tons.

Lake Texoma at US377 Bridge

PDTF Red River at US83

## ZEBRA MUSSELS—BEWARE TEXAS BOATERS

On April 3, 2009 the first adult Zebra Mussel was found in Lake Texoma. Since then, numbers have continued to increase and there is now an established population within Lake Texoma. Since then, the Texas Parks and Wildlife Department (TPWD) and several other entities have feared the spread of the highly invasive mussel into other river basins, such as Lake Lavon via Sister Grove Creek, both of which are in the Trinity River Basin. Although Zebra Mussels have been found in Sister Grove Creek, there have currently been no sightings at Lake Lavon. TPWD has attempted to treat Sister Grove Creek with a commercial chemical, but this was determined to be relatively ineffective. As summer time approaches, it is more important than ever to know how to properly clean boats and other recreational watercraft operated in waters known to be infested with Zebra Mussels. To learn more about what you can do to help protect Texas lakes, visit:

**http://www.texasinvasives.org**

East Amarillo Creek at US287, October - 2010

East Amarillo Creek at US287, April - 2011

## DROUGHT

Texas has never been known for its annual rainfall, that is until recently when hardly any was received. Vast areas throughout the state are experiencing severe drought conditions and according to the State Climatologist, most of the state may not be out of the woods just yet.

Over the past year and a half, Texas has seen the ongoing impact of the drought throughout both the Canadian and Red River Basins. As flow continues to decline, concentrations of almost all water quality parameters have increased. While this is not necessarily a concern, as there is a justifiable reason for the increases seen statewide, it does not remediate the quality of our rivers, lakes and streams. Likewise, it does not negate the need for continued water quality monitoring.

As a result, several stakeholders raised concerns regarding how water quality data collected during this drought would impact future assessments. The main concern is that during the next assessment, and possibly some thereafter, data collected during the drought would begin to be incorporated into water quality assessments for the EPA. Since conditions during this time have concentrated certain parameters and are not truly representative of "normal" conditions, stakeholders were concerned that drought data could create several 303(d) listings.

In response, the TCEQ has cooperated with several Clean Rivers Program partners to develop an interim Drought Monitoring Guidance. The goal of this is to collect additional meta-data so that when data collected during this time period is assessed or reviewed in the future, values will be better understood making for a more viable assessment overall. The Authority has worked closely with the TCEQ throughout this process and has implemented these procedures into all routine monitoring activities.

East Amarillo Creek at US287, January - 2011

East Amarillo Creek at US287, July - 2011

## NUTRIENT CRITERIA

Traditionally, nutrients have been assessed with narrative criteria and screening levels. The submission of the 2010 Integrated Report (IR) to the Environmental Protection Agency (EPA) is the first time the TCEQ has proposed adding numeric nutrient criteria for surface waterbodies. In all, numeric chlorophyll-*a* criteria was created for approximately seventy-five (75) reservoirs throughout the state. The next step will be to establish criteria for the remaining reservoirs and then streams.

One of the biggest obstacles the TCEQ will have to overcome is to determine just how they will create *water quality standards* for nutrients. This topic has been very hot lately due to the implications it has on both municipalities, industries and potentially any permitted discharger. Once a method is determined, regulators will need to work with permittees, laboratories and stakeholders to determine what limits are actually achievable. Cooperation and communication between several parties will be critical in years to come.

Several work groups have been assembled by interested parties to ensure that all needs are met when numeric nutrient criteria becomes effective in the future. The Authority has been very involved in several of these groups to ensure the best interests of both the Canadian and Red River Basins are taken into consideration throughout this process.

Wolf Creek at FM1454

## WATER QUALITY ASSESSMENT OVERVIEW

New for the 2012 Canadian and Red River Basin Highlights Report is the implementation of a visual water quality indicator when browsing through the report. The goal of this new feature is to provide a rapid visual indicator of the overall condition of each impaired classified segment in both the Canadian and Red River Basins.

When reading through the specific waterbody information presented over the next several pages of this year's report, please remember that this data is merely a snapshot of a waterbody, and that the overall health can and does vary tremendously over the course of weeks, months, and years. Equally important is to keep in mind that while two classified segments may receive the same rank, this does not mean that they have similar impairments or concerns. Rankings are solely based on the frequency of impairments (NS), concerns for screening levels (CS), concerns for near non-attainment (CN), or a combination thereof.

| RANK | NS | CS | CN | DESCRIPTION |
|---|---|---|---|---|
| 💧💧💧💧💧 | 0 | 0 | 0 | Waterbody has no impairments or concerns |
| 💧💧💧💧 | 0 | 1 | 0 | Waterbody has one concern for screening levels |
| | 0 | 0 | 1 | Waterbody has one concern for near non-attainment of water quality standard |
| 💧💧💧 | 1 | 0 | 0 | Waterbody has one impairment |
| | 0 | >1 | 0 | Waterbody has more than one concern for screening levels |
| | 0 | 0 | >1 | Waterbody has more than one concern for near non-attainment of water quality standard |
| | 0 | 1 | 1 | Waterbody has one concern for both screening levels and near non-attainment of water quality standard |
| 💧💧 | >1 | 0 | 0 | Waterbody has more than one impairment but no concerns |
| | 1 | ≥1 | 0 | Waterbody has a single impairment and concern for screening levels |
| | 1 | 0 | ≥1 | Waterbody has a single impairment and a concern for near non-attainment of water quality standard |
| | 0 | >1 | >1 | Waterbody has no impairments but more than one concern for both screening levels and near non-attainment of water quality standard |
| 💧 | ≥1 | ≥1 | ≥1 | Waterbody has one or more impairments and multiple listings for both concerns for screening levels and near non-attainment of water quality standard |

## CANADIAN RIVER BASIN

### REACH I (Refer to map on page 23)

**Canadian River Below Lake Meredith (Segment 0101)** ♦♦♦♦
The Canadian River Below Lake Meredith has a concern for ammonia. At this time, a potential source has not been identified.

**Dixon Creek (Segment 0101A)** ♦
This sub-segment appears on the 2008 303(d) list for both bacteria and low dissolved oxygen impairments. There are also concerns for orthophosphorus, chlorophyll-*a* and nitrate. Plagued by low flows, Dixon Creek is often divided into two major pools and seldom has consistent flow. The area ranges drastically from underdeveloped to moderately developed with both agricultural and industrial uses. Increased nutrient input is most likely the cause for chlorophyll-*a* and bacteria levels. Both algal and bacteriological presence could potentially be the reason behind the low dissolved oxygen levels. Additional monitoring and 24-hour dissolved oxygen measurements will be needed for future assessments.

**Rock Creek (Segment 0101B)** ♦♦
Rock Creek is listed for a bacteria impairment and has a concern for nitrate. Rock Creek is primarily effluent dominated and is prone to low flow, as the area experiences little annual rainfall. Runoff from rainfall events is a likely contributor to the elevated bacteria levels that have been observed at the site. Potential point source contributors to the nitrate levels include both permitted discharges, as well as storm water and urban runoff.

### REACH II (Refer to map on page 24)

**Lake Meredith (Segment 0102)** ♦
Lake Meredith has impairments for chloride, mercury in edible fish tissue, sulfate and total dissolved solids (TDS). Currently, this area of northwestern Texas is in the midst of an ongoing drought with no end in site. As it stands, the Canadian River Municipal Water Authority (CRMWA) has already ceased removing water from Lake Meredith and switched almost entirely to groundwater as their primary source for drinking water. Elevated chloride and sulfate levels contribute to the TDS impairment. While the region upstream of Lake Meredith has naturally occurring salt deposits, which account for a majority of the "salt" influx, the onset of salt cedar over the past forty years has not helped matters. CRMWA has an ongoing project to control salt cedar within the watershed. However, the continuation of the drought and little annual rainfall have made it difficult to determine the project's effectiveness. The TCEQ is currently reviewing the listing for mercury in edible fish tissue and will most likely address this through Watershed Action Planning (WAP). The Authority has been heavily involved with both TCEQ and the Texas State Soil and Water Conservation Board (TSSWCB) throughout the WAP process thus far with the hope for reevaluation before the next assessment.

**Canadian River Above Lake Meredith (Segment 0103)** ♦♦♦
The Canadian River Above Lake Meredith is listed for a chloride impairment. This can be attributed primarily to naturally occurring salt deposits, although the ever increasing abundance of salt cedar along the segment has not helped matters. Salt cedar is an invasive plant that harms waterbodies in two ways. Not only does the plant remove water from the stream, it deposits salt around itself to deter other plants from using the available resources. These salt deposits are then transferred into the stream contributing to the elevated chloride levels. The CRMWA is currently administering a salt cedar control project to combat the issue. However, low annual rainfall has compounded the problem and conditions are unlikely to improve until ample annual rainfall returns to the area.

**East Amarillo Creek (Segment 0103A)** ♦♦♦
This sub-segment has no impairments but does have concerns for both chlorophyll-*a* and nitrate. East Amarillo Creek is heavily influenced by stormwater runoff from the City of Amarillo, treated wastewater effluent, and agricultural runoff. Nutrient rich runoff and wastewater effluent are most likely the source of the nitrate, which is classified as a nutrient, and possibly the culprit for the elevated chlorophyll-*a* levels that led to the concern. It is also very

likely that since a significant portion of the stream travels through unpopulated cropland, that wildlife have a significant impact on the water quality within Segment 0103A, as well.

**REACH III (Refer to map on page 25)**

**Rita Blanca Lake (Segment 0105) ♦♦**

Rita Blanca Lake appears on the 2008 303(d) List for a pH impairment, the only one in either basin. There are also concerns for chlorophyll-*a*, orthophosphorus, ammonia and total phosphorus. Rita Blanca has been a well-known migratory bird refuge, hence the nutrient related problems that have plagued the lake for several assessments. Low annual rainfall and inflow of water into the lake make for a low lake turnover rate. This, coupled with the high volume of wildlife present year-round, are the primary source of its listings.

**REACH IV (Refer to map on page 26)**

**Palo Duro Reservoir (Segment 0199A) ♦♦**

Palo Duro Reservoir is listed on the 2008 303(d) list for having low dissolved oxygen. There is also a concern for ammonia. The reservoir is still relatively new (impounded in 1991) and is subject to turbid conditions. Low annual rainfall have resulted in low reservoir levels, which can be associated with the observed low dissolved oxygen levels and high ammonia concentrations.

**REACH V (Refer to map on page 27)**

**Wolf Creek (Segment 0104) ♦♦♦♦**

Wolf Creek primarily travels through rural land dominated by agricultural related uses. Wolf Creek has a single concern for chlorophyll-*a*. Since the area receives little annual rainfall and has no known inflows from permitted dischargers, the creek maintains a very low flow throughout the year. With the ongoing drought, the creek has been dry during monitoring events. A possible explanation for the elevated chlorophyll-*a* is that during rainfall events, nutrient-rich runoff from agricultural operations creates an environment well-suited for algae, leading to increased concentrations when water is present.

Unnamed Tributary of West Amarillo Creek

## RED RIVER BASIN

### REACH I LOWER (Refer to map on page 28)

**Lower Red River (Segment 0201)** ♦♦♦♦
Like the other Red River segments (0202, 0203, 0204 and 0205), the Lower Red River is listed with a single concern for chlorophyll-*a*. While the exact source is unknown, it is likely influenced by segments preceding it to the west. Information from the Oklahoma Department on Environmental Quality could also help determine whether or not there are influences from Oklahoma tributaries.

**Mud Creek (Segment 0201A)** ♦
Mud Creek is listed on the 2008 303(d) list for both bacteria and low dissolved oxygen. Chlorophyll-*a* is listed as a concern. The Authority has monitored Mud Creek in the past in an attempt to isolate the source of bacteria with unsuccessful results. This is primarily due to the fact that much of the creek runs through privately owned property and the creek itself is plagued with beaver dams that prevent consistent flow. Low or no flow, coupled with agricultural nutrient-rich runoff, create an environment favorable for bacterial growth. Until adequate, consistent flow can be restored, it is unlikely that water quality will improve in this sub-segment.

**Red River Below Lake Texoma (Segment 0202)** ♦♦♦♦
A single concern for chlorophyll-*a* is currently the only issue with the Red River Below Lake Texoma. All segments above Segment 0202 (Red River Below Pease River - 0205, Red River Above Lake Texoma - 0204 and Lake Texoma - 0203) and several sub-segments also have a concern for chlorophyll-*a*. This being said, it is not surprising to see this trend continue westward through the basin.

**Pecan Bayou (Segment 0202C)** ♦♦♦♦
Pecan Bayou is an unclassified sub-segment listed for a chlorophyll-*a* concern. Pecan Bayou has little to no flow, although water is always present during monitoring events. The sub-segment travels through undisturbed, privately owned countryside for most of its length. The source of chlorophyll-*a* is currently unknown, although it is likely a combination of low flow and available nutrients.

**Pine Creek (Segment 0202D)** ♦♦♦
Pine Creek is a sub-segment of the Red River Below Lake Texoma, listed with concerns for orthophosphorus and chlorophyll-*a*. Pine Creek flows east through the northern part of Paris, Texas and joins with Smith Creek before entering the Red River. Flow has not been observed by Authority staff during routine monitoring events. Since there is no flow, it is possible that influence from the nutrient rich Smith Creek segment is promoting algal growth, leading to elevated chlorophyll-*a* levels as well as contributing to the concerns for orthophosphorus.

**Smith Creek (Segment 0202G)** ♦
Smith Creek is listed on the 2008 303(d) list for a bacteria impairment, along with concerns for low dissolved oxygen, ammonia, orthophosphorus and total phosphorus. Smith Creek is considered to be a perennial stream due to the significant effluent contributions of a permitted discharger. As a primarily effluent dominated stream, the creek characteristically has elevated nutrient levels (concerns). Although portions of the creek and several small tributaries in the upstream portion of the segment may influence the lower portion of the segment, current monitoring efforts have yet to find elevated bacteria levels there. It has been hypothesized that during heavy rainfall events, significant urban runoff does influence bacteria loading downstream, however this has not been proven. Additional monitoring to determine where nutrient levels are highest may be beneficial for future assessments and help lead toward the remediation of Smith Creek. Two additional monitoring stations have been added and are currently being monitored in FY-2012.

**Pat Mayse Lake (Segment 0209)** ♦♦♦♦
Pat Mayse Lake has a single concern for manganese in sediment. This is currently being monitored and evaluated by TCEQ regional staff.

### REACH I UPPER (Refer to map on page 29)

**Choctaw Creek (Segment 0202F)** ♦♦♦
Choctaw Creek is located in a semi-urbanized area of Grayson county. There are concerns for both nitrate and orthophosphorus.

This could be related to urban runoff and/or influenced from Post Oak Creek. Additional monitoring will help identify potential sources.

**Lake Texoma (Segment 0203) ♦♦♦**
Lake Texoma has no current impairments, but is host to several concerns including chlorophyll-*a* and orthophosphorus. Additionally, total dissolved solids (TDS) and chloride in finished drinking water are concerns. Chlorophyll-*a* concentrations observed during routine monitoring are most likely influenced by segments upstream, which also have similar concerns. The same can be said with regard to the "salt" problem seen within the segment. Ongoing efforts to reduce "salts" from entering the Red River, and subsequently Lake Texoma, are spearheaded by the efforts of the Chloride Control Project (CCP). Continued implementation of CCP project areas will hopefully reduce and remove the concern for chloride in finished drinking water, which may lower TDS concentrations as well.

**Big Mineral Creek (Segment 0203A) ♦♦♦**
Big Mineral Creek influences Lake Texoma and was found to have no impairments when assessed with the 2008 TWQI. The segment does have a concern for ammonia and orthophosphorus. The source of this contamination is unknown at this time.

**Red River Above Lake Texoma (Segment 0204) ♦♦♦**
The Red River Above Lake Texoma has concerns for both bacteria and chlorophyll-*a*. It is difficult to identify a single source of either concern considering how many tributaries flow into segment 0204 from both the Texas and Oklahoma side of the Red River. One possibility is the influence from such tributaries. Another may coincide with the shear amount of agricultural runoff that the Red River and its tributaries receive. Nutrient-rich agricultural runoff would promote both bacteria and chlorophyll-*a* within the waterbody. Increased monitoring of tributaries along with a push to receive and review data from the Oklahoma Department on Environmental Quality may shed light on problematic areas. Once identified, remediation efforts can take place, leading to a reduction in the bacterial and nutrient load this segment receives.

**REACH II (Refer to map on page 30)**

**Little Wichita River (Segment 0211) ♦♦**
A low dissolved oxygen impairment has plagued this segment since 1996. There is also a concern for chlorophyll-*a*. Recent trend analysis has revealed an increase in both sulfate and total dissolved solids (TDS) concentrations which will likely lead to a 303(d) listing with the approval of the 2010 IR. While portions of the Wichita River are heavily impacted by naturally occurring salt deposits, it is suspected that antiquated oilfield activities may be to blame for the elevated values seen in the eastern portions of the Little Wichita River. Additional monitoring to determine if such influence exists is a possibility in the future.

**Lake Arrowhead (Segment 0212) ♦♦♦**
Lake Arrowhead has no impairments but does maintain concerns for both ortho and total phosphorus. This is likely due to influence from waterbodies high in nutrients flowing into the lake. Chlorophyll-*a* concentrations are relatively low, although they are being monitored closely since nutrients are of concern within the segment.

**Wichita River Below Lake Diversion Dam (Segment 0214) ♦♦**
The Wichita River below Lake Diversion Dam has been listed for a bacteria impairment since 2006. While there is no bacteria impairment for Lake Diversion, there are bacteriological impairments on Segment 0214A (Beaver Creek) and will most likely be on Segment 0214B (Buffalo Creek), both of which have confluences with Segment 0214. The Wichita River Below Lake Diversion Dam also has concerns for chlorophyll-*a*, nitrate, and both ortho and total phosphorus. These can also be attributed to the two sub-segments, as well as agricultural run-off from the countryside it travels through before entering the City of Wichita Falls.

**Beaver Creek (Segment 0214A) ♦♦**
Beaver Creek is listed for a bacteria impairment, along with concerns for both chlorophyll-*a* and low dissolved oxygen. The creek flows primarily through uninhabited countryside used for agricultural purposes. Nutrient-rich runoff may contribute to the elevated

Smith Creek at Loop 286 in Paris, Texas

chlorophyll-*a* values observed during routine monitoring. While the cause for the observed low dissolved oxygen levels is unknown, it could potentially be drought-related. This may require 24-hour dissolved oxygen measurements to make a better determination.

**Wichita/North Fork Wichita River (Segment 0218 ) ♦♦♦♦♦**
Currently, there are no 303(d) impairments or concerns for this segment.

**Middle Fork Wichita River (Segment 0218A) ♦♦♦♦♦**
Currently, there are no 303(d) impairments or concerns for this segment.

**Lake Wichita (Segment 0219) ♦♦♦**
Lake Wichita currently has no impairments, but is listed with concerns for both ortho and total phosphorus, in addition to chlorophyll-*a*. In years past, Lake Wichita has been a great place for locals to enjoy several forms of primary contact recreation. However, past flood control issues led to a dam modification that has reduced the turnover rate of the lake significantly. This has led to continuous siltation of Lake Wichita, leading to depths as shallow as four feet in several areas, including mid-lake. Low turnover and influence from nutrient rich waters entering the stream have paved the way for extremely elevated chlorophyll-*a* values. While Lake Wichita did not have adequate data to receive preliminary chlorophyll-*a* criteria from TCEQ, monitoring has been increased and the segment will most likely be listed during the next assessment. Until the siltation has been addressed and the turnover rate can be shortened, it is unlikely that chlorophyll-*a* and nutrient issues will cease. One issue that has been discussed in the past was the potential dredging of Lake Wichita to remove the influx of silt and regain substantial depth throughout the lake. However, the cost to accomplish this would be extremely high. Currently, there are no plans to proceed with this project and no alternatives have been proposed. Golden Algae is also a problem. In 2009, a large bloom resulted in a massive fish kill estimated at over 200,000, which included some fish species that had not been observed in previous counts. There was also a documented case of golden algae in January of 2012.

Choctaw Creek at US 82

**South Fork Wichita River (Segment 0226)** ♦♦

Like other portions of the Wichita River, Segment 0226 is listed for a chloride impairment (all assessment units show impairments) with a concern for ammonia. The elevated chloride concentrations can be attributed to naturally occurring salt deposits within the area. It is the goal of the Chloride Control Project (CCP) to remediate these areas by diverting high saline waters to the Truscott Brine Reservoir. While several areas of the project remain incomplete, hopefully their completion will lead to lower concentrations in the future. While there is no known point source identified for the ammonia within the segment, it is most likely a combination of runoff originating from the predominantly agricultural countryside it flows through and the rivers use by various types of wildlife throughout the segment.

**REACH III (Refer to map on page 31)**

**Red River Below Pease River (Segment 0205)** ♦♦♦

Like the other Red River Segments (0201, 0202, 0203, and 0204), the Red River Below Pease River is troubled with a concern for chlorophyll-*a*. Additionally, like its counterparts, the most likely causes stem from runoff along the banks of the Red River and its several tributaries. There is also a concern for bacteria. Information regarding impairments and concerns from tributaries originating in Oklahoma could be beneficial when determining the best method for remediating this portion, along with other segments of the Red River.

**South Groesbeck Creek (Segment 0206B)** ♦

South Groesbeck Creek is a slow-moving stream that travels through privately owned property used for agricultural purposes. The segment is listed with a bacteria impairment and a concern for nitrate. A chlorophyll-*a* concern will likely accompany these with the approval of the 2010 Integrated Report. The likely culprit for these water quality issues is runoff occurring along the segment. Low flow allows the concentrations of these constituents to concentrate throughout the segment. Additional monitoring at various locations along South Groesbeck Creek will be required to determine if this is the case.

**Paradise Creek (Segment 0230A)** ♦♦
This sub-segment is listed with an impairment for bacteria and concerns for both chlorophyll-*a* and nitrate. This can be attributed to two main factors. During much of 2010 and 2011, north Texas, like most of the state, experienced and is still experiencing varying degrees of drought leading to decreased flow. This segment also has varying degrees of development and is influenced by both urban and agricultural runoff. Thus, when rainfall occurs, nutrient and bacteria rich runoff significantly impacts the stream leading to high bacteria values and a water column loaded with nutrients beneficial to algal growth. The return of constant flow may remediate some of these issues.

**REACH IV (Refer to map on Page 32)**

**Lower Prairie Dog Town Fork Red River (Segment 0207)** ♦♦
The Lower Prairie Dog Town Fork (LPDTF) is listed for a bacteriological impairment, along with concerns for chlorophyll-*a* and orthophosphorus. LPDTF is plagued by extremely low flows and high salt interferences. When there is rainfall in the area, the stream is inundated with runoff from the vast expanses of agricultural land it meanders through. A change in indicator bacteria, from *E. coli* to *Enterococcus*, may yield information beneficial to determining actual bacteria concentrations. The Authority's Environmental Laboratory is currently seeking accreditation from the TCEQ to test for *Enterococcus*.

**Buck Creek (Segment 0207A)** ♦♦
Buck Creek was listed during the 2008 assessment for bacteria with a concern for nitrate. The Buck Creek Project, administered by the Texas*AgriLife* office in Vernon, Texas has worked extensively on this segment. Under the direction of Ms. Phyllis Dyer and the hard work of several analysts and interested stakeholders, the study has been completed and a Watershed Protection Plan is being developed. Buck Creek will be removed from the 303(d) list when the 2010 IR has been approved by the EPA. The concern for nitrate is also being investigated by the Texas*AgriLife* office in Vernon. Since groundwater concentrations are some of the highest median values in the state, there is a possibility that naturally occurring springs may contribute to elevated surface water concentrations. This has been proposed for study in the future.

**Upper Prairie Dog Town Fork Red River (Segment 0229)** ♦♦
The Upper Prairie Dog Town Fork Red River (UPDTF) has a pH impairment, along with several concerns including chlorophyll-*a*, nitrate, and both ortho and total phosphorus. At this time, a source for the pH impairment has not been identified. However, there may be an explanation for the origin of the concerns. UPDTF joins with Lake Tanglewood (Segment 0229A), which shares identical concerns. It is likely that improvements in Segment 0229A will lead to similar results on Segment 0229. Additional monitoring around Lake Tanglewood may be beneficial and a more effective monitoring strategy for both segments.

**Lake Tanglewood (Segment 0229A)** ♦♦♦
A sub-segment of the Upper Prairie Dog Town Fork of the Red River, Lake Tanglewood has no impairments but does have concerns for chlorophyll-*a*, nitrate, and both ortho and total phosphorus. Although a point source has not been identified, research does indicate that the community was constructed before current standards for septic systems were in place. It is a possibility that some antiquated septic practices are now failing and contributing to the concerns listed. Additional research and monitoring will be required to identify a source before remediation can occur.

**REACH V (Refer to map on page 33)**

**Sweetwater Creek (Segment 0299A)** ♦♦♦
Sweetwater Creek has a single bacteria impairment with no concerns. This creek primarily flows through privately owned countryside used for varying degrees of agricultural production. There is little to no influence from industry or urbanized areas. Low flow, runoff, and abundant wildlife are the most likely sources of bacteria. Additional monitoring may be required to better isolate a potential source of bacteria within this segment. This consideration may be considered during our 2012 Coordinated Monitoring Meeting.

## PUBLIC INVOLVEMENT AND OTHER INFORMATION

### 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 1998, the Authority has provided this curriculum to over 10,000 students in the Canadian and Red River Basins.

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. The Environmental Services Division has worked with Midwestern State University to allow students to work within the ESD to complete a mandatory internship all environmental science majors must complete. The rigorous 150 hour internship allows students to work within the laboratory and test their analytical skills while learning about environmental testing. Since the Authority has begun hosting interns for Midwestern State, it is proud to say that each and every intern hosted has gone on to pursue a career in the field of environmental science.

Wichita River at FM368

## COORDINATION AND 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, the North Texas Municipal Water District 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.

## WATERSHED ACTION PLANNING (WAP)

The Watershed Action Planning (WAP) process is a new tool to help coordinate, document and track progress on the state's water quality initiatives. This tool was created with three objectives in mind:

1. Engage stakeholders more fully in determining strategies that restore water quality;
2. Improve access to state agencies' water quality management decisions and increase transparency of decision-making;
3. Improve accountability of state agencies' commitments to improve water quality.

Currently, the Authority is planning to implement WAP activities into its Coordinated Monitoring Meetings.

## ENVIRONMENTAL SERVICES LABORATORY

The Authority's laboratory achieved official NELAC accreditation in 2008. This insures that all samples tested comply with national standards of acceptance. NELAC quality assured data is used by the TCEQ in developing and revising water quality standards. Since the laboratory's initial accreditation, it has been audited by TCEQ in 2010 and is scheduled for another audit in 2012. The Authority's laboratory is currently accredited to perform analyses in both drinking and wastewater matrices, as well as solids.

The Authority's laboratory participated in an Extended Holding Time Study for *E. coli* Bacteria in the spring and summer of 2009. It is also currently involved with another *E. coli* Bacteria Extended Holding Time Study with the TCEQ. The aim of the on-going project is to help regulators determine the effects of an extended holding time when making quantitative determinations of indicator bacteria like *E. coli*. Extended holding times are occasionally used during surface water quality monitoring events since it is not always feasible to return samples to the laboratory and meet the required eight (8) hour holding time. This study is currently underway.

## 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*. 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.

- 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 funding and completion so that previously unusable water sources can be utilized without excessive treatment costs.
- Promote the new Watershed Action Planning (WAP) tool at meetings to help engage and encourage public participation within the Canadian and Red River Basin.

**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.
- 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.
- Continue to participate in local initiatives, such as the annual Earth Day Program, to help garner the interest of children in an effort to promote water conservation and stewardship of water quality resources within both the Canadian and Red River Basins.

**Analytical**

- Continue to work with TCEQ and other CRP partners to develop methodologies that support reducing the percentages of "censored" data submitted to TCEQ's Surface Water Quality Monitoring Database (SWQMIS) by researching methodologies to lower program Ambient Water Reporting Limits (AWRLs).
- 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 including total kjeldahl nitrogen (TKN), nitrate+nitrite, chlorophyll-*a* and so on.

**Rock Creek at Electric City Bridge**

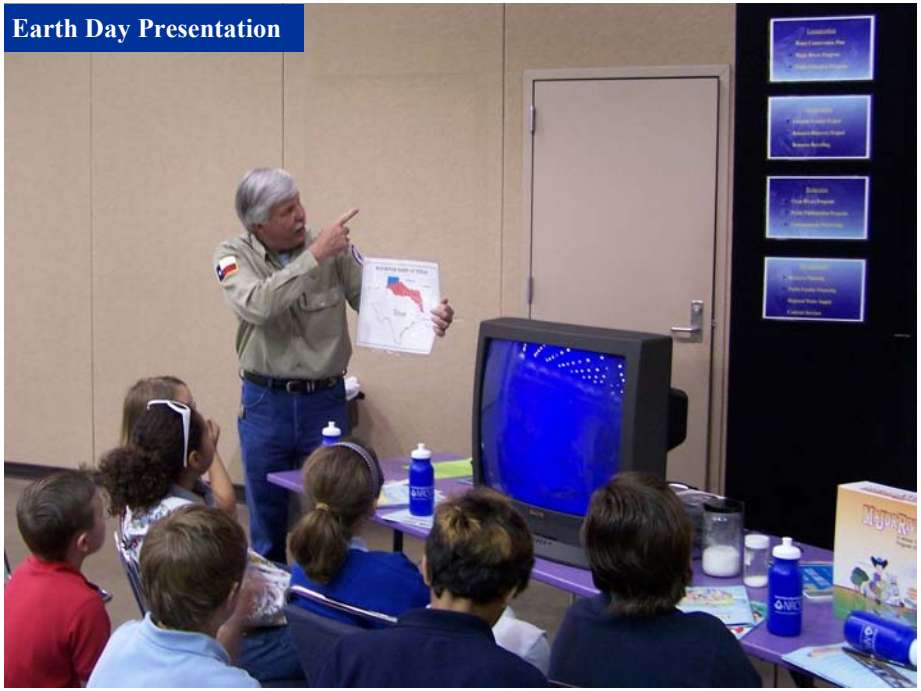
- Continue to work with the TCEQ on the newly accepted drought monitoring guidance to improve the amount and quality of metadata associated with water quality data.

**Standards**

- Continue to support the development of new standards, such as those seen in the new 2010 Texas Surface Water Quality Standards, that more accurately define criteria for contact recreation.
- Continue to support the development of achievable numeric nutrient criteria that encompasses the best interests of both the stakeholders and permittees, as well as the TCEQ.

**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 gather new information regarding invasive plant and animal species, such as Salt Cedar and the Zebra Mussels. Promote increased monitoring and remediation efforts to reduce the transfer and spread of invasive plant and animal species throughout Texas.

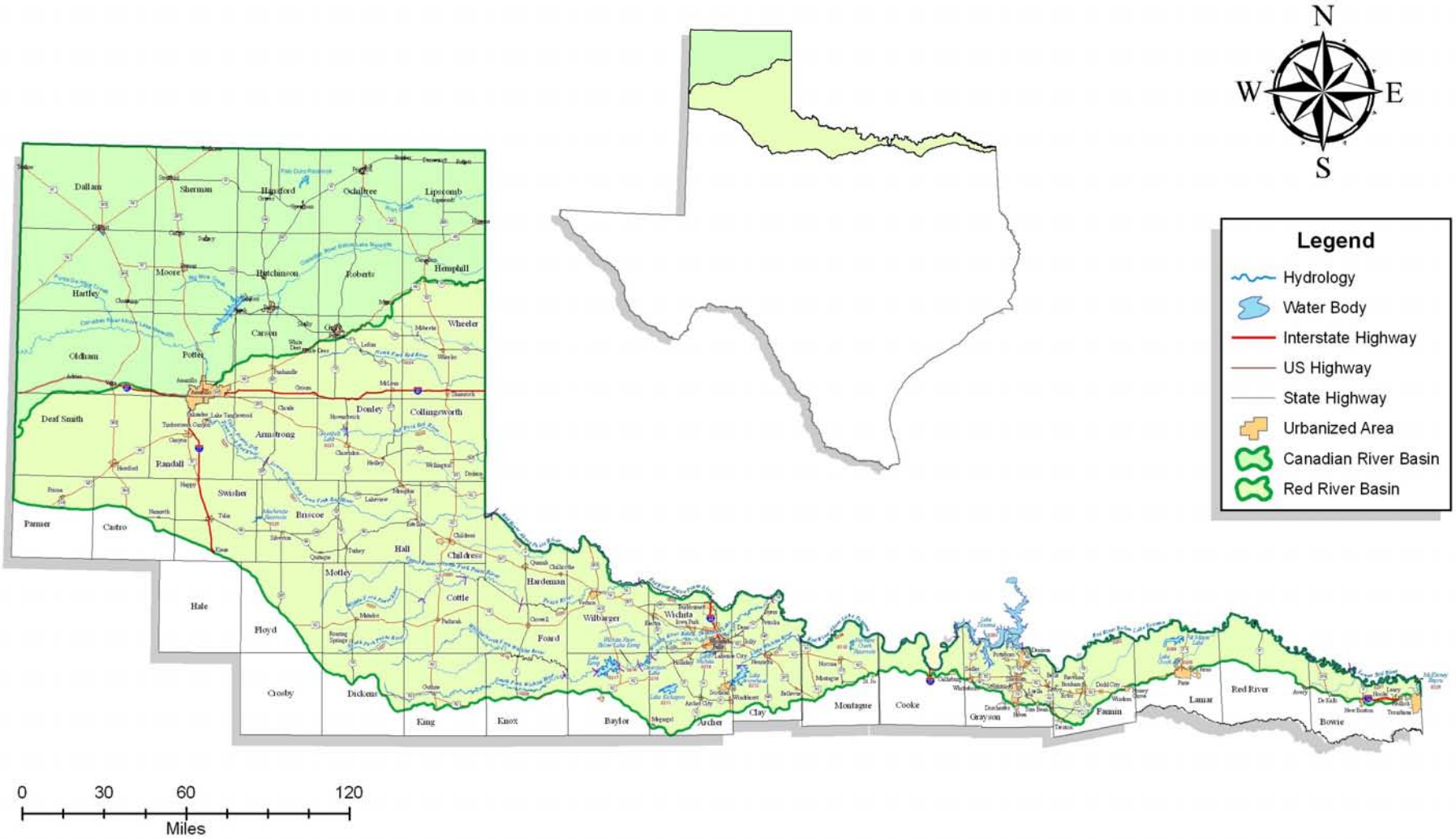


Earth Day Presentation

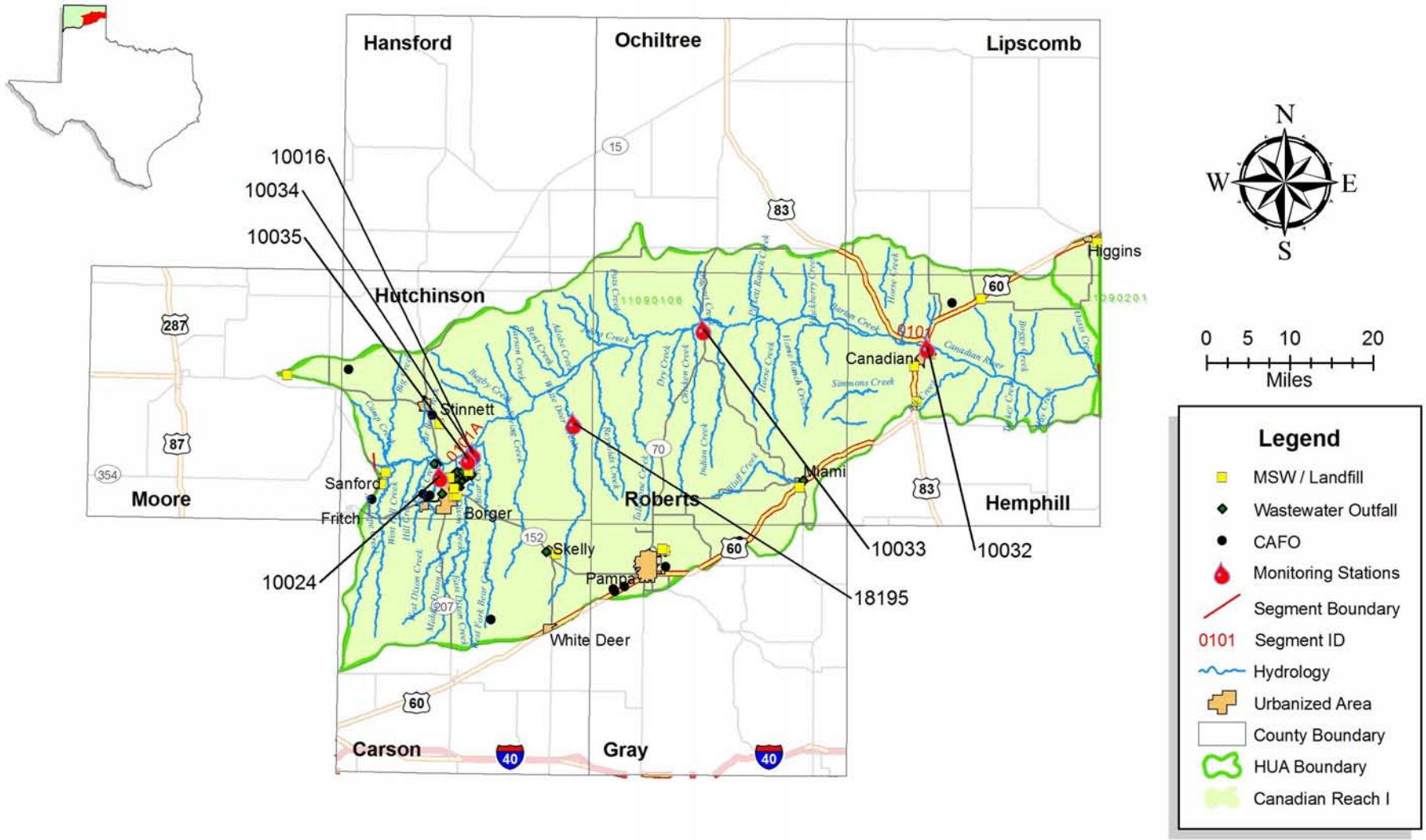
Coordinated Monitoring Meeting

# Red and Canadian River Basins

# Vicinity Map



# Canadian River Basin
# Reach I



# Canadian River Basin

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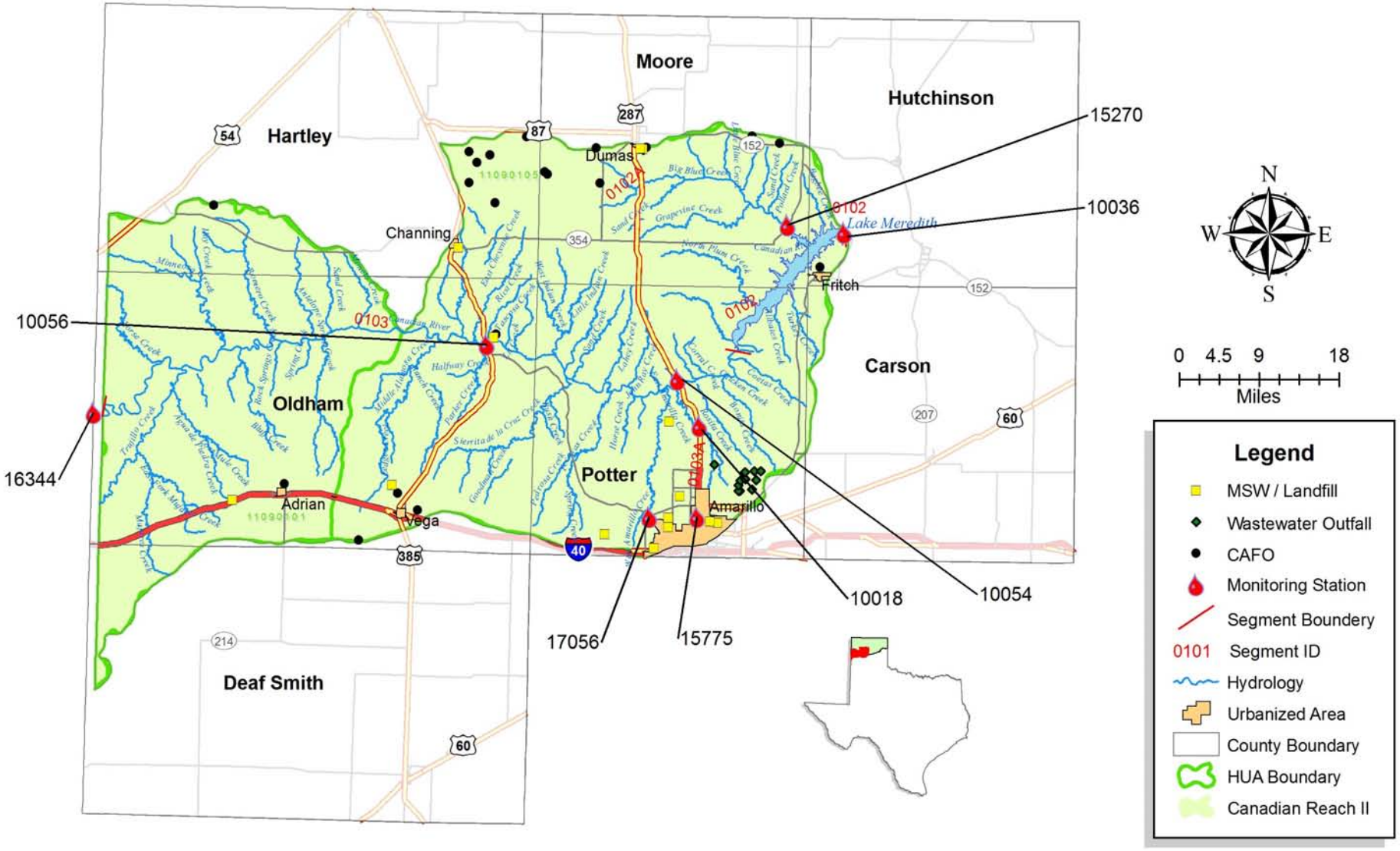

# Canadian River Basin

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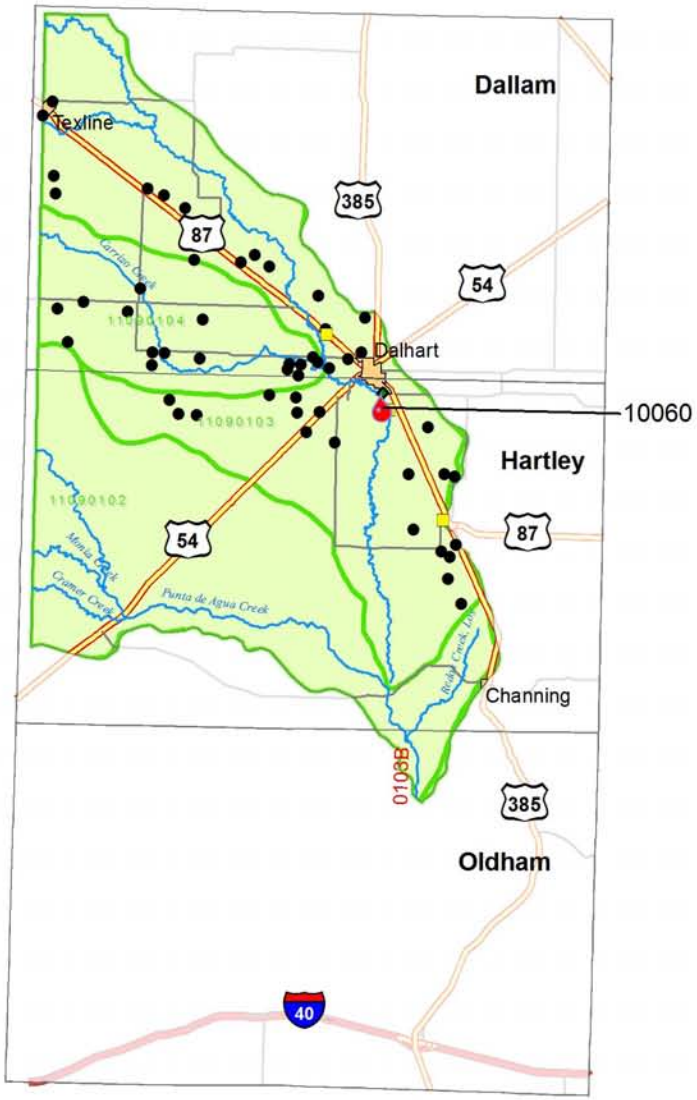
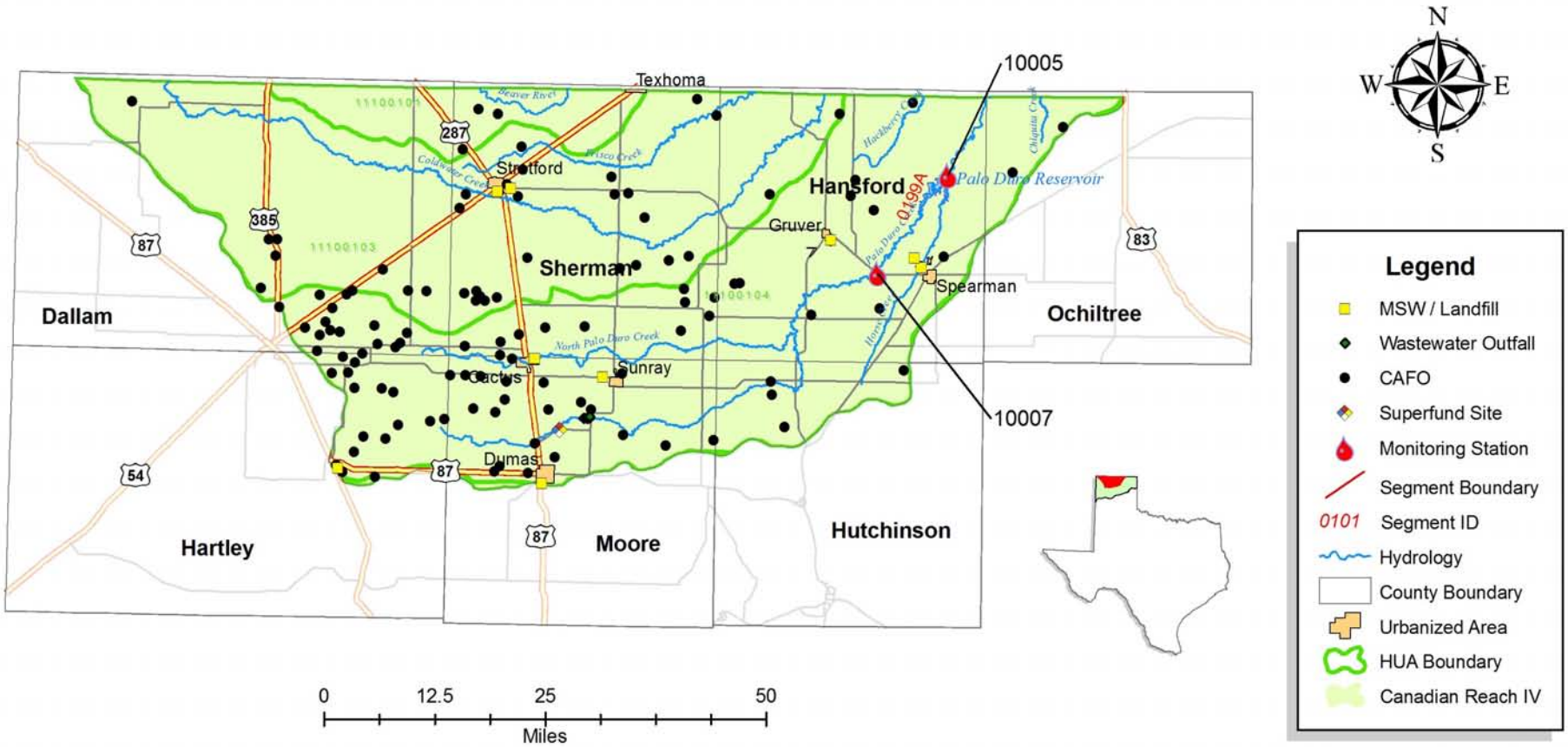


0 5 10 20
Miles

## Legend

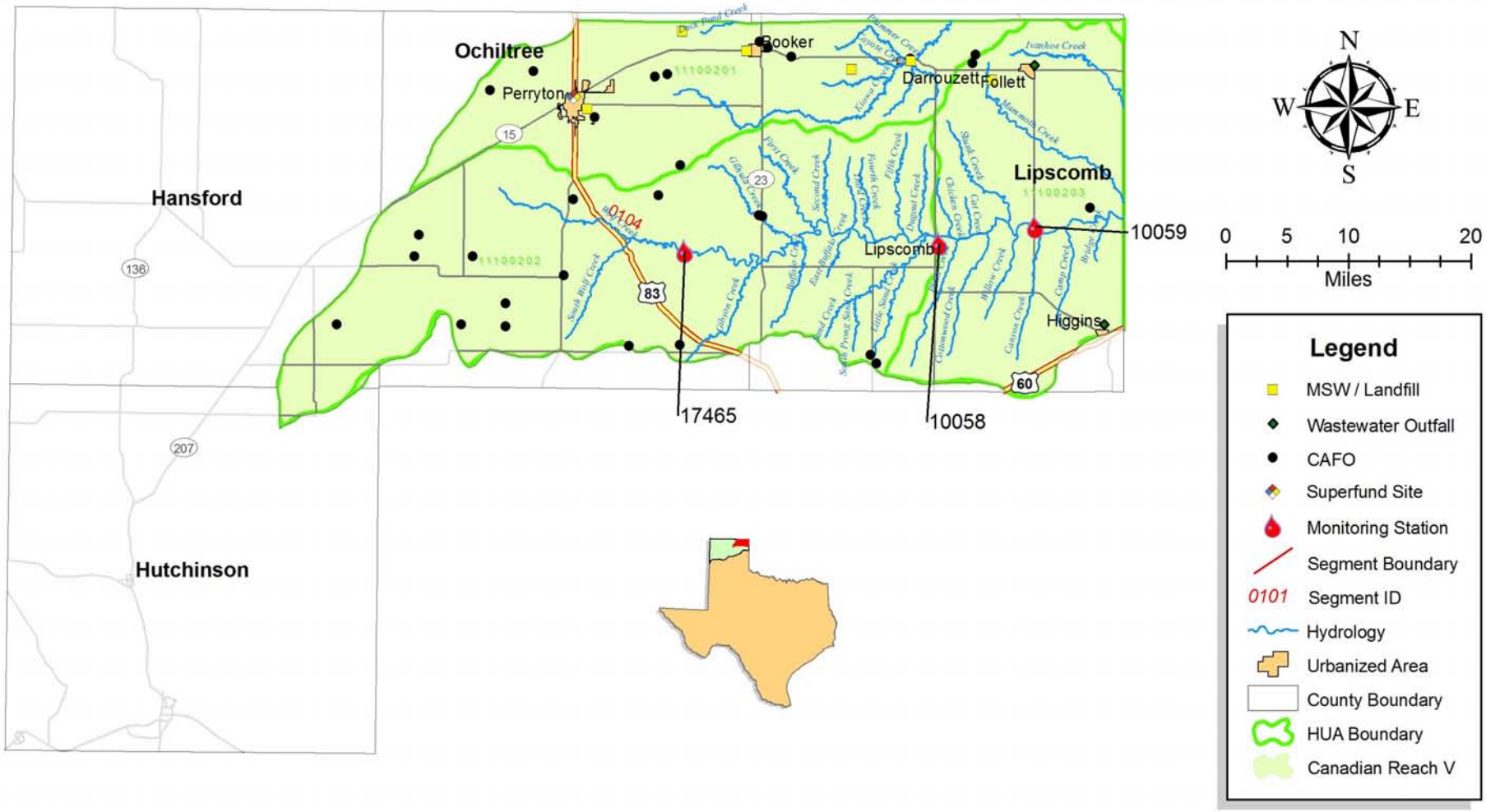
- MSW / Landfill
- Wastewater Outfall
- CAFO
- Monitoring Station
- 0101 Segment ID
- Hydrology
- County Boundary
- Urbanized Area
- HUA Boundary
- Canadian Reach III

# Canadian River Basin
# Reach IV

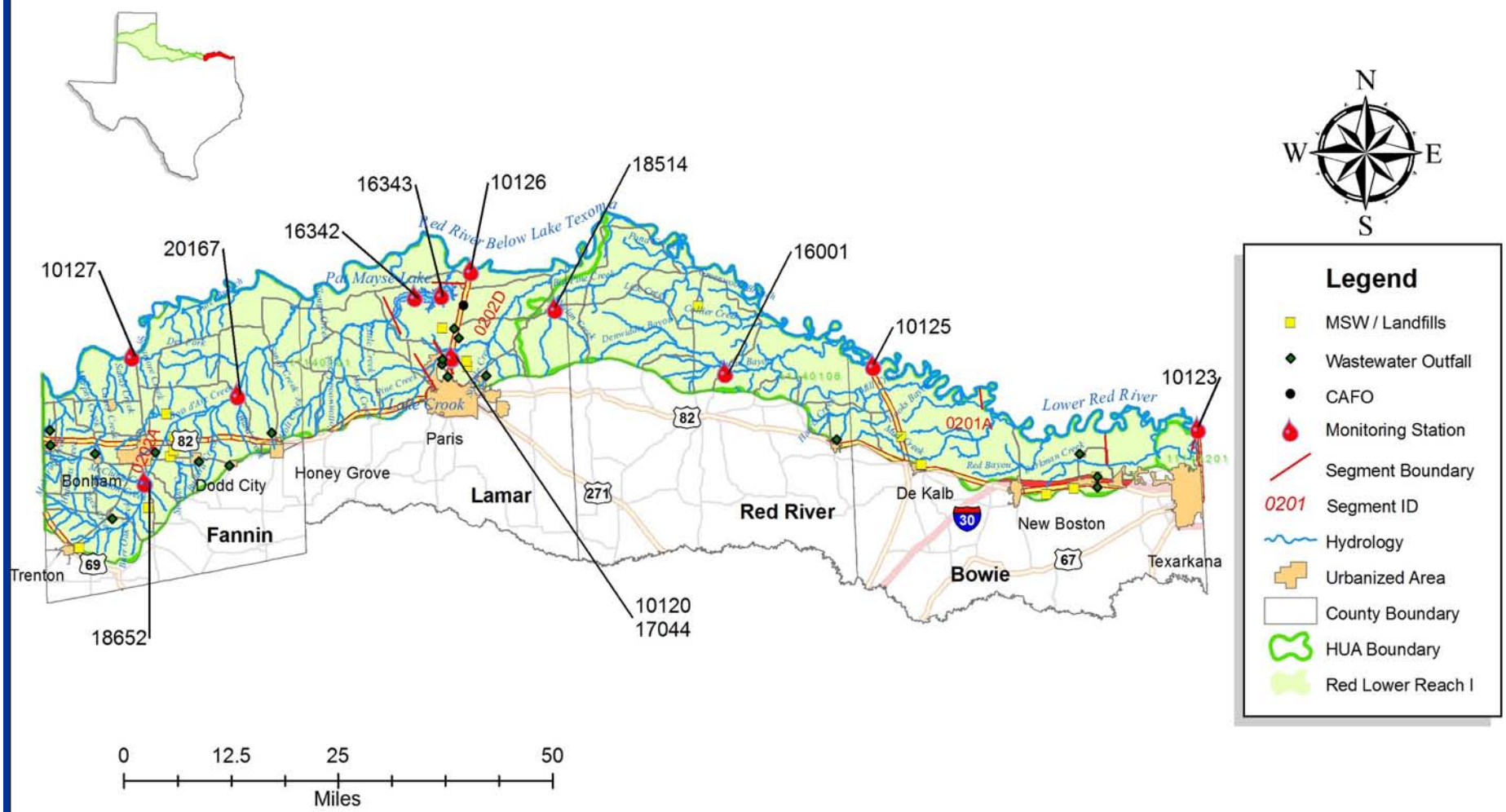


# Canadian River Basin

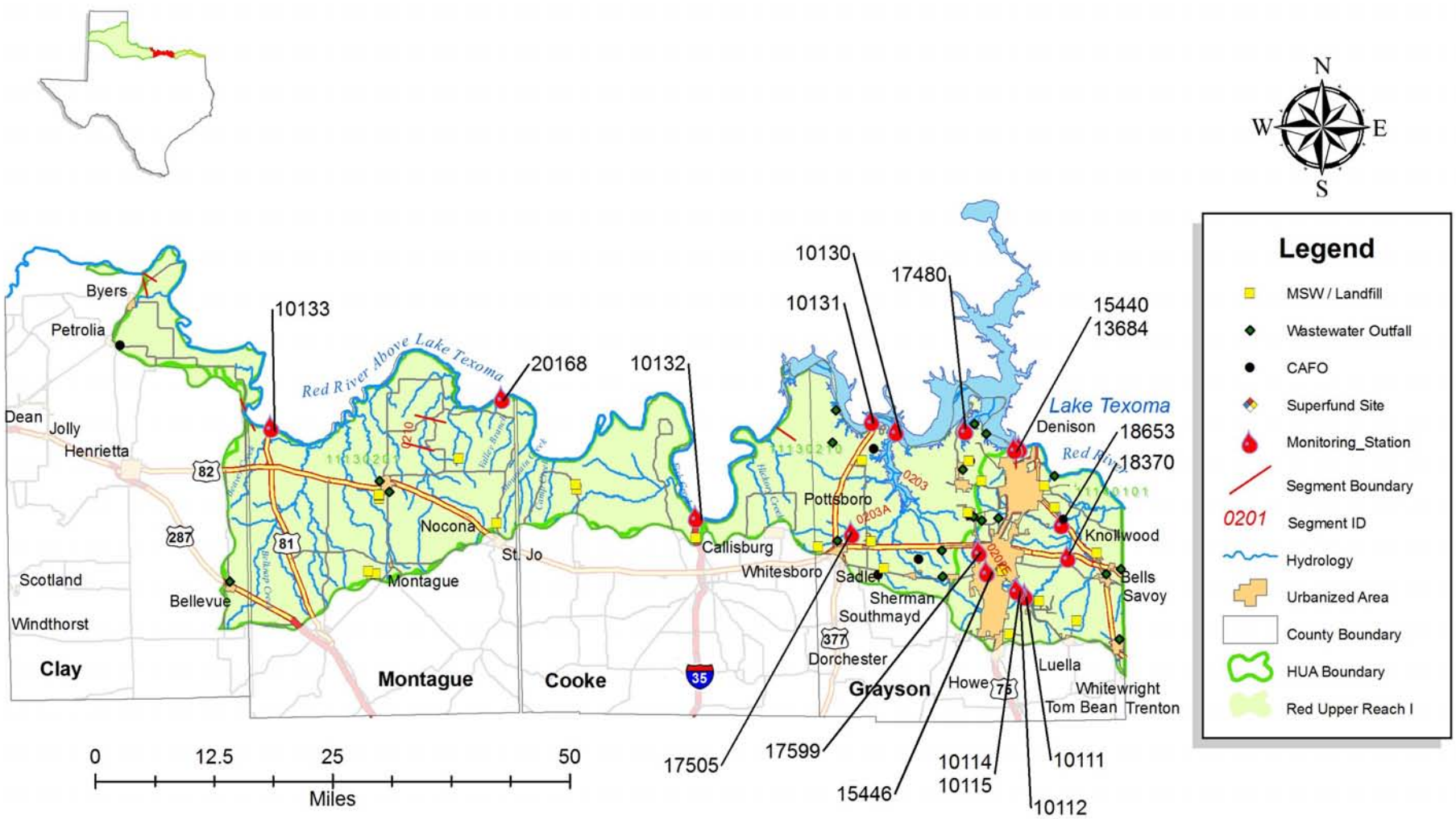
# Reach V



# Red River Basin
# Lower Reach I

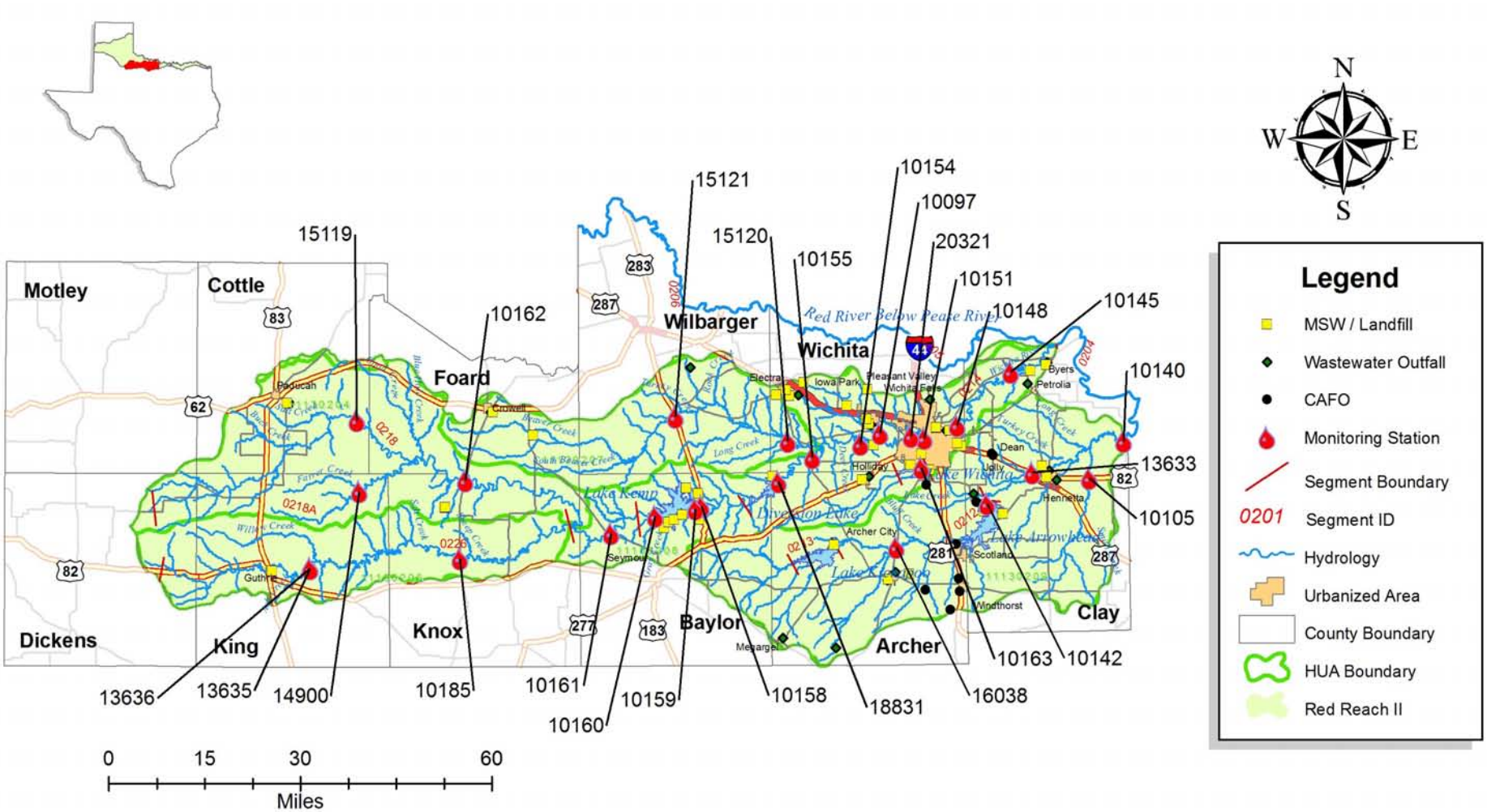


# Red River Basin
# Upper Reach I



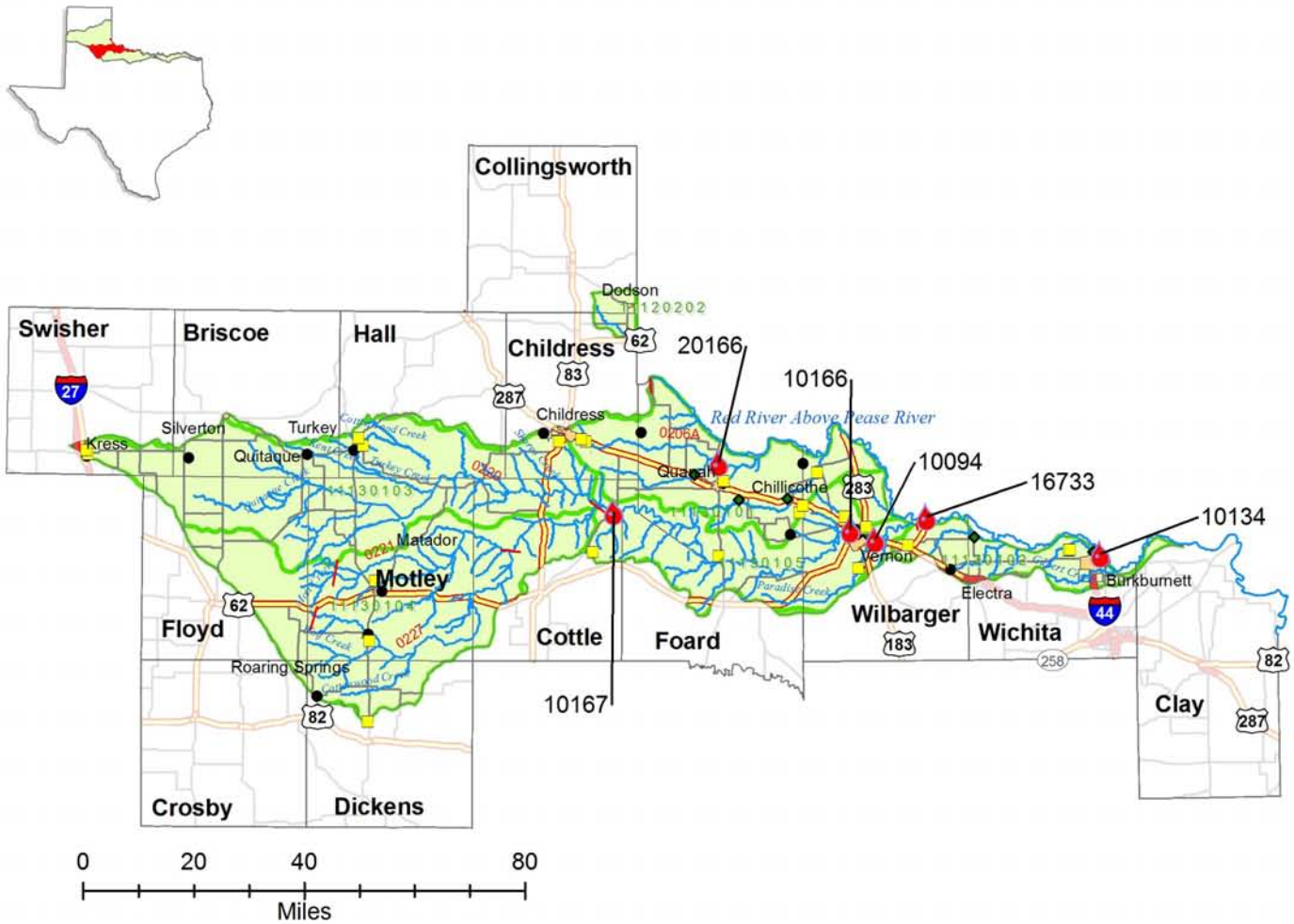
# Red River Basin

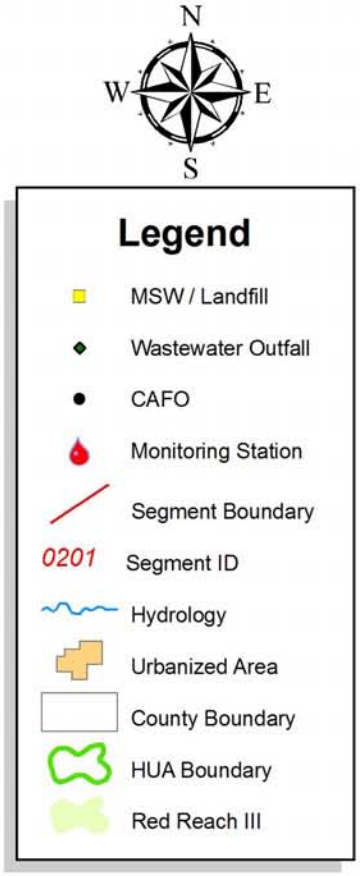
# Reach II



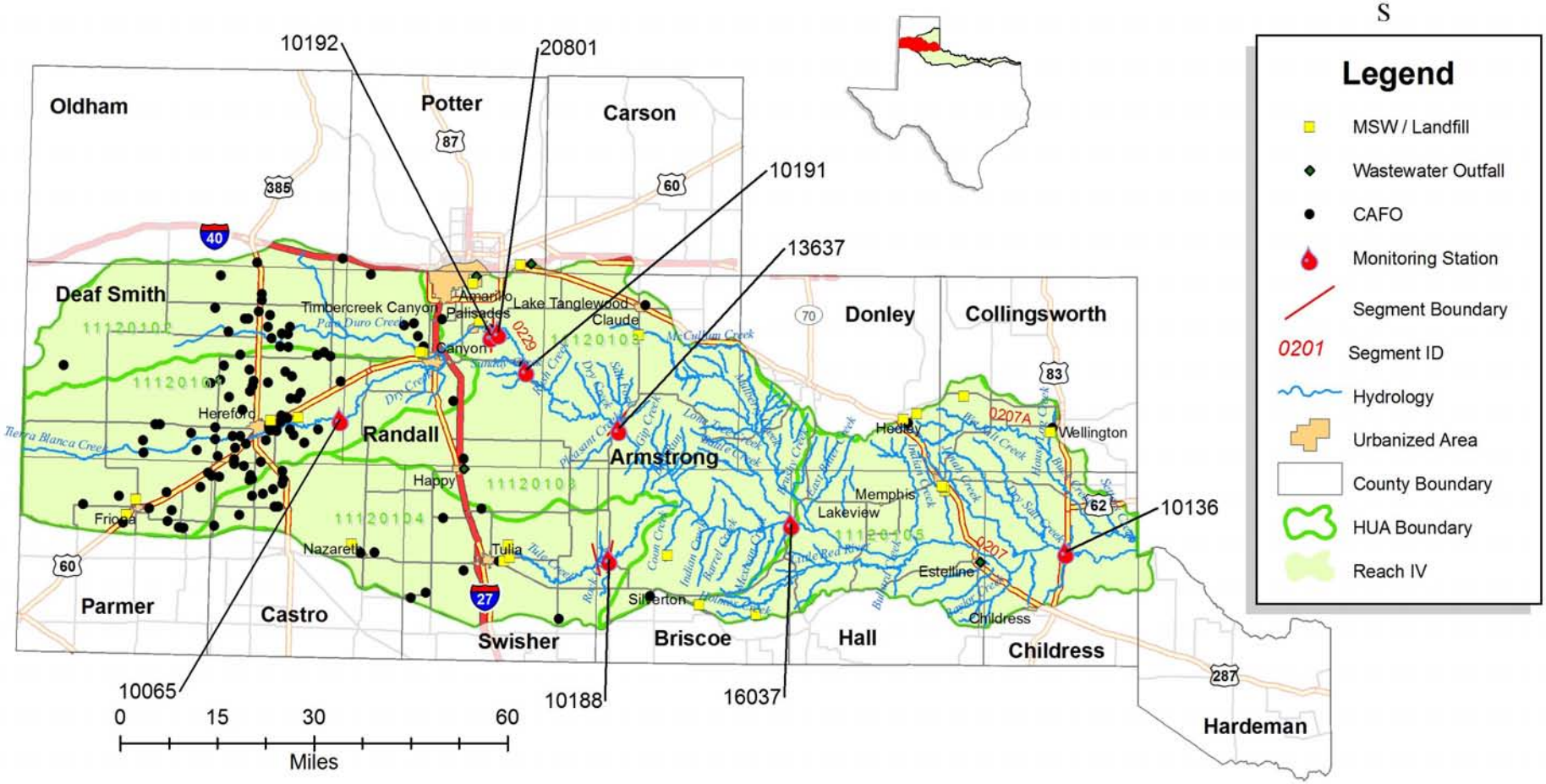
# Red River Basin

# Reach III



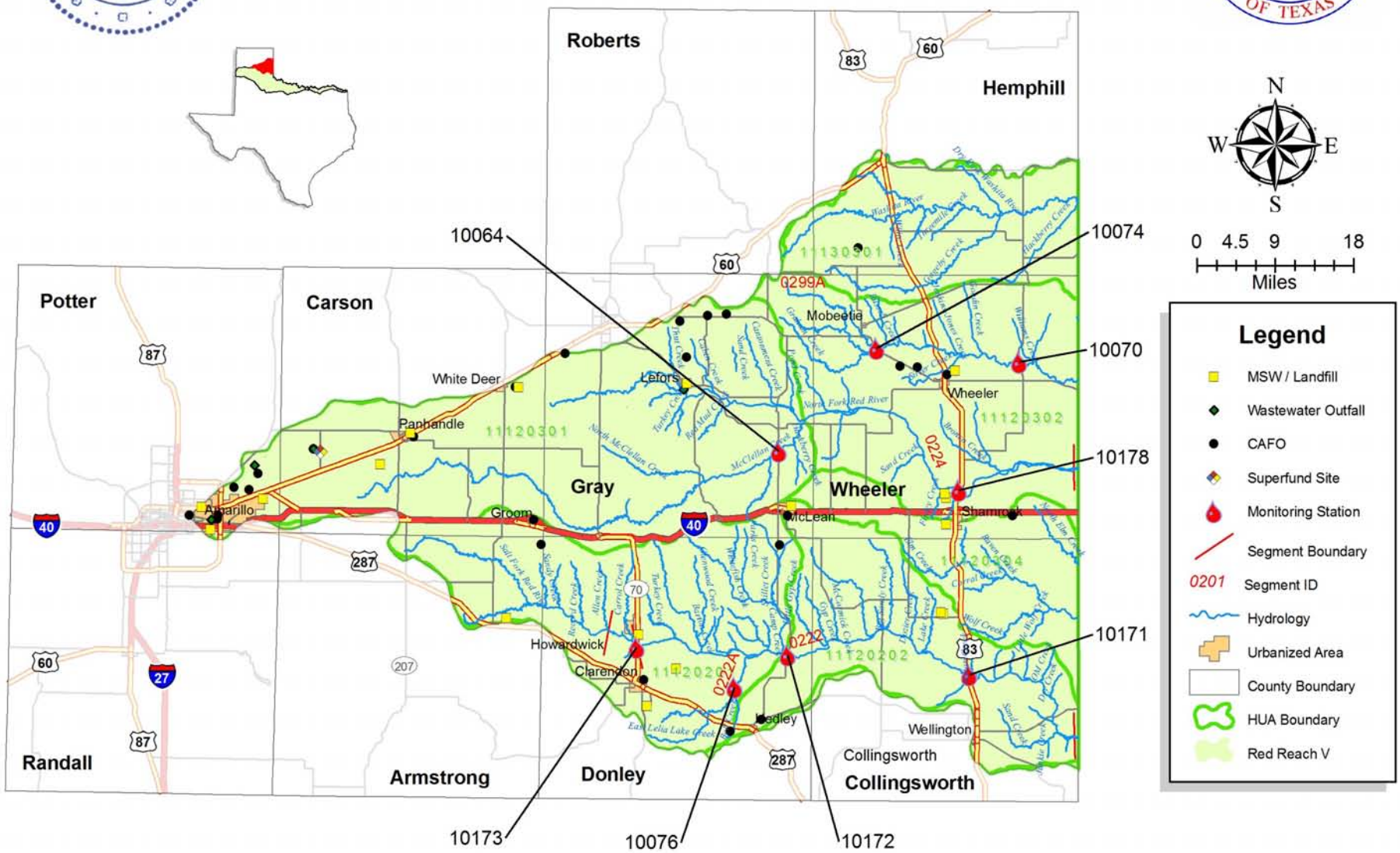



# Red River Basin
# Reach IV



# Red River Basin

# Reach V



White Deer Creek at Jeep Crossing

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