2011 Basin Highlights Report for the Rio Grande Basin in Texas

An update on Water Quality and Basin Activities

April 2011

International Boundary and Water Commission, U.S. Section,
Texas Clean Rivers Program

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photo D. Supercinske

The Texas Clean Rivers Program for the Rio Grande Basin

The International Boundary and Water Commission, U.S. Section (USIBWC) Texas Clean Rivers Program (CRP) is responsible for collecting water quality data throughout the Texas portion of the Rio Grande Basin. CRP is a state fee-funded program for water quality monitoring, assessment, and public outreach, and aims to maintain and improve the quality of water within each river basin in Texas through partnerships with the Texas Commission on Environmental Quality (TCEQ) and participating entities.

Visit our Website at:

http://www.ibwc.gov/CRP/index.htm

Cover photo: UTEP students sample with USIBWC CRP at Station 13276 near Anthony, Texas, August 2010. Back cover photos: TPWD sampling at Big Bend Ranch State Park, January 2010 (top left); the Pecos River at Sheffield, TX (right); snowy egrets in the Rio Grande in El Paso's Upper Valley, October 2010 (bottom left).

Introduction

In 1991, the Texas Legislature passed the Texas Clean Rivers Act (Senate Bill 818) to address water resources in an integrated, systematic manner, creating the Texas Clean Rivers Program (CRP). The CRP for the Rio Grande Basin was originally administered by the Border Environment Assessment Team of the Texas Commission on Environmental Quality (then called the Texas Natural Resources Conservation Commission). In 1998, the State of Texas contracted with the United States Section of the International Boundary and Water Commission (USIBWC) to implement the CRP for the Rio Grande to monitor and address water quality issues that are unique to an international water boundary.

This report summarizes the 2010 to 2011 USIBWC CRP water quality monitoring activities as well as water quality data for the Rio Grande Basin in Texas.

Aspects of the Texas Clean Rivers Program

The USIBWC is one of 15 partner agencies that collaborate with TCEQ to administer the Texas Clean Rivers Program in the 23 river and coastal basins of Texas. The main goals of CRP from the long-term plan include:

- Maintain a basin-wide routine water quality monitoring program and maintain a water quality database
- Provide quality-assured data to TCEQ for use in water quality decision-making
- Identify and evaluate water quality issues, and summarize in reports
- Promote cooperative watershed planning (for example: conduct Coordinated Monitoring Meetings and collaborate on watershed plans and water quality initiatives)
- Inform and engage stakeholders (for example: conduct Basin Advisory Committee Meetings and watershed education activities, maintain an updated website, print annual reports)
- Maintain efficient use of public funds
- Adapt program to emerging water quality issues

The Rio Grande Basin

The Rio Grande/Rio Bravo watershed covers an area of approximately 924,300 square kilometers (335,000 square miles). Approximately half of the watershed is in the United States and the other half in Mexico (Figure 1). Roughly 50,000 square miles of the watershed are within Texas (Figure 2).

The river runs 1,255 miles along the international boundary with Mexico. The study area of the USIBWC CRP Rio Grande Basin encompasses this international reach of the Rio Grande/Rio Bravo from the New Mexico/ Texas/ Chihuahua border (El Paso/Ciudad Juarez area) to the Gulf of Mexico (Brownsville/ Matamoros area).

The USIBWC CRP study area for this report is the Rio Grande Basin in Texas (Figure 2). For the purpose of coordination and planning, the USIBWC CRP study area has been divided into four sub-basins:

- the Upper Sub-Basin extending from the New Mexico/ Texas state line downstream to International Amistad Reservoir;
- the Pecos River Sub-Basin from the New Mexico/ Texas state line to its confluence with the Rio Grande upstream of Amistad Reservoir;
- the Middle Sub-Basin from International Amistad Reservoir downstream to International Falcon Reservoir and including the Devil's River; and
- the Lower Sub-Basin from International Falcon Reservoir downstream to the Gulf of Mexico.

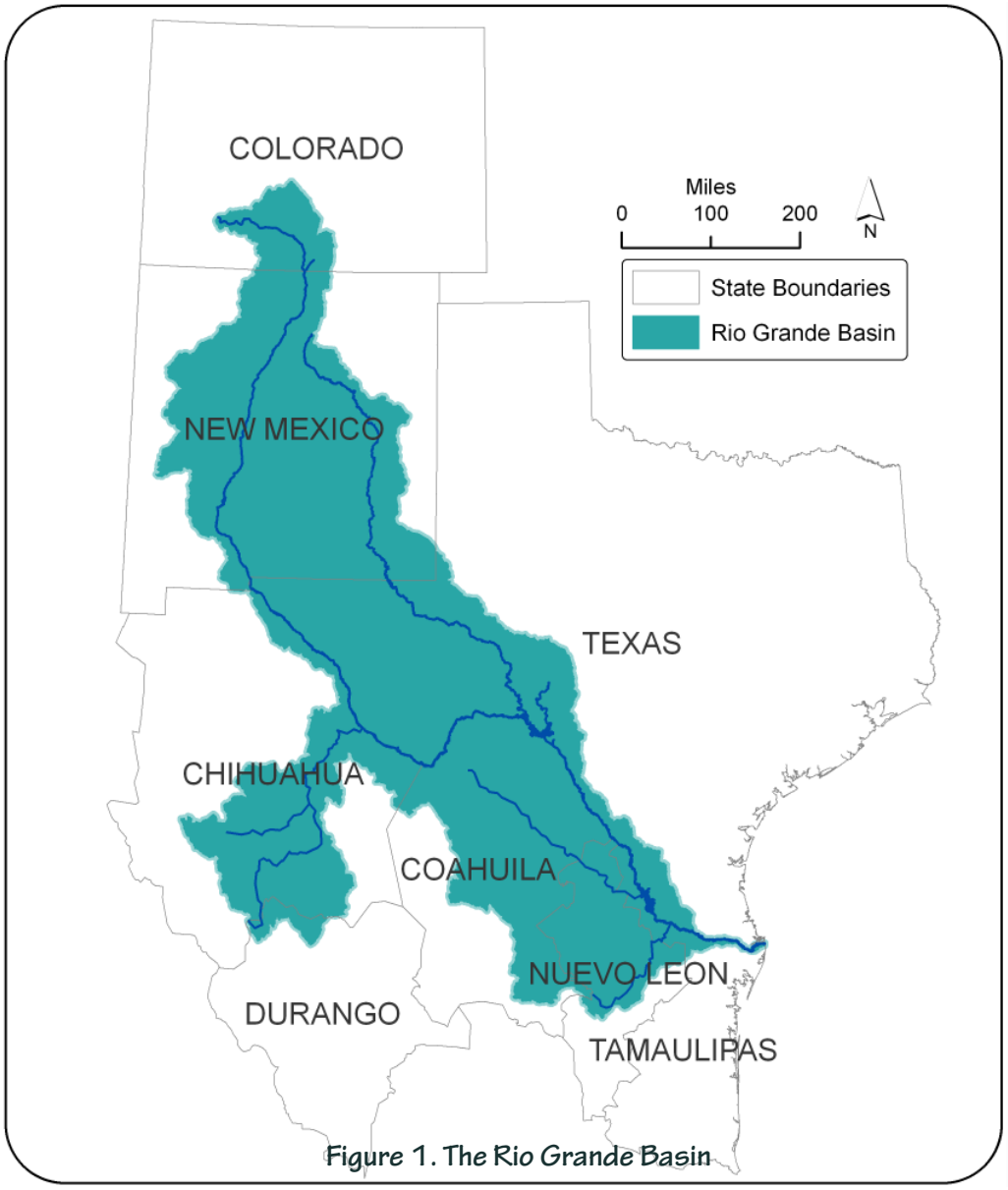


Figure 1. The Rio Grande Basin

Due to the basin's sheer size, the USIBWC CRP depends on sampling partners to collect the necessary water quality data for the State of Texas. CRP partners throughout the basin have been a valuable asset in water quality monitoring, providing advice and suggestions on improving the program and the basin, developing and assisting in special studies, and communicating and educating the general public.

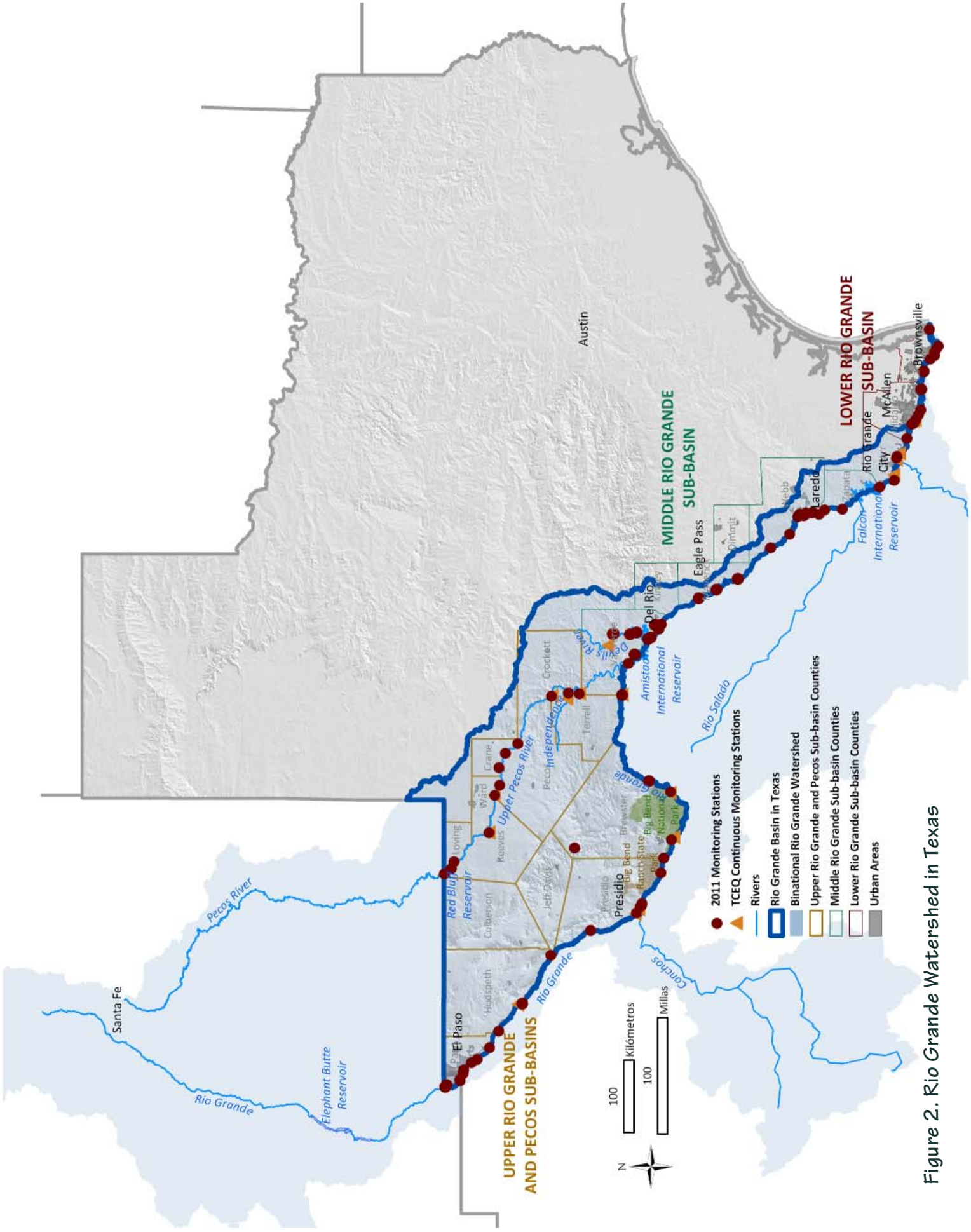


Figure 2. Rio Grande Watershed in Texas

This Year's Highlights

2010 Rio Grande Flood

At the end of June 2010, Hurricane Alex, and a week later, Tropical Depression #2, brought heavy rainfall throughout the Rio Grande Basin. IBWC went into 24-hour flood operations as it operated the releases from both Amistad and Falcon Dams. In early July, IBWC released floodwater into the interior floodway for the first time since 1988, which includes channels known as the Banker Floodway, Main Floodway, North Floodway, and Arroyo Colorado through portions of Hidalgo, Cameron, and Willacy Counties.

During the course of the flood, peak flows in the river at Laredo reached 126,000 cubic feet per second (cfs) and those at Rio Grande City almost 94,000 cfs. Flood conditions were experienced from near Amistad Dam at Del Rio, TX downstream some 600 miles to the Gulf of Mexico. USIBWC CRP collected bacteria data from the floodwaters and levee structures, but high bacteria levels were not detected due to the volume of water.

Emergency Floodway of the Lower Rio Grande near Harlingen, Texas, August 3, 2010

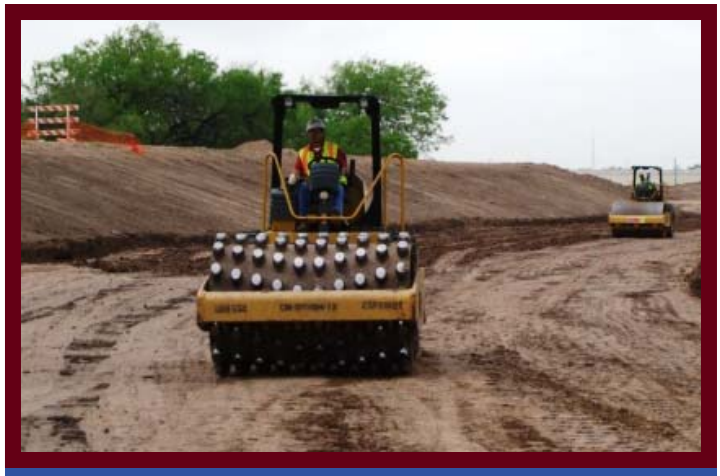
USIBWC Receives $220 Million in American Recovery Act Funds for Levee Work

The American Recovery and Reinvestment Act of 2009 (Recovery Act) appropriated $220 million to the USIBWC for Rio Grande levee rehabilitation. The purpose of the Recovery Act is to create and save jobs, promote economic recovery, and invest in infrastructure that will provide long-term economic benefits. USIBWC awarded all the funds for contracts in Hidalgo County, Texas in the Lower Rio Grande Valley and El Paso County, Texas and Doña Ana County, New Mexico in the Upper Rio Grande. The USIBWC is raising levee height and making structural improvements in compliance with standards established by the Federal Emergency Management Agency (FEMA) to protect against the 100-year river flood.

Release of floodwaters from Falcon Dam, July 2010

USIBWC Awarded Asarco Cleanup Funds

USIBWC has been awarded $19 million for environmental cleanup as part of the settlement of the bankruptcy case for Asarco, a copper smelter that operated for a century in El Paso, Texas. USIBWC will use settlement funds to clean up contaminated soil at the American Dam/ Carlos Marin Field Office



Recovery Act levee construction in Hidalgo County, Texas, March 2010

complex. Additionally, the funds will address soil and groundwater remediation as part of a project to rehabilitate the American Canal.

Rio Grande Silvery Minnow Recovery

The U.S. Fish and Wildlife Service (USFWS) is celebrating a significant milestone in working toward the recovery of the endangered Rio Grande silvery minnow. Beginning in 2008, the USFWS has captively propagated and released approximately 1.5 million silvery minnows into the fish's historic range in the Big Bend reach of the Rio Grande in Texas, where it had not been seen since 1960. The results of this on-going recovery project include demonstrable improvement of the species' status. Researchers have found silvery minnows during quarterly monitoring near release sites and during other fish monitoring efforts. In 2010, the USFWS detected successful breeding of silvery minnows in the Big Bend reach for the first time since releases began, including documentation of eggs, larval fish, and juvenile fish. Conservation partners include the Middle Rio Grande Endangered Species Collaborative Program, National Park Service (NPS), USIBWC, U.S. Geological Survey (USGS), Texas Parks and Wildlife Department (TPWD), and the University of Texas–Pan Am (UTPA).

The American Dam is adjacent to the Asarco smelter's smokestacks.

photo R. Skiles, National Park Service

The initial release of Rio Grande Silvery Minnows in December 2008 in Big Bend National Park

Dia del Rio Drew Together Entire Basin

In 2010, the Rio Grande International Study Center (RGISC) in Laredo received a grant from the Border Environmental Cooperation Commission (BECC) to conduct a basin-wide outreach event. On October 16, Dia del Rio, the RGISC brought together agencies and organizations from Colorado, New Mexico, Texas and Mexico to conduct outreach events such as cleanups and presentations. In addition, 67 schools participated in a water quality "snapshot," collecting water quality samples from the headwaters of the Rio Grande in Colorado down to the Gulf of Mexico on October 6. USIBWC CRP collaborated with a local high school in El Paso, Texas to collect samples from American Dam.

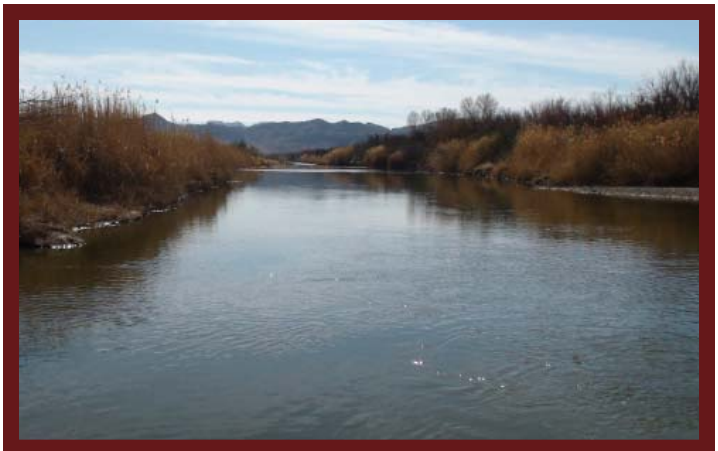
Students from Franklin High School in El Paso, TX collect water samples at American Dam for Dia del Rio on October 6, 2010

Big Bend Conservation Group Forms

In 2010, the USFWS, USGS, NPS, and TPWD signed a Memorandum of Understanding (MOU) establishing the Big Bend Conservation Cooperative (BBCC). The MOU will strengthen cooperative working relationships and advance conservation work in the Big Bend region. The four agencies also collaborate with other U.S. and Mexican entities working towards conservation efforts in the Big Bend and have had on-going binational meetings to collaborate efforts, leading to a new group called the Big Bend Binational Conservation Cooperative (BBBCC).

Regional Advisory Council Launched

In the fall of 2010, the Rio Grande/Rio Bravo Advisory Council (RAC) formed to address watershed issues from the headwaters in Colorado to the mouth in the Gulf of Mexico. The RAC is formed by individuals representing local, state and federal agencies, non-profits, and other entities in both the U.S. and Mexico with interests in the Rio Grande watershed. Activities include watershed education, policy actions, a documentary, and acceptance into America's Great Waters Coalition. For more info, contact Stephanie Dolansky-Mahathey at smahathey@gmail.com.



BBBCC projects will work to study and conserve the Rio Grande and its surrounding landscape in the Big Bend region, including the above stretch in Big Bend Ranch State Park, taken January 2010

Sabal Palm Audubon Sanctuary Re-opens

Audubon Texas has partnered with the Gorgas Science Foundation of Brownsville, Texas to re-open Sabal Palm Audubon Sanctuary to the public in January 2010. Sabal Palm is home to many native species of plants and animals that reach the northernmost limit of their Mexican range and do not occur elsewhere in the U.S. This sanctuary protects the only remaining stands of sabal palm forest.

photo Sabal Palm Audubon Sanctuary

An outdoor classroom built in 2006 overlooks the river at Sabal Palm Sanctuary

2010 Standards adopted by Texas

The 2010 Revisions to the Texas Surface Water Quality Standards (TSWQS) were adopted by the TCEQ in July 2010. Standards must still be approved by the U.S. Environmental Protection Agency (EPA) prior to being applied for federal permitting programs and other Clean Water Act (CWA) purposes. In these revisions, Texas also adopted nutrient criteria for many reservoirs throughout Texas. The 2010 TSWQS for the Rio Grande Basin are listed in Table 2 of this report.

Rio Grande Basin Initiative

Texas AgriLife Research, Texas AgriLife Extension Service and the New Mexico State University College of Agriculture and Home Economics are implementing strategies for meeting present and future water demand in the Rio Grande Basin under the *Efficient Irrigation for Water Conservation* in the Rio Grande Basin project, also known as the Rio Grande Basin Initiative (RGBI). The Annual Accomplishment Report, which includes updates on irrigation studies, education, urban water conservation, and more, is available on the RGBI webpage (p. 43).

photo TWRI

Students work with personnel from the RGBI to collect data on hydrology for conservation efforts and to assess irrigation impacts, Summer 2009

IBWC hosts Binational Summit

In March 2011, the U.S. and Mexican Sections of IBWC convened high-ranking government officials and experts from both countries at the Binational Border Sanitation and Water Quality Summit. Over 200 participants gathered to discuss challenges and solutions to border sanitation issues.

The IBWC Commissioners and other distinguished panelists at the Binational Border Sanitation and Water Quality Summit, March 2011

New USIBWC CRP Laboratory

Beginning with fiscal year 2011, the USIBWC has contracted for up to five years with Alamo Analytical Laboratories, LTD in San Antonio, Texas to perform water quality analysis for the Clean Rivers Program and other USIBWC environmental analysis. Alamo Analytical is nationally accredited, as required by TCEQ, and meets all requirements to perform laboratory analysis for CRP.

Border Security Affects Monitoring

Border violence and suspicious activities increased alarmingly in 2010, leading to discussions about safety and security among USIBWC CRP, TCEQ, and other monitoring personnel. Several water quality monitoring stations in El Paso, Hudspeth and Webb counties were postponed until further notice due to unsafe conditions. USIBWC CRP personnel regularly coordinate with Border Patrol for sampling behind the border fence.

A mass spectrometer used to analyze metals and inorganic compounds at Alamo Analytical Laboratories

Least Disturbed Streams Study

TCEQ Surface Water Quality Monitoring Program (SWQM), TCEQ Regional Staff, TPWD and other participating entities will be conducting a *Least Disturbed Streams Study* throughout Texas. The sampling will take place over the next several years and will evaluate the biological condition of least disturbed streams in ecoregions throughout Texas and determine if small unclassified streams could support significant aquatic life uses. Included as candidates for Least Disturbed Steam study sites are streams in the Middle Rio Grande (Mud Creek, Las Moras Creek, Pinto Creek, Sycamore Creek) and in the Upper and Pecos Sub-Basins (the Wild and Scenic, Alamito Creek, Devils River, Live Oak Creek, and Independence Creek).

Inside the border fence at the Rio Grande near Fabens Port of Entry, Station 15704, Sep. 2009

USIBWC Data Management System

USIBWC is working to upgrade the data management system for various departments throughout the agency. End products will include queryable search engines for water quality data and water accounting data, spatial files, and a robust map viewing service.

Overview of Water Quality Monitoring

How do we tell the quality of water?

During the past year, the USIBWC CRP continued to maintain its large network of water quality stations. CRP and TCEQ gain an understanding of the conditions of the water quality through routine monitoring, which is performed at fixed locations at regular intervals throughout the year. Table 1 shows the kinds of data that we analyze during routine monitoring and why.

Routine monitoring helps us understand questions about how the river can be used (Table 3), such as:

- Is it swimmable?
- Is it drinkable?
- Is it fishable?
- Is it healthy for aquatic life?

CRP partners throughout the basin collect water quality and sediment samples at about 80 routine monitoring stations. When these samples are collected for laboratory analysis, personnel also make field observations to record conditions at the time the sample was taken. Field observations include things such as weather conditions at the time of collection, recent rain events in the area, water color, and other general notes related to water quality and stream uses. Important field measurements are made using different pieces of equipment. Measurements include: water and air temperature, water depth, Secchi disk, stream flow and how that flow compares to the normal flow for that water body. Three of the most important water quality parameters in a water body -- pH, specific conductance, and dissolved oxygen (DO). These field parameters are described in more detail in Table 1.

The routine collection of field parameters together with laboratory parameters, also described in Table 1, allow us to determine the health of the river ecosystem and what potential human and ecological issues we should focus on. Data is compared with TSWQS criteria in Table 2 and screening levels in Table 4; these steps are described in the next section.

When routine monitoring shows a water quality issue or trend, we begin more intensive monitoring and special studies, which are created to gather information to address a specific water quality issue.

USIBWC staff collect water samples and field parameters at Station 13272 in El Paso, TX

Students from El Paso Community College (EPCC) collect samples for CRP and for their own bacteria research at Station 17040 near Sunland Park, NM, November 2010

A graduate student collects phytoplankton samples for her thesis at routine Station 15704 near Fabens in El Paso County, December 2010

Table 1. Water Quality Parameters

Field Parameters		
Parameter	**Description**	**Effects to Water body**
pH	Measure of how acidic or basic the water is. The values range from 0 to 14, with 7 being neutral. pH values less than 7 indicate acidity, whereas a pH greater than 7 indicates a base.	Values greater than 9.0 and less than 5.0 can have detrimental affects on the health of aquatic life, wildlife, and humans.
Specific Conductance	Indicator of how well the water conducts electricity. Pure water does not conduct electricity; impurities of water are what allow electricity to pass through the water. These impurities are salts and metals. Since total and dissolved metal values are very low, conductivity primarily measures how much salt is in the water.	High conductivity can cause physiological effects in animals and plants.
Dissolved Oxygen (DO)	Measure of the oxygen in the water. DO is one of the most important water quality parameters.	Low DO values can lead to reduced numbers of aquatic life in a water body. Very low levels (<2) can be indicative of higher levels of oxygen-demanding pollutants that use up DO during the decay process.
Secchi Depth	A measure of the transparency of water - the maximum depth at which a black and white disk is visible.	Higher transparency leads to healthier aquatic plant life (particles in water block sunlight for photosynthesis).
Stream Flow	Volume of water moving over a location over a period of time. Low flow conditions common in the warm summer months create critical conditions for aquatic organisms.	At low flows, the stream has a lower assimilative capacity for waste inputs from point and nonpoint sources.
Conventional Laboratory Parameters		
Parameter	**Description**	**Effects to Water body**
Solids	Total and dissolved materials of any kind (calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates).	High total dissolved solids indicate higher amounts of dissolved salts which can reduce the diversity of aquatic life and can render the water unusable for human consumption.
Nutrients	Nutrients include nitrogen compounds, ammonia, and phosphorus.	High levels can cause excessive plant growth, which can lead to reduced dissolved oxygen, reduced stream flow and reduced navigability of the waters. Elevated ammonia can also be toxic to aquatic life.
Chlorophyll-a	Chlorophyll-a is an indicator of excessive plant and algal growth in the water.	High levels for long periods indicate low water quality and are indicative of excess nutrient levels.
Alkalinity	A measure of the acid neutralizing ability of water due to the amount of carbonates, bicarbonates, and hydroxides.	Alkaline water is detrimental to agriculture and plant growth.
Non-conventional Laboratory Parameters		
Parameter	**Description**	**Effects to Water body**
Metals	Aluminum, arsenic, barium, chromium, copper, lead, mercury, nickel, silver, and zinc. Metals can be tested as total or dissolved metals in water or metals in sediment to determine long-term accumulation.	High concentrations can result in long- and short-term effects on aquatic life and human health.
Organics	Chemicals containing carbon and hydrogen. Organic compounds analyzed are herbicides, pesticides and industrial compounds both in water and in sediment.	Organics can result in long- and short-term effects on aquatic life and human health.
Biological Parameters		
Parameter	**Description**	**Effects to Water body**
Nekton	Fish captured in the river during biological surveys using both electrofishing and seining methods	Using Index of Biologicial Integrity (IBI), Indicate biodiversity and overall health of river.
Benthics	Freshwater macroinvertebrates collected during a five-minute kick net method	Using IBI, Indicate biodiversity and overall health of river. Excellent indicators of water quality.

Table 2. Primary Surface Water Quality Standards for the Rio Grande Basin*

2010 Texas Surface Water Quality Standards for the Rio Grande Basin											
SEGMENT		USES			CRITERIA						
Segment	Segment Name	Recreation	Aquatic Life	Domestic Water Supply	Cl^- (mg/l)	$SO4^{2-}$ (mg/l)	TDS (mg/l)	DO (mg/l)	pH range (SU)	Bacteria geomean (#/100ml)	Temperature (deg F)
2301	**Rio Grande Tidal**	PCR	E	-	-	-	-	5.0	6.5-9.0	35	95
2302	**RG Below Falcon Reservoir**	PCR	H	PS**	270	350	880	5.0	6.5-9.0	126	90
2303	**Falcon International Reservoir**	PCR	H	PS**	200	300	1,000	5.0	6.5-9.0	126	93
2304	**RG Below Amistad International Reservoir**	PCR	H	PS**	200	300	1,000	5.0	6.5-9.0	126	95
2305	**International Amistad Reservoir**	PCR	H	PS	150	270	800	5.0	6.5-9.0	126	88
2306	**RG Above Amistad International Reservoir**	PCR	H	PS	300	570	1,550	5.0	6.5-9.0	126	93
2307	**RG Below Riverside Diversion Dam**	PCR	H	PS	300	550	1,500	5.0	6.5-9.0	126	93
2308	**RG Below International Dam**	NCR	L	-	250	450	1,400	3.0	6.5-9.0	605	95
2309	**Devils River**	PCR	E	PS	50	50	300	6.0	6.5-9.0	126	90
2310	**Lower Pecos River**	PCR	H	PS	1,700	1,000	4,000	5.0	6.5-9.0	126	92
2311	**Upper Pecos River**	PCR	H	-	7,000	3,500	15,000	5.0	6.5-9.0	33	92
2312	**Red Bluff Reservoir**	PCR	H	-	3,200	2,200	9,400	5.0	6.5-9.0	33	90
2313	**San Felipe Creek**	PCR	H	PS	50	50	400	5.0	6.5-9.0	126	90
2314	**RG Above International Dam**	PCR	H	PS	340	600	1,800	5.0	6.5-9.0	126	92

PCR - Primary Contact Recreation
E - Exceptional Aquatic Life
geomean - geometric mean

ALU - Aquatic Life Use
L - Limited Aquatic Life
Cl^- - chloride

NCR - Noncontact Recreation
H - High Aquatic Life
$SO4^{2-}$ - sulfate

PS - Public Water Supply
TDS - Total Dissolved Solids
DO - Dissolved Oxygen

The indicator bacteria for freshwater is *E. coli* and Enterococci for saltwater (2301, 2312, 2311).
The DO criterion in the upper reach of Segment 2307 (Riverside Diversion Dam to the end of the rectified channel below Fort Quitman) is 3.0 mg/L when headwater flow over the Riverside Diversion Dam is less than 35 cfs. The critical low-flow for Segments 2309 and 2313 is calculated according to §307.8(a)(2)(A) of this title.

* The Standards listed above are the Draft 2010 Revisions to the Texas Surface Water Quality Standards (TSWQS). The revisions were approved by TCEQ in August 2010 but are considered draft until approved by the EPA. More information on primary standards can be found at TCEQ's TSWQS website (http://www.tceq.texas.gov/permitting/water_quality/wq_assessment/standards/eq_swqs.html). Major changes from the 2000 Standards include primary contact recreation designation, changes in bacteria indicator for saline waters, removal of fecal coliform as an alternate indicator, removal of grab sample bacteria standard, and removal of public supply designation for Segment 2308.
**Designated in the 2010 TSWQS as a sole-source surface drinking water supply, as provided by the TCEQ Drinking Water Protection Team.

2010 Texas Nutrient Criteria for the Rio Grande Basin			
Segment	Segment Name	Station ID	Chlorophyll-a Criteria (µg/L)
2312	**Red Bluff Reservoir**	13267	25.14***

*** Criteria for chlorophyll-a are attained when they are not exceeded by the median of monitoring data results.

Designated Uses

The State of Texas assigns designated uses to specific water bodies. Typical uses include domestic water supply, categories of aquatic life use, recreation categories, and aquifer protection. Table 3 describes the designated uses for the Rio Grande Basin, and Table 2 lists the uses and standards for each segment. Designated uses and water quality standards are defined in the TSWQS. For more info, see TSWQS website (p. 43).

Contact recreation (CR) – Fishing, swimming, wading, boating, and direct water contact. *E. Coli* and Enterococci bacteria are used as indicators. The draft 2010 revisions to the TSWQS created subcategories of Primary (PCR) and Secondary Contact Recreation (SCR). PCR refers to activities such as swimming, and SCR refers to non-immersing recreation activities such as canoeing and fishing. All segments of the Rio Grande that were previously contact recreation are now designated as PCR.

Public water supply (PS) – As a drinking water source, the primary concern is total dissolved solids (TDS). The TSWQS include a list of parameters that are screened to ensure domestic water supply use.

Aquatic life use (ALU) – To protect aquatic species. This designated use has four levels depending on the ability of a water body to support aquatic life such as fish and benthic macroinvertebrates (aquatic insects). The primary parameter is DO. The four aquatic life use categories are exceptional, high, intermediate, and limited.

Fish consumption (FC) – This applies to all water bodies where citizens may collect and consume fish. The TSWQS include a list of parameters that are screened to ensure the fish consumption use is met.

General use – To safeguard general water quality rather than for protection of one specific use.

Table 3. Designated Uses for Freshwater

Designated Uses			
Designated Use	**Description**	**Primary Parameter**	**Criteria**
Contact Recreation (CR)	Fishing, swimming, wading, boating, etc	Bacteria: *E. Coli*	Geometric Mean 126 colony forming units (CFU) for *E. Coli*
		Tidal and saline-Enterococcus (Entero)	35 CFU Entero
Public Water Supply (PS)	Drinking water source	See full list of Human Health Criteria in Table 3 of the TSWQS	
Aquatic Life Use (ALU)	4 levels depending on the ability of water body to support aquatic life	DO - average values	Exceptional 6.0 mg/L
			High 5.0 mg/L
			Intermediate 4.0 mg/L
			Limited 3.0 mg/L
	Toxics in Water	See full list of Aquatic Life Criteria in Table 1 of the TSWQS	
Fish Consumption (FC)	Prevent contamination to protect human health	See full list of Human Health Criteria in Table 3 of the TSWQS Example: Mercury - 0.0122 ug/L in water & fish	
General Use (GU)	General water quality	Water Temp, High pH, Low pH, Dissolved Solids, Nutrients, and Chlorophyll-a. See Tables 2 and 4.	

Aquatic life studies, such as this one in the Upper Pecos River, evaluate the health and diversity of organisms such as fish and insects that live in the water

What do we do with the water quality data?

Once samples are collected, an accredited laboratory analyzes the lab parameters in Table 1, then CRP checks both field and laboratory data for accuracy, quality and adherence to approved methods. CRP submits the reviewed and quality-assured data to the TCEQ, which also runs quality assurance checks on the data before including the data in TCEQ's Surface Water Quality Monitoring Information System (SWQMIS) database (the public interface can be accessed at http://www8.tceq.state.tx.us/SwqmisWeb/public/index.faces.)

Data from the past seven years that contain at least 10 data points are then compared to the TSWQS that have been assigned to each stream segment (Table 2). This comparison is used to create a summary of water quality, the Integrated Report (previously called the Texas Water Quality Inventory), which is done by the TCEQ every two years as required by the CWA. Any section of a water body that does not meet the primary standards is then placed on the 303(d) List, which contains impaired water bodies throughout the state.

Impairments are determined when a section does not meet the primary standards assigned to the segment. The designated use of the stream segment (Table 3) determines what value will be set for the standard. Primary water quality standards (Table 2) are set for chloride, sulfate, total dissolved solids (TDS), DO, pH, temperature, and bacteria.

Table 4. Secondary Screening Levels for Water Quality Concerns

Secondary Screening Levels	
Secondary Screening Level Freshwater	
Ammonia	0.33 mg/L
Nitrate + Nitrite	1.95 mg/L
Total Phosphorus	0.69 mg/L
Orthophosphorus	0.37 mg/L
Chlorophyll-a	14.1 ug/L
Secondary Screening Level Tidal	
Ammonia	0.46 mg/L
Nitrate + Nitrite	1.10 mg/L
Total Phosphorus	0.66 mg/L
Orthophosphorus	0.46 mg/L
Chlorophyll-a	21.0 ug/L

Concerns are identified when data is compared to secondary screening levels, which are listed in Table 4 to the right. Secondary screening levels are determined based on the water body type. The entire Rio Grande Basin is a freshwater stream except Segment 2301, which is listed as a tidal stream. The secondary parameters for freshwater and tidal water are listed in Table 4 to the right.

A section is listed as having a concern if more than 25% of the data fail to meet the screening levels listed in Table 4. The SWQM website (p. 43) has more information on secondary screening levels.

Sections of a water body on the 303(d) List are then assessed to determine the course of action to take in identifying the source of the impairment and possible corrective solutions.

Date	Flow (ft3/sec)	Water Depth (m)	Days since last precip	Air Temp (deg C)	Water Temp. (deg C)	Dissolved Oxygen (mg/l)	PH (S.U.)	Secchi Disc (m)	Fecal Coliform (#/100ml)	E. Coli	Specific Conductance (S/cm)	Chloride (mg/l)	Sulfate (mg/l)	Alkalinity (mg/l)	Total Hardness (mg/l)	BOD (mg/l)	Total Suspended Solids (mg/l)	Volatile Suspended Solids (mg/l)	Total Dissolved Solids (mg/l)
12/09/2008												434	733						
01/13/2009	310	0.43	> 7	15	9.8	10.6	7.8	0.26	1738	1733	3300	508	752	260	737	3	42	8	2270
02/18/2009	182	0.46	> 7	11.8	14.3	10.6	7.7	0.34	875	579.4	3580	592	893	240	707	5	33	10	2500
03/18/2009	8	0.46	4	13.5	17.3	8	8.1	0.18			2580	398	768		577	2	40	8	1940
04/02/2009					17.9	6.7	7.8	0.1			3410								
05/20/2009	1024	0.61	> 7	25.6	22.2	7.2	7.9	0.12	725	307.6	1560	139	469	215	457	< 2	234	28	1120
06/17/2009	323	0.61	> 7	31.5	28.4	7.3	7.8	0.21	100	36.8	1880	196	575	195	474	< 2	66	10	1420
07/20/2009			> 7		29.9	8.3	7.7	0.12			2910								
08/19/2009	4	0.54	5	30.6	28.7	6.9	7.9	0.17	150	51	2280	286	749	178	581	2	113	21	1670
09/29/2009			> 7		27.3	7.2	7.9	0.07		120	2450	319	557	218			103	15	1410
10/19/2009	2225	1.22	7	25.2	21.7	7.6	8.1	0.08	550	170	1190	75.7	423	377	684	< 2	1430	137	801
11/09/2009	338	0.46	> 7	24	17.9	9.6	8	0.15		35	2620	446	734	231	671	< 2	104	17	1650
12/15/2009			> 7		12.9	9.2	7.9	0.27				448	608	226			24	4	1960
01/12/2010	223	0.61	> 7	9.4	6.3	14.5	8.3	0.37	0	10	2940	517	646	249	604	2	14	5	2000
02/09/2010	241	0.61	6	8.1	12	11	8.4	0.24	75	30	3220	650	723	204	687	6	66	14	2160
03/16/2010			> 7		15.8	11	8.2	0.18		< 10	3460	496	713	196			46	15	2400
03/23/10	164	0.46	> 7	9.1	15.6	10.8	8.3	0.3	13	15	3240	569	804	197	660	5	40	12	2200
05/19/2010	80	0.3	> 7	24.1	24.7	8.9	8.4	0.18	38	3	3670	716	1140	199	776	5	100	24	2540
06/16/2010	72	0.3	> 7	27.8	25.9	7.1	8.8	0.18	87	27	2780	358	828	192	587	3	94	26	1900
06/22/2010			> 7		32.2	6	7.8	0.04			2720								
08/18/2010	1293	0.76	4	30	29.1	6.3	7.9	0.09	413	49	1360	94.6	415	178	394	< 2	450	50	872
Average	615.9				19	8.0	7.8		748	116		400	665						1858
Standard					34	5	6.5 - 9.0		200	126		300	570						1550

Data example from station 13229 in Presidio, Texas. Water quality data for over 100 stations in the Rio Grande Basin is available on the USIBWC CRP webpage at http://www.ibwc.gov/CRP/monstats.htm

How is the quality of water?

Major water quality issues throughout the basin include bacteria and salinity. **Impairments and concerns in the Rio Grande Basin are listed in Table 5 and shown in Figure 3 (a-c)**. The Draft 2010 Integrated Report lists additional segments as impaired from the 2008 Integrated Report. River water with high bacteria levels may pose health risks to swimmers and other recreational users. High salinity can damage crops, is expensive to treat for drinking, and is harmful to freshwater fish and aquatic invertebrates. USIBWC CRP is committed to collecting the necessary water quality information so that the appropriate authorities can make decisions pertaining to water quality issues.

Trash in the river near Canutillo, Texas, October 2010. Trash may deteriorate water quality and negatively affect aquatic organisms.

Shown below are: a USIBWC CRP data report; a graph showing high salinity values that have led to the impairment of Segments 2307 and 2306; a view of the Draft 2010 Integrated Report.

USIBWC Texas Clean Rivers Program
4171 North Mesa
Suite C-100
El Paso, TX 79902

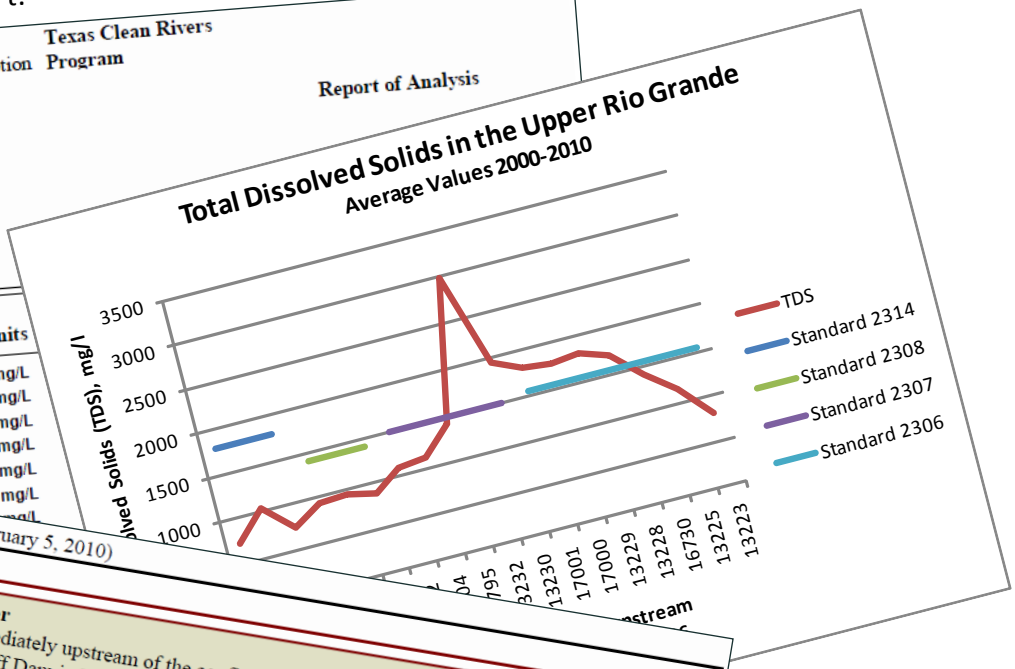
Project Description: Texas Clean Rivers Program

Report of Analysis

Lab Order Number: 0911234

Lab ID: 0911234-001
Field ID: 15817-RG @ W/Z CL

Test	Result	Units
Calcium	81.9	mg/L
Hardness as CACO3 by SM 2340B	283	mg/L
Potassium	5.43	mg/L
Magnesium	19.1	mg/L
Sodium	108	mg/L
Silica	13.7	mg/L
Silicon		
Chloride		
Fluoride		
Sulfate		
Alkalinity, T		
Biochemical		
Chlorophy		
Pheophytin		
Escheric		
Nitroger		
Nitroge		
Phosp		
Total		



DRAFT 2010 Texas 303(d) List (February 5, 2010)

SegID	Name	Description	Parameter	Category	Year First Listed
2311	Upper Pecos River	From a point immediately upstream of the confluence of Independence Creek in Crockett/Terrell County to Red Bluff Dam in Loving/Reeves County	depressed dissolved oxygen		
		2311_03 From US Hwy 67 upstream to FM 1776		5c	2006
		2311_04 From FM 1776 upstream to US Hwy 80 (Bus 20)		5c	2006
2314	Rio Grande Above International Dam	From International Dam in El Paso County to the New Mexico State Line in El Paso County	bacteria		
		2314_01 From the International Dam upstream to the Anthony Drain confluence		5c	2002

Table 5. Water Quality Impairments and Concerns in the Rio Grande Basin

Water Quality Impairments and Concerns in the Rio Grande Basin - 303(d) List					
Segment	Segment Name	Parameter (s) Impaired	Year First Listed	Parameter(s) of Concern	Type of Concern
2301	Rio Grande Tidal	No Impairment		Bacteria Chlorophyll-a	CN CS
2302	RG Below Falcon Reservoir	Bacteria	1996, 2010	Mercury in Edible Tissue Depressed DO Ammonia*	CS CS CS
2302A	Los Olmos Arroyo	Bacteria	2004	Chlorophyll-a*	CS
2303	International Falcon Reservoir	No Impairment		Toxicity in Ambient Water Total Phosphorus* Ammonia* Nitrate* Orthophosphorus*	CN CS CS CS CS
2304	RG Below Amistad International Reservoir	Bacteria	1996	Toxicity in Ambient Water	CN
2304B	Manadas Creek	No impairment		Bacteria Chlorophyll-a	CN CS
2305	International Amistad Reservoir	No Impairment		Nitrate	CS
2306	RG Above Amistad International Reservoir	Bacteria Total Dissolved Solids* Chloride* Sulfate*	1999 2010 2010 2010	Chlorophyll-a Total Phosphorus Fish Kill Report*	CS CS CN
2307	RG Below Riverside Diversion Dam	Bacteria Chloride Total Dissolved Solids	1996 1996 1996	Nitrate Orthophosphorus Total Phosphorus Ammonia Chlorophyll-a Depressed DO Bacteria*	CS CS CS CS CS CS CS
2308	RG Below International Dam	No Impairment		Chlorophyll-a Nitrate Total Phosphorus Ammonia*	CS CS CS CS
2309	Devils Rivers	No Impairment		No Concern	
2310	Lower Pecos River	No Impairment		Harmful algal bloom/golden alga	CN
2311	Upper Pecos River	Depressed DO	2006	Harmful algal bloom/golden alga Bacteria Chlorophyll-a Depressed DO	CN CN CS CS
2312	Red Bluff Reservoir	No Impairment		Harmful algal bloom/golden alga Chlorophyll-a Nitrate 1,2-Dibromoethane in water*	CN CS CS CN
2313	San Felipe Creek	No Impairment		No Concern	
2314	RG Above International Dam	Bacteria	1996	Chlorophyll-a	CS

CN - Concern for near-nonattainment of the Water Quality Standards
CS - Concern for water quality based on screening levels
*** - Draft 2010 Integrated Report**

Note: Each Segment is further subdivided into Assessment Units (AU). The entire segment may not be impaired. The complete list of impairments and AUs can be found at the TCEQ 303(d) website (p. 43).

Figure 3a. Water Quality Impairments and Concerns in the Rio Grande Basin

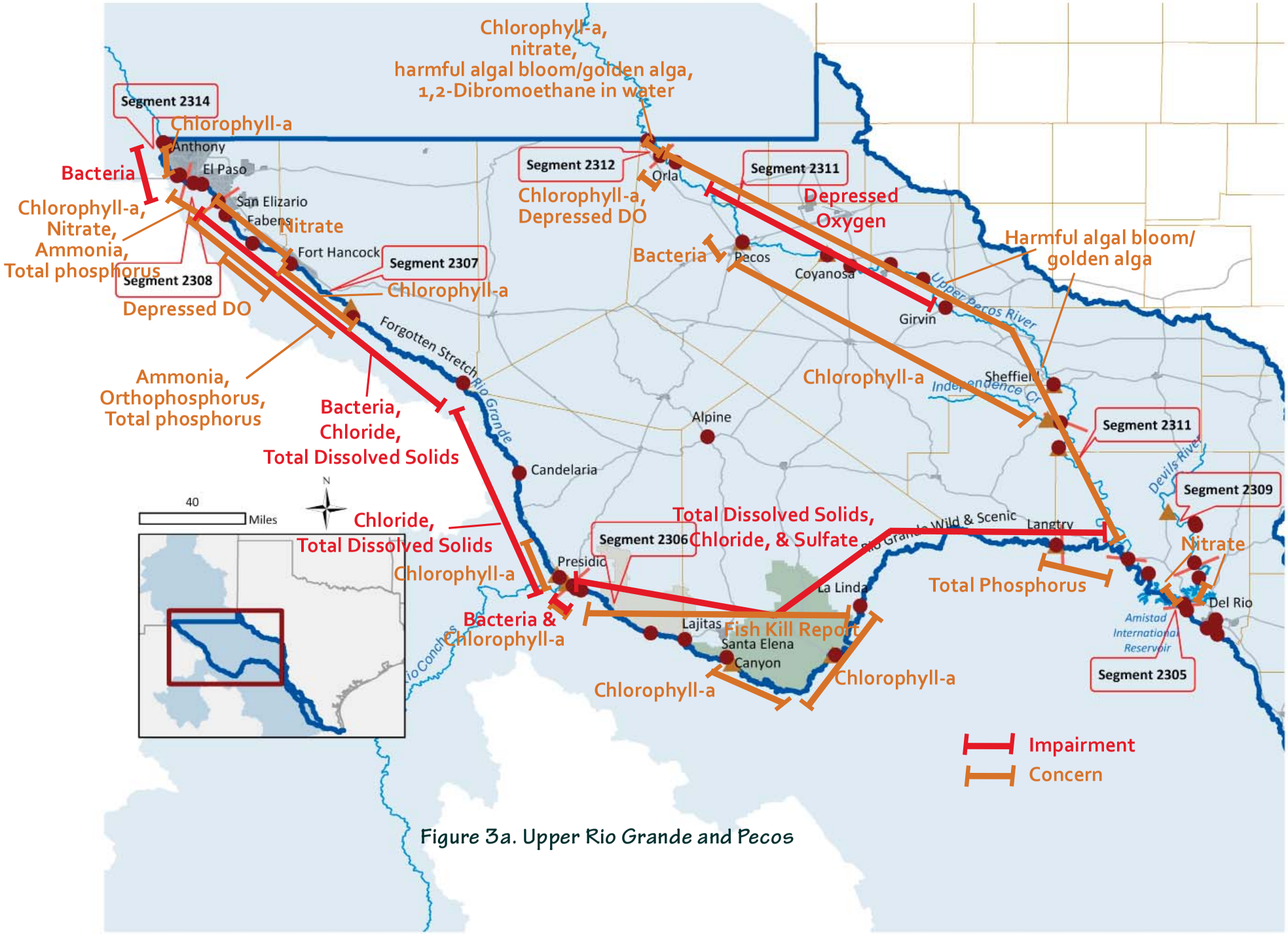


Figure 3a. Upper Rio Grande and Pecos

Figures 3b and 3c. Water Quality Impairments and Concerns in the Rio Grande Basin

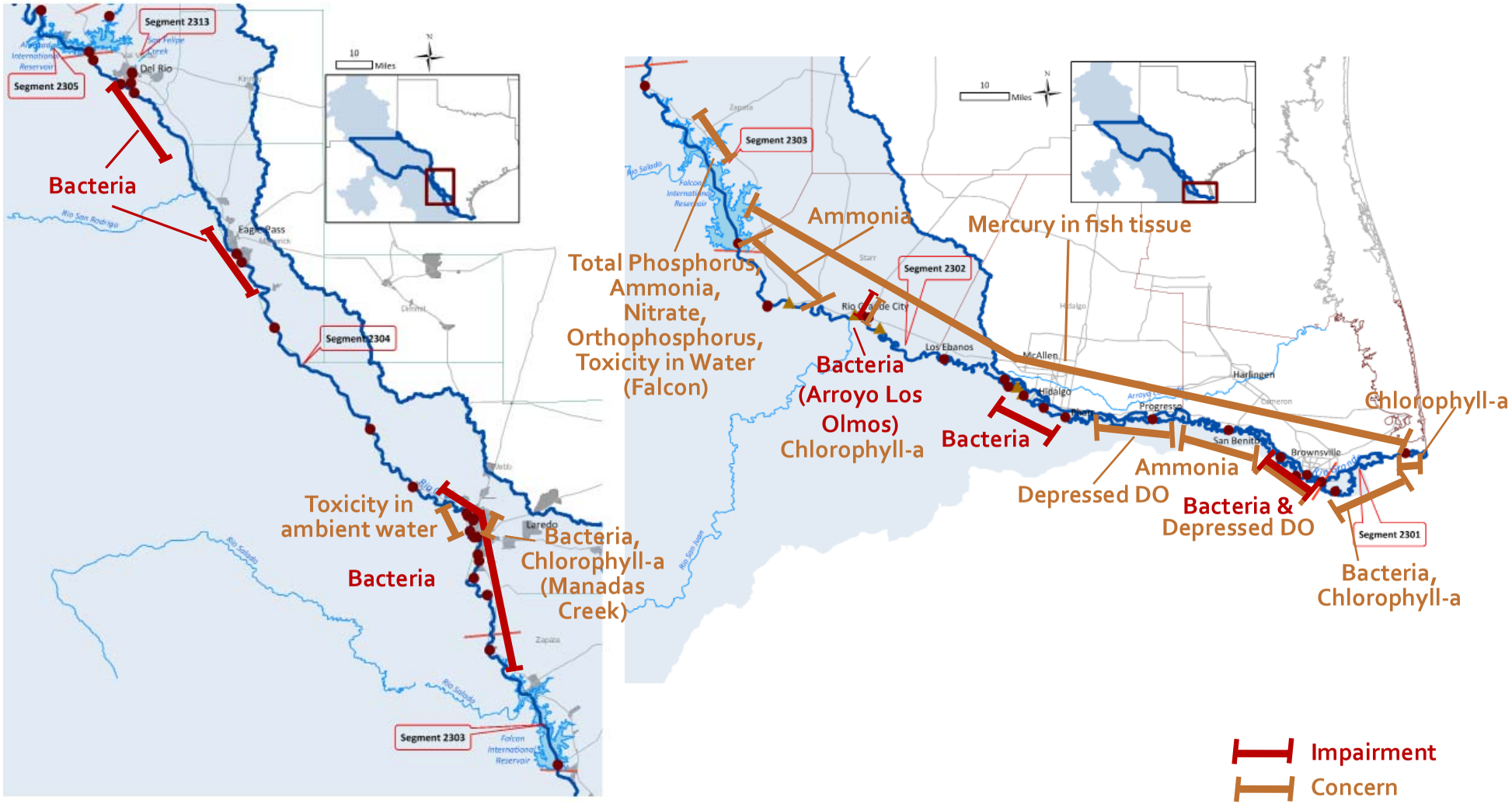


Figure 3b. Middle Rio Grande

Figure 3c . Lower Rio Grande

Sub-Basin Summaries

Upper Rio Grande Sub-Basin

New Mexico addresses Bacteria

Monitoring for the Paso del Norte Watershed Council (PdNWC)'s Watershed Based Plan began in spring 2010. The project is part of a watershed restoration grant through the New Mexico Environment Department (NMED) and EPA's Federal CWA Section 319(h) Nonpoint Source Grant. The project is addressing the bacteria impairment in the lower reach of the Rio Grande in New Mexico between Elephant Butte and American Dam in Texas. Activities include monthly monitoring for bacteria as well as genetic identification to determine the source of the bacteria. Data will be included in the Rio Grande Watershed Based Plan to provide recommendations for best management practices to address bacteria contamination.

New Mexico to conduct Water Quality Survey

NMED Surface Water Quality Bureau (SWQB) will be conducting a water quality study of the Lower Rio Grande in New Mexico and associated tributaries, from Percha Dam downstream to the international boundary. The study will be conducted from April 2011 to March 2012, and results will be used to determine water quality status, track water quality improvements and identify impaired water bodies.

Continuous Water Quality Monitoring

TCEQ and the USGS have collected continuous water quality data at five sites since September 2009. The continuous water quality monitoring (CWQM) sites collect data at 15-minute intervals for temperature, specific conductance, DO, and pH. Three of the CWQM sites are

Upper Rio Grande Sub-Basin Characteristics

The Upper Rio Grande Sub-Basin extends from the Texas-New Mexico state line downstream to the International Amistad Dam, a length of 650 miles (1,045 km). The river flows through 8 counties in the United States and consists of five river segments: 2314, 2308, 2307, 2306, and 2305.

In segment 2314, the river meanders in and out of Texas and New Mexico and in some parts forms the boundary between the two states. After Segment 2314, the Rio Grande forms the international boundary between the United States and Mexico. During irrigation season, the water in the river is used for agriculture by New Mexico, Texas, and Mexico. The city of El Paso, TX also uses the river to provide half of its drinking water supply. The sister cities of El Paso and Ciudad Juarez, Chihuahua have a combined population of over 2 million and lands surrounding the cities are used primarily for agriculture. This reduces the quantity and the quality of water in the river significantly. Water in the river downstream of these cities is primarily composed of agricultural return flows, wastewater effluent, and raw or partially treated sewage. Because of this, the upper Rio Grande downstream of El Paso/Juarez is very high in salts and bacteria.

As the river flows by the sister cities of Presidio, TX and Ojinaga, Chihuahua, the Rio Conchos combines with the Rio Grande improving the water quality and increasing water quantity significantly. The combined water from both rivers then flows through Segment 2306, which includes Big Bend Ranch State Park, Big Bend National Park, and the Rio Grande Wild and Scenic, where tourism and wildlife depend on the quality and quantity of water.

Pecos River, the largest U.S. tributary, enters the Rio Grande at the upstream arm of Amistad International Reservoir. The International Amistad Dam, near Del Rio, TX, is operated by the IBWC. Benefits created by the dam include flood prevention for downstream communities, improved water quality, water supply, and steady, continuous flow in the river below the dam as well as fishing and recreation. The dam also contains two hydroelectric plants that can produce electricity for communities on both sides of the border.

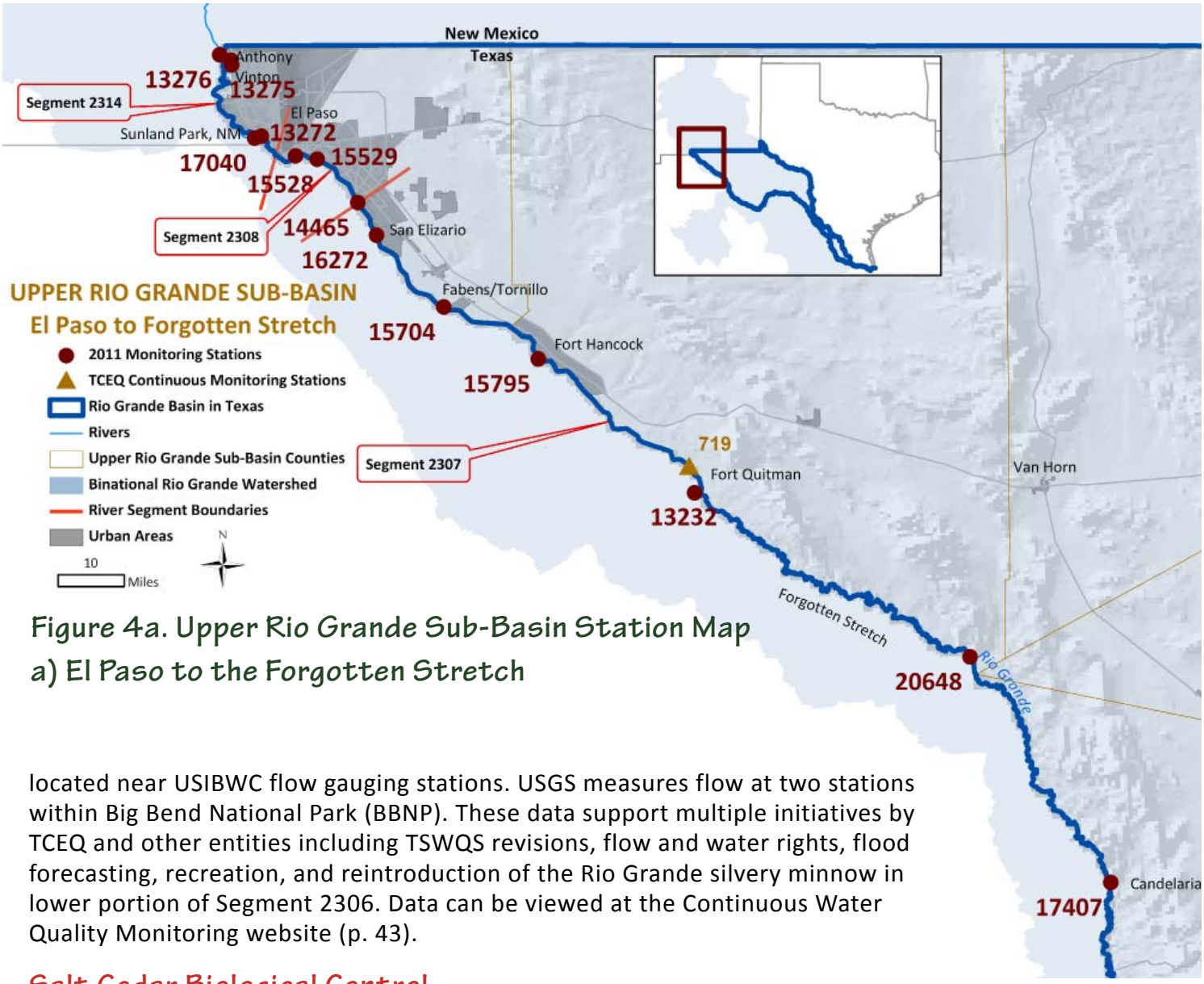


Figure 4a. Upper Rio Grande Sub-Basin Station Map
a) El Paso to the Forgotten Stretch

located near USIBWC flow gauging stations. USGS measures flow at two stations within Big Bend National Park (BBNP). These data support multiple initiatives by TCEQ and other entities including TSWQS revisions, flow and water rights, flood forecasting, recreation, and reintroduction of the Rio Grande silvery minnow in lower portion of Segment 2306. Data can be viewed at the Continuous Water Quality Monitoring website (p. 43).

Salt Cedar Biological Control

Over the past several years, the US Department of Agriculture (USDA) has been conducting a project to control invasive saltcedar along the Rio Grande near the Presidio and Candelaria areas. The biological control method uses a natural predator of saltcedar, a beetle, that eats the leaves of the shrub. In 2010, beetle populations increased dramatically and crossed into Mexico. The beetle is not harmful to humans and is beginning to control large areas of saltcedar. USDA is working with USIBWC to facilitate communication with Mexico regarding the beetle populations.

Winter Storm Freezes Rio Grande

In February 2011, record low temperatures near 0° Fahrenheit caused the Rio Grande in the El Paso area to freeze.

The winter storm of February 2011 created record low temperatures near 0° F that caused the Rio Grande in El Paso to freeze.

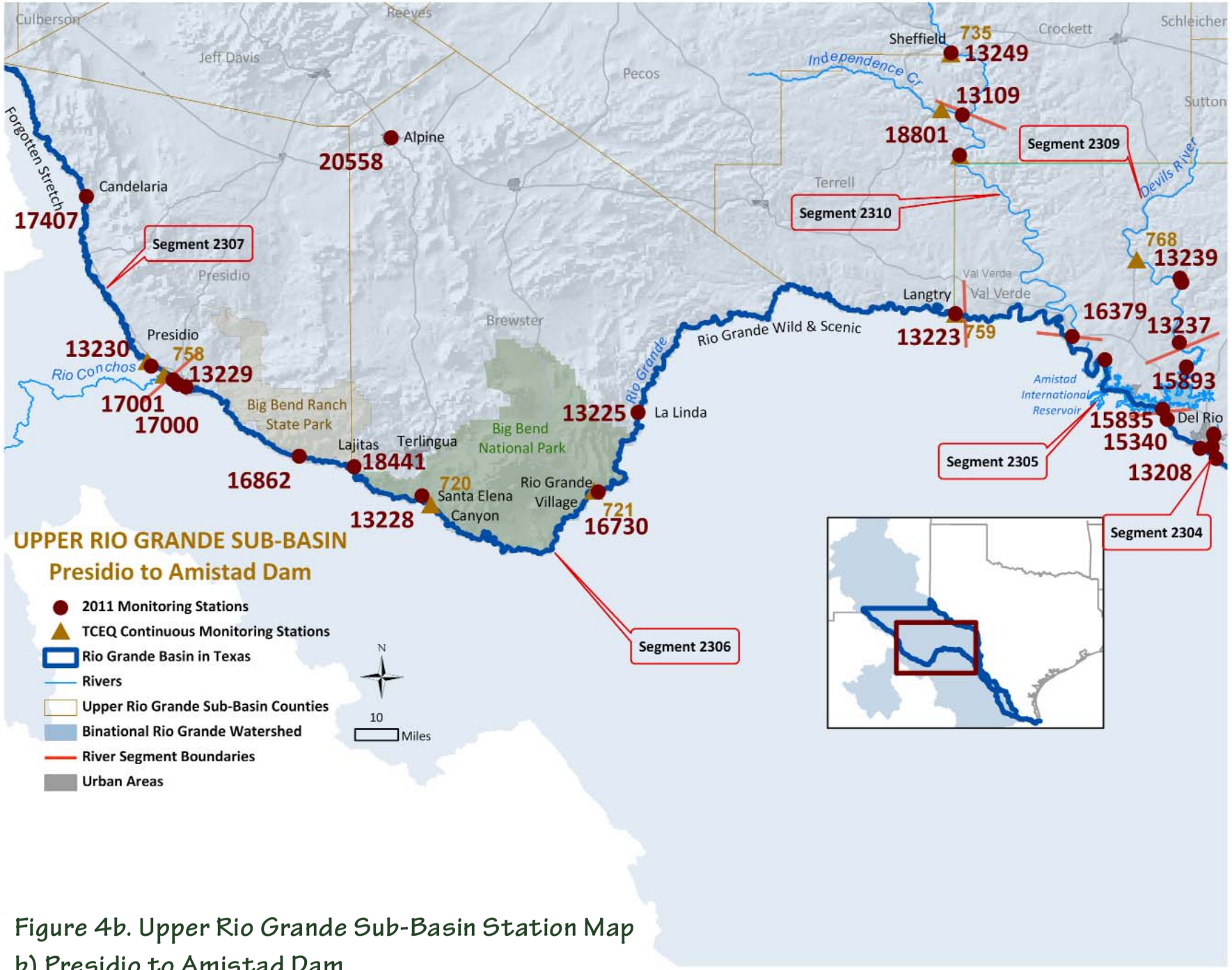


Figure 4b. Upper Rio Grande Sub-Basin Station Map
b) Presidio to Amistad Dam

Upper Rio Grande Nutrients and Salinity

In the past several years, BBNP, the USGS, TCEQ and the USIBWC have conducted a special study in Big Bend to track the source of nutrient and salinity contamination between Presidio and Amistad Dam. Some portions of the study have concluded and a report is currently being prepared by USGS. In addition, TCEQ has been collecting benthic macroinvertebrate samples and water quality data from Presidio to the lower reaches of Segment 2306 just upstream of Lake Amistad. Water quality and benthic macroinvertebrate data will be used by TCEQ to revise the TSWQS for TDS, chloride, and sulfate for Segment 2306.

Collecting benthic macroinvertebrate samples in the Lower Canyons in March of 2009. Data is being used to revise the TSWQS in Segment 2306.

Silvery Minnow Habitat Research

In 2010, the USGS, in cooperation with the USFWS, began to assess the relation of seasonal flow conditions to available habitat and recruitment of Rio Grande silvery minnow in the Big Bend reach of the Rio Grande. Phase I work in 2010 included detailed field mapping of the river using high accuracy GPS in concert with GIS. Mapped units will include comprehensive fish assemblage, physical habitat, and explanatory spatial variables and will soon be presented in an online mapping application. Results from this study will help to refine the process of release site selection, assist in the development of a more focused species monitoring assessment strategy, and provide detailed physical habitat information for the species over a range of flow conditions. For more information, please contact Bruce Moring (jbmoring@usgs.gov).

USGS crews use GIS to map silvery minnow habitat at the Rio Grande and Terlingua Creek in Big Bend NP, August 2010

photo Bruce Moring, USGS

Big Bend Lower Canyons Water Quality

Personnel from BBNP, in cooperation with the USIBWC CRP, TCEQ's SWQM, and Sul Ross State, have been characterizing the water resources and monitoring water quality in the remote Lower Canyons of the Rio Grande. Located in Brewster and Terrell Counties, the Lower Canyons have been referred to as the best wilderness canoe trip in the lower 48 states. Studies have focused on water quantity and quality of springs flowing into this section of the Rio Grande. These limestone springs increase the flow and improve water quality throughout this reach of the Rio Grande. Information from this study led the Far West Texas Water Planning Group to recognize these springs as "ecologically significant." These springs come from the Edwards-Trinity Plateau Aquifer on the Texas side and the Cerro Colorado-la Partida, Santa Fe del Pino aquifers in Mexico. Future research questions center around determining source information for these springs as well as springs on the lower Pecos and Devils River. Information like this can be used by communities and landowners to provide appropriate protection plans. Preliminary results from this study were presented at the fall Geological Society of America meeting in 2009.

River Restoration in Big Bend

Natural and cultural resources and park infrastructure along the Big Bend reach of the Rio Grande are threatened by increased flooding attributed to changing channel conditions. Sedimentation has led to

channel narrowing. This problem was dramatically illustrated in late 2008 when flooding occurred along the entire river corridor from above Presidio/ Ojinaga to Lake Amistad. Although the peak discharge was only a one in 12-15 year event, flood elevations achieved record heights. Channel narrowing has resulted in a loss of channel flow conveyance, flooding at lower discharges, and continued growth in flood plain elevation, even though flood magnitudes have decreased. Channel sedimentation is exacerbated by the invasion of non-native salt cedar (*Tamarix spp.*) and giant river cane (*Arundo donax*), which have increased sedimentation along the river margins. Additionally, anecdotal observations indicate that floodwaters from tributary flooding are now ponded behind sediment build-up at the confluence with the main stem. Over the past six years, the NPS, World Wildlife Fund, TPWD, and counterparts in Mexico have completed riparian rehabilitation projects on some 35 miles of the river. Focused on removing exotic vegetation, the projects have involved citizens from both countries and opened up riparian zones to native vegetation.

Upper Rio Grande CRP Partners

USIBWC American Dam/Carlos Marin Field Office
El Paso Water Utilities (EPWU)
El Paso Community College (EPCC)
University of Texas at El Paso (UTEP)
TCEQ El Paso Office
USIBWC Presidio Office
Big Bend National Park
Big Bend Ranch State Park/ Texas Parks & Wildlife
USIBWC Amistad Dam Office
Sul Ross University

Station 16862, Rio Grande at Colorado Canyon in Big Bend Ranch State Park, January 2010

Organics in Sediment

From 2007 to 2011, USIBWC CRP has collected data on pesticides and other organics in sediment at routine monitoring sites. For the first several years, organics were collected twice a year at all USIBWC CRP stations. In 2010 and 2011, USIBWC CRP reduced sampling to once a year at stations where organic parameters had been detected. In the Upper Rio Grande Basin, 29 pesticides were analyzed in sediment at 11 stations. The majority of data did not detect any pesticides in the sediment; however, DDE and endrin were detected in very small quantities at several stations in the Upper Rio Grande downstream of El Paso and Presidio. Endrin is listed by the United Nations as a Persistent Organic Pollutant, and DDE is an insecticide that bioaccumulates in animals. Data and a project description are available on the USIBWC CRP monitoring data web page.

USIBWC CRP collects sediment to test for organics at Station 13272 in El Paso, Sept. 2010

Upper Rio Grande Algae Research

Texas State University is conducting research on benthic algal communities and phytoplankton in the Upper Rio Grande. Preliminary data shows that dominant algal species are different upstream and downstream of Big Bend National Park, where spring discharges in the Lower Canyons influence algal community structure in the river. Algal species typically found in small spring-fed streams become a major component of benthic-algal communities found in the Rio Grande in the Lower Canyons, and changes in algal community structure indicate improvements in water quality. Research findings will be published next year.

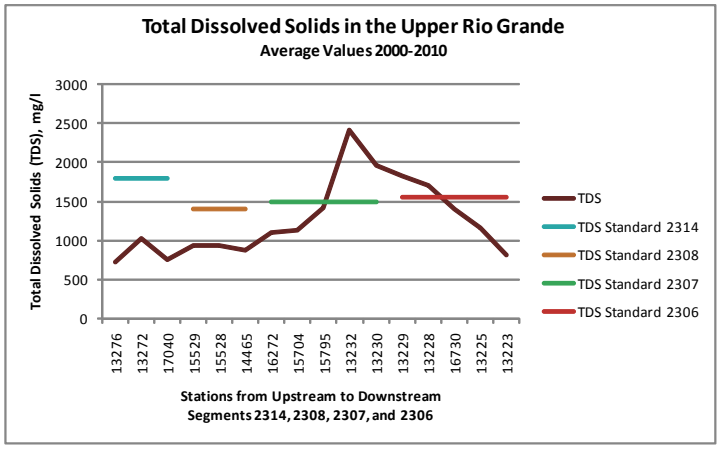
UPPER RIO GRANDE SUB-BASIN WATER QUALITY UPDATE

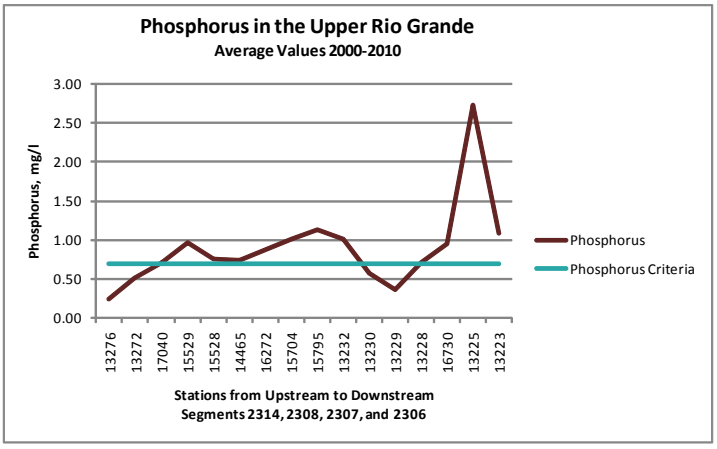
In the past year, TCEQ, USIBWC CRP and monitoring partners have continued to monitor water quality at 27 stations in the Upper Rio Grande Sub-Basin, including Amistad Reservoir and the Devils River. Table 6 and Figure 5 provide information about the water quality in the Upper Rio Grande.

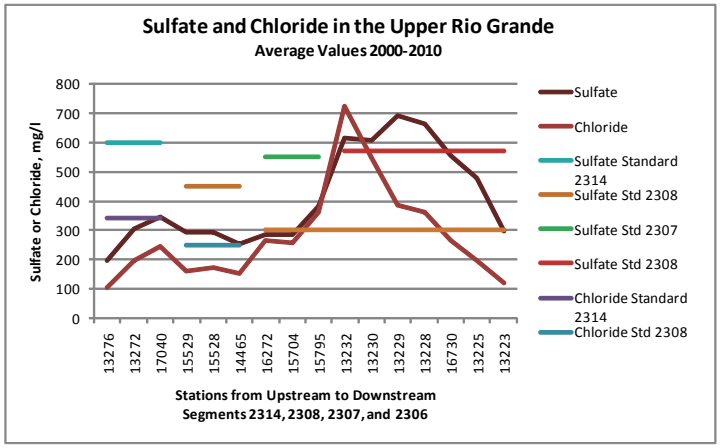
The Coordinated Monitoring Schedule for the Upper Rio Grande Sub-Basin can be found at: http://cms.lcra.org/

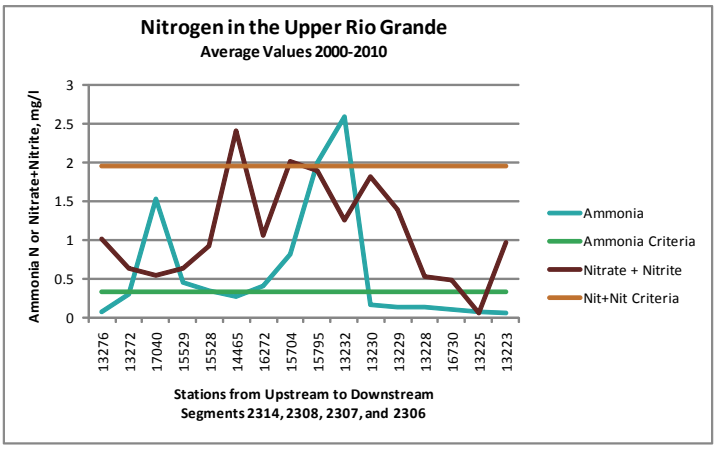
Table 6: Water Quality Review of the Upper Rio Grande Sub-Basin

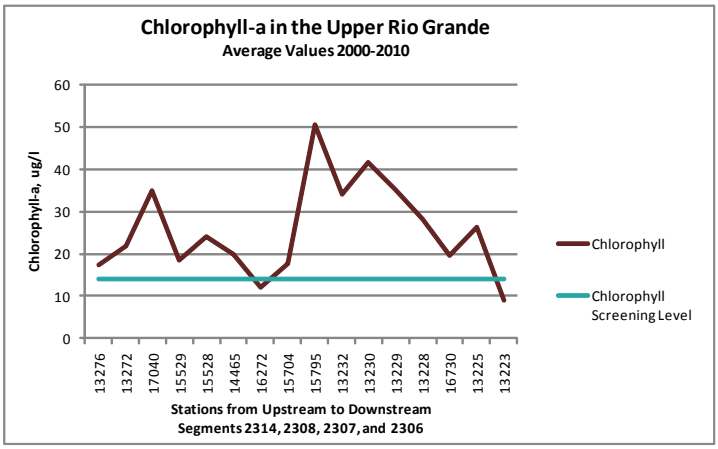
Table 6: Water Quality Review of the Upper Rio Grande Sub-Basin					
Segment Name	Uses	Stations	Length	Segment Characteristics	Water Quality Summary
2314 - RG Above International Dam	PCR, H, PS, FC, GU	13276, 17040, 13272	21 mi	Segment runs from New Mexico boundary through El Paso County. The river runs into and out of New Mexico near Sunland Park. Treaty allotments of water for the U.S. are then diverted at American Dam, and carried through El Paso in the Rio Grande American Canal Extension (RGACE) and Franklin Canal for use as a drinking water source and for irrigation by U.S. farmers. Mexico's water is diverted at International Dam and used for irrigation in the Juarez Valley.	Contact recreation impairment due to **high bacteria**. Primary impacts are concentrated animal feeding operations (CAFOs), irrigated agriculture, some industry, and municipal wastewater treatment plant effluent. Concerns for high c**hlorophyll-a** values, caused by non-point sources.
2308 - RG Below International Dam	NCR, L, PS,	14465, 15528, 15529	15 mi	The upper portion is concrete lined to prevent meandering of the international boundary. Since U.S. and Mexican treaty water are diverted upstream, this segment contains very little to no water, resulting in designated uses for limited aquatic life and noncontact recreation.	Meeting all primary standards, which are less stringent than other segments. Concerns for **nutrients** (phosphorous, nitrate, and chlorophyll-a), probably from urban runoff.
2307 - RG Below Riverside Diversion Dam	PCR, H, PS, FC, GU	16272, 15704, 15795, 13232, 13230, 20648	222 mi	The upper portion of this segment receives flow from irrigated agriculture and wastewater treatment plant effluent from both countries as well as poorly treated sewage. Very little impacts the lower portion of this segment as the river meanders through rough terrain and sparse ranch land, the "Forgotten Stretch."	Impairments of **high bacteria, chloride, and TDS**. Bacteria issues can be attributed to urban runoff and other nonpoint sources as well as municipal discharges. Salinity issues are due to flow alterations from upstream diversions, irrigated crop production, nonpoint sources, and natural causes. Concerns for **nutrients** probably from irrigated crop production.
2306 - RG Above Amistad International Reservoir	PCR, H, PS, FC, GU	17001, 17000, 13229, 16862, 18441, 13228, 16730, 13225, 13223	313 mi	Flows from Rio Conchos confluence in Presidio County to the confluence with Ramsey Canyon in Val Verde County. Flows through Big Bend Ranch State Park and Big Bend National Park, then joins the headwaters of Amistad Reservoir.	**Bacteria** levels are high downstream of Presidio/Ojinaga; Big Bend reach has elevated algal growth; high nutrient levels below Big Bend; **high TDS, sulfate and chloride** in the upper portion of segment. Entire segment added to 2010 Impairment list for salinity. Salinity causes are similar to Segment 2307.
2305 - International Amistad Reservoir	PCR, H, PS, FC, GU	13835, 15892, 15893	75 mi	From Amistad Dam in Val Verde County (Val Verde) to a point 1.8 km (1.1 miles) downstream of the confluence of Ramsey Canyon on the Rio Grande Arm in Val Verde and to a point 0.7 km (0.4 miles) downstream of the confluence of Painted Canyon on the Pecos Arm in Val Verde.	Reservoir has high aquatic life use and contact recreation uses being met; **nitrate** concern but exact sources are not known. High salinity input from the Pecos is potentially a concern.
2309 - Devils River	PCR, E, PS, FC, GU	14942, 13239, 13237	67 mi	From a point 0.4 miles (0.6 km) downstream of the confluence of Little Satan Creek in Val Verde County to the confluence of Dry Devils River in Sutton County.	Exceptional aquatic life and contact recreation uses fully supported; excellent water quality with low salinity (typical TDS values are below 500 mg/l). Few impactors.

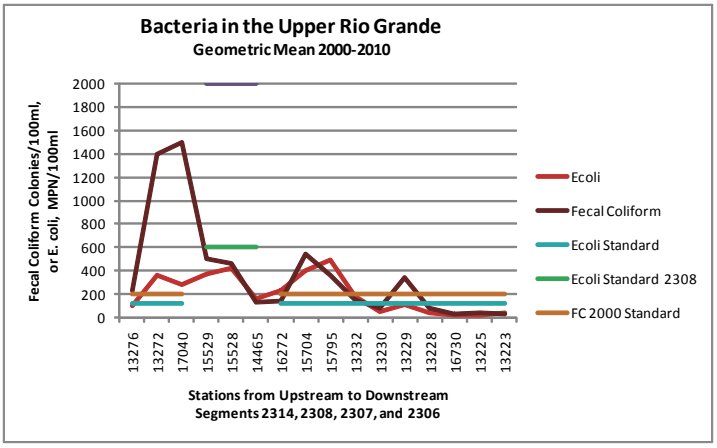












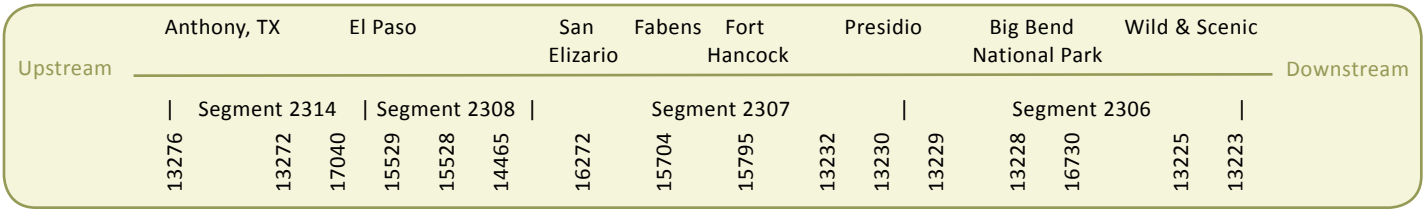


Figure 5. Graphs of major water quality parameters in the Upper Rio Grande

The graphs above show 11-year averages of TDS, sulfate, chloride, phosphorus, ammonia nitrogen, nitrate + nitrite, chlorophyll-a, and fecal coliform and *E. coli* bacteria for 16 stations in the Upper Rio Grande, with the upstream-most stations on the left and downstream stations on the right. Standards or secondary screening level criteria show where certain parameters are high. Salts and some nutrients increase towards Presidio, and bacteria values are higher in the El Paso area.

Pecos River Sub-Basin

Upper Pecos River Aquatic Life Monitoring

The Upper Pecos River (Segment 2311) is currently listed as impaired on the draft 2010 Texas 303(d) List for depressed 24-hr DO. In December 2010 and January 2011, TCEQ, TPWD, and USIBWC CRP conducted aquatic life monitoring (ALM) at four stations in the Upper Pecos during winter low flow when releases from Red Bluff Dam stop. This study will include analysis of fish and macrobenthic assemblages, habitat quality, 24-hr DO, conventional water analyses, field measurements, and instantaneous flow, at the same stations as the previous aquatic studies conducted in this stretch of the Pecos River. This ALM will be used to review water quality standards, determine the appropriate aquatic life use and develop the Use Attainability Analysis (UAA) for the Upper Pecos River.

Field crews collect fish via electrofishing method at Station 13249 near Sheffield, December 2010

Upper Pecos River Salinity Special Study

TDS values in the Pecos River enter Texas above 5,000 mg/L and climb to an average value of 20,000 mg/L as the water flows downstream to Girvin. TCEQ, USIBWC CRP and Texas AgriLife Research are conducting a special study in the Pecos River to determine possible sources contributing to the increasing salinity. From 2008 to 2010, TCEQ collected monthly samples at six stations along the Pecos between Girvin and Imperial where salinity is highest. Texas AgriLife is currently evaluating the data to help determine the salt load and source of salinity in the river.

Pecos River Water Quality Coalition

In September 2010, Texas Senator Uresti and Texas House Representative Gallego hosted a meeting of

Pecos River Sub-Basin Characteristics

The Pecos River begins in the mountains of North-Central New Mexico and flows along the eastern portion of the state. Shortly after the Texas – New Mexico state line, the Pecos River is impounded by Red Bluff Dam, creating Red Bluff Reservoir. Releases from Red Bluff are made in accordance with the Pecos River Compact for distribution to irrigation districts in the basin. The river then flows southeast until it empties into the Rio Grande upstream of International Amistad Dam. The Pecos River is 926 miles long and drains approximately 38,300 square miles. The Pecos River in Texas is 409 miles (658 km) and is divided into three designated stream segments: 2312, 2311, and 2310.

Segment 2312 is Red Bluff Reservoir, from Red Bluff Dam in Loving/Reeves County upstream to the New Mexico State Line in Loving/Reeves County, up to the normal pool elevation of 2842 feet. Segment 2311 is the Upper Pecos River, from a point immediately upstream of the confluence of Independence Creek in Crockett/Terrell County upstream to Red Bluff Dam. Segment 2310 is the Lower Pecos River from a point 0.7 kilometer (0.4 mile) downstream of the confluence of Painted Canyon in Val Verde County upstream to a point immediately upstream of the confluence of Independence Creek.

The Upper Pecos River is plagued by naturally high salinity, invasive salt cedar, and extreme drought conditions. Salinity of the Upper Pecos River is an important issue because, as the largest tributary to the Rio Grande in the US, the Pecos River contributes approximately 29.5 % of the salt loading into Amistad Lake while contributing only 11% of the stream flow. In the Lower Pecos River, freshwater inflows from tributaries such as Independence Creek lower the salt concentration and increase biological diversity.

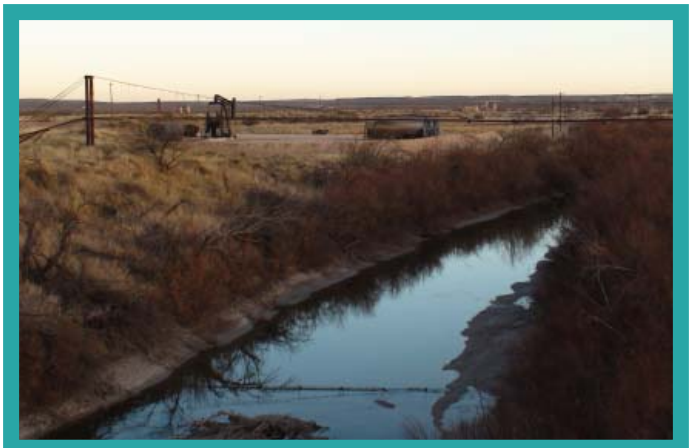
Pecos stakeholders to discuss the urgency of the Pecos water quality issues. The resulting Pecos River Water Quality Coalition is a group of lawmakers, state and federal representatives, and other stakeholders working on ways to address salinity and other water quality issues in the Pecos River. A joint Senate and House resolution was submitted to the 2011 Texas Legislature to secure additional federal funding for research and management projects.

Pecos River CRP Partners

- TCEQ Midland Office
- Texas AgriLife Extension Service
- Sul Ross University

Salinity Studies

The Texas Water Resources Institute (TWRI) is currently developing a project proposal to more specifically determine the sources of salts entering the Pecos River in Texas upstream of Girvin and will isolate their intrusion points in the river. Work in this proposed project is a critical step in being able to effectively manage salt loads transported by the river in the future. This project proposal will be submitted to the Texas State Soil and Water Conservation Board for funding consideration.



The Pecos River is surrounded by oil pumps that dot the western Texas landscape. This picture is at Station 13265 north of Orla, TX, Dec. 2010

A study is currently underway that utilizes salinity and flow data from 2006-2010 collected at four continuous water quality monitoring stations on the Pecos. The data is being used to estimate salt loads at the four stations for comparison with historical trends and will be critical for assessing the impacts of WPP implementation.

Pecos Watershed Protection Plan

The Texas AgriLife Extension Service, along with the USIBWC CRP, TCEQ, the TWRI, and the TSSWCB, has completed an EPA-funded project to develop a watershed protection plan (WPP) for the Texas portion of the Pecos River, and efforts are underway to implement portions of the WPP. The WPP outlines needed management practices that can be voluntarily implemented in identified areas of the watershed to address water quality and other watershed concerns. The WPP has also identified potential sources of financial and technical assistance that landowners can utilize to offset some costs of voluntary practice implementation, while also setting goals and developing a timeline for planned implementation. Current projects include treating previously unsprayed saltcedar infestations, removing decaying matter and saltcedar debris along the river, implementing biological saltcedar control sites, and developing water quality management plans. In addition, TCEQ will construct, install and operate a new CWQM station at Girvin with funding provided by TSSWCB through their EPA-funded 319(h) grant program.

Public meetings geared for landowners along the Pecos River were held in March 2011 to discuss WPP aspects such as cost-share projects, saltcedar spraying, and water quality. (Pecos, TX)

This plan is vital to the future ecosystem of the Pecos River. The Pecos River has experienced lowered water quality and stream flows, and the aquatic community of the Pecos River has been drastically altered, according to fishery biologists and to local users of the river. The greatly reduced aquatic diversity has been negatively affected by changes in river hydrology, salinity, riparian community destruction, oil and gas activities, irrigation demands, long and short-term droughts, damming of the river and over-

grazing. These factors, both natural and man-made, have allowed introduced plant species, such as saltcedar, to dominate the riparian systems within the watershed. The WPP addresses this issue by recommending best management practices for implementation throughout the watershed. For more information on the project and to view reports developed from the research conducted by the various partnering agencies, visit the Pecos River WPP website (p. 43).

Continuous Water Quality Monitoring

The TCEQ currently operates six CWQM stations on the Pecos River and will soon be expanding its network to eight. The data generated is being used to monitor changes in salt concentrations (using specific conductance) and surface water flow associated with salt cedar removal, to collect data to support research on the cause of toxic golden alga blooms, to provide data for the Integrated Report, and to support the Pecos River WPP by monitoring dissolved oxygen. The two new sites will be installed at Girvin, TX and Red Bluff, NM in support of the WPP.

The continuous water quality monitoring station on the Pecos at Pecos, TX, April 2010

Iraan Volunteer Monitors

The Iraan Independent School District is continuing with its efforts to use the Pecos as an outdoor classroom through an Ecology class for the Pecos River and associated local basin. Science teachers from Iraan High School and representatives for the Pecos River WPP participated in water quality monitoring training for the Texas Stream Team, a statewide volunteer monitoring program. They are continuing to collect water quality information at several sites in and around Iraan, Texas in support of the WPP and educational goals.

Kokernot Springs Restoration Project

The Kokernot Springs Restoration Project is a multi-phase project aimed at showcasing the return of the spring and the adjacent floodplain to a condition that represents a more functional and sustain-

Table 7. Water Quality Review of the Pecos River Sub-Basin

Water Quality Review of the Pecos Sub-Basin					
Segment	**Uses**	**Stations**	**Length**	**Segment Characteristics**	**Water Quality Summary**
2312 - Red Bluff Reservoir	H, GU, FC, PCR	13269, 13267	11 mi	From the TX/NM state line to end of dam. High salinity prevents use as a public water supply and restricts agriculture to salt-tolerant crops.	Segment has concern for **golden alga blooms**, as well as nitrate and chlorophyll-a. **Fish kill reports** are also listed as a concern for 2312, with exact causes unknown. Concern for 1,2-Dibromoethane, a chemical probably produced by algae. Salinity values are typically over 6,000 mg/L.
2311 - Upper Pecos River	H, GU, FC, PCR	13265, 13264, 13260, 13257, 15114	349 mi	From Red Bluff Reservoir to Independence Creek.	Water is not drinkable due to high salinity. **Salinity** increases in this segment, climbing to an average of 21,000 mg/L at Girvin, although overall TDS is within the standard (15,000 mg/L). Segment has concern for **golden alga blooms**. Aquatic life is negatively affected by **depressed dissolved oxygen** and has led to a DO impairment. 2311 also has concerns for **fish kills** and **chlorophyll-a** (exact causes unknown).
2310 - Lower Pecos River	H, PS, GU, FC, PCR	13109, 13246, 13240, 16379, 18801	49 mi	From confluence of Independence Creek to the confluence with the Rio Grande.	Waters from Independence Creek in the past have brought salinity values down to treatable drinking water levels, but recent data shows abnormally high values of chloride, sulfate, and TDS. Segment has concern for **golden alga blooms** and **fish kills**.

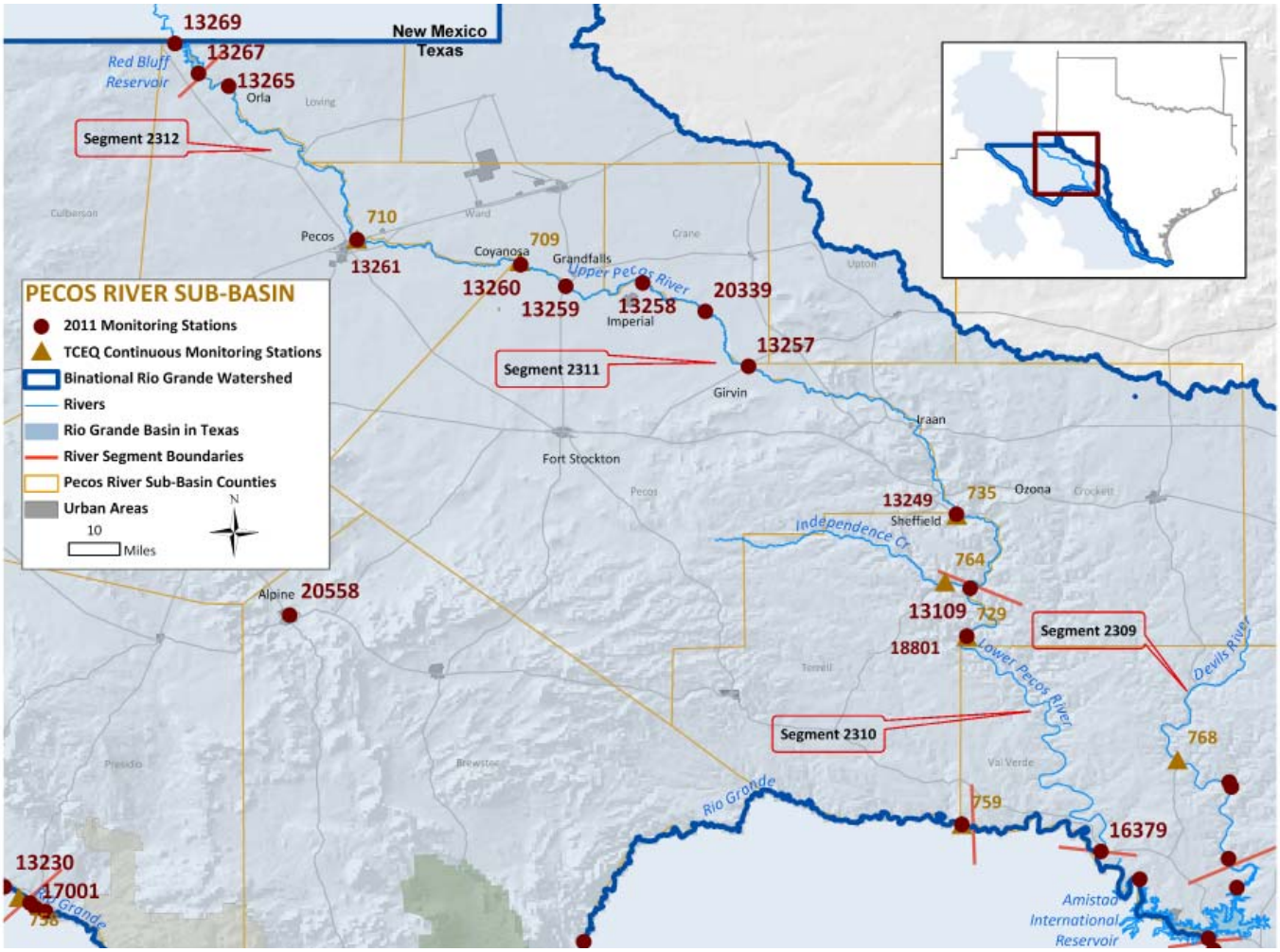


Figure 6. Pecos River Sub-Basin Station Map

able geo-hydrologic and biologic condition. Located on the campus of Sul Ross State University in Alpine, Texas, Kokernot Springs is considered to be in a geo-hydrologic non-functional state. The project includes spring flow quantity and quality monitoring, mapping, planning, public and institutional input regarding the future desired conditions of the spring, invasive species removal, native species reintroduction, natural wetlands restoration, removal of impediment structures, volunteer recruitment, and outreach. The project is coordinated by Sul Ross Rio Grande Research Center and is a collaboration of citizens, land managers, and research scientists affiliated with the Big Bend Binational Conservation Cooperative (BBBCC). For more info email rioresearch@sulross.edu.

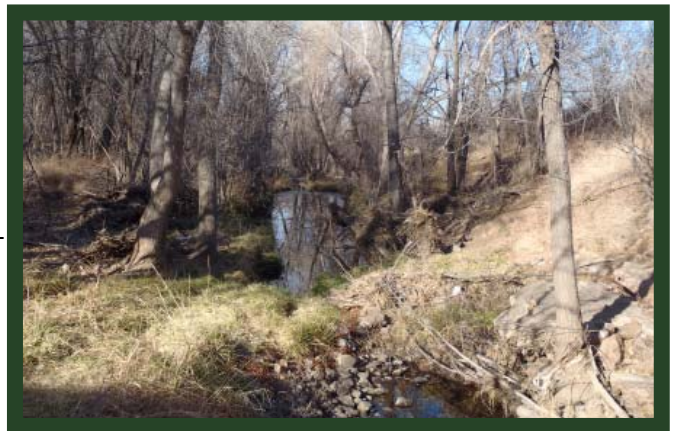


photo Sul Ross University

Kokernot Spring in Alpine, Texas, where research is being conducted to restore the spring

PECOS RIVER SUB-BASIN WATER QUALITY UPDATE

In the past year, the TCEQ Midland Regional Office has continued to monitor water quality at 10 stations in the Pecos River Sub-Basin, including Independence Creek. Table 7 and Figure 7 provide information about the water quality in the Pecos River.

The Coordinated Monitoring Schedule for the Pecos River can be found at: http://cms.lcra.org/

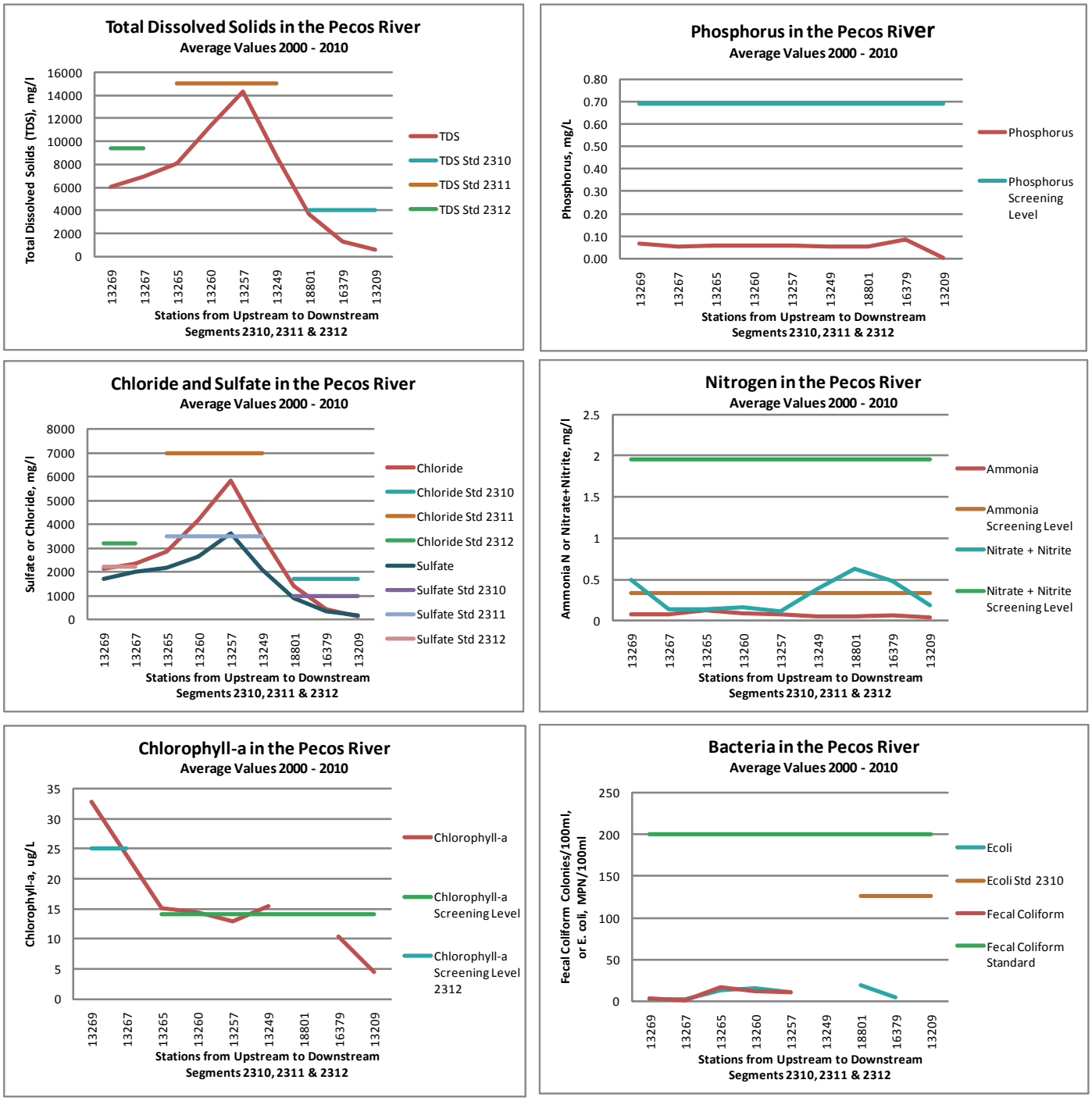


Figure 7. Graphs of major water quality parameters in the Pecos

The graphs above show 11-year averages of TDS, sulfate, chloride, phosphorus, ammonia nitrogen, nitrate + nitrite, chlorophyll-a, and fecal coliform and *E. coli* bacteria for 9 stations in the Pecos River Sub-Basin, with the upstream-most stations on the left and downstream stations on the right. Standards or secondary screening level criteria show where certain parameters are high. Salts are extremely high in the Pecos but generally do not exceed the TSWQS, which are set high to account for the natural salts in the river. High salinity values near Girvin are attributed to hydrologic changes in the river.

Middle Rio Grande Sub-Basin

Laredo Bacteria Special Study

The USIBWC CRP partners have collected bacteria data in 10 routine monitoring stations in the Laredo area for many years, and the data has consistently shown high bacteria values beginning in downtown Laredo. The Rio Grande has been listed as impaired for bacteria in the Laredo area since the Texas began listing in 1996. USIBWC CRP, in partnership with RGISC, Texas A&M International University (TAMIU), TCEQ, and the Laredo Community College (LCC), has been planning a special study to investigate and characterize the bacteria contamination and to identify possible sources of bacteria. The intensive monitoring and survey work will be conducted Summer 2011.

2010 Flood Damage

The 2010 flood substantially affected the communities along the Middle Rio Grande. High flows eroded banks and affected projects such as the Department of Homeland Security (DHS) revegetation of the banks where *Arundo donax* (river cane) had been removed the previous year. Laredo's RioFest annual kayak/canoe race was cancelled due to debris along the river and damage to river parks.

Laredo Environmental Summit

In October 2010, Laredo held its first Environmental Summit in partnership with the TCEQ Border Initiative. The purpose of the summit was to bring together local and state stakeholders to identify and address environmental needs and resources in Webb County and to collaborate on solutions to Laredo's environmental challenges. The summit focused on illegal dumping, conservation, and water issues. USIBWC CRP partner Dr. Vaughan spoke about water quality.

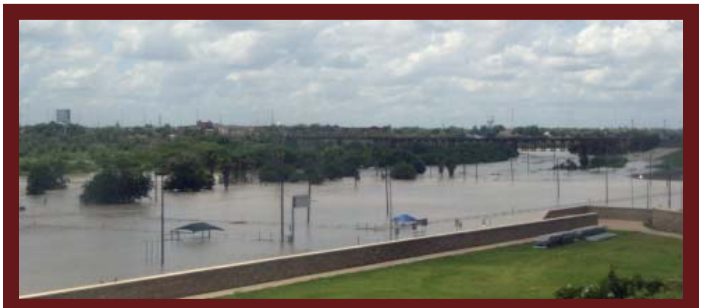
Rave on the Rio

On October 14, 2010, the RGISC collaborated to host an evening of talks and festivities to celebrate the Rio Grande. Keith Bowden, Rio Grande enthusiast and author of "The Tecate Journals," shared photographs of his experiences kayaking down the Rio

Middle Rio Grande Sub-Basin Characteristics

The Middle Rio Grande Sub-Basin consists of that portion of the river flowing from just below International Amistad Reservoir to just above International Falcon Reservoir and also includes San Felipe Creek. The 303-mile (487-km) stretch of the Middle Rio Grande flows past five counties in Texas and the Mexican states of Coahuila, Nuevo Leon, and Tamaulipas. Del Rio, Eagle Pass and Laredo along with Mexican sister cities Ciudad Acuña, Piedras Negras, and Nuevo Laredo comprise the bulk of the populations living along the Rio Grande in this reach. Laredo, in particular, is one of the fastest growing cities in Texas. Increased trade with Mexico, manufacturing growth, and tourism have contributed to population increases in the area.

Water impounded behind Amistad Dam slows in velocity and much of the suspended solids carried from the Upper Rio Grande Sub-Basin settles. Water in the middle Rio Grande is used for irrigation and increasingly for municipal use. Most municipalities along the river are dependent on surface water for domestic and industrial use. Del Rio, TX is the only major city that relies on groundwater for its water needs.



The International Bridge in downtown Laredo during the July 2010 flood.

Author Keith Bowden shared his experiences boating the Rio Grande, at the Rave on the Rio in Laredo

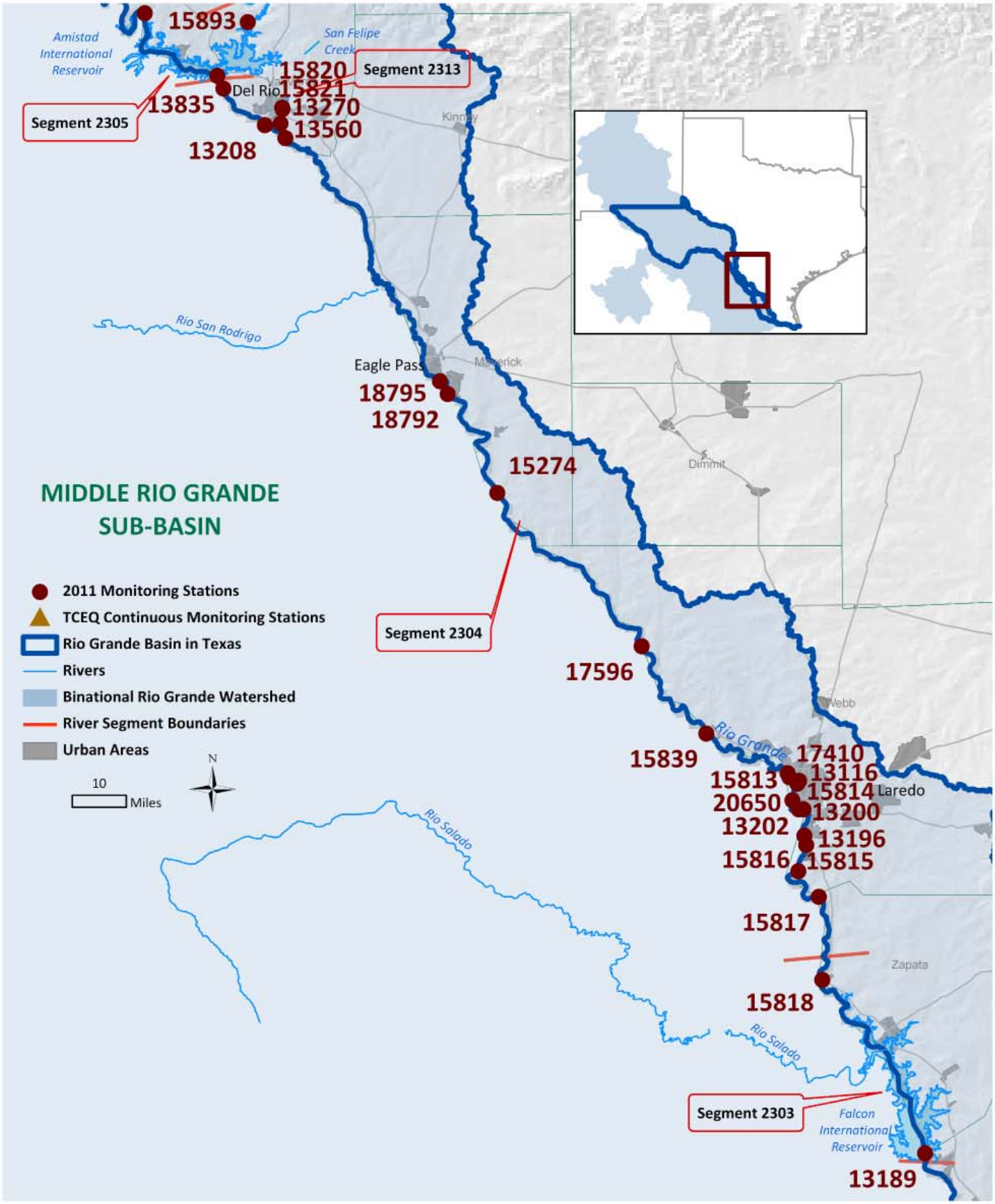


Figure 8. Middle Rio Grande Basin Station Map

Grande. The evening featured talks from TCEQ as well as poetry, music, and dance, in addition to a summary of water quality in the Middle Rio Grande as part of the public meeting portion of the USIBWC Clean Rivers Program.

Organics in Sediment

From 2007 to 2011, USIBWC CRP has collected data on pesticides and other organics in sediment at routine monitoring sites. For the first several years, organics were collected twice a year at all USIBWC CRP stations. In 2010 and 2011, USIBWC CRP has reduced sampling to once a year at stations where organic parameters had been detected. In the Middle Rio Grande Sub-Basin, 29 pesticides were analyzed in sediment at 10 stations. The majority of data did not detect any pesticides in the sediment; however, DDE, DDD, methoxychlor, and endrin were detected in small quantities at several stations in the Middle Rio Grande in the Laredo and Del Rio areas. Data and a project description are available on the USIBWC CRP monitoring data web page.

Middle Rio Grande CRP Partners

USIBWC Amistad Field Office
USIBWC Falcon Field Office
City of Laredo Environmental Services Dept.
City of Laredo Health Department
City of Laredo Health Department Laboratory
Rio Grande International Study Center
TCEQ San Antonio Regional Office
TCEQ Laredo Regional Office
Texas A&M International University
Laredo Community College

Members of GSEP prepare to dive to sample at San Felipe West Spring in Del Rio, Texas

Springs Research

The Goodenough Springs Exploration Project (GSEP), a private technical diving organization, partnered with the TWDB to investigate water quality in three springs in the Del Rio area: Goodenough Spring and Slaughter Bend Springs both in Amistad Reservoir, and San Felipe Springs in Del Rio. Sampling took place in September 2009 and March 2010. The research took place under a NPS permit to conduct scientific research in Amistad National Recreation Area, as well as permission from the City of Del Rio. Divers collected water samples and photographed the condition of the submerged water treatment plant equipment. Data is available at the TWDB website (wells 7130901, 7017501 and 7041302). Contact ray@raykamps.com.

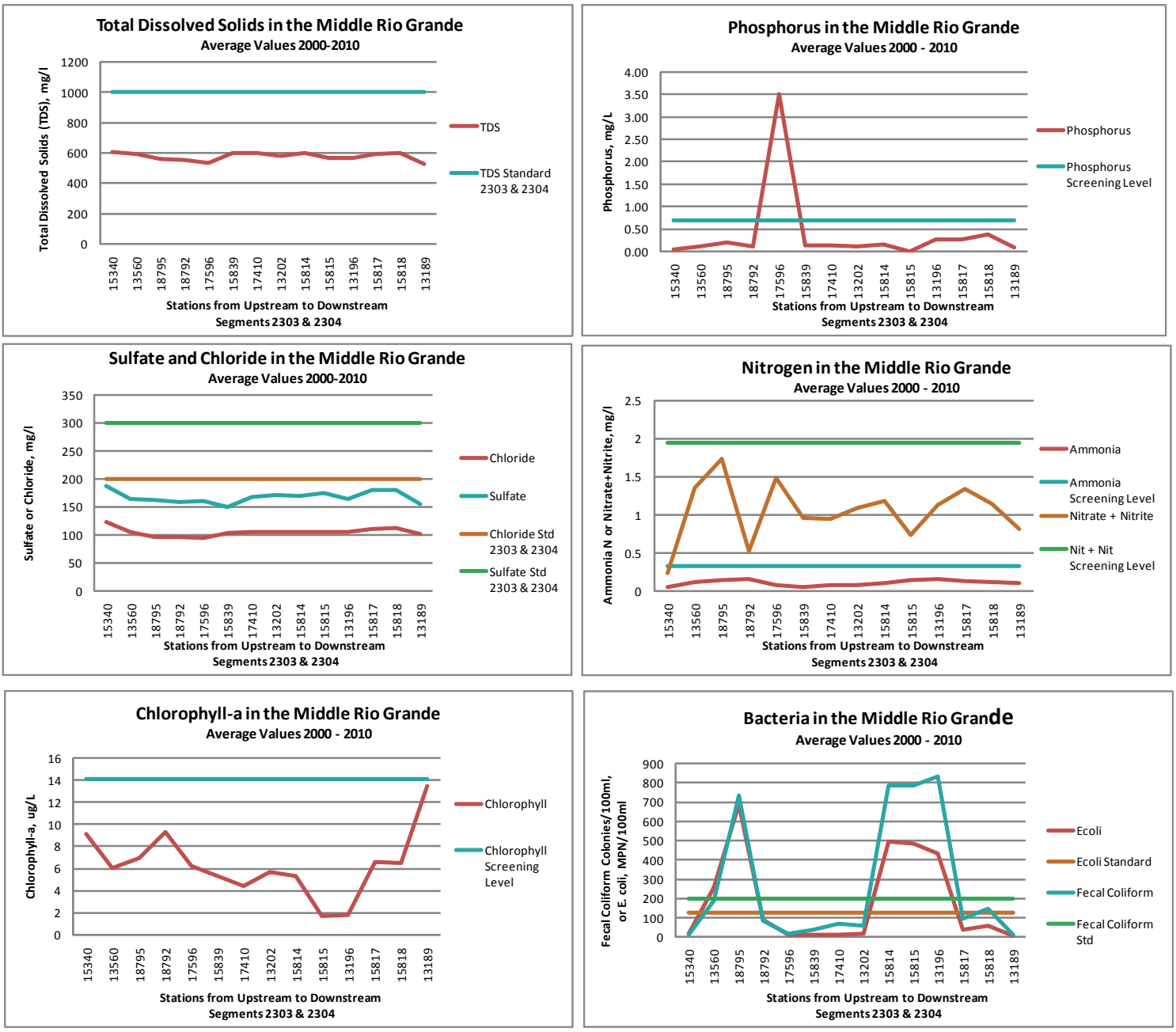
Mussels Research

In November 2009, TPWD listed three native Rio Grande mussels (*Potamilus metnecktayi* (Salinas Mucket), *Popenaias popeii* (Texas Horn Shell) and *Truncilla cognata* (Mexican Fawnsfoot)) on the state threatened list. Mussel experts from LCC, TPWD, Texas State University, and other collaborating universities have been conducting research on these mussels, with recent focus on the Devils River and the Middle Rio Grande, including marking mussels for recapture.

MIDDLE RIO GRANDE SUB-BASIN WATER QUALITY UPDATE

In the past year, TCEQ, USIBWC CRP and monitoring partners have continued to monitor water quality at 23 stations in the Middle Rio Grande Sub-Basin, including Falcon Reservoir and San Felipe Creek. Table 8 and Figure 9 provide information about the water quality in the Middle Rio Grande.

The Coordinated Monitoring Schedule for the Middle Rio Grande Sub-Basin can be found at: http://cms.lcra.org/



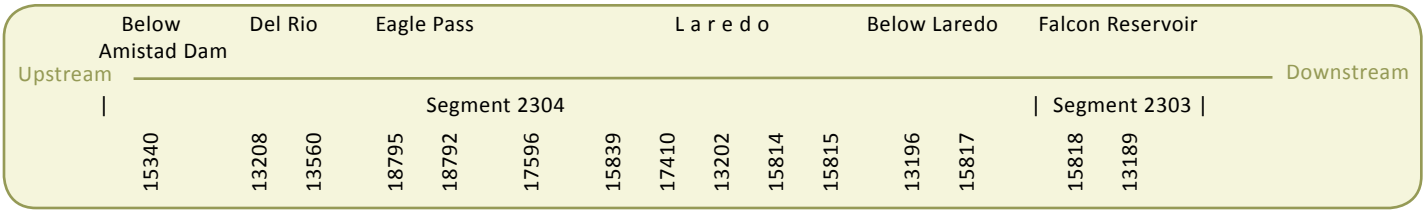


Figure 9. Graphs of major water quality parameters in the Middle Rio Grande

The graphs above show 11-year averages of TDS, sulfate, chloride, phosphorus, ammonia nitrogen, nitrate + nitrite, chlorophyll-a, and fecal coliform and *E. coli* bacteria for 14 stations in the Middle Rio Grande, with the upstream-most stations on the left and downstream stations on the right. Standards or secondary screening level criteria show where certain parameters are high. Bacteria is the principal problem in the Middle Rio Grande, particularly in the Del Rio and Laredo areas.

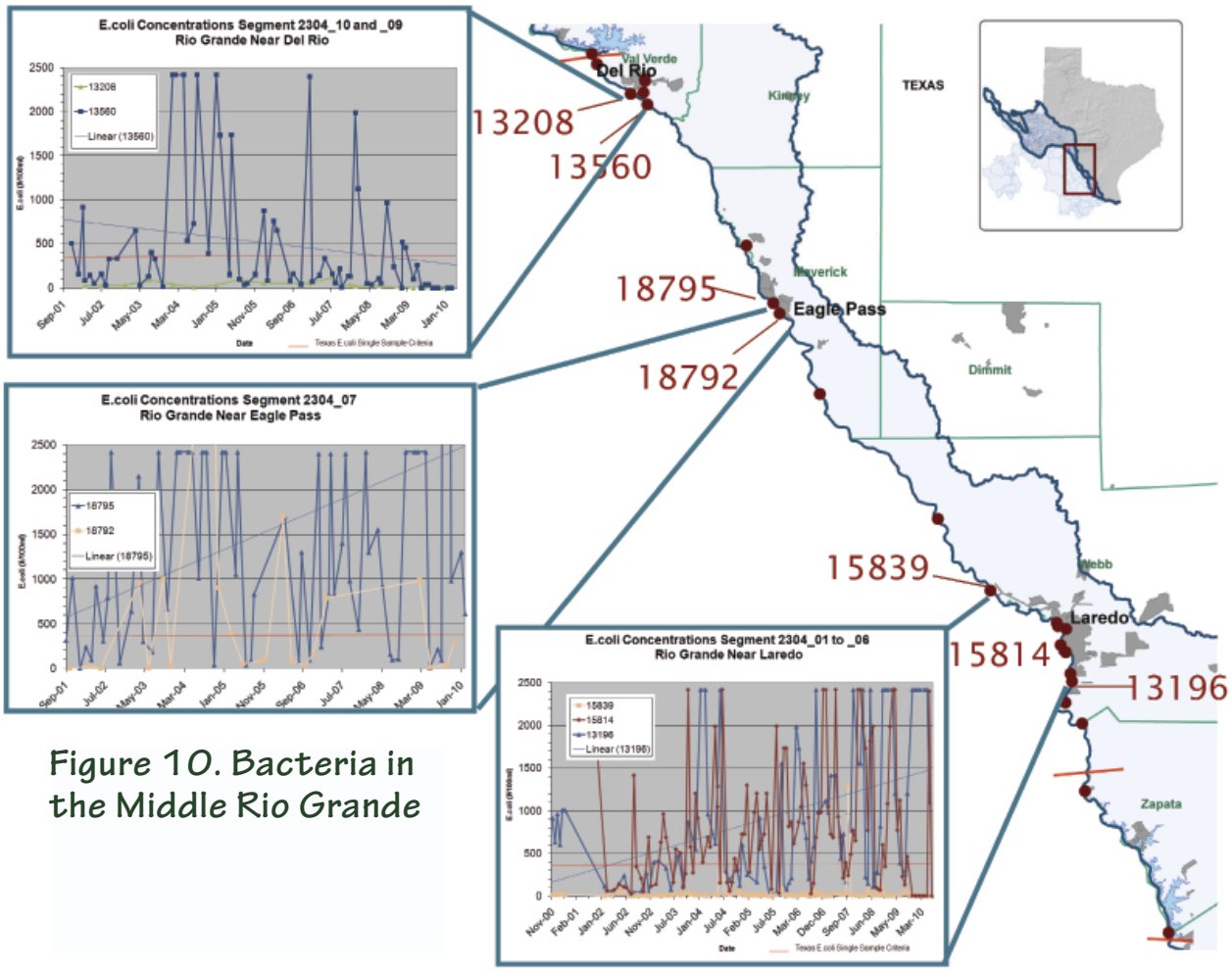


Figure 10. Bacteria in the Middle Rio Grande

Table 8. Water Quality Review for the Middle Rio Grande Sub-Basin

Water Quality Review for the Middle Rio Grande Sub-Basin					
Segment	**Uses**	**Stations**	**Length**	**Segment Characteristics**	**Water Quality Summary**
2304 - Rio Grande Below Amistad Reservoir	H, PS, GU, FC, PCR	15340, 13208, 13560, (13206, 13205)*, 18795, 18792, 15274, 17596, 15839, 17410, 15813, 13202, 15814, 13201, 15815, 13196, 15816, 15817	226 mi	From Amistad Dam to the confluence of Mexico's Rio Salado.	Impaired for contact recreation due to **high bacteria** below Del Rio; concern for nitrate and low DO from below the dam to the confluence with San Felipe Creek; near Laredo, concern for toxicity in ambient water and impaired for **bacteria**. High bacteria likely due to municipal effluent, urban runoff, and discharges outside of U.S. jurisdiction.
2304B - Manadas Creek	H	13116	1 mi	(Unclassified water body) Small, perennial stream in northwest Laredo.	Concerns for **bacteria** and **chlorophyll-a** likely due to urban runoff. Although not officially listed, 2304B has high metals due to previous industrial activity.
2303 - International Falcon Reservoir	H, PS, FC, PCR	15818, 13189	68 mi	Falcon Reservoir is used for recreation, water supply, and hydroelectric power generation. Less water is impounded in Falcon than in Amistad.	No impairments; however there is a concern for t**oxicity in ambient water** near Zapata, likely from municipal effluent. Previous concerns for nitrate and ammonia in the lake have been removed.
2313 - San Felipe Creek	H, PS, GU, FC, PCR	15820, 15821, 13270	9 mi	Originates in the Del Rio area, where two springs make up the San Felipe Creek, providing the city with a high-quality water supply for drinking, fishing, and swimming.	All uses are fully supported. San Felipe Creek has a positive effect on the Rio Grande, since the water quality is high and reduces some of the loading in the Rio Grande.

* Inactive station

Lower Rio Grande Sub-Basin

Brownsville Bacteria Special Study

In March and April 2010, USIBWC CRP and the University of Texas at Brownsville (UTB) conducted field work for the Brownsville Bacteria Special Study. The study was designed to characterize the bacteria contamination in a 20-mile stretch of the Rio Grande in Brownsville, TX through intensive water quality monitoring and to conduct a survey of all structures along the river to help identify possible point sources of pollution. The results were inconclusive since high bacteria values were not detected during the March and April sampling events; however, the study was successful in identifying all the structures along the bank. A final report will be posted on the USIBWC CRP website by summer of 2011, and USIBWC will work towards addressing issues arising from the survey.

Part of the Brownsville study included a survey of all structures and drains on both banks of the river in the study area.

Brownsville PUB to analyze Entero

The 2010 TSWQS required that for saline waters, including the tidal portion of the Rio Grande in Segment 2301, Enterococcus be analyzed instead of *E. coli* for a primary contact recreation bacteria indicator. USIBWC CRP partner Brownsville Public Utilities Board (BPUB) has received accreditation in Entero analysis and has been added to the USIBWC CRP QAPP to analyze Entero for tidal Stations 16288 and 13176. We look forward to the collaboration and assistance from BPUB.

Flood Waters Bacteria Analysis

USIBWC CRP staff traveled to the LRGV the

Lower Rio Grande Sub-Basin Characteristics

The Lower Rio Grande Sub-Basin stretches from just below Falcon Dam to the mouth of the Rio Grande at its confluence with the Gulf of Mexico. This portion of the river is divided into two segments, 2301 and 2302. This 280-mile (451-km) stretch of the Rio Grande runs through Starr, Hidalgo, and Cameron Counties of Texas and forms the border between those counties and the Mexican State of Tamaulipas. Major cities in the sub-basin include McAllen, Harlingen, and Brownsville on the United States side of the river and Matamoros and Reynosa on the Mexican side. The largest portion of water used in the area is consumed by agriculture. However, 2000 census data identified the Lower Rio Grande Valley (LRGV) as having the fourth largest increase in population in the country. Increased municipal and industrial demands will only further strain a limited resource already taxed by previous drought conditions and high agricultural use. Groundwater in the area is brackish resulting in the construction of a desalinization plant and possibly more plants in the future.

In 2004 and 2008, increased rainfall and water deliveries from Mexico have allowed reservoirs to increase their storage. Research is also being done to increase storage on the river by constructing a weir near Brownsville. Additional studies are being conducted on desalinization of groundwater and ocean water to supplement drinking water supplies in the LRGV.

Invasive aquatic weeds such as hydrilla and water hyacinth have been an issue in the Lower Rio Grande. These aquatic plants choke portions of the river, preventing boat traffic, impeding water flow and increasing water loss through consumption and evapotranspiration. Control methods (mechanical removal and biological control using triploid grass carp) have reduced the problem significantly.

Heavy rains, such as those in the late summer of 2008 and the flood of 2010, have helped push the aquatic plants into saline waters where they cannot survive. At present, the problem is not the serious issue that it was in 2003, but hydrilla is rapidly re-establishing itself in the river.

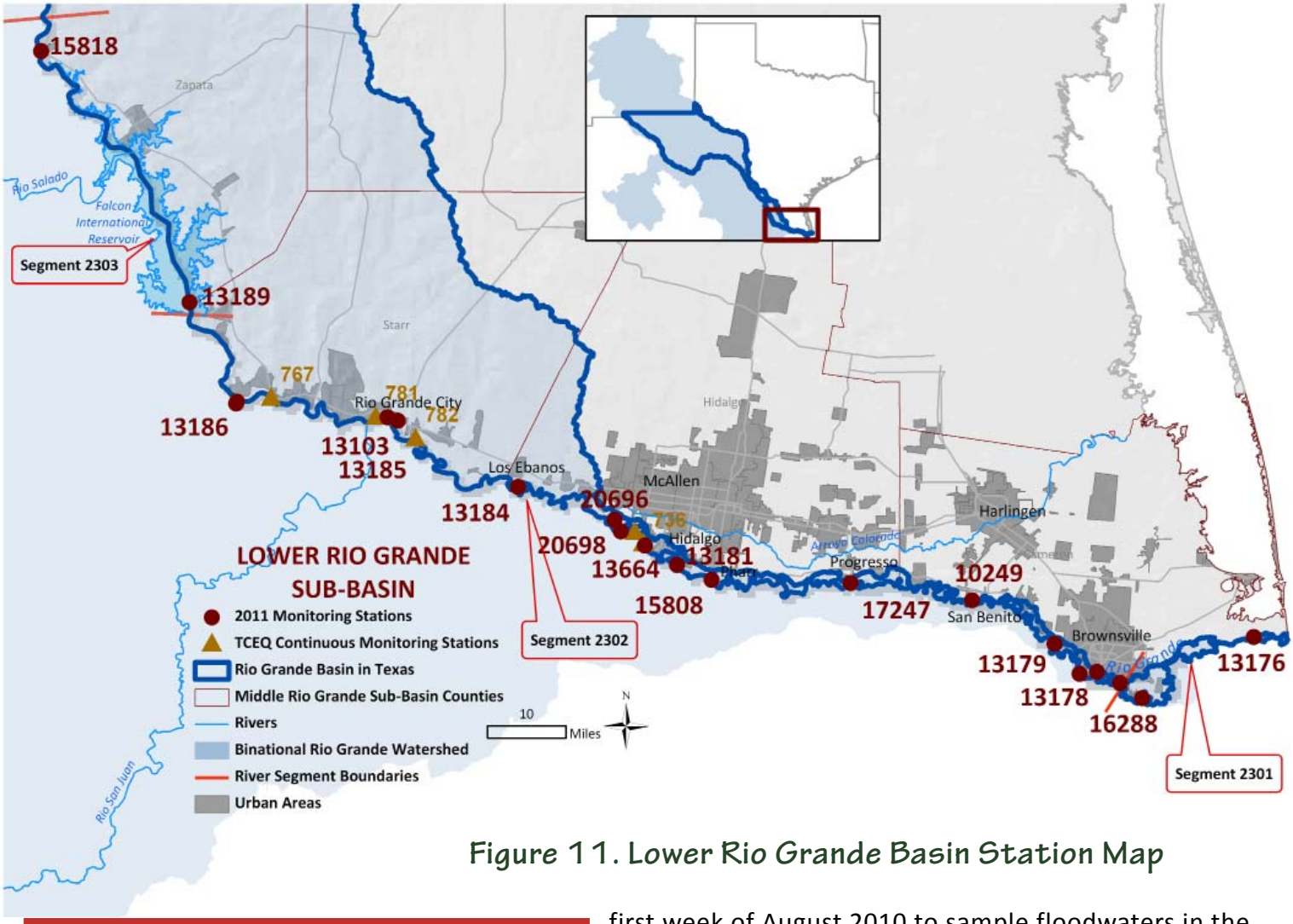


Figure 11. Lower Rio Grande Basin Station Map

USIBWC CRP collected water samples for bacteria analysis at levee structures along the emergency floodways of the LRGV, August 2010

first week of August 2010 to sample floodwaters in the Rio Grande and its emergency floodways resulting from Hurricane Alex and subsequent rain events. USIBWC CRP and Mercedes staff collected 59 samples in levee structures, floodway waters, and Rio Grande flood waters. Analysis of *E. coli* was performed to assist safety officers to assess the human health affects of USIBWC staff working on the levee structures. High levels of *E. coli* indicate the possible presence of other disease-causing organisms. Despite foul odors at many sites, bacteria levels at most sites were not particularly high, due to the sheer volume of water.

Organics in Sediment

From 2007 to 2011, USIBWC CRP has collected data on pesticides and other organics in sediment at routine monitoring sites. For the first several years, organics were collected twice a year at all USIBWC CRP stations. In 2010 and 2011, USIBWC CRP has reduced sampling to once a year at stations where organic parameters had been detected. In the Lower Rio Grande Sub-Basin, 29 pesticides were analyzed in sediment at 12 stations. Pesticides in sediment were detected at half of the stations in the Lower Rio Grande, more than any other part of the Rio Grande Basin that was tested. DDE, DDT, Methoxychlor, Endrin, and Chlordane were detected in small quantities at 6 stations from downstream of Falcon all the way to Brownsville. Data and project description are available on the USIBWC CRP monitoring data web page.

The Rio Grande near Brownsville, Texas taken from a boat in March 2010 during the Brownsville Bacteria Special Study field work.

Lower Rio Grande CRP Partners

- USIBWC Mercedes Field Office
- USIBWC Falcon Dam Field Office
- University of Texas at Brownsville
- US Fish & Wildlife Department, Lower Rio Grande Valley National Wildlife Refuge
- Sabal Palm Audubon Sanctuary
- Brownsville Public Utilities Board
- TCEQ Harlingen Regional Office

BECC Projects improve Water Quality

Several wastewater infrastructure projects, funded by NADBank and certified through BECC, were completed in 2010 in the Lower Rio Grande Basin. Completion of the Miguel Aleman wastewater treatment plant in 2010 will improve water quality in an impaired section of the river near Hidalgo, Texas. Other projects include wastewater improvements in Roma and San Benito, TX.

Monitoring Water Quality for Crop Irrigation

Concentrated agricultural activities in the LRGV are dependent on quality water to irrigate crops. A number of crops are susceptible to high TDS concentrations in irrigation water. Recent increases in TDS concentrations in the LRGV have emphasized the importance of CWQM data for water resource management and supply in the region. Isolating the source of the high TDS values is an important component to managing the water. There are currently eight CWQM stations, located on the Rio Grande, being used by the TCEQ Rio Grande Watermaster to ensure quality water is delivered to LRGV farmers.

Table 9. Water Quality Review for the Lower Rio Grande Sub-Basin

Water Quality Review for the Lower Rio Grande Sub-Basin					
Segment	**Uses**	**Stations**	**Length**	**Segment Characteristics**	**Water Quality Summary**
2302 - Rio Grande Below Falcon Reservoir	H, PS, GU, FC, PCR	13186, 13185, 13184, 20698, 20696, 13664, 13181, 15808, 13180, 17247, 10249, 13179, 13178, 20449, 13177	231 mi	Classified as a freshwater stream. Extends from Falcon Dam to below Brownsville and includes Anzalduas Dam and most of the LRGV.	The majority of this segment has no impairments, but there are consistently **high bacteria** counts around urban areas such as Brownsville, Rio Grande City, and McAllen/Hidalgo, impairing the segment for contact recreation. Increased sulfate levels, indicating potential wastewater influences that can adversely affect the public water supply. The entire segment has a concern for fish consumption due to elevated **mercury** in fish. Colonias without wastewater infrastructure as well as urban runoff may cause the bacteria and DO issues.
2302A - Arroyo Los Olmos	L	13103	25 mi	Unclassified water body. Intermittent stream with pools, and limited aquatic life.	Impaired for **bacteria**, with exact source unknown but might be due to urban runoff and other nonpoint source pollution during rain events.
2301 - Rio Grande Tidal	E, GU, FC, PCR	16288, 13176	49 mi	Classified as a tidal stream. Extends from the confluence of the Rio Grande with the Gulf of Mexico to a point 6.7 miles downstream of the International Bridge in Brownsville, Cameron County.	Classified as a tidal stream. There are no impairments but closer to the Gulf there are high **chlorophyll-a** levels. The 2010 assessment used Enterococcus as a bacteria indicator, showing a concern for **bacteria**.

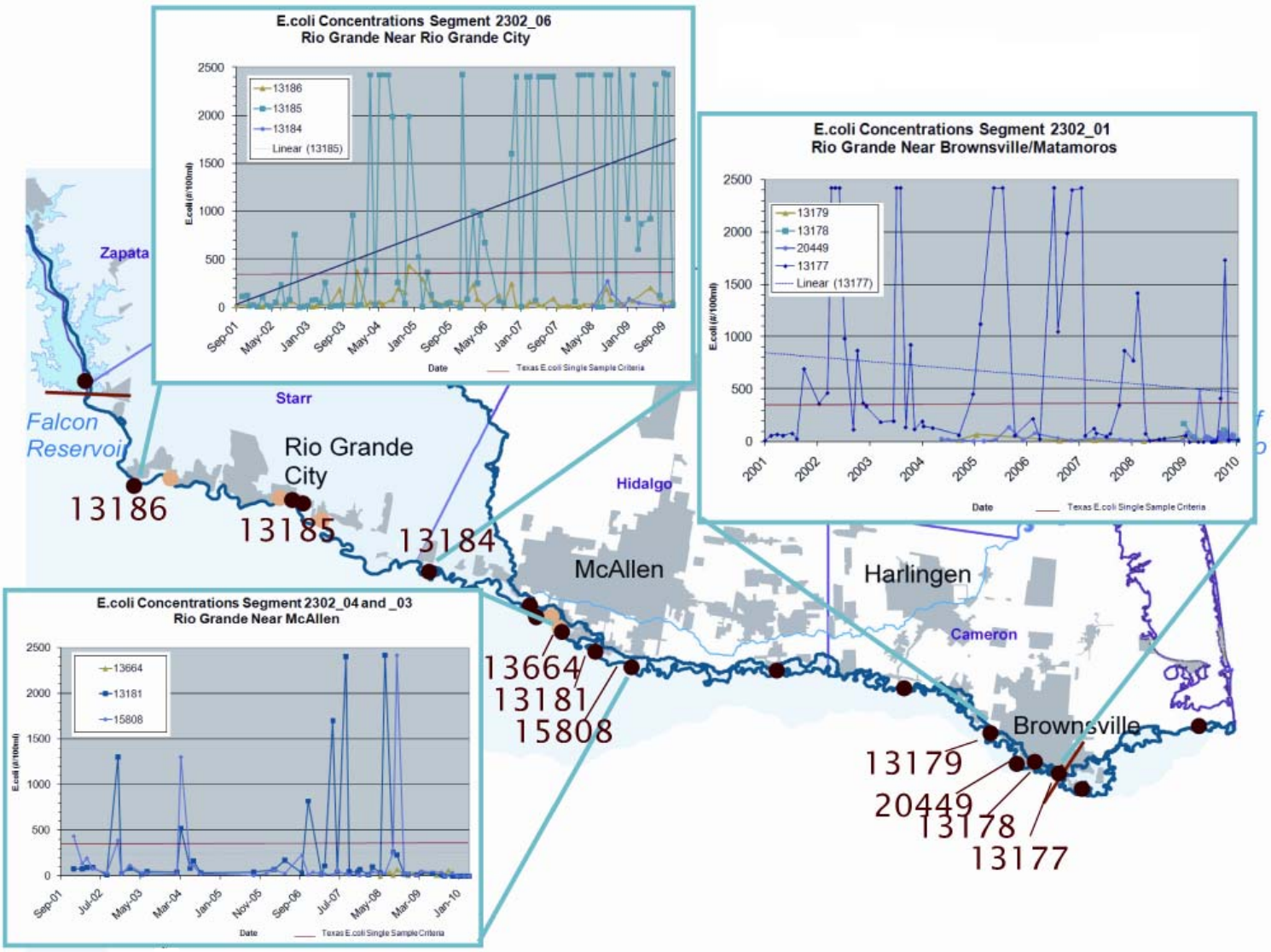


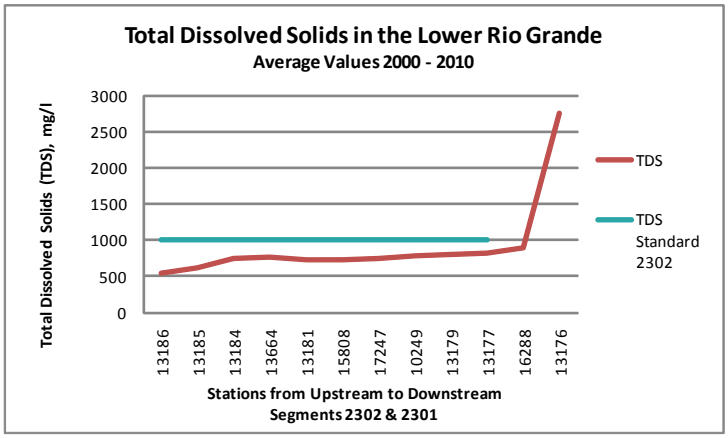
Figure 12. Bacteria in the Lower Rio Grande

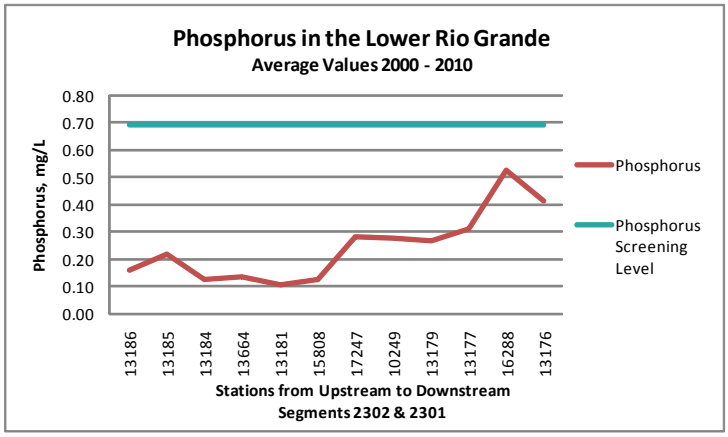
LOWER RIO GRANDE SUB-BASIN WATER QUALITY UPDATE

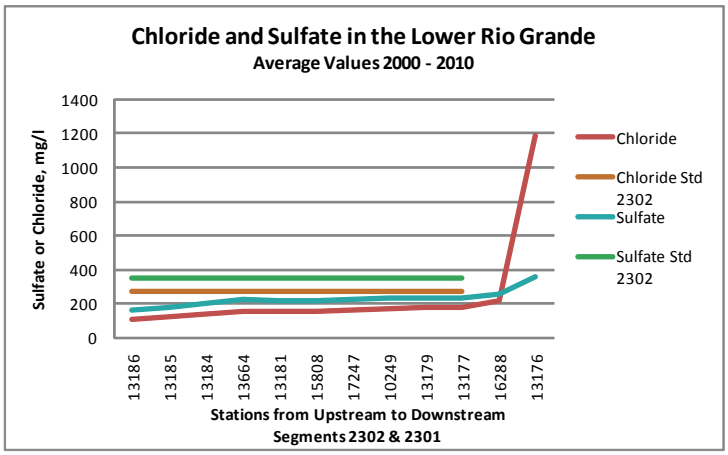
The Coordinated Monitoring Schedule for the Lower Rio Grande Sub-Basin can be found at: http://cms.lcra.org/

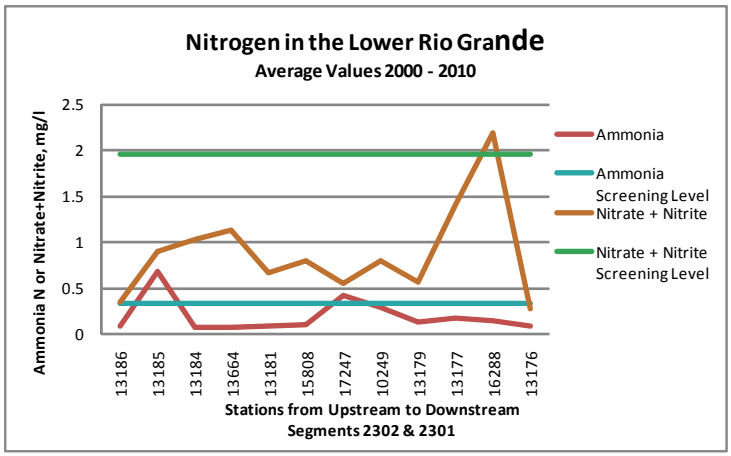
In the past year, TCEQ, USIBWC CRP and monitoring partners have continued to monitor water quality at 23 stations in the Lower Rio Grande Sub-Basin. Table 9 and Figures 11 and 12 provide information about the water quality in the Lower Rio Grande.

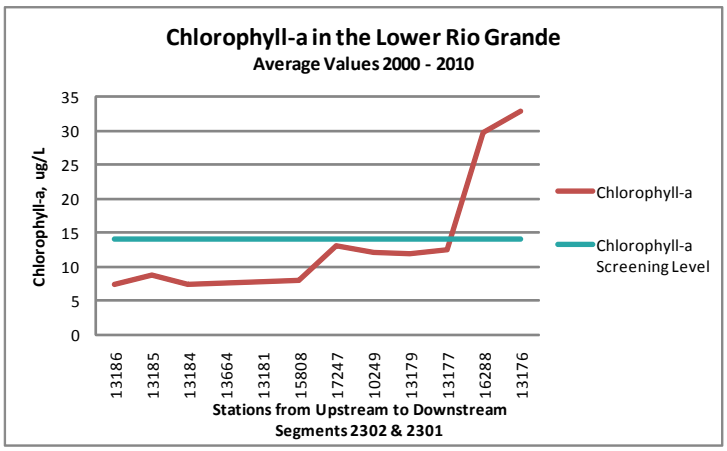
Figure 12 shows bacteria values collected over the past 10 years at 10 stations in the Lower Rio Grande. The sub-graph on the right for Brownsville stations shows that bacteria trends are decreasing and may explain why results of bacteria from the Brownsville Bacteria Special Study were low. However, there is an increasing trend of high bacteria values particularly near Rio Grande City at Station 13185. Although this section of the river is not impaired for contact recreation in TCEQ's 2010 Integrated Report, the data shows that this section of the river will likely be listed as impaired in the upcoming 2012 assessment.

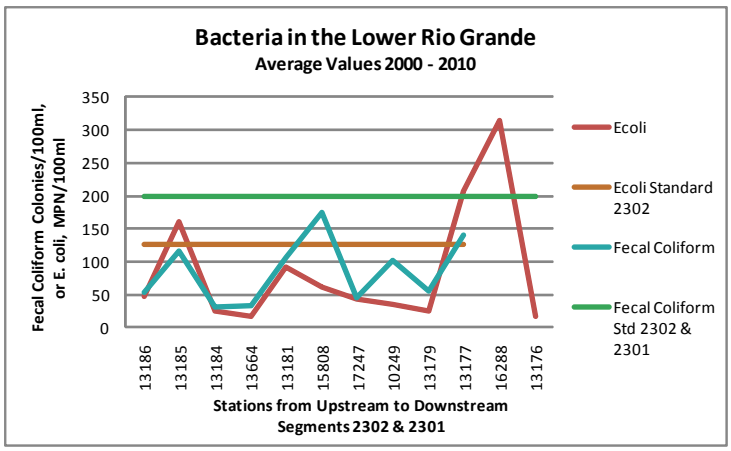












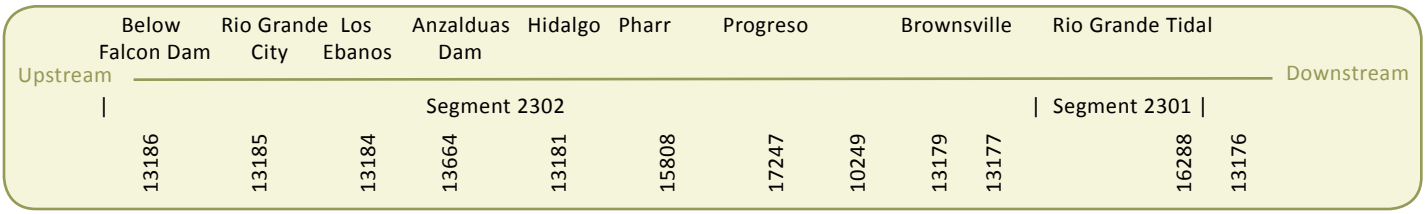


Figure 13. Graphs of major water quality parameters in the Lower Rio Grande

The graphs above show 11-year averages of TDS, sulfate, chloride, phosphorus, ammonia nitrogen, nitrate + nitrite, chlorophyll-a, and fecal coliform and *E. coli* bacteria for 12 stations in the Lower Rio Grande, with the upstream-most stations on the left and downstream stations on the right. Standards or secondary screening level criteria show where certain parameters are high. Toward the end of Brownsville and into the tidal stretch, salts, nutrients, bacteria, and chlorophyll-a increase.

USIBWC CRP Public Outreach and Public Participation

Basin Advisory Meetings

The Basin Advisory Committee (BAC) is a group of private citizens, government agency representatives, citizen groups, and academia who provide input and information for the CRP program to ensure issues and concerns in the community are addressed. Input from the BAC assists the CRP in determining changes to the monitoring schedule, new monitoring sites, special studies, and dissemination of information. People who are interested in providing input on environmental issues and who would like to participate in the Rio Grande BAC can contact anyone in the CRP (see the back cover of this report for contacts). Although they are called Committees, the USIBWC BAC meetings are much more informal and are open to all the public to participate.

USIBWC CRP staff showed different methods of measuring water quality during the Upper Rio Grande BAC meeting in El Paso, September 2010

BAC meetings are held once a year in various locations throughout the basin in conjunction with the USIBWC Rio Grande Citizens' Forum or similar gathering of stakeholders. The meetings provide the USIBWC CRP with an opportunity to update the public on recent activities and future plans, as well as act as forums for research exchange and input about the program. In 2010, USIBWC CRP held a BAC meeting in Laredo for the first time in six years. The Laredo meeting, held with the RGISC's Rave on the Rio celebration in October, covered water quality issues in the Middle Rio Grande Sub-Basin.

USIBWC CRP staff conduct water quality experiments with acids and bases with local school children at the El Paso Water Festival, October 2010

Water Festival

USIBWC CRP supports the annual EPWU El Paso Water Festival by hosting a booth to educate children about water quality. This year, USIBWC CRP conducted water quality experiments with 4th and 5th graders in El Paso County. The children learned about dissolved oxygen and pH and how they affect the water and aquatic organisms.

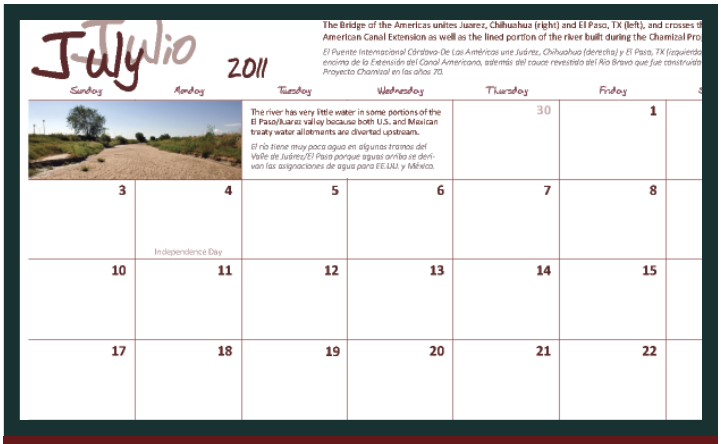
River Cleanups

In 2010, USIBWC continued to coordinate river cleanups with local groups, such as EPCC and UTEP students. During three cleanups throughout the year at the Borderland Bridge in El Paso, volunteers picked up 98 bags of trash, 38 tires, 4 carpets, scrap metal and wood, and a mattress!

River cleanup near Borderland Bridge in El Paso County with students from EPCC, July 2010

2011 Rio Grande Calendar

USIBWC CRP compiled an outreach calendar to promote awareness of the Rio Grande. We distributed several thousand bilingual calendars to the public throughout the Texas border region.



The *2011 Rio Grande Basin Calendar* is bilingual

Bacteria Factsheet

USIBWC CRP collaborated with the Paso del Norte Watershed Council's Water Subcommittee to create a bacteria factsheet to promote awareness of *E. coli* issues in the Rio Grande. The factsheet addresses many questions received during public meetings and media interviews regarding bacteria in the river. The document is available in hardcopy and electronically on the USIBWC CRP publications website.

USIBWC Adopt-a-River Program

The USIBWC Adopt-a-River Program in El Paso County, Texas and Doña Ana County, New Mexico has been expanding and receiving media attention. A newspaper article published in September 2010 caused many more groups to adopt sections of the river. Almost the entire stretch in Texas from Amistad Dam upstream to the New Mexico border has been adopted. Thanks to the volunteers who work to promote a litter-free Rio Grande!

Girl Scouts play Water Bingo by the river with staff from El Paso Water Utilities after the girls' Adopt-a-River cleanup, El Paso, September 2010

Service Learning Program

The EPCC has received a 3-year grant through Learn and Serve America to create service learning opportunities for minority science, technology, engineering, and math (STEM) students. USIBWC is one of several participating entities that will provide opportunities for hands-on experiences such as with water quality monitoring, compiling Rio Grande related watershed training and outreach materials, river cleanups, creating videos and websites, and analyzing water quality data.

Other Outreach activities

USIBWC CRP staff have participated in numerous additional outreach activities to disseminate information about the Rio Grande, the CRP, and water quality. In April 2010, USIBWC CRP held an educational booth at the Fort Bliss Earth Day Fair. USIBWC CRP staff gave guest lectures at the University of Texas at El Paso for various graduate departments on Rio Grande water quality. Additionally, USIBWC CRP staff has attended numerous trainings and conferences for watershed outreach and monitoring.

USIBWC CRP staff teach about the water cycle at the Fort Bliss Earth Day Fair, El Paso, April 2010

Many thanks to our former Data Manager Kati Carberry, who is the new CRP Program Manager at the Nueces River Authority.

USIBWC CRP Website

The USIBWC CRP maintains a website with a wealth of information:

Study Area

Maps of the Rio Grande Basin and monitoring station locations.

Monitoring Station Data

USIBWC CRP and TCEQ water quality data in Excel files by station; information about quality assurance, parameters, and standards.

Calendar/Activities

Information about public meetings, monitoring meetings, outreach activities.

Publications

All annual reports for CRP for the Rio Grande Basin since 1999 (both Basin Highlights Reports and 5-year Basin Summary Reports), outreach materials, and administrative documents.

Media Gallery

Photo albums and videos about monitoring, research, geography, wildlife, and outreach.

Participation

Information about Basin Advisory Committees and how the public can get involved.

USIBWC CRP Website
http://www.ibwc.gov/CRP/index.htm

Partner Links

Resources for monitoring partners, links to other CRP planning agencies, and links to environmental groups and resources for the Rio Grande.

Adopt-a-River

USIBWC's Adopt-a-River Program for the Upper Rio Grande to promote a litter-free Rio Grande.

Studies

Links and information on USIBWC CRP studies and related projects; scientific research portal; GIS links and data for the Rio Grande Basin.

About the Rio Grande

Introduction to the Rio Grande Basin.

About CRP

Contacts for the USIBWC CRP and program information.

Referenced Websites

TSWQS - http://www.tceq.texas.gov/permitting/water_quality/wq_assessment/standards/eq_swqs.html
SWQM - http://www.tceq.texas.gov/compliance/monitoring/water/quality/data/wqm/mtr/index.html
TCEQ 303(d) - List http://www.tceq.texas.gov/compliance/monitoring/water/quality/data/wqm/305_303.html
CWQM - http://www.tceq.texas.gov/compliance/monitoring/water/quality/data/wqm/swqm_realtime.html
TPWD Golden Alga - http://www.tpwd.state.tx.us/landwater/water/environconcerns/hab/ga/
Pecos WPP - http://pecosbasin.tamu.edu
FORG - http://www.friendsoftheriogrande.com
Texas Stream Team - http://txstreamteam.rivers.txstate.edu
Rio Grande Basin Initiative - http://riogrande.tamu.edu

Errata from the 2010 Rio Grande Basin Highlights Report: *cover image was downstream, back image was upstream (p2). Lower Rio Grande impairment downstream of Falcon Dam to Rio Grande City is incorrect and is not an impairment, and concerns for DO and bacteria near Amistad Dam were listed incorrectly (p12). Table 9 listed Station 13109 incorrectly as Station 13209 (p19). On Page 20, information incorrectly insinuates that the Pecos salinity was the cause of the drinking water standard exceedance in Amistad in the 80s. Figure 4 incorrectly lists Station 13717 as a 2010 Station (p22). On back cover, Kati Carberry's email address was incorrect (however Kati is now at the Nueces River Authority).*
Errata from 2011 Rio Grande Basin Calendar: *Error in dates in last week of March.*

Contact the Texas Clean Rivers Program for the Rio Grande Basin:

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Texas Clean Rivers Program,
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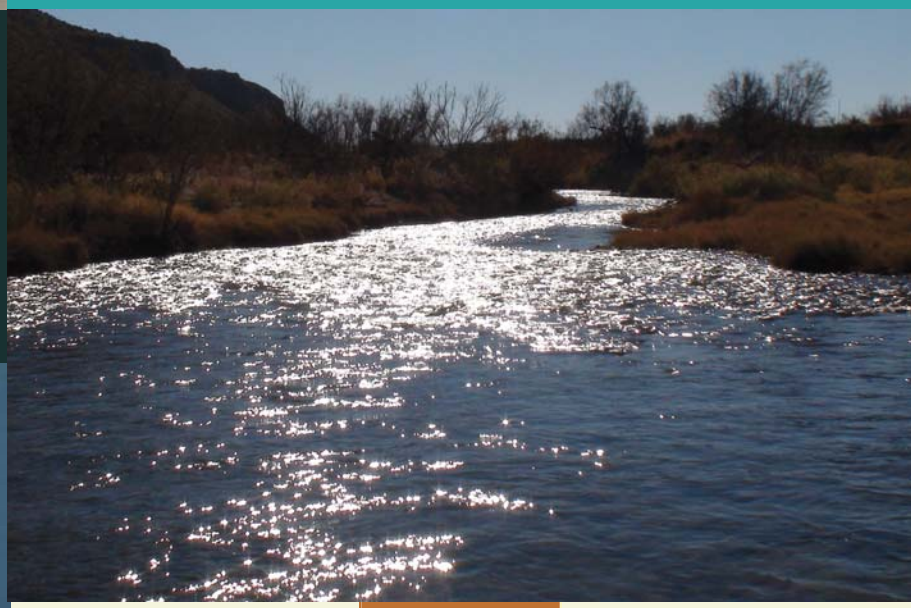
915-832-4701, Fax 915-832-4166
www.ibwc.gov/CRP/index.htm
crp@ibwc.gov



The preparation of this report was financed through grants from and in cooperation with the Texas Commission on Environmental Quality