April 30, 2001

Basin Highlights Report: The Rio Grande Basin

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

Building a foundation through:

- Partnerships with federal, state, and local governments, and local citizens.
- Incorporating concerns through special studies
- Developing a network for water quality monitoring and
- Public Education

Inside this issue:

Texas Clean Rivers Program

The U.S. Section of the International Boundary and Water Commission (USIBWC) during the past year has continued to enthusiastically support and administer the Texas Clean Rivers Program (CRP) in the Rio Grande Basin, providing expert insight into the needs and water quality issues that are unique to an international water boundary.

CRP staff training our CRP Partners from the Pecos sub-basin.

CRP partners throughout the basin have been a valuable asset in water quality monitoring, advice and suggestions on improving the CRP program, developing and assisting in special study programs, and communicating with and educating the general public. Government agencies and private citizens are working towards a common goal, the preservation of our most valuable natural resource, water.

Ongoing special studies are also providing greater insight into the state of the river and areas with special needs. More of these kinds of studies will help in maintaining the river as well as improve conditions.

Coordinated Monitoring Meetings

Our annual coordinated monitoring meetings this year were held in Pecos, Harlingen, Laredo, and Big Bend National Park. These meetings help us maintain a peak level of communication with our partners to discuss issues affecting the program, the environment, and the monitoring concerns at the local level.

Topics discussed included coordinated monitoring schedules, special projects, FY 2002 program tasks, issues within the sub basins that need to be addressed, new monitoring stations and parameters, and priority areas of concern.

Public Involvement

Coordinated Monitoring Meeting Held in Laredo, Texas (April, 2001)

Where can I get more information?

Water quality information is available through the CRP office in El Paso by contacting Mr. Wayne Belzer, CRP data manager, at 915-832-4703. Water quality data, basin maps, annual reports, and other information is available in printed or electronic format. Copies of previous reports and studies are also available through the CRP office. Water quality data and additional reports can also be obtained through the Texas Natural Resource Conservation Commission (TNRCC).

Public information is also available at the following web sites:

U.S. IBWC - www.ibwc.state.gov

U.S. IBWC Clean Rivers Program - www.ibwc.state.gov/CRP/welcome.htm

TNRCC– www.tnrcc.state.tx.us

U.S. Environmental Protection Agency's your community web site -

www.epa.gov/epahome/comm.htm

How can I get involved?

Individuals and volunteer groups can participate in the Clean Rivers Program as members of the Basin Advisory Committee (BAC) or by participating in the water quality monitoring program. BAC meetings are open to the public and held annually within each sub-basin to discuss the previous year's activities. Members of the public are encouraged to present ideas and information that will help the CRP focus on issues that are important to the local community. CRP staff take the information collected from the BAC meetings and address the issues by collecting additional information through special studies or utilizing existing data. People who are interested in water quality monitoring can participate as a partner in the CRP. The CRP provides training and loans equipment to groups who agree to collect water quality samples in their area of interest utilizing CRP guidelines.

Collecting water samples in the Rio Grande upstream of Laredo, Texas.

The BAC meetings will be held this year at the following locations:

Upper Rio Grande BAC meeting– El Paso, Texas

Pecos BAC meeting– Pecos, Texas

Middle Rio Grande BAC meeting– Laredo, Texas

Lower Rio Grande BAC meeting– Harlingen, Texas

Rio Grande Basin Screening Analysis Criteria

Assessments of stations along the river were done by compiling all of the data submitted to Texas Natural Resource Conservation Commission (TNRCC) from January 1995 to the most present data online for each station. This data was then compared against the Texas *Surface Water Quality Standards (TSWQS)* that are assigned to each stream segment to determine if segments are meeting the surface water quality standards. Primary standards were evaluated as fully supporting if the segment exceeded standards criteria less than 10% of the time, partially supporting if the segment exceeded standards 10 – 25% of the time, and not supporting if the segment exceeded the standards more than 25% of the time. The primary standards are water temperature, chlorides, sulfates, total dissolved solids, pH, dissolved oxygen, and indicator bacteria. Nutrient levels were evaluated as no concern if the segment exceeded secondary standards less than 25% of the time and as concern if the segment exceeded the standards more than 25% of the time. The nutrient parameters that were screened are ammonia, nitrate + nitrite, chlorophyll-A, total phosphorous, and ortho-phosphorous. Assessments were not done for organics or metals in water, in sediments, and in fish tissue because more data needs to be collected. The CRP is presently collecting data on a regular basis for those parameters to fill in data gaps.

Data was analyzed from 1995 to the most current available data using Texas surface water quality standards.

Routine Water Quality Monitoring

What does the Clean Rivers Program look for under "routine water monitoring?

The CRP collects samples and analyzes them for constituents that would degrade water quality, limit the intended uses of the water, or harm the aquatic life. Monitoring of selected sites is done no less than four times per year and as much as once a month. These sites have been identified by TNRCC and prioritized by the basin's Steering Committee and it's partners.

Here is an explanation of the parameters the Clean Rivers Program tests for and why.

Some of the parameters analyzed include:

Acute Toxicity - The ability of a substance to cause poisonous effects to test organisms resulting in biological harm or death after a single exposure or dose.

Alkalinity - A measure of the acid-neutralizing capacity of water. Bicarbonate, carbonate and hydroxide are the primary cause of alkalinity in natural waters.

Ammonia-Nitrogen - Naturally occurring in surface and wastewaters, it is produced by the breakdown of compounds containing organic nitrogen. High levels can be lethal to certain fish species.

Biochemical Oxygen Demand (BOD) - A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. High BOD levels are an indicator of increased pollution in the water.

Chloride - One of the major inorganic ions in water and wastewater. Industrial processes can increase concentrations. High levels can also affect metallic objects and plant growth.

Chlorophyll-a - Photosynthetic pigment that is found in all green plants. The concentration of chlorophyll-a is used to estimate phytoplankton biomass (all of the phytoplankton in a given area) in surface water.

Conductivity - Dissolved substances in water dissociate into ions with the ability to conduct electrical current. Conductivity is a measure of how salty the water is; salty water has high conductivity.

Dissolved Oxygen (DO) - The oxygen freely available in water. Dissolved oxygen is vital to fish and other aquatic life and for the prevention of odors.

Fecal coliform - Bacteria found in the intestinal tracts of warm-blooded animals. Organisms used as an indicator of pollution and possible presence of waterborne pathogens.

Nitrate-Nitrogen - A compound containing nitrogen that can exist as a dissolved solid in water. Excessive amounts can have harmful effects on humans and animals.

Orthophosphate - Nearly all phosphorus exists in water in the phosphate form. Orthophosphate can de directly utilized by plants and organisms, is usually the least abundant nutrient, and is commonly the limiting factor. Excessive amounts of phosphorus can contribute to the eutrophication of lakes and rivers.

pH - The hydrogen ion activity of water caused by the breakdown of water molecules and presence of dissolved acids and bases.

Sulfate - Sulfate is derived from rocks and soils containing gypsum, iron sulfides and other sulfur compounds. Sulfates are widely distributed in nature.

Total Dissolved Solids (TDS) - The amount of material (inorganic salts and small amounts of organic material) dissolved in water. High TDS concentrations can limit the use of water for agriculture, drinking water, and industrial use.

Total Hardness - The sum of the calcium and magnesium concentrations, expressed as calcium carbonate in mg/L.

Total Organic Carbon - Method used to determine the amount of organic carbon present in water and wastewater.

Total Suspended Solids - A measure of the total suspended solids in water, both organic and inorganic.

Pecos Sub Basin

Overview

The Pecos River begins its journey in the Sangre de Cristo Mountains of North-Central New Mexico, travels through Eastern New Mexico, crosses into Texas at the Red Bluff Reservoir, winds southeast through west Texas, and then empties into the Rio Grande in Val Verde County above the International Amistad Reservoir. The Pecos flows about 926 miles (1,490 km) and drains about 38,300 square miles (99,197 square km).

The Pecos River and the Saltcedar intrusion along the banks.

The Texas Clean Rivers Program conducts its monitoring and assessment of the Pecos sub basin from the Red Bluff Reservoir to the Rio Grande. The Pecos sub basin is divided into three segments: Segment 2312 Red Bluff Reservoir – from the New Mexico state line to Red Bluff Dam in Loving/Reeves county with two monitoring stations; Segment 2311 Upper Pecos River – From Red Bluff Dam in Loving/Reeves County to a point immediately upstream of the confluence of Independence Creek in Crockett/Terrell County with 5 existing monitoring stations and 2 new stations; and Segment 2310 Lower Pecos River – From a point immediately upstream of the confluence of Independence Creek in Crockett/Terrell County to a point 0.4 miles (0.7 km) downstream of the confluence of Painted Canyon in Val Verde County with three stations.

Special Projects/Activities in the Basin

One of the largest problems in the Pecos River is the domination of the local vegetation by the highly invasive phraetophyte, saltcedar (Tamarisk sp.). Saltcedar was introduced to the United States in the early 1800's and was planted along the Pecos in 1925 in an attempt to control soil erosion. Since that time, saltcedar has outcompeted the native vegetation, increased soil and water salinity, increased the possibility of flooding due to decreased channel width and increased sedimentation, and increased water loss due to evapotranspiration. Projects along the Pecos have been initiated both in New Mexico and in Texas in an attempt to control the saltcedar overgrowth.

Saltcedar Plant

The Pecos River Ecosystem Project in Texas is attempting to decrease the number of saltcedar by aerial application of herbicide along the banks of the river. The project is concerned with the effect of saltcedar on quality and quantity of water in the Pecos River. This project is using different types of herbicide in various combinations and different application methods to determine which method has the highest yield. Water quality data is being monitored by the Upper Pecos Soil and Water Conservation District (SWCD) to ascertain the impact on the river from this project. The Upper Pecos SWCD became a CRP partner last year and is monitoring water quality at two sites on the Pecos River.

CRP staff members performed an assessment of the fish and benthic macroinver-

Red Bluff Reservoir from on top of the dam.

tebrate community in the Pecos River near Orla, Texas. This aquatic community assessment was conducted in the Upper Pecos River northeast of Orla (TNRCC Station # 13265). The study was conducted to supplement previous assessment efforts by the TNRCC Midland Regional Office in 1998 at other locations in the Pecos River. This project was fully coordinated with the TNRCC Midland Regional Office and TNRCC Austin headquarters. Habitat, fish, and macroinvertebrate data have been reviewed and compiled. Clean Rivers Program staff received biological training in Denton, TX earlier this year. This has provided the necessary training required to complete the metric analyses for the data obtained from the project. Metric analyses will be completed this spring and report writing will be coordinated with the TNRCC Midland Office soon after.

Segment Assessment

Segment 2312 – Red Bluff Reservoir

This segment is designated for contact recreation and high aquatic life use. Station 13269 (Red Bluff Reservoir 0.5 miles (0.8 km) south of Texas-New Mexico border) data show that the segment is fully supporting in the primary standards and has no concerns for nutrient screening levels. Station 13267 (Red Bluff Reservoir above dam, north of Orla) data show that the segment is also fully supporting in the primary standards and has no concerns for nutrients.

Segment 2311 – Upper Pecos River

This segment is designated for contact recreation and high aquatic life use. This segment has extremely high salt content due to natural geologic salt deposits that are impacting the river. Saltcedar intrusion has also contributed to the salt content and is being addressed as discussed above. State standards for chlorides, sulfates, and TDS for this segment allow for criteria that are about ten times higher as compared to other river segments in the state. Station 13265 (Pecos River at FM 652 Bridge NE of Orla) data show that the segment is fully supporting and has no concerns. Station 13260 (Pecos River at FM 1776 SW of Monahans) data show only partially supporting dissolved oxygen and fecal coliform. There were no concerns for nutrients. Station 13257 (Pecos River at US 67 NE of Girvin) data show that the segment is not supporting in Sulfate and only partially supporting in total dissolved solids, due to the high sulfate counts. Dissolved oxygen is making a declining trend and has fallen below standards several times over the past five years. The data showed no concerns in nutrient screening levels. Station 15114 (Pecos River 1.6 miles (2.57 km) upstream of US 290 bridge, SE of Sheffield) data show that the segment is fully supporting and has no concerns. This station does show an increasing trend in fecal coliform and ortho-phosphorous that may need addressing in the future. Station 13249 (Pecos River bridge on US 290 SE of Sheffield) data show only partial support in dissolved oxygen, but no other concerns. Two new stations, RG008 (Pecos River near Mentone, TX) and RG009 (Pecos River near Pecos, TX), have had data collected for the past year and will be submitted to TNRCC for permanent station identification numbers. These two sites are currently being monitored by the Up-

The Pecos River near Pecos, TX.

per Pecos SWCD to obtain water quality data for the Pecos River Ecosystem Project. Data at these points will continue to be collected and will provide future assessments for this segment.

Segment 2310 – Lower Pecos River

This segment is designated for contact recreation, high aquatic life use, and as a domestic water supply. Station 13109 (Independence Creek 0.5 miles (0.8 km) downstream from John Chandler Ranch Headquarters) data show it is fully supporting and has no concerns. Independence Creek provides an influx of high quality natural water to the Pecos River, thus improving the quality of the water in the Pecos River downstream from the confluence. Station 13246 (Pecos River 4.67 miles (7.52 km) upstream from the Val Verde/Terrell/Crockett County line convergence) data show only partial support for chloride and sulfate and no support for total dissolved solids.

Concerns

Saltcedar intrusion is being addressed. Further reduction of this plant and re-establishment of indigenous species needs to be continued. High salt content in the ground is a naturally occurring impact but should still be addressed. Reduced flow from dams has prevented dilution of the salts and allowed salt content to continually increase; therefore, reduction in the salt intrusion should be looked at to see if and how salinity increases can be prevented. Monitoring has been increased and new stations have been added. Further analysis of this data can provide greater insight into where new testing should take place and what parameters should be tested more frequently.

Upper Rio Grande Sub Basin

Overview

An estimated 11 million people make up the United States-Mexico border population. Population growth during 1993–1997 in the border region has been rapid, averaging about 4.3% per year on Mexico's side of the border and 1.8% on the United States' side. The major populated areas of the Upper Rio Grande include El Paso/Ciudad Juarez (including surrounding areas) and Presidio/Ojinaga. Population estimates for these "sister cities" are 700,000 for El Paso and approximately 1.2 million for Ciudad Juarez, and 5,000 for Presidio, TX and 23,000 for Ojinaga.

In the context of the Texas Clean Rivers Program, the Upper Rio Grande Basin is the area extending from the New Mexico/Texas state line downstream to the International Amistad Dam near Del Rio, TX. The river flows through eight counties and consists of five designated river segments; 2314, 2308, 2307, 2306

and 2305 in order from upstream to downstream. The designated uses for each of these segments include contact recreation, high aquatic life-use, and public water supply. However, the Rio Grande below International Reservoir (Segment 2308) is designated as non-contact recreation with limited aquatic life-use.

Special Projects/Activities in the Basin

The Texas Clean Rivers program is currently involved in several projects throughout the basin. Some of these projects include:

1) A study of chemical and microbial contamination in the Upper Rio Grande has been conducted. One year of data was collected for this project, and Dr. Maria Alvarez published a final report in December 2000. Funding for an additional year of monitoring has been awarded from the Center for Border Health Program to Dr. Alvarez with El Paso Community College. Since the sites are current routine monitoring stations, CRP staff will continue to assist the effort for another monitoring year. Starting in March 2001, Arizona State University will join the sampling campaign with Dr. Alvarez to analyze river water for cryptosporidium.

2) The Texas Clean Rivers Program staff continue to be actively involved in the planning phases of the Paso del Norte Watershed Council. The Watershed Council was organized to provide a new approach to addressing issues involving the Rio Grande/Rio Bravo. It seeks to foster both the cooperation and the science-based management approach needed to solve watershed-level problems. By design, the Watershed Council consists of a diverse group and anyone interested in regional water issues can join and participate including municipalities, water agencies, researchers, educators, businesses, voluntary organizations and concerned citizens from south-central New Mexico, far west Texas and northern Chihuahua.

3) The Rio Grande Citizens' Forum was established by the USIBWC in 1999 to facilitate the exchange of information regarding USIBWC activities on the Rio Grande between Percha Dam, New Mexico and Fort Quitman, Texas. It is designed to unite community members, enabling the early and continued two-way flow of information, concerns, values, and needs between USIBWC and the general public, environmentalists, irrigation districts, municipalities, and others interested in the river. Members of the Rio Grande Citizens' Forum Board, who serve as unpaid volunteers, represent a variety of interests along the Rio Grande in west Texas and southern New Mexico. The group is co-chaired by [illegible] Marin, Principal Engineer with the USIBWC, and Kevin Bixby, Director of the Southwest Environmental Center in Las Cruces.

4) The USIBWC is in its early stages of implementing an "Adopt-A-River" program in the upper basin. Organizations can adopt up to a 2 mile (3.2 km) section of the Rio Grande for a minimum of two years. The group will be required to pick litter up a minimum of three times per year. Several organizations have al-

ready shown interest and have signed up for this program. The "Adopt-A-River" program will be implemented in the area from Percha Dam in New Mexico downstream to Ft. Quitman in Texas. For more information about this program please contact Ms. Margie Garay at (915) 351-1030.

5) In June 2000, Bruce Babbitt, Secretary of the U.S. Department of the Interior, and Julia Carabias, Mexico's Secretary of Environment, Natural Resources, and Fisheries (SEMARNAP), signed a Joint Declaration to expand binational planning efforts to improve and conserve the natural resources of the Rio Grande/Rio Bravo and associated habitats. The Secretaries signed the document at the conclusion of the *Rio Grande/Rio Bravo Binational Symposium: Fort Quitman to Amistad Reservoir*, which was held at the Hotel Lucerna in Ciudad Juarez, Chihuahua. The Joint Declaration indicates the intention of the Department of the Interior and SEMARNAP to form a binational task force, under the direction of the International Boundary and Water Commission, United States and Mexico (IBWC) to:

- develop a plan to implement recommendations from the symposium;
- examine options and opportunities to ensure minimum flows in this reach of the Rio Grande to maintain environmental integrity;
- strengthen cooperative action and mechanisms to improve and conserve the river;
- undertake research about the biologic and hydrologic conditions of the region;
- develop and exchange compatible information systems;
- facilitate public participation in developing strategies for environmental sustainability; and
- join with other organizations on natural resource program initiatives.

Who is participating in the Clean Rivers Program in the Upper Rio Grande Sub Basin?

- US IBWC American Dam Office– collects water quality samples in the El Paso area.
- University of Texas at El Paso– collects samples in El Paso area.
- El Paso Community College– conducting special study in El Paso/Hudspeth county.
- El Paso Water Utilities– analyzes samples for CRP partners in El Paso.
- US IBWC Presidio Office– collects samples in the Rio Grande in the Presidio area.

Segment Assessment

Segment 2314 - Rio Grande Above International Dam

Channelized section of the Rio Grande (Segment 2308) in the El Paso area.

This segment extends from the New Mexico State Line downstream to International Dam in El Paso County. The primary land-use in this area consists of pecan orchards, cotton and alfalfa farming, confined animal feeding operations (CAFO) and intermingled residential areas near the lower part of the segment. Water deliveries to Mexico occur in this segment at International Dam, where water is diverted into Mexico at the Acequia Madre Canal. By treaty the United States is required to supply Mexico with 60,000 acre-feet of water per year. The United States diverts its water allotment from the Rio Grande at American Dam into the Rio Grande American Canal Extension (RGACE). Water from RGACE is utilized for agricultural uses and public drinking water supplies in the El Paso/ Hudspeth County region. Two sites in this segment are monitored by the USIBWC and the TNRCC; station 13276 (Rio Grande above Anthony Drain) and 13272 (Rio Grande at Courchesne Bridge.) Data collected over a five-year period was screened to determine if the segment was supporting its designated uses of contact recreation, high aquatic life, and domestic water supply. All primary standards at both sites were fully supported except for fecal coliform bacteria, which was not supported at the Courchesne site. The average fecal coliform levels at station 13272 for the five-year period was 983 colony forming units (cfu) as compared to the 200 cfu/100ml standard for that segment. These elevated fecal coliform levels may be due to the land-use activities just upstream from the site. Nutrients were also a concern at station 13272. There are two agricultural return drains, which empty into the Rio Grande directly upstream from station 13272 that may be influencing water quality. These drains will be targeted for monitoring in FY2002.

Segment 2308 - Rio Grande Below International Dam

Station 15795 - Rio Grande at Alamo Grade control structure.

Any water remaining after the two diversions upstream in segment 2314 flows through segment 2308. The majority of this segment consists of the channelized portion of the river, which flows through downtown El Paso near the Chamizal Memorial. As a result of this segment being channelized, it has been designated for non-contact recreation and low aquatic life-use. Chlorides, sulfates and fecal coliform standards were partially supported at station 15529 (Rio Grande 1.5 miles (2.4 km) upstream from the Haskell R. Street WWTP outfall), which was the uppermost site with sufficient data to do an assessment. Ammonia is a concern at this site; however, other nutrients were not assessed due to lack of data. Downstream stations 15528 (Rio Grande 0.8 miles (1.3 km) downstream from Haskell R. Street WWTP outfall) and 14465 (Rio Grande at Riverside Canal) were fully supporting all primary standards except chlorides, which were partially supported at both sites. Ammonia is a concern at these two sites also. Recent ammonia data at these sites show dramatic improvements from historical data. This may be due to the fact that the Haskell R. Street wastewater treatment

plant has upgraded the aeration basin to improve the de-nitrification process thus reducing ammonia levels in its discharge. At the same time, effluent from the plant is now being discharged into RGACE, therefore, reducing the impact to the Rio Grande. Flow through this segment is very minimal, however, seepage from International Dam and runoff from rain events account for the majority of flow.

Rio Grande at Candelaria near Presidio, Texas

Segment 2307 - Rio Grande Below Riverside Diversion Dam

Perhaps one of the longest segments in the Rio Grande is segment 2307. This segment extends from below Riverside Diversion Dam in El Paso County and flows over 200 miles downstream to the confluence with the Rio Conchos in Presidio County. Segment 2307 faces many challenges due to upstream influences caused by El Paso and Ciudad Juarez. Agricultural and municipal wastewater flows from both Mexico and the United States influence the upper portion of this segment. Chlorides, sulfates, TDS, and fecal coliform standards were not supported at stations 15795 (Rio Grande at Alamo Grade control structure) and 13232 (Rio Grande at Neely Canyon.) No concerns for nutrients were detected at station 15795. However, concerns for ammonia, total phosphorous, and chlorophyll-a were evident downstream at station 13232. Station 13230 (Rio Grande 2.4 miles (3.86 km) above the Rio Conchos) also showed that primary standards for chlorides, sulfates and TDS were not fully supported. The majority of land-use practices throughout this segment include farming and ranching with influence from fast growing communities and townships along the border area in the upper portion of the segment.

This segment deserves more monitoring attention to fully understand the causes of non-supported standards. The CRP program has expanded their monitoring effort in this segment by monitoring at two additional sites. These include Rio Grande at Little Box Canyon downstream from the Fort Quitman gage and Rio Grande at Candelaria at the USIBWC gaging station. Both sites have been sampled monthly since November 2000 and may continue for another monitoring year.

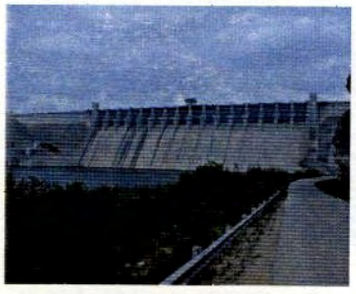
Segment 2306 - Rio Grande Above Amistad Reservoir

International Amistad Reservoir is currently at 43.7% of normal conservation capacity

This segment is designated for contact recreation, high aquatic life-use, and as a domestic water supply. The major influences to this segment occur in the upper portion near the cities of Presidio, TX and Ojinaga, Chihuahua. The Rio Conchos, a major tributary to the Rio Grande, also influences water quality in this segment. Data analyzed from stations located in the upper portions of this segment indicate that chloride, sulfate, TDS, and fecal coliform levels were not supported. Ammonia at station 13229 (Rio Grande below Rio Conchos), and chlorophyll-a at station 13228 (Rio Grande at Santa Elena Canyon near Big Bend) were the only two nutrients that indicated a concern. Data analyzed from stations located in the lower portion of this segment met all primary standards except for chlorides and TDS, and a partial support for sulfate at station 13225 (Rio Grande

at FM 2627 (Gerstacker Bridge) below Big Bend.) No concern was observed for all in the lower portion of the segment. Big Bend National Park consists of the major landowner throughout the middle portion of this segment. However, the majority of land-use practices in this segment include small scale farming and ranching on both sides of the border.

Segment 2305 - International Amistad Reservoir



International Amistad Reservoir spillway

This 75-mile long segment comprises Amistad Reservoir, which is designated for contact recreation, high aquatic life-use, and as a public water supply source. The Pecos and Devils Rivers are two major tributaries to this segment. All primary standards were supported at all monitoring sites in this segment except for chlorides. The standard for chloride is 150 mg/l for this segment as compared to the five-year average of 166 mg/l. Chloride concentrations are heavily influenced by the Pecos River, which has chloride concentrations up to 1306 mg/l at certain sites. Nutrient screening levels for this segment were only available to evaluate ammonia and total phosphorus, both of which indicate a concern. The ammonia and total phosphorus standards were exceeded 25% over the five-year period. This reservoir environment helps improve water quality in the Rio Grande.

Upper Rio Grande Basin Summary

A review of the data from upstream to downstream segments in the Upper Basin indicates non-support of standards for chloride in segments 2307, 2306, and 2305. The sulfate and TDS standards were also not supported in the lower half of segment 2307 and upper half of segment 2306. Increasing trends for pH and fecal coliform bacteria in segments 2308 and the upper portion of 2307 were also observed. Increasing fecal coliform bacteria levels in these two segments can be attributable to major population increases in El Paso, TX and Ciudad Juarez, Chihuahua. Due to the implementation of the North American Free Trade Agreement (NAFTA) in the early 90's, strong economic development along the border has occurred. The economic growth associated with NAFTA has also caused most border communities to see population increases thus leading to more anthropogenic effects on the Rio Grande. The lack of wastewater infrastructure along the border to accommodate the increasing populations can be correlated to the deteriorating water quality conditions in the upper portion of this basin. Ammonia and total phosphorus levels are a concern in segment 2305; the data indicate a slight increasing trend. More data is required in this segment to fully assess the quality of water at Amistad International Reservoir.

Middle Rio Grande Sub Basin

Overview

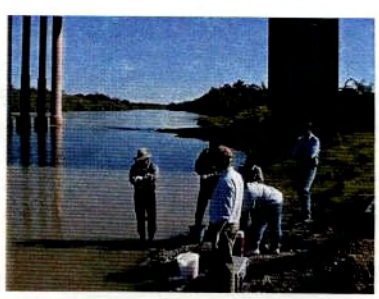
The Middle Rio Grande sub basin represents the portion of the river below International Amistad Reservoir downstream to International Falcon Reservoir. The middle sub-basin is divided into three river segments; Segment 2304- Rio Grande below International Amistad Reservoir, Segment 2313- San Felipe Creek, and Segment 2303- International Falcon Reservoir. Designated uses for these segments include contact recreation, high aquatic life, and public water supply. Surface water quality standards are applied to these segments to limit the amount of pollutants entering the river and in order to insure the designated uses of each segment can be met. Texas Clean Rivers Program partners collect water quality information year-round, which is entered into a database to help the TNRCC assess each river segment within the Rio Grande basin.

Collecting samples during the Nuevo Laredo Study.

Water stored at International Amistad and Falcon Reservoirs belongs to both the United States and Mexico and is used for boating, fishing, and to generate electric power. Water releases from the dam are coordinated by the TNRCC's Rio Grande Watermaster and by Mexico's National Water Commission (CNA). Water rights holders notify the Watermaster of the amount of water needed for municipal, irrigation, and industrial needs. IBWC operates the international reservoirs and release the water amounts specified by the Rio Grande Watermaster and CNA.

Just downstream of Amistad Reservoir is the City of Del Rio. The City has a population of over 35,000 people and an annual average rainfall of 24 inches (610 mm). The San Felipe Springs surfaces in Del Rio and provides the City with an excellent water supply. Swimming and fishing are also popular activities as the creek flows through Del Rio. Ciudad Acuńa, located across the Rio Grande in Mexico, adds to the popularity of this border region with it's rich history and tourism industry.

The City of Eagle Pass, TX is located in Maverick County at the junction of U. S. Highways 277 and 57. It serves as the county seat and the principle commercial center for the county. The City also serves as a port of entry into Piedras Negras, Coahuila, Mexico and derives considerable economic support from trade and tourism from Northern Mexico. The City of Eagle Pass utilizes water from the Rio Grande, as its primary source of drinking water. Eagle Pass owns water rights equal to 7,770 acre-feet of water.



CRP Partners and staff on the Rio Grande near Colombia Bridge working on the Nuevo Laredo special study.

Laredo, TX is the second fastest growing city in the United States. Between 1960 and 1990 Laredo's population more than doubled. This is attributed to Laredo's growing importance as a manufacturing and trading center on the U.S. - Mexico border, which has drawn increasing numbers of people from the surrounding region. The estimated population figure for 1995 is 155,877 for Laredo, Texas, and 335,000 for Nuevo Laredo, Tamaulipas, Mexico. By the year 2000, Laredo is expected to increase by 21% to 189,021. The city of

Nuevo Laredo has also experienced continued population growth. Between 1960 and 1990, the city's population more than tripled. This can be linked to the direct trade relationship Laredo and Nuevo Laredo share.

Special Projects/Activities in the Basin

Nuevo Laredo International Wastewater Treatment Plant: Intensive Monitoring Study

The Nuevo Laredo International Wastewater Treatment Plant (NLIWTP) began full operations in 1996. This plant was designed to meet discharge standards established by the United States and Mexico in IBWC Minute No. 279, "Joint Measures to Improve the Quality of the Waters of the Rio Grande at Laredo, Texas/Nuevo Laredo, Tamaulipas," dated August 28, 1989. Water samples were collected in the Rio Grande in the fall of 1995 to evaluate the water quality upstream and downstream of the NLIWTP prior to start-up.

The objective of the study was to make a comparative analysis of the water quality data collected before and after the NLIWTP went into operation to assess the beneficial water quality effects of the treatment plant on the receiving water. Samples were collected November 6-15, 2000 above and below the NLIWTP outfall in the Rio Grande. Study participants included personnel from the United States and Mexican Sections of the IBWC, the United States Environmental Protection Agency (EPA)- Region 6 and the TNRCC, Mexico's National Water Commission; their Rio Grande Regional Office Laboratory and Northern Gulf Regional Office Laboratory, the State Secretariat of Urban Development and Ecology (SEDUE), the State Commission on Potable Water and Sewerage (CEAPA), and the Municipal Commission on Potable Water and Sewerage (COMAPA).

Setting up equipment for sampling and monitoring.

A joint bi-national report will be prepared by both Sections of the IBWC and is scheduled for completion in the fall of 2001. Preliminary results of samples collected under the Clean Rivers Program are included in the summary of Segment 2304.

Who is participating in the Clean Rivers Program in the Middle Sub Basin?

- USIBWC Amistad Field Office - collect water samples in the upper portion of segment 2304. Field data, flow, and samples are taken at four sites on the Rio Grande with the farthest site located in Eagle Pass.

- City of Del Rio Water Operations Department - has started to collect water samples at three sites on the San Felipe Creek (segment 2313).

- City of Laredo County Health and the Environmental Engineering Departments participate in the CRP. The County Health Department collects sam-

ples that are tested for the presence of fecal coliform at eight sites on the Rio Grande in Laredo. The Environmental Engineering Department collects field data and flow measurements from a site on Manadas Creek and sends the samples to the CRP contract lab for analysis .

- Rio Grande International Study Center (RGISC)- collects water samples at seven sites in segment 2304 along the Laredo/Nuevo Laredo area. Over the years, Dr. Tom Vaughan and the RGISC have collected valuable information on the Rio Grande.

- TNRCC San Antonio Field Office- collects water quality data at five sites on segment 2304. The surface water quality monitoring team (SWQM) also lends its expertise by providing training and many years of experience in water monitoring.

Segment Assessment

Segment 2304- Rio Grande Below International Amistad Reservoir

This segment is currently on the Texas 2000 Clean Water Act Section 303(d) list as not meeting the surface water quality standards for pathogens (fecal coliform) and toxicity in ambient water. Segments that are listed on the 303(d) list require a comprehensive assessment known as the Total Maximum Daily Load (TMDL) to determine the causes of nonattainment for a given pollutant. There are currently no TMDL's scheduled for listed segments on the Rio Grande. The areas of concern were identified as downstream of the Cities of Del Rio, Eagle Pass, and Laredo.

Primary Standards- Analysis of the data shows that this segment continues to not support the designated use of contact recreation because of elevated fecal coliform concentrations. The increases in concentration continue to occur in and below the three major populated areas of the segment. Although there are cropland and agricultural activities surrounding these cities, the primary cause of increased pathogens would be discharges into the river from wastewater treatment plants, untreated waste discharges, and runoff during rain events.

International Falcon Reservoir is currently at 13.3% of normal conservation capacity!

Nutrient Screening Levels- Analysis of the nutrients supports the inference that increases due to return waste-streams are leading to increases in fecal coliform and other constituents found in wastewater such as ammonia-nitrogen and phosphorus. Ammonia and Total Phosphorus levels are a concern in all three populated areas.

What is being done to correct the situation?

Wastewater infrastructure projects are being implemented in cities that never had wastewater treatment and older treatment plants are being upgraded. The

changes are gradual and will take time to see the benefits. However, there are still areas such as colonias and parts of cities on both sides of the border that lack wastewater infrastructure which leads to untreated or partially treated discharges into the river.

Power generating plants at International Falcon Reservoir

Segment 2303- International Falcon Reservoir

The Falcon Reservoir is also on the 303(d) list as exceeding the chloride and total dissolved solids criteria established to protect water quality uses. Not enough information is available to assess current conditions or to determine if water quality is improving or degrading. It is imperative that more data gathering be initiated in the reservoir to ensure the needs of the Lower Rio Grande will be met and to identify potential problems before they occur. It is also important to collect more information to help support the 303(d) listing or to indicate that de-listing the segment is supported.

Segment 2313- San Felipe Creek

Only one station was assessed due to lack of data for the other stations currently being monitored. San Felipe Creek is a high quality spring that surfaces in Del Rio and provides the city with a superior water supply. As it flows through the city, there is an increase in fecal coliform counts that exceed the state standard. There is a wastewater treatment plant discharging into the creek that may be increasing the fecal coliform concentration. The Del Rio Water Operations Department has started to collect samples upstream and below the treatment plant and should provide more information to assess a larger portion of creek.

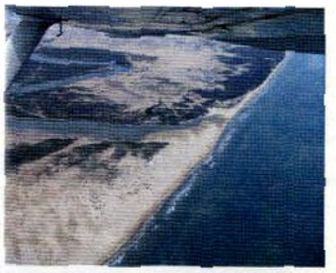
Lower Rio Grande Sub Basin

Overview

The Lower Rio Grande is denoted as the portion of the Rio Grande below the International Falcon Reservoir downstream to the Gulf of Mexico. This section stretches for about 280 miles (450 km) along three counties (Starr, Hidalgo, and Cameron) and is home to over 955,000 people. The primary industry in this area is agriculture, making up more than 80% of the areas income. The Lower Rio Grande is the center for the production of fruits and vegetables for Texas. Cotton and sorghum are also top production crops in the sub-basin.

The Lower Rio Grande sub-basin is divided into two segments: Segment 2302 Rio Grande below Falcon Reservoir – from Falcon Dam in Starr County to a point 6.7 miles (10.8 km) downstream of the International Bridge in Cameron County with 10 monitoring stations and Segment 2301 Rio Grande Tidal – from a point 6.7 miles (10.8 km) downstream of the International Bridge in Cameron County to the confluence with the Gulf of Mexico in Cameron County with one monitoring station.

Special Projects/Activities in the basin



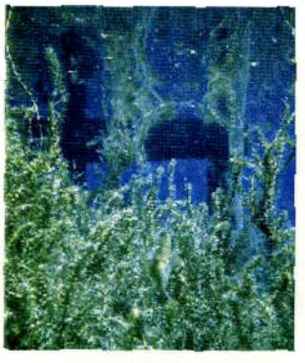
Rio Grande stops short of the Gulf of Mexico

An on going issue in this area has been the low water flow conditions in the region. Virtually all water needs in the sub-basin are provided by the Rio Grande because groundwater supply is limited and is of poor quality. Increased water demands from a growing urban and industrial population, reduced riparian habitat and ground cover, and recent drought conditions have contributed to the low water levels. Agricultural use of the water constitutes 82 to 90 percent of the water in this sub-basin.

Recent articles and pictures have shown that the Rio Grande doesn't have enough water to reach the mouth of the Gulf of Mexico. This is a concern because, according to the Cameron County Marine Extension, the lack of freshwater and saltwater interaction may endanger many aquatic species like the brown shrimp, white shrimp and snook. Many theories have been stated as to how this has occurred. One explanation is that the Falcon Reservoir is not releasing because it is at only 13% capacity and storage needs to be increased due to losses occurring from drought conditions. Other theories include low tides and increased vegetation clogging the river channel. No immediate solution to this issue has been proposed.

Weeds clogging the Rio Grande in Segment 2302

Invasive weeds that are clogging gates and channels have also plagued the lower Rio Grande sub-basin. These plants, Hydrilla and Hyacinth, lie within the river channel and cannot be reduced using herbicides because the water is used for agriculture and Mexico uses the river water as its drinking water supply source. Hydrilla is a submersed plant that grows from the river floor to the water surface at the rate of an inch a day causing other submersed plant life to get shaded out, makes boating and fishing impossible, and swimming dangerous. Water Hyacinth is a floating plant that reduces sunlight into the river and reduces the amount of dissolved oxygen. It too clogs the river surface making boating and fishing impossible and has an incredible growth cycle; populations can double in only 12 days.



Hydrilla Plant

Pilot projects are underway to try and resolve this issue . A six-month project will introduce grass carp into the sub-basin. The carp will feed on the invasive plants and reduce the plant population. Monitoring of the carp will be done to ensure that they don't have an adverse effect on the sub-basin as well. Other species that will be introduced for biocontrol of the plants are weevils that feed on Hydrilla and Hyacinth and the Hydrilla leaf-mining fly.

Who is participating in the Clean Rivers Program in the Lower Sub Basin?

- City of Brownsville - Collect field data and water samples in segment 2301.
- US IBWC Mercedes Office - Collect field data and water samples in segment 2302 and in Falcon Reservoir (segment 2303).

Segment Assessment

Rio Grande in Segment 2302

Segment 2302 – Rio Grande below Falcon Reservoir

This segment is designated for contact recreation, high aquatic life use, and domestic water supply. Station 13186 (Rio Grande below Rio Alamo near Fronton) data shows that the segment is fully supporting and has no concerns. Station 13185 (Rio Grande at Fort Ringhold 1 mile (1.6 km) downstream from Rio Grande City), Station 13184 (Rio Grande at SH 886 near Los Ebanos), and Station 13664 (Rio Grande 0.5 miles (0.8 km) below Anzalduas Dam, 12.2 miles (19.6 km) from Hidalgo) do not have data more recent than 1998. The data that we do have when compared to current standards shows that the stations are fully supporting and have no concerns. Station 13181 (Rio Grande at International Bridge at US 281 at Hidalgo) data shows that the segment is not supporting in fecal coliform. The data showed no concerns for nutrient screening levels. Station 15808 (Rio Grande 0.12 miles (0.2 km) upstream of Pharr International Bridge on US 281) data shows that the segment is not supporting in fecal coliform and only partially supporting in total dissolved solids. Station 13179 (Rio Grande near River Bend boat ramp approximately 5 miles (8 km) west of Brownsville on US 281) data does not meet the criteria of containing more than nine values during the assessment period per each parameter. The data that is available show that this point is fully supporting and has no concerns. Station 13177 (Rio Grande at El Jardin Pump Station near Brownsville) data show that this station is not supporting in fecal coliform and total dissolved solids. Station 13103 (Arroyo Los Olmos Bridge on US 83 South of Rio Grande City) also does not have sufficient data to evaluate against the standards, but data available show that the station is not supporting in fecal coliform, dissolved oxygen, chlorides, sulfate, and TDS. This has been determined to be due to stagnant water flow at this station, which is an arroyo near the Rio Grande.

Segment 2301 – Rio Grande Tidal

This segment is designated for contact recreation and exceptional aquatic life use. This segment contains only one monitoring station, Station 13176 (Rio Grande Tidal at SH 4 near Boca Chica). Data from this station shows it is not supporting in fecal coliform and has concerns in total phosphorous, ammonia, and chlorophyll-A. The ammonia trend has been steadily increasing over the past five years, but is still within limits.

Concerns

Most of the data shows little concern in this area for water quality as all segments are meeting the primary standards and nutrient criteria except for slight fecal contamination near major cities. Values in the river need to be consistently monitored to evaluate the effect on the river from the Rio Grande not reaching the Gulf of Mexico.

Figures

Figure 1. Map of the Rio Grande Basin region highlighting river segments, monitoring stations, rivers, and populated areas in the basin.

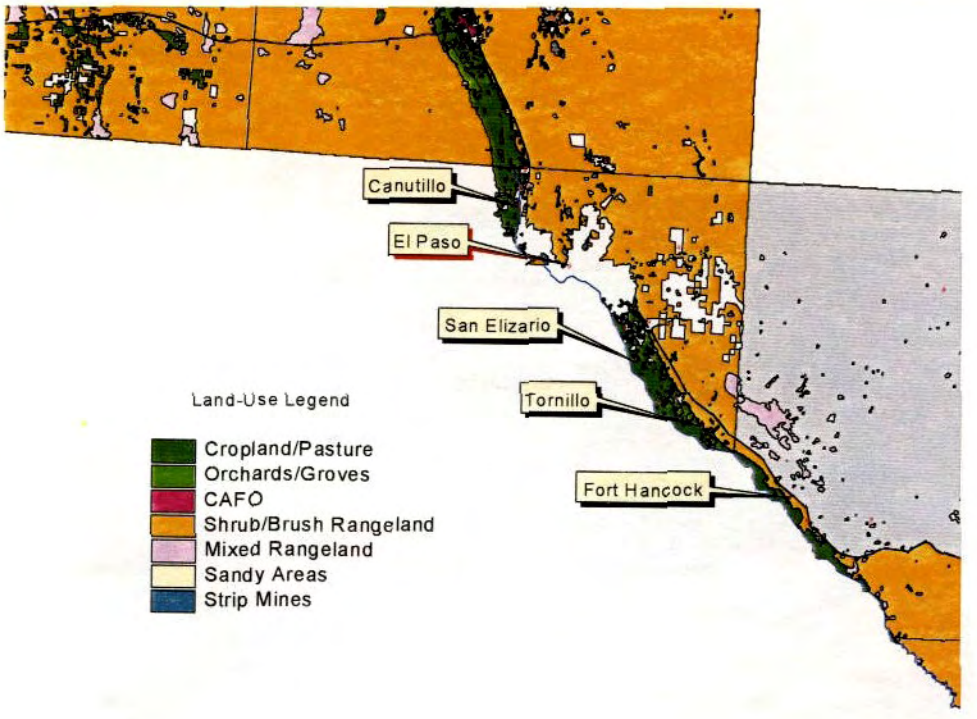


Figure 2. Land use map of the El Paso area.

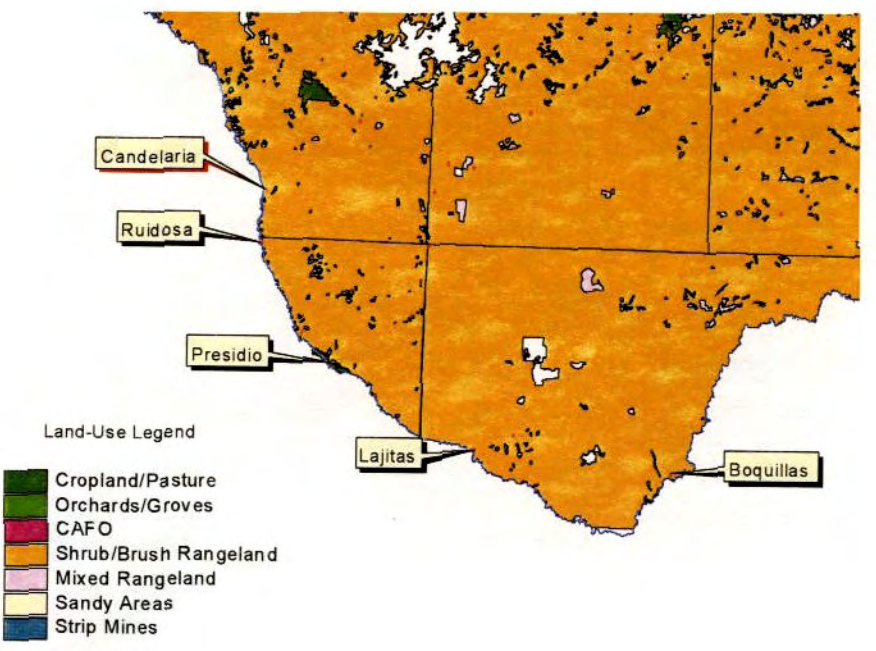


Figure 3. Land use map of the Presidio area.

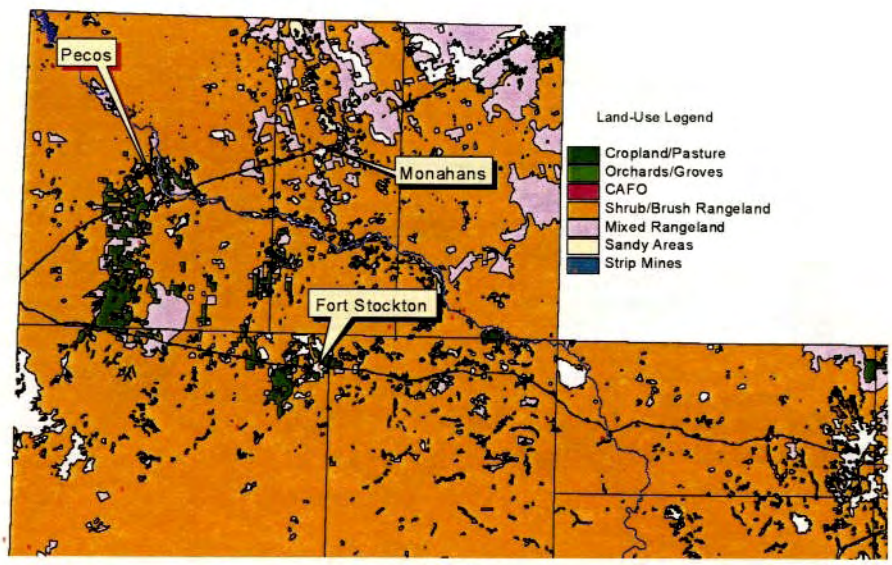


Figure 4. Land use map of the Pecos area.

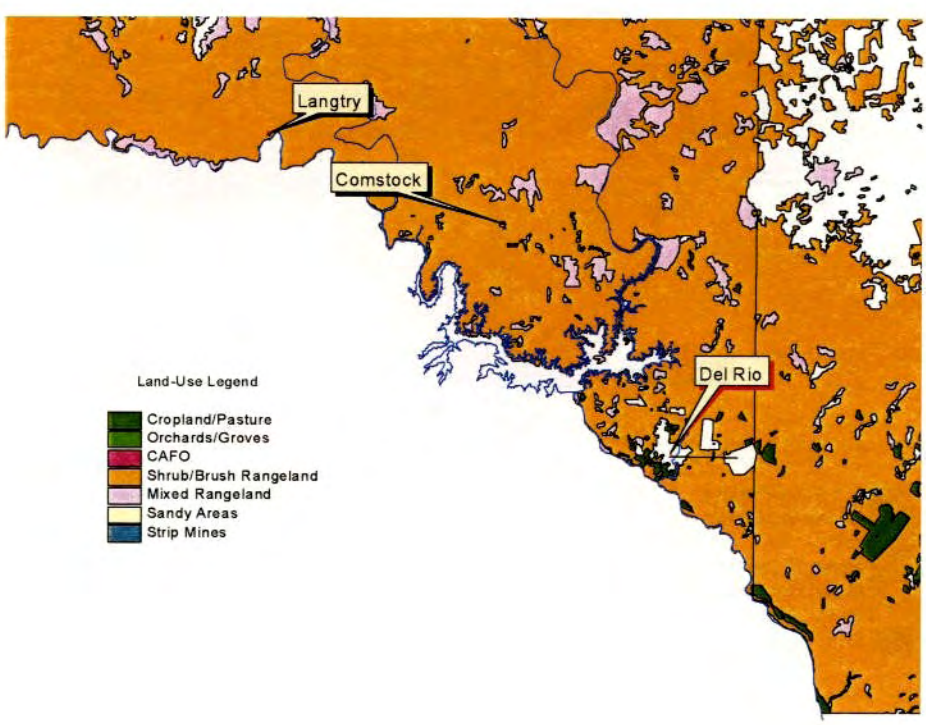


Figure 5. Land use map of the Amistad area.

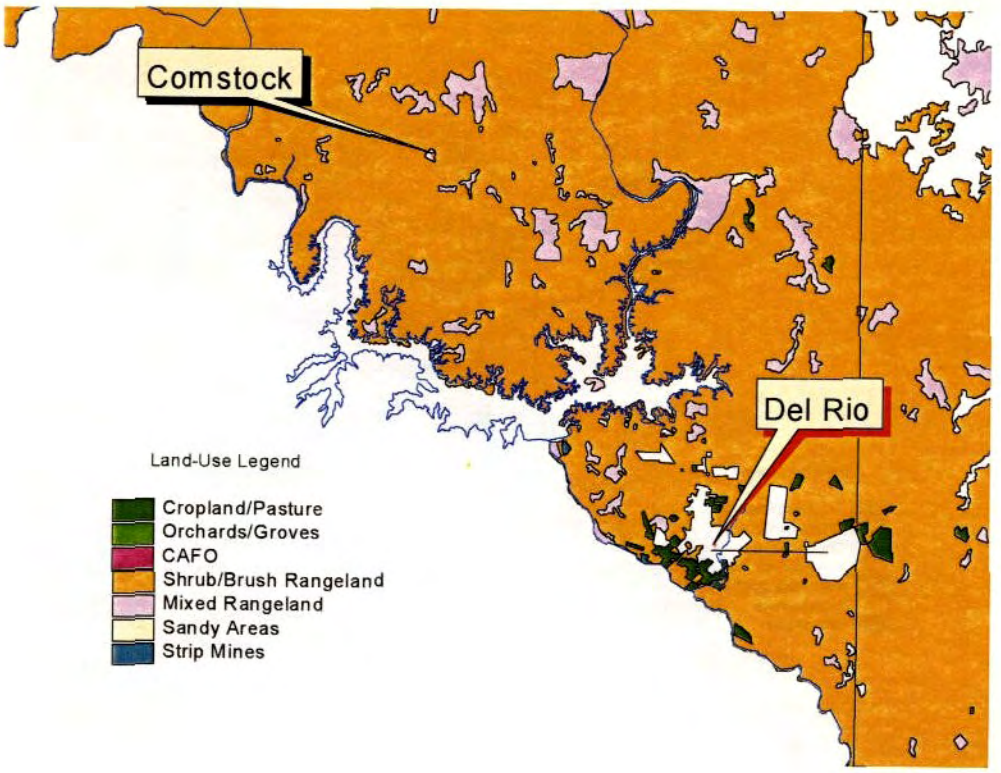


Figure 6. Land use map of the Del Rio area.

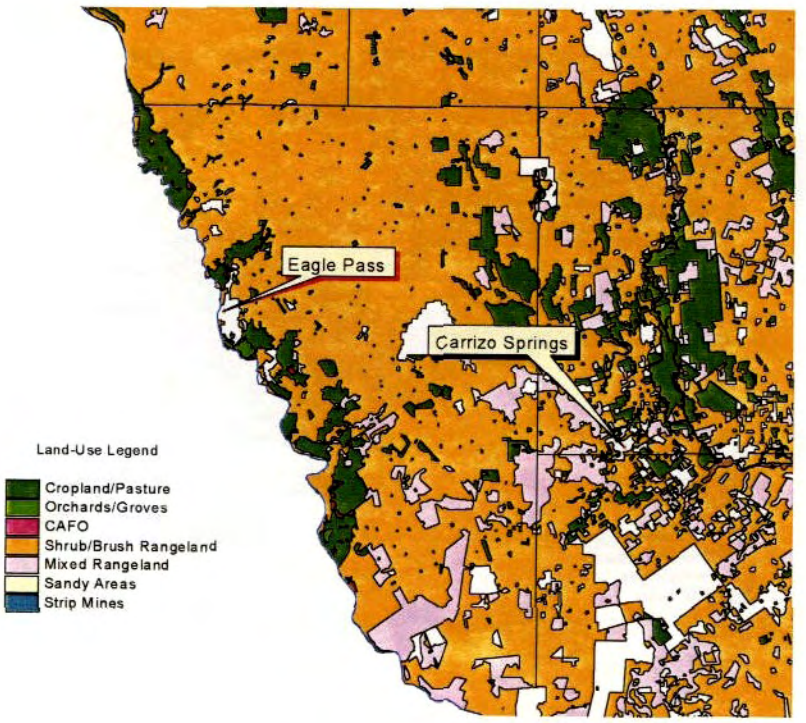


Figure 7. Land use map of Eagle Pass area.

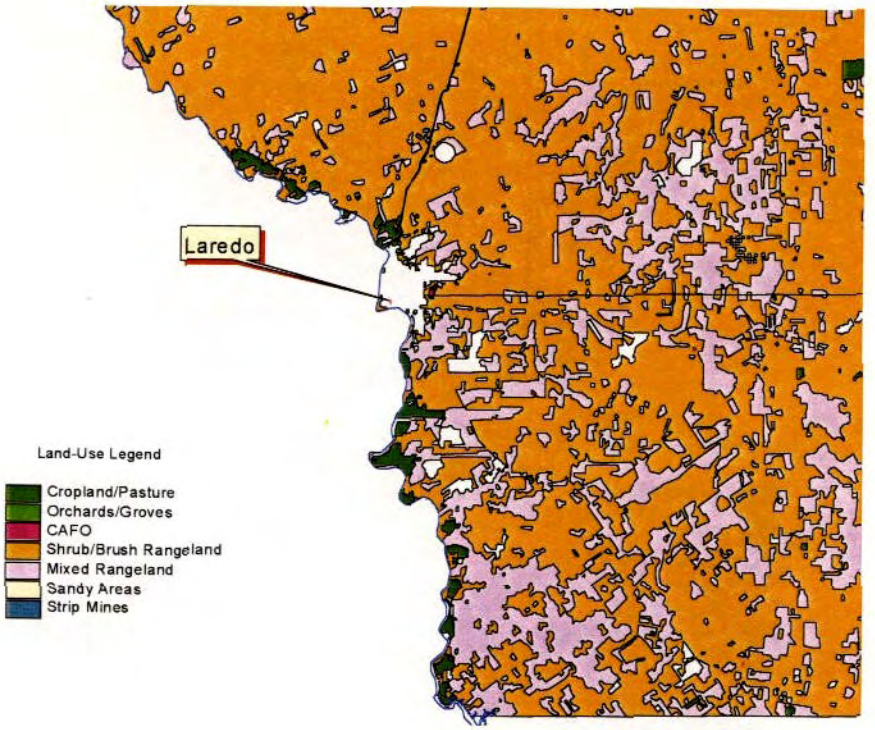


Figure 8. Land use map of the Laredo area.

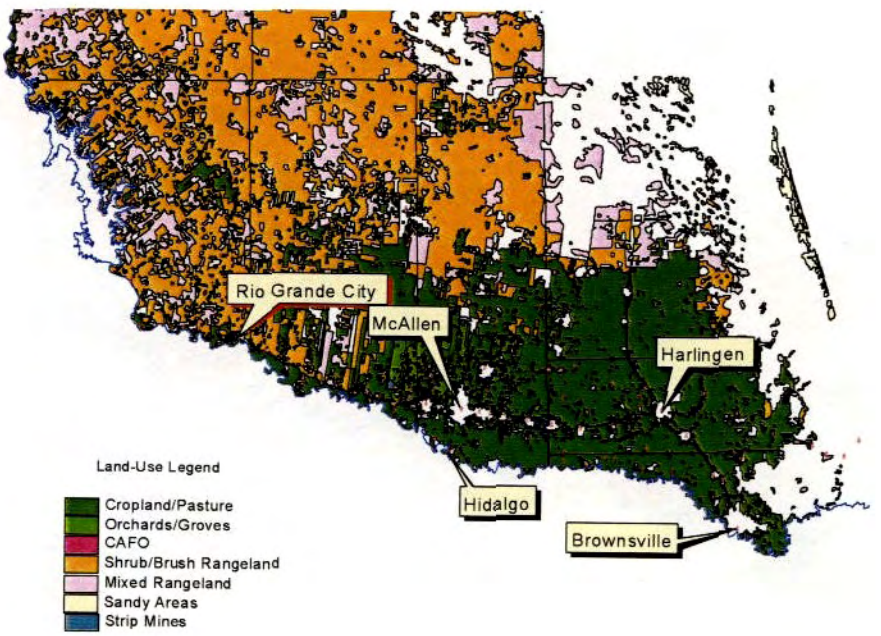


Figure 9. Land use map of the Lower Rio Grande area.

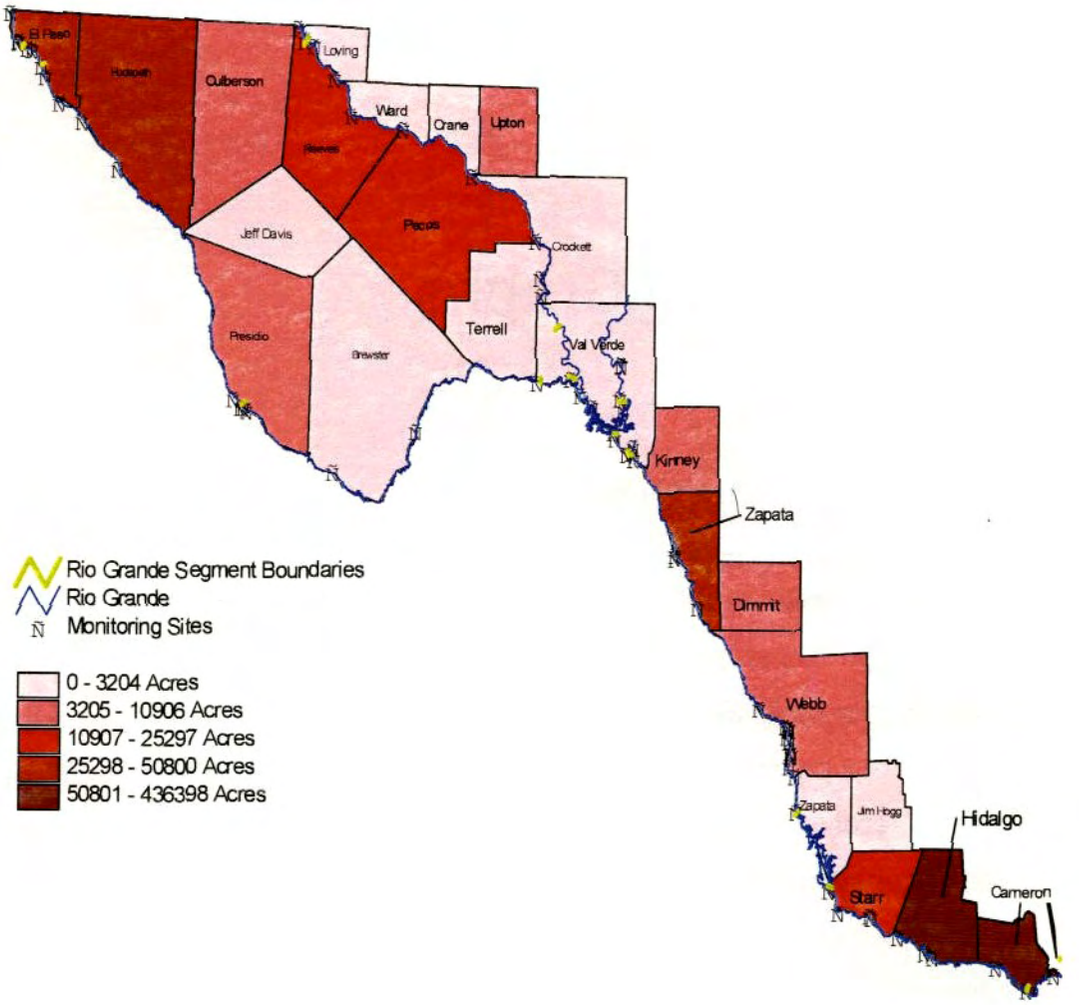
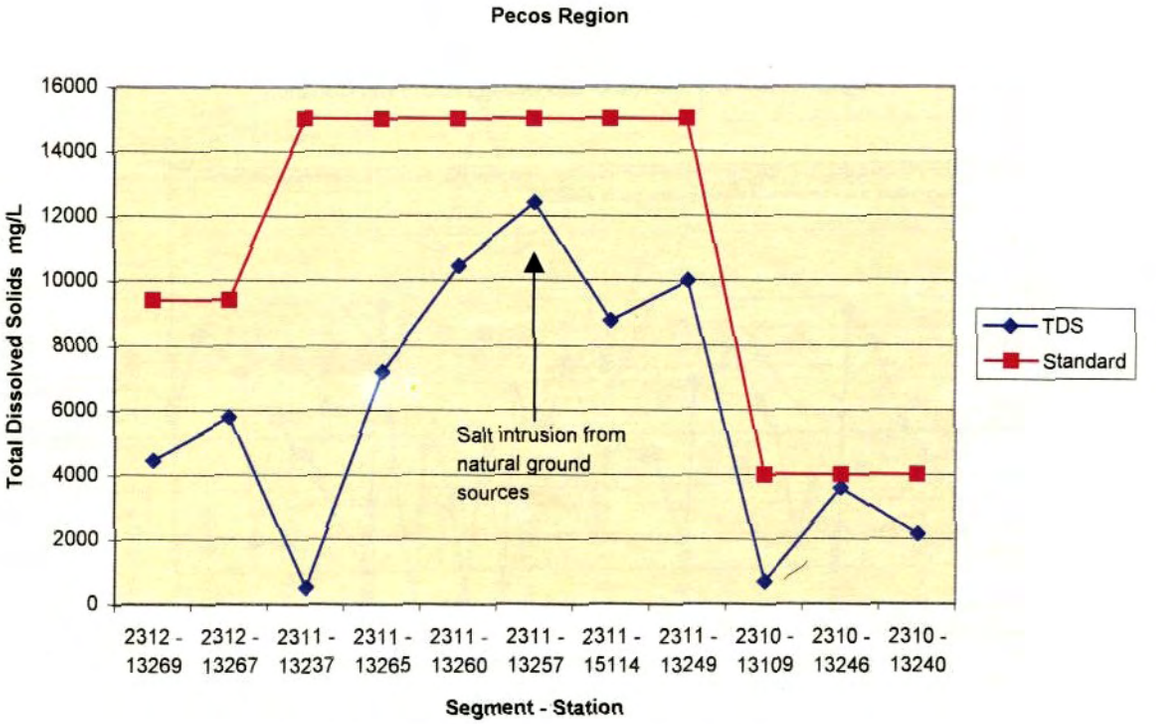
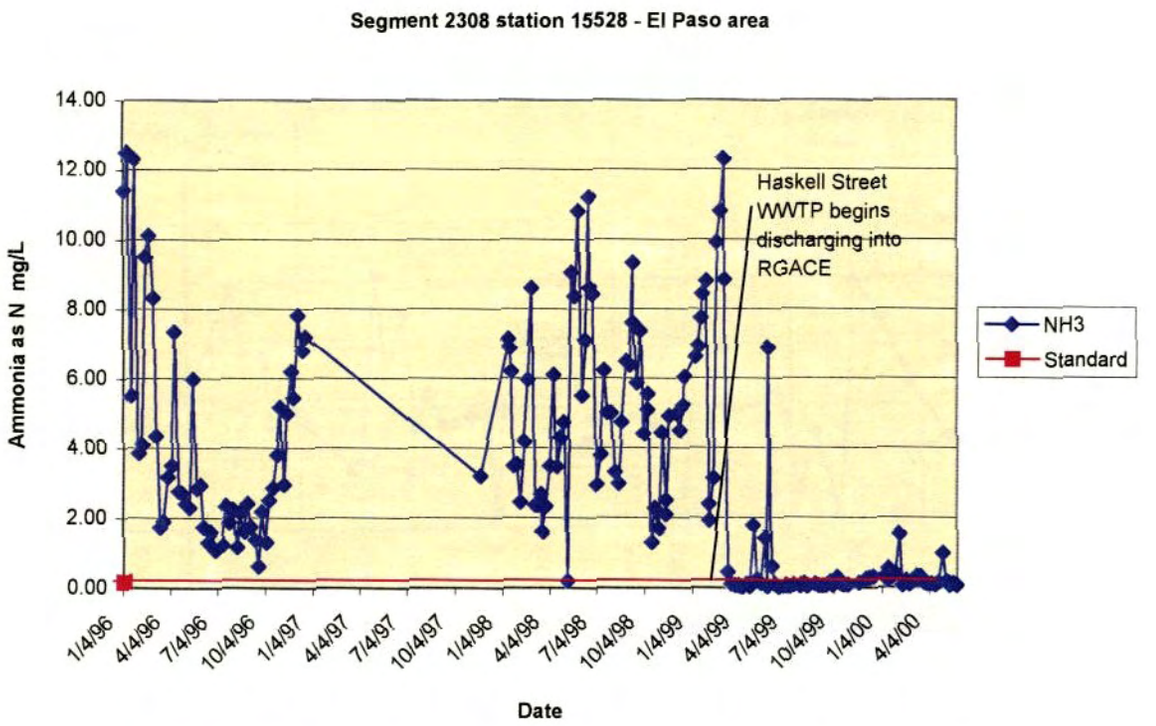


Figure 10. Map of irrigated acreage by county in the Rio Grande Basin.

Graphs



Graph 1. Graph of the high salt content in Pecos area.



Graph 2. Graph showing reduction in ammonia after introduction of RGACE

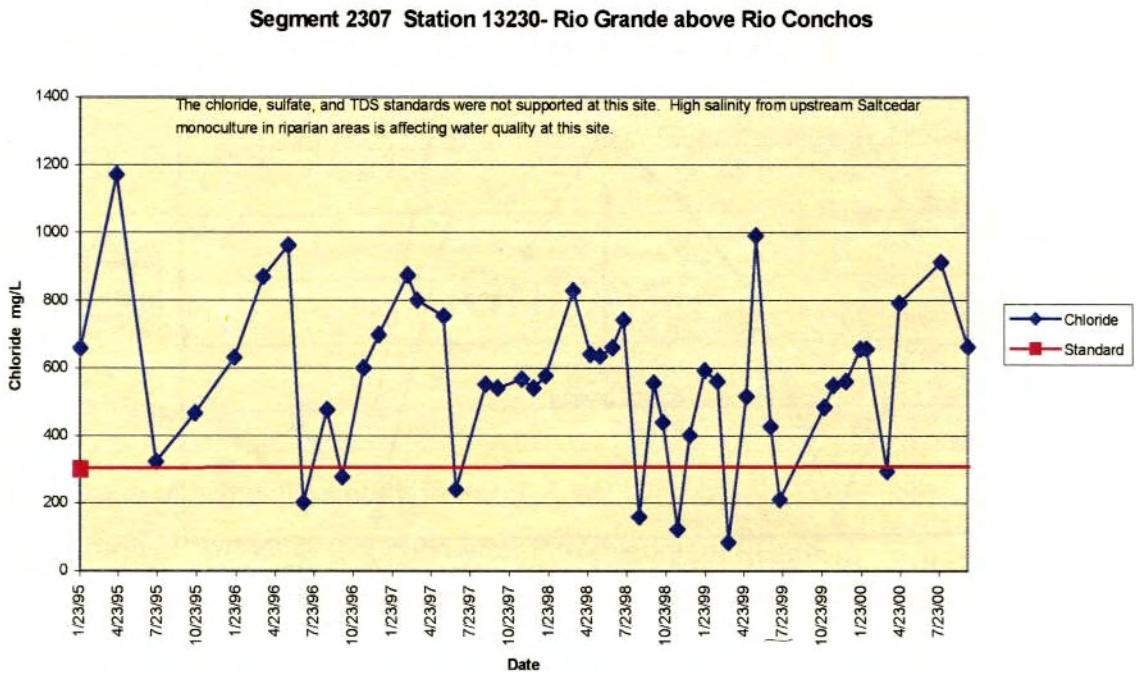


Table 3. Graph of high chloride values exceeding parameter limits in segment 2307.

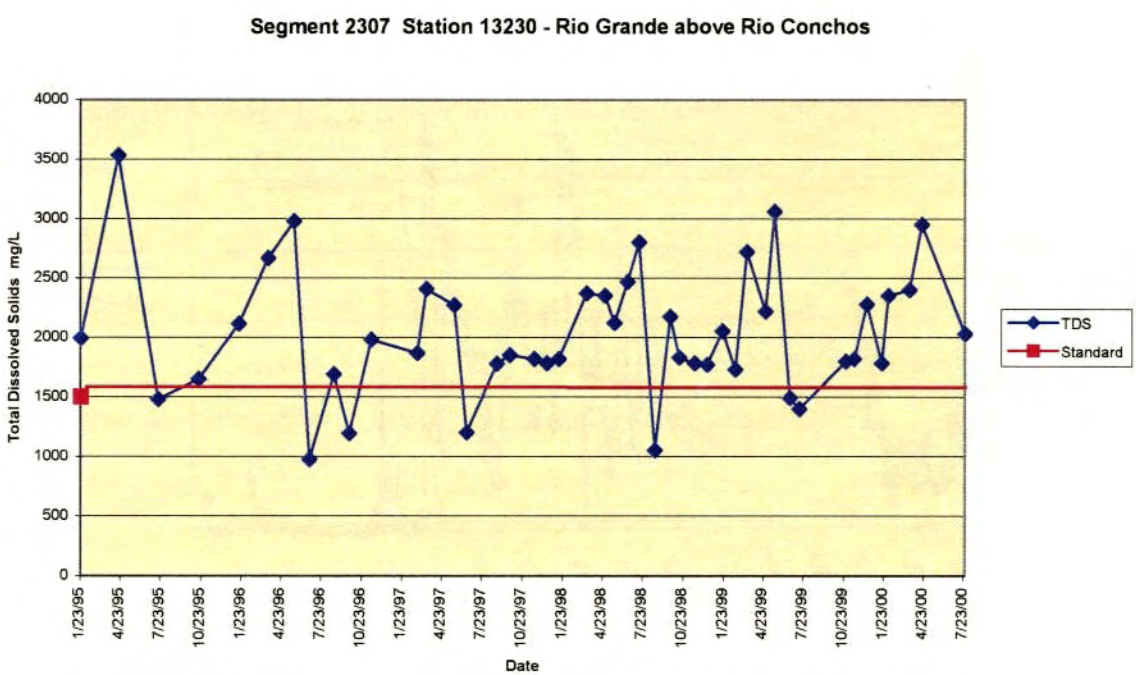
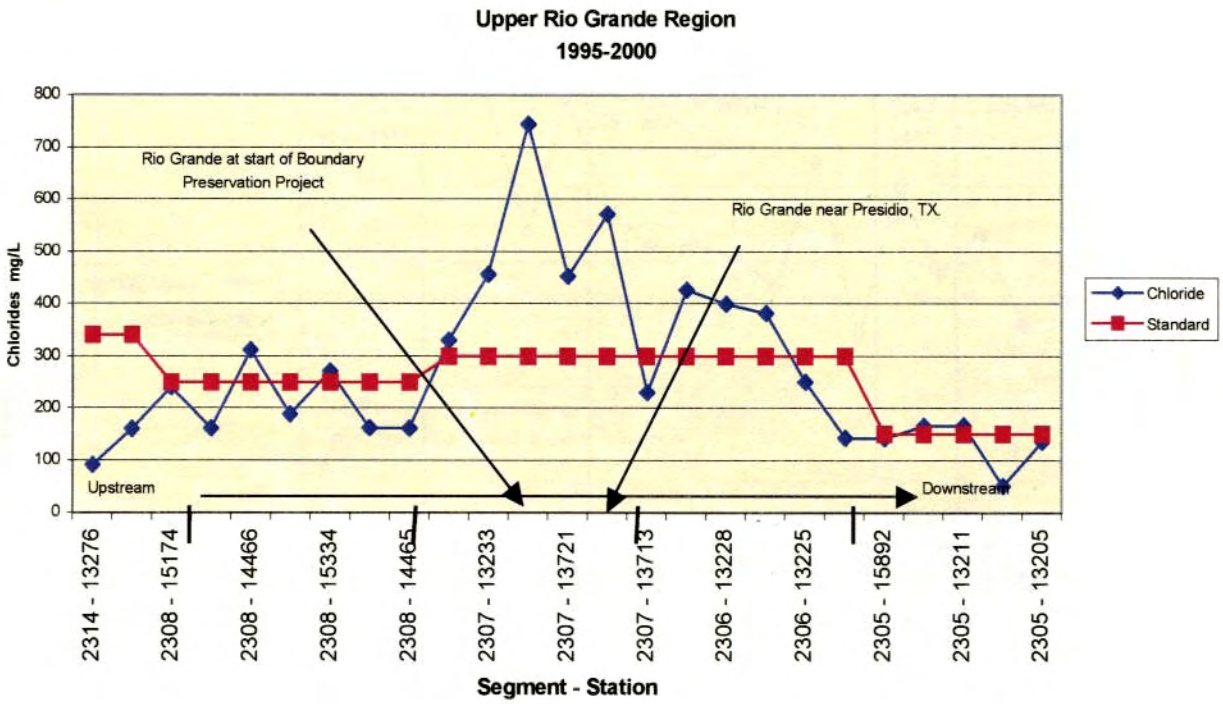
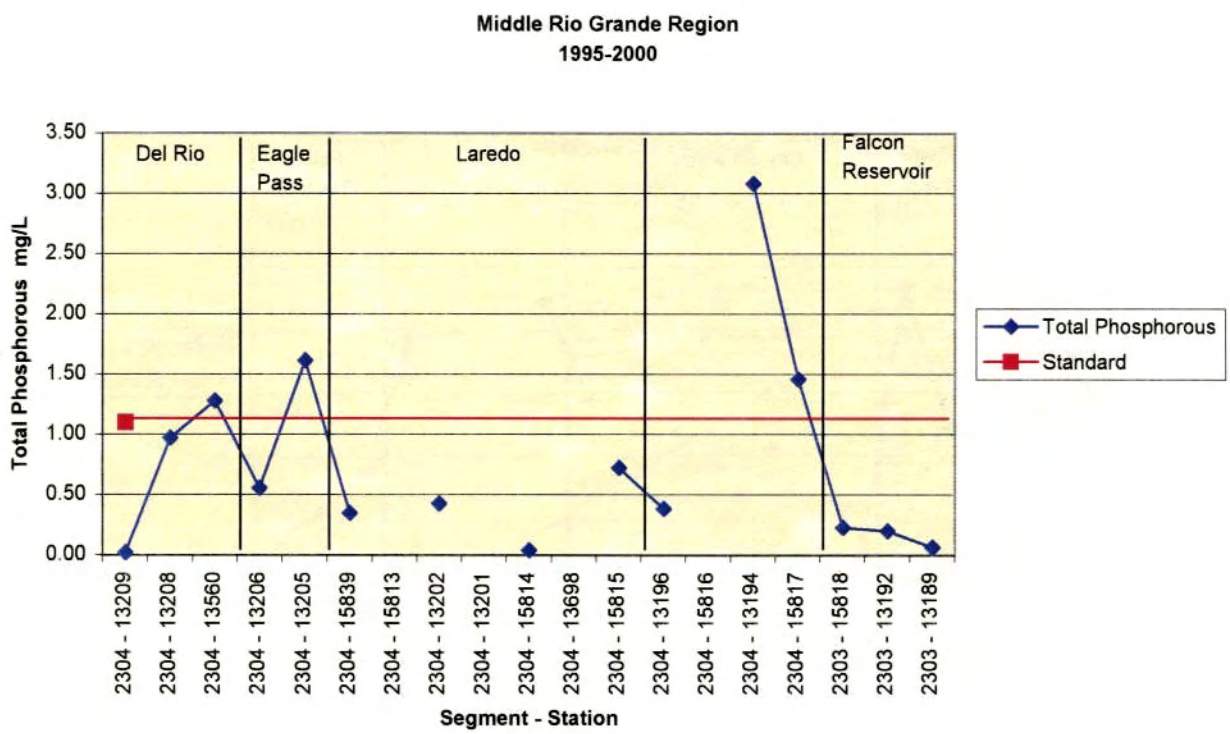


Table 4. Graph of high TDS values exceeding parameter limits in segment 2307



Graph 5. Graph showing chloride spike in Presidio area.



Graph 6. Graph showing increased total phosphorous values in Middle Rio Grande area.

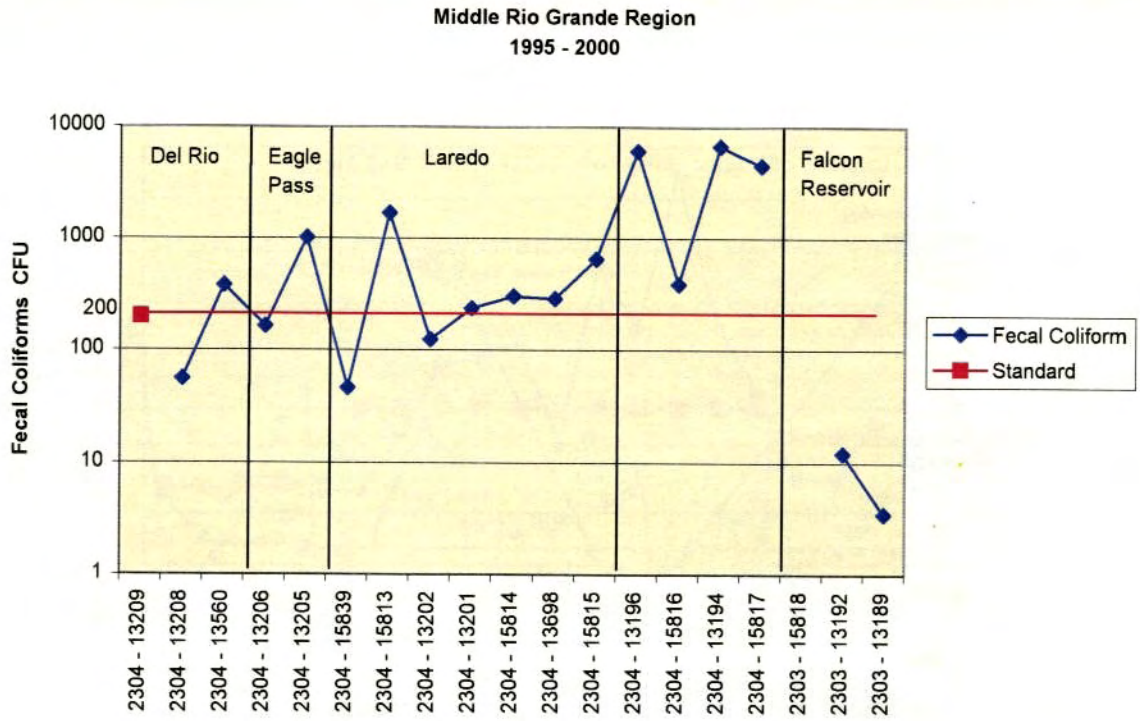


Table 7. Graph showing fecal coliform values in Middle Rio Grande area.

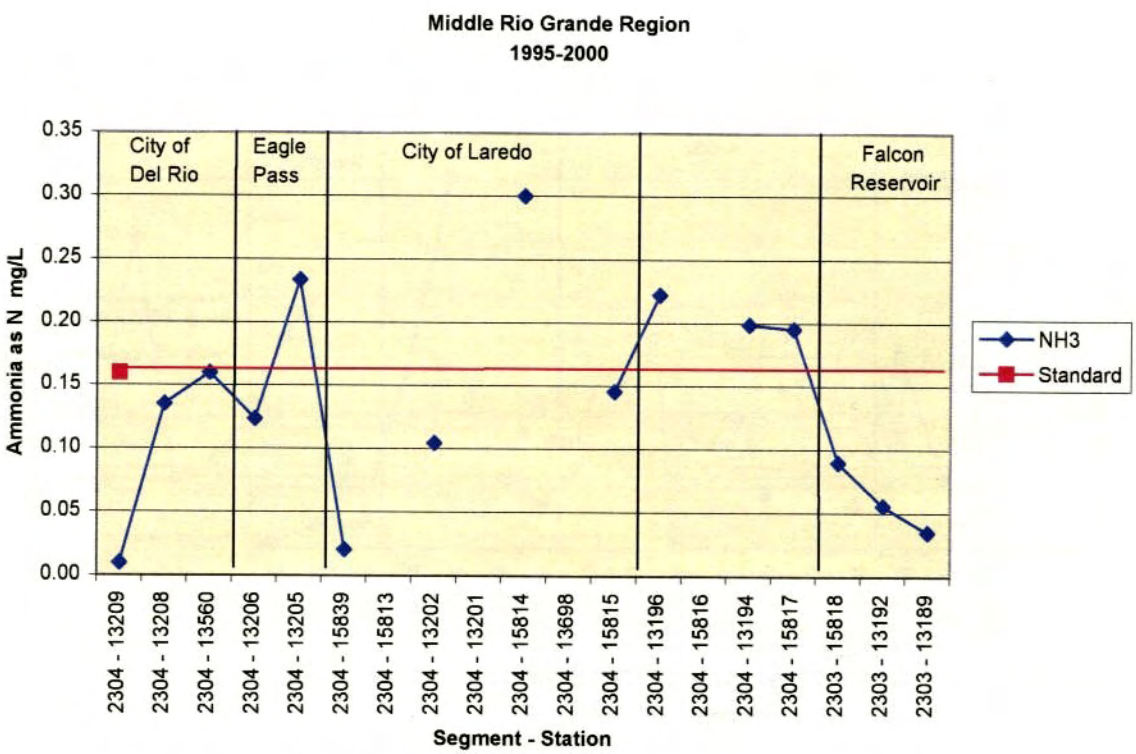
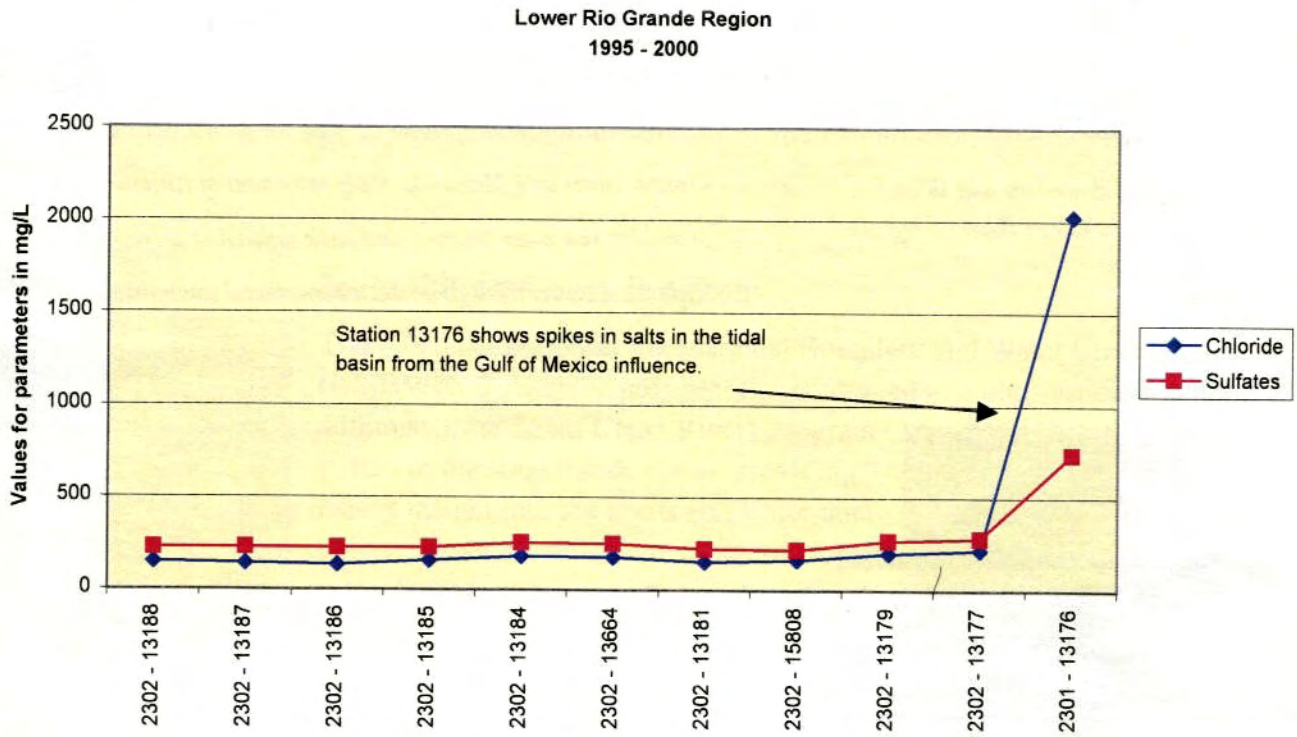
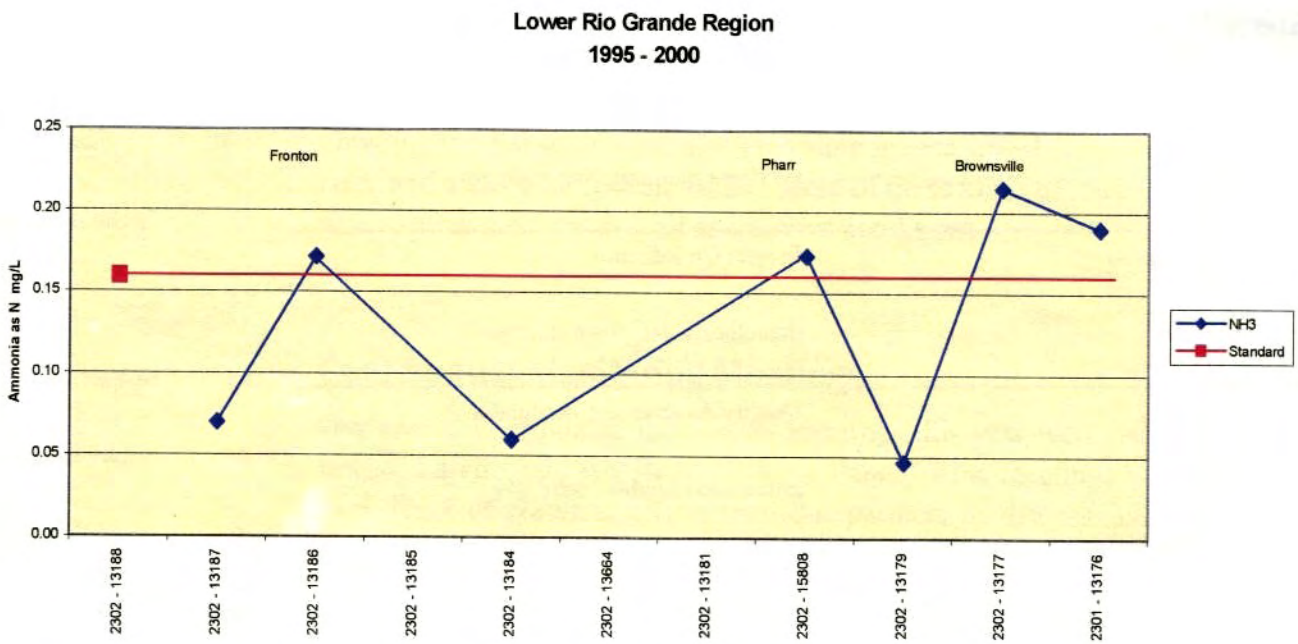


Table 8. Graph showing ammonia values in Middle Rio Grande area.



Graph 9. Salt graph of the Lower Rio Grande area.



Graph 10. Graph of ammonia increasing downstream of major populated areas in segment in lower Rio Grande Region

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