ENVIRONMENT

Common Ground

The Rio Grande, or *Río Bravo* as it is called in Mexico, serves as the dividing line and lifeblood of the Texas-Mexico Border region. All along its 1,254-mile length, two great nations draw upon its wealth to support sprawling agricultural and industrial enterprise, and provide drinking water for a fast-growing populace. To any Border resident, the river is ever-present, ever-powerful, ever-vital.

But its origin is not so dramatic. In fact, the big river begins more than 600 miles north of the Texas border as a stream in the San Juan Mountains of Colorado. By the time it flows into El Paso, the gathering water has already irrigated crops in the San Luis Valley of Colorado and plunged through New Mexico's 800-foot Rio Grande gorge, providing whitewater rapids for the bravest of rafters. New Mexican farmers also depend on the river for irrigating chiles, cotton fields, and pecan groves.

The river courses past some 1.6 million residents of El Paso-Juarez, the largest international community on the Texas-Mexico border, and past more than 300 *maquiladoras*.

Southeast of El Paso, rafters are out of luck. Of the river water that reaches El Paso-Juarez in a typical year, Mexican users are assured of 14 percent, U.S. users take 79 percent, and only 6 percent flows downstream—an arrangement rooted in a 1906 compromise between the neighboring countries.[1] Consequently, the river occasionally runs dry past El Paso, all along the border from Fort Quitman to Presidio almost 300 miles south and east.[2]

El Paso and Juarez primarily draw upon two underground aquifers, the Hueco Bolson and the Mesilla Bolson, for drinking water. As the aquifers dwindle, however, El Paso leaders have been looking to the river—historically a major source for irrigation—as an alternative source. Juarez will likely be forced to do the same as groundwater recedes. There are no agreements or international treaties on how much either city or state takes from the two aquifers.

A River Trickles Through It

Cutting a line in the desert that stretches from far West Texas into Sonora, the river trickles downstream—fed by an occasional creek or draw—and gradually picks up speed. In Presidio, Texas, and Ojinaga, Chihuahua, almost 300 miles down river from El Paso, the river flows through an international community with an estimated population of 27,000 in 1995. The river gains strength as the Rio Conchos rushes down from the Sierra Madre mountains in northern Mexico to join the Rio Grande at Presidio.[3]

To any Border resident, the river is ever-present, ever-powerful, ever-vital.

PHOTO: Texas Department of Transportation.

The Rio Grande provides water for both countries on the border.

The Amistad International Dam, built jointly by the U.S. and Mexico in 1969, diverts water for both countries.

From Presidio-Ojinaga, the river flows through the canyons of the Big Bend National Park, and on the Mexican side, the Cañon de Santa Elena and Maderas del Carmen Protected Areas and the Boquillas del Carmen National Park. This region includes breathtaking mountains, vast deserts, and the canyons at Santa Elena, Mariscal, and Boquillas—"among the noteworthy canyons of the North American continent," by one account.[4]

As the river curves around the national park, 680 miles from El Paso and a little more than halfway to the Gulf of Mexico, the Amistad International Dam, built jointly by the U.S. and Mexico in 1969, diverts water for both countries. Some 56 percent of the facility's total water storage capacity belongs to the U.S. while Mexico owns nearly 44 percent, based on the reservoir design.[5]

A Metropolitan River

The twin cities of Del Rio-Ciudad Acuña and Eagle Pass-Piedras Negras nestle along the river between the wilderness of Big Bend and Laredo-Nuevo Laredo, the major metropolitan area along the river's middle section. Laredo, the busiest inland port on the U.S.-Mexico border, draws 98 percent of its water, supplying homes, businesses, industry, farms, and ranches, from the river.

In 1991, the Texas Historical Commission (THC) identified the 200-mile stretch of the Rio Grande from Laredo to Brownsville as one of the most historic regions in the state—explored by Spaniards before Englishmen arrived at Jamestown and Plymouth.[6] To promote tourism and heighten awareness of the region's historic sites, THC created Los Caminos del Rio Heritage Project. Partners in the project included the Texas Department of Parks & Wildlife (TPWD), THC, National Park Service, Mexico's Tourism Ministry, local communities and non-governmental groups from both sides of the border. Some of this partnership's successes include the restoration of historic buildings in the Roma National Historic Landmark District, restoration of the 1850s-era Port Isabel Lighthouse, and development of a lighthouse visitors center.[7]

Downstream from *los dos* Laredos is a second major international dam, the Falcon Dam. Built in 1953, the dam fills a reservoir providing water to both countries. The river reaches one of the most fertile agricultural regions in either country here, with farms as far as one can see growing fruits and vegetables. Hidalgo County is ranked sixth in the state in total agricultural receipts and first in crop receipts.[8] Agriculture mixes with commerce along the U.S. side of the river, while on the Mexican side, *maquiladoras* appear near the river.

PHOTO: U.S. Department of Justice, Immigration and Naturalization Service.

The Brownsville Port of Entry is part of a 200-mile stretch of river considered one of the most historic regions in the state.

Water released from Falcon Dam, restricted to meet the needs of farmers and Border communities, flows through the Lower Rio Grande Valley, a metropolitan area with nearly 1.5 million people, including nearby residents of Mexico.[9] Water flow becomes limited, however, during the March to July irrigation season.

Water users in the Lower Rio Grande Valley have found themselves in competition with natural river vegetation for the river's water. The hydrilla, a green plant that is 95 percent water, and the hyacinth, a lily-like plant, have grown so thick that they restrict the flow of the river as it pours into the Gulf of Mexico.[10] Local community leaders are researching potential solutions to eliminate or reduce the number of plants in the river.

Despite an increasingly urban backdrop, the river in the Lower Rio Grande Valley provides a wildlife setting for an "exceptionally high number" of plant and animal species. As the river approaches its final destination in the Gulf of Mexico, the mix of salt water from the Gulf and fresh water from the river provides a setting for white shrimp, Atlantic croaker, blue crab, and flounder. Pouring into the Gulf through *Boca Chica* (translated as "small mouth"), the river makes wetlands and marshlands an idyllic home to more than 400 species of birds.[11]

Keeping the River Clean

In 1993, a 13-year-old Laredo boy died after contracting an amoebic infection while swimming in this same river.[12] The boy had taken a dip near a water treatment plant. State and local health officials later found the river contaminated with naegleria—an amoeba that can cause fatal inflammation of the brain. According to the Texas Natural Resource Conservation Commission (TNRCC), "warm, fresh waters that are stagnant or slow moving are ideal conditions for naegleria." In its *1996 Regional Assessment of Water Quality in the Rio Grande Basin*, TNRCC said the overall probability of infection was about one in 100 million that a person exposed to water inhabited by naegleria would be afflicted.[13] The Laredo boy's death was one tragedy too many.

The Rio Grande has been polluted in one way or another for decades. Residents have struggled to deal with high levels of fecal coliform bacteria, pesticides, and salinity all along its 1,254-mile length.

Some reasons for the dirty water have been clear for a long time, too.

Juarez, with an estimated 1.2 million residents in 1997, has never had a public sewer treatment plant, and produces 75 million gallons of raw sewage each day.[14] However, two wastewater treatment plants have been approved by the Border Environment Cooperation Commission (BECC). Estimated cost is $31 million.

PHOTO: U.S. Department of Justice, Immigration and Naturalization Service.

Pollution and litter line many stretches of the Rio Grande.

The current Juarez wastewater collection system carries waste to a series of canals known as *aguas negras*, or black waters, draining into an open ditch that runs parallel to the Rio Grande. During the growing season, the water is mixed with ground water to irrigate fields 30 miles south of Juarez. In the off-season, the *aguas negras* empty into the Rio Grande.[15] Bacteria levels were so high in the stretch downstream from El Paso-Juarez in 1996 that the state declared it unsafe for swimming. Year by year, however, routine state water monitoring does not occur "at a frequency or in enough locations to ensure that surface waters are entirely safe for swimming," TNRCC has said.

The hydrilla, a green plant that is 95 percent water, and the hyacinth, a lily-like plant, have grown so thick that they restrict the flow of the river.

Controlling both natural and human salinity sources is difficult and costly.

High bacteria levels persist all along the river, particularly near Border cities. This is generally attributed to sewage lines, wastewater treatment plants, and runoff from city streets, farms, and dairies. In a 1996 assessment of the Rio Grande, state health officials found pesticides in the river near Laredo-Nuevo Laredo and the Lower Rio Grande Valley. Of seven pesticides found in excess of federal levels established to protect human health, three were widely used in homes and gardens, indicating a mix of urban and agricultural sources.

Too Much Salt, Too Much Sediment

Salinity, or the saltiness of the river, has emerged as another major problem along the river. As salinity increases, the quantity of water that can be used for drinking or irrigation decreases. Natural conditions, including salty waters from the Pecos River (fed by salty underwater springs) that join the Rio Grande upstream from Del Rio, are a major source of salinity. Irrigation also increases salinity, because irrigation water evaporates, leaving dissolved salts in standing groundwater, which seeps into the river.

At first glance, salinity may not seem a major problem, particularly compared to fecal coliform bacteria or chemical pollution. But rising salt levels in the river could hinder irrigation in agriculture and threaten community water supplies, as well as the health of river wildlife—all dependent on steady sources of fresh water.[16]

In addition, controlling both natural and human salinity sources is difficult and costly. A standard method of controlling salinity is to increase the flow of fresh water. In the Border region, however, where the Rio Grande remains the major source of water, adding fresh water is not a viable option. Additional research is necessary to identify innovative ways of controlling salinity in irrigation and generally managing the salt that ends up in the river.

Public and private entities in Texas are implementing desalination projects to develop alternative water sources and conserve water. Seventy-six desalination plants were operating in the state as of 1996. These plants—located as far north as Amarillo and as far south as Harlingen—take inland brackish water and freshwater, and wastewater and prepare it for industrial, municipal and power plant uses.

Desalination is a process that removes substances and minerals (including, but not limited to salt) from seawater, brackish water, or treated wastewater. A number of technologies have been developed for desalination, including multi-stage flash, reverse osmosis, distillation, and electrodialysis.

Separation of the substances or minerals from the water is accomplished through two general methods, distillation or membrane. In Texas, 10 plants use the distillation process and sixty-five plants use the membrane process.

The membrane process is used by newer plant installations. These plants use more efficient technologies such as reverse osmosis (RO) and electrodialysis reversal (EDR). In RO, water is pumped at high pressure through permeable membranes, separating the salts from the water. The EDR process uses specially charged membranes to remove ionized salts from the water. Almost three-fourths of the desalination plants (49) in Texas use the RO method and 15 plants remove substances from water through the EDR process.

In general, the cost to produce water from desalination is high, and depends on a variety of factors including the process used, plant capacity, quality of feeder water, energy costs to run the plants, and final use of the water. Research and technology improvements are needed to make desalinated water more economically viable.

Water sediments, such as undissolved plant debris, rocks, and soil,

also dirty the river, particularly near major dams, which trap sediments and reduce reservoir capacity. By one account, a reservoir adjoining the Elephant-Butte Dam, built in 1916 on the Rio Grande in New Mexico, has lost 19 percent of its capacity because of accumulated sediment.

Water and *Colonias*

Colonias might not be noticeable to a rafter floating down the border river, but they exist up and down the Texas side of the border. A 1996 Texas Water Development Board (TWDB) survey of "economically distressed" areas identified nearly 1,500 *colonias* with a population of nearly 350,000 (see **Table 9.1**). While some *colonia* residents have potable water, many do not, relying instead on stretched garden hoses from house to house. Most residents have inadequate septic systems or in some cases use outhouses.[17] The untreated waste threatens the quality of both the groundwater and river water throughout the region.

On rainy days, unpaved *colonia* streets often wash out, making it difficult for school buses to enter neighborhoods. Children walk to school through mud-filled streets and yards sometimes flooded with human waste overflowing from inadequate septic systems. Residents of a Laredo school district reported in 1996 that in extremely wet weather, school district buses failed to pick up middle and high school students in the *colonias*. District officials, defending shortfalls in service, explained that dirt roads in the subdivisions were sometimes impassable, even dangerous.[18]

The 1989 Texas Legislature created the Economically Distressed Areas Program (EDAP) to provide local governments with funds for water and wastewater service to *colonias*. Qualifying for the assistance were counties next to the border and counties with a per-capita income 25 percent less than the state average and unemployment rates 25 percent greater than the state average. Texas voters approved $100 million in state general obligation bonds to fund the program in 1989 and an additional $150 million in 1991. In addition, the U.S. Environmental Protection Agency (EPA) contributed $200 million in federal funds to the program. By early 1998, the TWDB, which

TABLE 9.1
Colonias in Selected Texas Border Counties, 1996

County	Number of Colonias	Colonia Population
Brooks	7	612
Cameron	111	38,839
Dimmit	6	4,139
Duval	1	100
Edwards	1	1,321
El Paso	151	72,754
Frio	3	730
Hidalgo	868	129,880
Hudspeth	3	1,018
Jeff Davis	1	200
Jim Hogg	2	100
Jim Wells	16	5,576
Kinney	2	331
La Salle	7	1,465
Maverick	44	13,969
Pecos	5	1,450
Presidio	7	756
Reeves	2	540
Starr	124	33,546
Terrell	1	1,000
Uvalde	8	1,863
Val Verde	11	3,467
Webb	43	16,353
Willacy	8	3,542
Zapata	7	3,734
Zavala	14	6,036
Total	**1,453**	**343,321**

SOURCES: John Sharp, Texas Comptroller of Public Accounts, and Texas Water Development Board.

The 1989 Texas Legislature created the Economically Distressed Areas Program (EDAP) to provide local governments with funds for water and wastewater service to colonias.

administers the program, was in negotiations with the EPA for an additional $50 million to $100 million in federal funds.

Water for the Few

In 1996, most *colonia* residents resided in El Paso, Hidalgo, and Cameron counties. From 1989 through 1997, six EDAP projects were completed, serving 21,000 people. Another eight projects, totaling $138 million, were under construction, with the number of people served by 2000 expected to reach nearly 100,000—success for the fortunate, but still short of serving some 300,000 others awaiting water and wastewater services.

The mountains surrounding the area create a single air basin, causing airborne pollution to stagnate over the sister cities.

As of March 1998, more than 40 other projects were in EDAP planning stages.

The application process is cumbersome. An entity applying for EDAP funds is first required to apply for a facility planning grant to determine the scope of a desired project, the type of water or wastewater system most effective for the area, and the number of people to be served. Once a plan is done, applicants may seek construction financing. But adjacent or overlapping government jurisdictions—such as cities or water districts—often go through lengthy negotiations to determine who serves the *colonia*.

In some cases, one jurisdiction, such as a water supply corporation, has prior authority—through a Certificate of Convenience and Necessity—to provide the *colonia* with water, but a nearby city or town might be able to provide water and sewer services at a lower cost. In such cases, the city or town might buy out the water supply corporation's right to serve water, with the cost of the buyout based on the corporation's lost future earnings.

Disagreements between cities over how to serve *colonias* in the most cost-effective way sometimes complicate planning. Too often, negotiations last months or even years; as of early 1998, more than half of the 40 EDAP projects in the planning stage had been pending for more than three years, and two had been waiting for almost seven years.[19]

Among possible contributing factors for the delays, program rules may have been at fault and local engineers may not have met contractual demands. Whatever the causes, *colonia* residents were not routinely informed of delays or offered opportunities to question plans and hear explanations.

Delays in exchanges of information between state agency staff, local governments, engineers, and consultants appear to slow progress, too. Since 1989, the TWDB has reorganized the EDAP staff several times in an attempt to streamline the process. Yet delays persist. In September 1997, the board began a campaign to contact local officials about pending projects and urge them to move forward. Results were mixed, with several entities dropping out of the program and others committing to proceed rapidly.[20] Still, state staff did not put in place a formal method for talking to *colonia* residents about projects or reasons for delay. Meanwhile, residents continue living without running water and indoor toilets.

On a Clear Day

The Franklin Mountains surrounding El Paso-Juarez are beautiful—if you can see them. The mountains surrounding the area create a single air basin, causing airborne pollution to stagnate over the sister cities. In El Paso, pollution sources include industries and automobiles.[21] In Juarez, *maquiladoras*, cars that use leaded gasoline, dust from unpaved roads, and brickmakers burning tires for fuel foul the air.

The sky is not always clear over majestic Big Bend National Park either. An unmistakable haze sometimes hangs over the grand park.

"The bad days are about the same, but the good days are getting worse," said Jim Yarborough, a physical scientist with the EPA's Region 6.[22]

A joint study by the U.S. National Park Service and the Mexican government, released in May 1998, identified coal-fired electricity plants and other industrial sources in both Texas and Mexico as probable pollution sources. The next phase of the study, scheduled to get underway in 1999, is expected to identify the exact sources of pollution through chemical traces at selected industrial sources.[23]

Texans got a clear indication in the Spring of 1998 that you don't necessarily have to live along the border to be affected by air pollution. Thousands of uncontrolled fires in Mexico and Central America created smoke that spread into Texas and caused the first statewide air pollution public health alert.

Texas bore the brunt of the persistent smoke pollution, which began wafting over the state in early May. The haze was noticeable in Louisiana, and signs were apparent as far north as North and South Dakota.

The focus of the public health concern was particulate matter, which reached record levels at state air quality monitoring stations. The Lower Rio Grande Valley was the worst spot, but it affected air quality in Austin, Corpus Christi, San Antonio, Houston, Dallas-Fort Worth, East Texas and parts of West Texas, including the Big Bend region.

Federal and state officials called for emergency fire fighting aid, coordinated through the federal Agency for International Development (AID). AID said these wildfires were the worst in Mexico in 50 years.

Particulate matter at such levels can cause breathing difficulties, especially for the elderly, children, and individuals with respiratory conditions or heart disease.

Another instance of air pollution along the border affecting residents hundreds of miles away involves world-class science. Astronomers working at the University of Texas McDonald Observatory in the mountains near Fort Davis have a stake in the Border region's air quality, too. The observatory, with one of the first and most productive lunar ranging stations able to measure continental drift and distances to the moon, draws research scientists from around the world. One of the earth's largest, most powerful telescopes, the Hobby-Eberly Telescope, was installed in October 1997.[24] Aided by the world's largest mirror, as tall as a three-story building, the telescope is designed to collect and analyze light from astronomical objects such as comets, planets, stars, and galaxies. But if the air's not clear, you can't see.

Cross-Border Solutions

For more than a century, U.S. and Mexican leaders have recognized the significance of cross-border cooperation on environmental issues. The Treaty of 1848 establishing the river as a new U.S.-Mexico boundary was modified in 1953 to set today's boundary, taking into account the changing course of the river. In 1889, a treaty signed by representatives of both nations created the International Boundary Commission. A commissioner appointed by each country was entrusted with enforcing rules established in an 1884 agreement to fix the location of the boundary as the river meandered. In 1944, another treaty—the Treaty on Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, otherwise known as the Water Treaty—converted the commission to the International Boundary and Water Commission (IBWC). The treaty increased the commission's authority to include issues affecting the quality, conservation, and use of water on the border.[25]

Other international agreements by the IBWC, called "minutes," reflect the commission's water quality authority. In 1989, Minute 279 authorized joint projects to improve water quality in the Rio Grande at Nuevo Laredo and Laredo, resulting in the April 1996 opening of a $56 million wastewater treatment plant in Nuevo Laredo. The U.S. paid $17 million of the construction

Thousands of uncontrolled fires in Mexico and Central America created smoke that spread into Texas and caused the first statewide air pollution public health alert.

El Cobalto

For eight weeks in late 1983, Vicente Sotelo Alardin's pick-up, sidelined by a flat tire, sat parked on a back street near his house in Ciudad Juarez, across the Rio Grande from El Paso. Countless people passed by it each day, and neighborhood children climbed into the truck bed to play games.

No one knew the truck was dangerously "hot." From a distance of less than one meter, it emitted 50 rads an hour of radioactivity, enough to reduce the number of white blood cells that protect the body from infection and to inflict at least temporary damage to the chromosomes of anyone close by.

Sotelo's truck wasn't the worst of it, though. Officials on both sides of the border soon learned that the part-time electrician and hospital handyman had become a link in a chain reaction representing what is now acknowledged as the worst radioactive contamination in North American history.

Because the spill was so unusual, its full dimensions were difficult to measure. Unlike most nuclear accidents, in which a handful of people are exposed to brief bursts of high radiation, the Juarez incident involved thousands of people exposed to low levels of radiation over an extended period. Even so, the 200 or so residents in the immediate area received the largest radiation doses on public record. Measured in terms of the total number of people exposed, the Juarez incident fell somewhere between the partial meltdown at Pennsylvania's Three Mile Island reactor in 1979 and the 1986 accident at the former Soviet Union's Chernobyl nuclear plant.[1]

The Juarez incident fell somewhere between the partial meltdown at Pennsylvania's Three Mile Island reactor in 1979 and the 1986 accident at the former Soviet Union's Chernobyl nuclear plant.

The trouble had begun two months earlier, when Sotelo was sent to haul away some unused material from a warehouse operated by his employer, the *Centro Médico* in Juarez. Among the several pieces of equipment Sotelo and a coworker transported across town to the *Jonke Fénix* junkyard was a 20-year-old Picker 3000 radiotherapy machine that the hospital had purchased from the X-ray Equipment Co. in Fort Worth, which had in turn bought the unit from Methodist Hospital in Lubbock. Once in Juarez, the machine had languished in the warehouse for lack of a qualified technician to fix it.

Sotelo's mistake was in pilfering an unmarked capsule from the load and throwing it into the back of his pick-up truck. Later, when he pried open the capsule, out spilled 6,010 small, silvery pellets that looked like cake decorations but were in fact loaded with high levels of the radioactive cobalt 60 isotope. Some of the pellets rolled into the truck bed and onto the road. Others remained inside the capsule, which Sotelo took to the junkyard and sold as scrap for the peso equivalent of $9. There, the capsule was dumped near a huge magnet used to load scrap metal onto trucks bound for two northern Mexico foundries. According to investigators, each pellet in the capsule was capable of producing a dose of 25 rads per hour.[2] As the junkyard magnet moved the scrap metal around, the pellets were mixed with other materials, pulverized, and spread across the area. Others became imbedded in truck tires and were then jarred loose along highways. An estimated 300 curies of radioactive cobalt found their way to the two Mexican foundries, one of which manufactured metal table legs for shipment to the largest distributor of restaurant tables in the U.S., while the other produced steel rods used in the reinforcement of concrete building projects. About 600 tons of the contaminated steel were shipped to the U.S. from December 1983 to January 1984.

Then, on January 17, 1984, a radiation alarm went off when a delivery truck took a wrong turn near the gates of Los Alamos National Laboratory in New Mexico. Later in the month, a different truck—this one transporting table legs—set off a radiation monitor in an Illinois State Police officer's patrol car.

Authorities eventually traced the radioactivity to the Juarez junkyard, where tests established that the capsule had been delivered on or before December 6—a date fixed with certainty because all paperwork gen-

erated at the site *after* that date turned out to be radioactive. Authorities immediately closed the junkyard and impounded Sotelo's pick-up. It took another two months to mop up the *Jonke Fénix* and track down the contaminated table legs and rebar steel at sites in Canada, Mexico, and 23 different U.S. states, including Texas.

Mexican health officials also ordered the demolition of 109 houses built with reinforcing rods containing the radioactive material in the western state of Sinaloa. Because pellets might have fallen anywhere on the roads between Chihuahua and Juarez, officials flew over the area in a special reconnaissance helicopter on loan from the U.S. Department of Energy. They found 22 radioactive sites and actually dug eight pellets out of the highway asphalt. And to prevent any more tainted steel from entering the U.S., the federal Nuclear Regulatory Commission and Customs Service officials installed radiation monitors at all border crossings.

Although the use and transfer of nuclear devices are strictly regulated in the U.S., international sales weren't monitored. In the case of the sale of the Picker 3000 radiotherapy machine, no U.S. laws had been skirted. Brokers were under no obligation to notify Mexico's nuclear authorities or to check into the competence or licensing of the purchaser. The *Centro Médico* may have violated Mexican regulations when it failed to notify that country's National Commission on Nuclear Safety and Safeguards that it had imported the machine, but no action was ever taken against the Juarez clinic.

In the years since, one worker at the junkyard has died from a rare bone cancer. Others have suffered sterility, skin discoloration, and other disorders. Hundreds of Juarez residents have been tested for radiation poisoning, and at least a dozen have shown chromosome damage.

The hapless Sotelo—who, remarkably, seems to have escaped serious contamination—was arrested in 1990 on theft charges. In the prison where he still awaits sentencing, the guards call him El Cobalto—the Cobalt Man.

Meanwhile, a decade and a half later, the story of the worst radiation disaster in North American history continues to underscore the potential that increased trade and growing cross-border links pose for public health risks, environmental damage—and personal tragedy.

ENDNOTES

1 Susan West, "Hot," *Science* (December 1984); Paul Salopek, "Global Trade in Used Technology Imperils the Unwary," *El Paso Times* (July 28, 1991); Katherine Silberger, "¡Desastre!" *Village Voice* (June 16, 1992).

2 A rad is a unit of absorbed radiation. One to 50 rads per hour is considered a highly dangerous dose. By comparison, a bystander at Three Mile Island would have received a dose of only about 100 millirads, or one-tenth of a rad.

costs, with Texas providing another $2 million. Minute 294, signed in 1995, authorized the IBWC to provide Border communities with technical assistance in developing infrastructure plans to address their sanitation needs.

In 1983, the neighboring countries began to focus on joint environmental issues in the La Paz Agreement.[26] The document formalized joint environmental cooperation between Mexico and the U.S. to "prevent, reduce, and eliminate sources of air, water, and land pollution in the (border) zone extending 100 kilometers along each side of the international boundary." Later additions to the La Paz Agreement enhanced cooperation on specific environmental issues such as wastewater treatment facilities in Tijuana, Baja California, and San Diego, California; accidental spills of hazardous waste along the border; the cross-border shipment of hazardous wastes; limits on air emissions and monitoring of copper smelters on the border; and the joint assessment of causes of urban pollution on the border, as well as the development of emergency response solutions to environmental disasters (see *El Cobalto*).

In 1992, an integrated environmental plan was approved for the U.S.-Mexico border area, known as the Integrated Border Environmental Plan (IBEP), an outgrowth of talks between the nations' presidents. Goals include strengthening enforcement of environmental laws; reducing pollution; increasing cooperative planning, training, and

Two side agreements to the North American Free Trade Agreement linked environmental protection to economic growth.

education; and improving mutual understanding of Border environmental challenges.

Border residents, critical of the IBEP, denounced the "top down" approach taken by both federal governments in developing the environmental plan. In October 1996, the EPA tried to answer the complaints by creating the Border XXI Program, with three components: public involvement, decentralization of environmental management and technical support for state and local authorities, and improved communication and cooperation among federal, state, and local government agencies.

The first agreement, the North American Agreement on Environmental Cooperation (NAAEC), took effect, as did NAFTA, on January 1, 1994. Intended to promote sustainable development through joint environmental and economic policies, NAAEC brought together environmental officials from Mexico, Canada, and the U.S. in the Commission for Environmental Cooperation (CEC) and charged them with protecting, conserving, and improving the environment in each country through increased cooperation and public participation. By 1996, the commission had launched nearly 40 projects focused on four major themes—conservation, protecting human health and the environment, enforcement, and public information and outreach.[27]

The second NAFTA side agreement established the BECC and the North American Development Bank (NADBank) to encourage the improvement of environmental infrastructure along the border. The commission, drawing upon technical and environmental criteria, recommends projects that address environmental challenges for possible funding by NADBank (see **Table 9.2**).

By March 1997, NADBank—governed and funded equally by Mexico and the U.S.—had received $337 million in paid-in capital and $1.9 billion in callable capital, or funds set aside to meet future outstanding debts.[28] By the side agreement, NADBank financing was limited to Border environmental infrastructure projects certified by the BECC.

NADBank has been criticized by some observers for its slow start. Originally chartered in November 1993 and based in San Antonio, as of mid-1998 the bank had funded or approved six major project loans—two in the U.S. and four in Mexico—and has 15 others in development stages.[29]

NADBank officials say that, although Mexico is a full partner, the bank is still viewed as a foreign financial institution and key constitutional questions had to be addressed before it could operate as envisioned. Now that these issues are resolved and the legal framework is in place, the bank expects project loans to flow at a much quicker pace.

Mercedes, Texas, is the site of one of NADBank's early projects. The project, approved in late 1996 and scheduled for completion in 1999, involves an interim loan from the bank to help fund a $4.1 million expansion of water and sewer systems. Among the beneficiaries of the new utilities will be 4,000 *colonia* residents.[30]

The Border Environmental Infrastructure Fund—an EPA-funded, NADBank-administered grant program—helps pay some construction costs for projects. Money from the fund can be packaged as part of NADBank loans to make projects more affordable for small communities.

In addition, NADBank administers the Institutional Development Cooperation program, which is supported by bank earnings and earmarked to help utilities strengthen their operations by providing training and technical assistance in financial accounting and management.

Cleaning Up

In the U.S., the EPA began taking innovative steps to promote cross-border solutions to environmental problems in the early 1990s. Supplemental enforcement projects

TABLE 9.2
Summary of North American Development Bank Projects and Loan Activity, through March 1998

Location	Project	Total Cost	Approval	# of Residents to Benefit
Agua Prieta, Sonora, Mexico	Construction of Solid Waste Landfill	$2.0 million	Nov-96	80,000
Alton, Texas	Wastewater Collection and Treatment Project	$14.8 million	Jun-97	6,000
Brawley, California	Water Treatment Improvement	$24.8 million	Sep-95	26,000
Juarez, Chihuahua, Mexico	Construction of Two Wastewater Treatment Plants and Improvement of Collectors	$31.1 million	Sep-97	1,150,000
Del Rio, Texas	Water Treatment Plant and Improvements	$40.2 million	Mar-98	42,000
Douglas, Arizona	Upgrade of Water and Sewer Systems	$2.0 million	Jan-96	14,000
El Paso, Texas	Expansion of Wastewater Treatment Facility with a Water Reuse System	$11.7 million	Nov-95	90,000
El Paso, Texas	Johnathan Rogers Water Treatment Plant Expansion	$37.8 million	Dec-97	668,000
El Paso, Texas	Wastewater Treatment System Self-Help Loan Project for the Colonias of El Paso County	$155,000	Jul-96	900
Ensenada, Baja California, Mexico	Rehabilitation of Existing System and Construction of New Wastewater Treatment Facility	$8.1 million	Sep-95	250,000
Matamoros, Tamaulipas, Mexico	Sanitary Sewage Plant	$1.1 million	Jan-96	23,000
Mercedes, Texas	Expansion of Water Supply, Wastewater Collection, and Treatment System	$4.1 million	Nov-96	14,000
Mexicali, Baja California, Mexico	Sanitation System Expansion and Construction	$50.3 million	Dec-97	601,000
Naco, Sonora, Mexico	Water Supply Expansion and Sewage Plant Improvements	$1 million	Apr-96	6,000
Nogales, Sonora, Mexico	Construction of New Aqueduct, Regulating Tanks, and Waterlines	$39 million	Jan-96	215,000
Puerto Penasco, Sonora, Mexico	Construction of a New Solid Waste Landfill	$2.2 million	Nov-96	32,000
Reynosa, Tamaulipas, Mexico	Rehabilitation and Construction of Sanitation System	$80 million	Mar-98	420,000
San Diego, California	Expansion of South Bay Water Reclamation Plant	$99.3 million	Jun-97	1,900,000
Somerton, Arizona	Construction of Wastewater Treatment Plant	$2.7 million	Nov-96	7,000
Tijuana, Baja California, Mexico	San Antonio de Los Buenos Sewage Treatment Plant Improvements	$18.1 million	Jun-97	1,100,000
Tijuana, Baja California, Mexico	Expansion of Wastewater Treatment Plant	$177,000	Jun-97	990,000

SOURCES: John Sharp, Texas Comptroller of Public Accounts, and North American Development Bank.

(SEPs), occasionally offered to violators of state or federal environmental laws, afford an unusual opportunity to reduce fines through projects that improve the environment in affected communities. From 1995 to 1998, EPA employed SEPs as an alternative enforcement approach. In Texas in 1996, the EPA settled 31 enforcement cases with SEPs. The deals led to nearly $10 million in local environmental projects, including seven along the border and three in San Antonio, or $871,000 in Texas projects.[31]

In April 1997, the EPA broke new ground by reaching its first international SEP, involving two El Paso companies and their Juarez *maquiladora*. The first El Paso company had recently purchased a manufacturing operation from the second company. Both were cited for hazardous waste violations for using an unapproved carrier to transport hazardous waste on 13 occasions. The first company agreed to EPA conditions, paid a reduced fine, and implemented an SEP at its *maquiladora*, resulting in changes that reduced hazardous waste and air emissions and eliminated wastewater discharge.

International SEPs may provide even greater opportunities for cross-border investments that could lead to cost-effective environmental benefits for Texas and Mexico. By one analysis, an environmental investment in Mexico is more likely to generate a "greater environmental benefit per dollar than if projects were limited to the U.S. side alone." The explanation is simple: air, water, and soil pollution know no boundaries, a recognized fact whether residents work in downtown El Paso, in rural Big Bend National Park, or closer to the busy port of Laredo. Solutions that address symptoms on one side of the artificial line almost invariably fail to solve the overall problem—possibly at great cost and without lasting satisfaction.

In 1993, the Texas Legislature authorized the TNRCC to apply SEPs, but only within the state's borders. Of 41 enforcement orders issued in El Paso County through fiscal 1996 and the first eight months of fiscal 1997, only two cases led to SEPs, limiting the amount of private investment in local environmental projects.

PHOTO: Texas Comptroller of Public Accounts.

Colonias ***residents near Mercedes will benefit from expansion of water and sewer systems backed by an interim loan from North American Development Bank.***

Air, water, and soil pollution know no boundaries, a recognized fact whether residents work in downtown El Paso, in rural Big Bend National Park, or closer to the busy port of Laredo.

State and Local Agreements

While the two federal governments understandably retain responsibility for binding international agreements, not everything originates in Mexico City or Washington, D.C. Along the Texas-Mexico border, treaty-like agreements have frequently entwined state and local communities. Texas has gradually developed formal relationships with each of the four Mexican states on its border.

The annual Border Governors' Conference, bringing together the elected leaders of 10 U.S. and Mexican border states, produces a communiqué expressing the intent of participants to cooperate

and communicate on a variety of issues such as education, transportation, health, tourism, and environment.[32] One recent result was an effort to formalize environmental agreements at the state level and develop action plans for state-to-state collaboration. In November 1996, TNRCC hosted the retreat, at which the U.S. and Mexican states agreed to establish programs for reuse and recycling, information sharing that included the development of a geographic information system database, developing a volunteer program, developing state-to-state environmental strategic plans, and collaborating with *maquilas* and other industries in technology and information exchanges.[33] Texas and Nuevo Leon were the first to formalize the state-to-state agreements in July 1997 with a deal reached between officials from TNRCC and Nuevo Leon's *Subsecretaría de Ecología*. Both states agreed to exchange information and technology, coordinate activities and programs, and obtain resources from industry, academic institutions, and professional organizations.

The Rio Grande Alliance (RGA), a transboundary initiative funded by EPA Region 6 and operated by TNRCC, provides a forum for collaboration among diverse groups from the Rio Grande Basin. The RGA creates opportunities for the exchange of information and serves as a matchmaker linking resources to needs. For example, the RGA brought together TNRCC and the University of Texas School of Public Health to provide small communities technical assistance on sewage collection systems. The paired agencies also developed an inventory of environmental projects in the basin intended to help local decision-makers plan future projects.[34]

For decades, TPWD and the U.S. Fish and Wildlife Service have tried to conserve and restore the habitat of the lower Rio Grande. In 1985, before NAFTA resulted in agreements on the environment, TPWD hosted the first U.S.-Mexico border states conference touching on recreation, parks, and wildlife. The conference subsequently took place every 18 months, hosted by different states, until NAFTA took hold in 1994 and federal agencies asserted their oversight responsibilities. The Texas-sponsored conference served as a forum to discuss wildlife conservation corridors and to encourage more federal involvement and funding, particularly on the Mexican side, where Mexico City retained jurisdiction over the nation's natural resources.[35]

Another conservation effort, the Rio Grande Wildlife Corridor Project, established in 1979, brought together TPWD, the U.S. Fish and Wildlife Service, and private landowners practicing conservation on their lands. Among project beneficiaries were the white-winged dove and endangered and threatened species such as the ocelot, a cat that requires a habitat with thick vegetation.[36] Dove hunting and bird-watching, major economic activities for the Rio Grande Valley, also benefited from the project.

Communities Reaching Out

Individual Border communities are reaching out in a more formal fashion. In 1993, leaders in El Paso-Juarez, with help from the Environmental Defense Fund, established the Paso del Norte Air Quality Task Force to inform the international community about air quality problems and to initi-

PHOTO: Texas Natural Resource Conservation Commission.

Increased cooperation between state and federal governments in both countries should help reduce pollution.

The Border region, like all of Texas, needs additional water supplies to meet the needs of a growing population and economy.

ate joint pollution reduction projects. The task force's binational activities included working with Juarez officials to improve Mexican vehicle inspection and maintenance programs and to set up emission diagnostic centers and training programs for mechanics to help them comply with Mexican environmental laws. Mexican instructors were trained at University of Texas-El Paso and Colorado State University and, in turn, trained more inspectors in Mexico.

The task force also has worked with federal agencies to speed up the use of alternative fuel vehicles and address traffic congestion at border crossings. The task force further recommended the creation of an International Air Quality Management District to provide a method to conduct local activities including data collection, pollution prevention, public education, technology transfers, and the development of cross-border pollution control strategies.[37]

Among other local agreements with environmental implications, officials in Brownsville-Matamoros and Eagle Pass-Piedras Negras have "sister city" plans. In May 1997, Brownsville's mayor and the *presidente municipal* of Matamoros signed a "sister city" agreement for a joint contingency plan and hazardous material emergency preparedness and response plan. In March 1998, the respective leaders of Eagle Pass and Piedras Negras reached a similar agreement. In each case, the plans were based on an addition to the 1983 La Paz Agreement calling for the coordination of contingency planning and hazardous material emergency preparedness and response by both countries.

Water in the Future: Every Drop Counts

The Border region, like all of Texas, needs additional water supplies to meet the needs of a growing population and economy. Groundwater and surface water resources supply almost equal shares of the state's water needs, but groundwater supplies have been receding year after year. By 2050, the TWDB expects surface water to meet about 69 percent of the state's needs, with groundwater use declining to slightly more than 30 percent.[38] Every drop will count.

In 1994, 20 percent of the state's water served city residents, 13 percent provided for industrial needs, and 67 percent was devoted to agriculture. By 2050, the increasing urbanization of Texas is expected to result in city residents taking 34 percent of the state's water, industry absorbing 20 percent, and agricultural interests taking 46 percent—a projected decline attributed to less farmland, improved irrigation management, more efficient irrigation systems, and more acreage set aside for conservation.

Upper Rio Grande Region

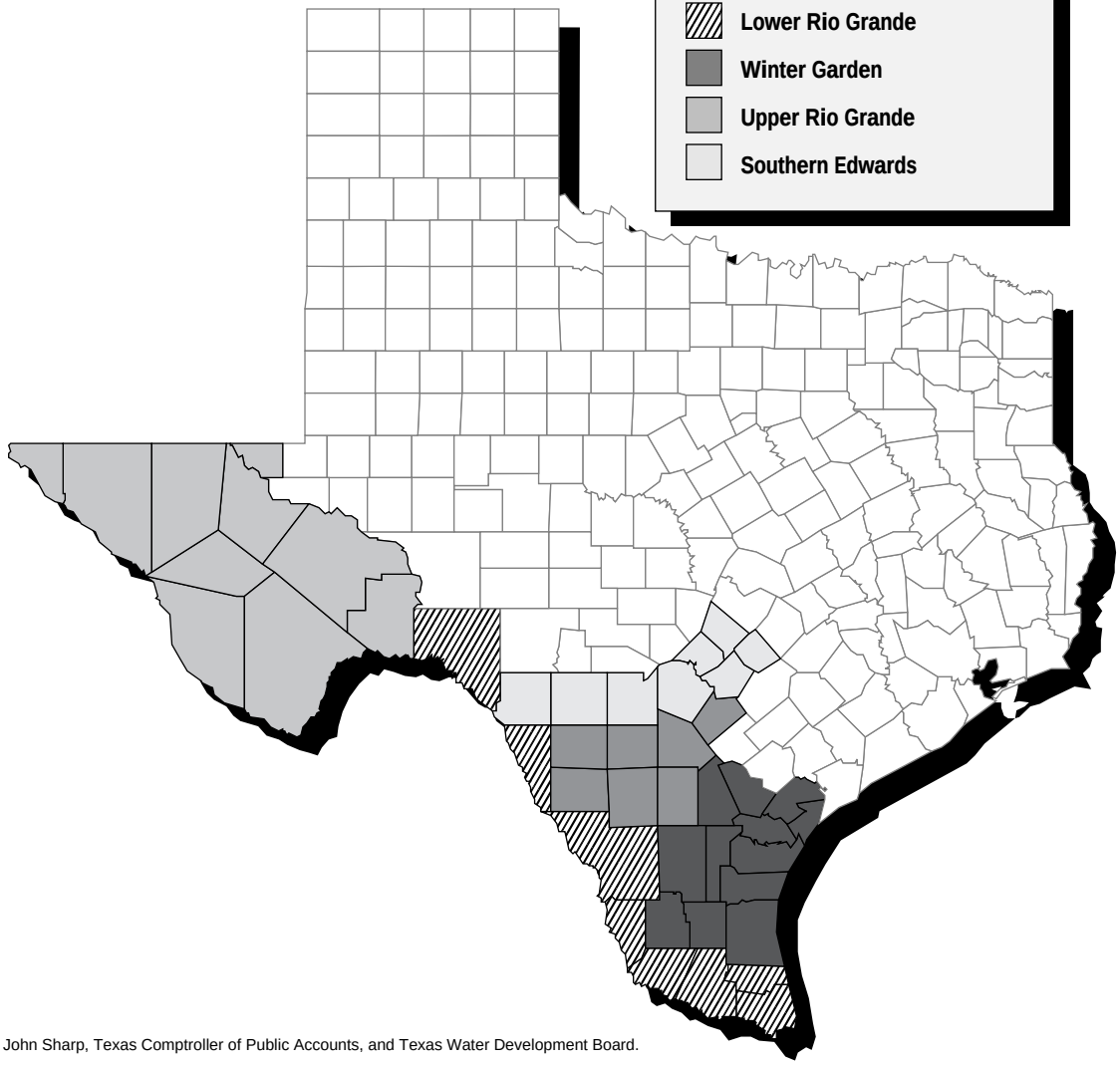
Ten counties comprise the Upper Rio Grande region of the 1997 state water plan. The region counted 647,000 people as of 1990 and expected to claim 1.6 million inhabitants by 2050—not counting an anticipated surge in residents on the Mexico side of the border (see **Map 9.1**). During the same period, cities in the region will increase their water use to serve their growing populations (see **Table 9.3**).

As noted, El Paso's water reaches residents from the two underground aquifers and the Rio Grande, which also provides water to Mexico, Colorado, and New Mexico. The Rio Grande Compact between Texas, Colorado, and New Mexico, ratified by the Texas Legislature in 1939, established procedures for regulating each state's share of water.

The Pecos River Compact, signed by Texas and New Mexico in 1949, regulates the distribution of water from the Pecos River. Among the compact's provisions, New Mexico is barred from reducing the river's flow below 1947 water levels.

The Hueco Bolson and Mesilla Bolson aquifers provide most of El Paso's drinking water and 35 per-

Map 9.1
Water Planning Regions Along the Texas-Mexico Border



SOURCES: John Sharp, Texas Comptroller of Public Accounts, and Texas Water Development Board.

cent of the Upper Rio Grande region's water. However, 98 percent of irrigation water in the region comes from the river. With groundwater supplies dwindling, El Paso has been forced to look to the river to meet more of its needs. In 1990, only 21 percent of the city's municipal water supply came from the Rio Grande. By 1995, the river supplied 43 percent of the city's water, replacing aquifer resources.[39]

To increase its share of water rights, El Paso has leased land outside the city. But the leases may fall short of yielding enough water for city needs. The TWDB projects that as El Paso grows, municipal water use will likely increase from a projected 128,176 acre-feet in 2000 to about 214,404 acre-feet by 2050.[40] Agricultural use, accounting for 75 percent of water used in the region, is expected to decline by 36 percent during the same period as the number of area ranches and farms also drops and more efficient methods of irrigation

TABLE 9.3
Municipal Water Use Projections for Selected Cities, 2000 and 2500 (in acre-feet)

Region	City	2000	2050
Upper Rio Grande	El Paso	128,176	214,404
	Alpine	1,451	2,326
	Fort Davis	236	225
	Fort Bliss	6,609	5,642
	Pecos	3,030	3,397
	Socorro	1,480	1,800
Southern Edwards	San Antonio	220,405	391,640
	San Marcos	8,431	17,691
	New Braunfels	10,410	25,888
	Seguin	4,197	7,288
	Uvalde	5,173	7,871
	Hondo	2,032	2,393
Winter Garden	Crystal City	2,113	2,090
	Carrizo Springs	2,396	4,530
	Cotulla	941	1,131
	Floresville	1,337	1,756
	Lytle	652	904
	Pleasanton	2,306	3,429
Lower Rio Grande	Del Rio	12,106	15,716
	Laredo	46,536	95,722
	McAllen	30,246	43,902
	Edinburg	7,610	15,051
	Harlingen	10,759	15,777
	Brownsville	30,971	49,046
Coastal Bend	Kingsville	5,513	7,397
	Beeville	2,408	3,097
	Alice	3,420	3,119
	Refugio	660	635
	Ingleside	693	992

SOURCES: John Sharp, Texas Comptroller of Public Accounts, and Texas Water Development Board.

are developed.

Recognizing these potentially dire challenges, El Paso leaders have forged ahead in water conservation and reuse. In 1985, the city began bringing wastewater treatment standards up to drinking water standards and using the effluent to recharge its groundwater sources. During 1998, the city plans to install parallel water lines to residents, providing some reclaimed water for domestic landscape needs. In addition, the Public Service Board, the city-owned utility, developed an industrial park adjacent to a wastewater treatment plant to provide industrial tenants with reclaimed water for project needs.[41]

Other El Paso projects to increase the area's water supply include the blending of fresh and brackish water, an aquifer recharge project, and a desalinization pilot project. Several areas of the state are involved in similar water supply preservation efforts. Successful projects could be implemented to help preserve the Border water supply.

Lower Rio Grande Region

The fast-growing Lower Rio Grande Region, comprising eight counties with a population of 919,505 in 1990, is projected to be home to 3 million people by 2050—a 228 percent increase. Municipal water use is expected to trail the tripling in population with a possible 171 percent increase in water needs. Agricultural use should decline by 14 percent in the Lower Rio Grande region, from nearly 1.4 million acre-feet in 1990 to 1.2 million acre-feet in 2050.

In 1997, 18 percent of the water in the Lower Valley was used by municipalities, an amount expected to increase to as much as 30 percent by 2050. Projected cuts in agricultural water use would likely provide communities with options to obtain additional water rights. But the shift in water use from agriculture to municipal needs will increase demands for water treatment plants.

The Lower Rio Grande Valley Development Council, representing Willacy, Cameron, and Hidalgo counties, recently formed a committee to develop an

integrated water plan for the three counties. The first phase, completed in 1997, analyzed the region's population, water supply, and projected water needs. A second phase, drawing on more than $1 million from the Economic Development Administration, Bureau of Reclamation, TWDB, municipalities, irrigation districts, and private funding, called for developing strategies and alternatives for a regional water management plan. The tri-county water plan, expected by Fall 1998, was being crafted to meet state planning requirements spelled out in Senate Bill 1 as approved by the 1997 Texas Legislature (see *Senate Bill 1, A State Water Plan*).[42]

Winter Garden Region

The Winter Garden region, consisting of seven counties yielding a bounty of peanuts, vegetables, and other agricultural products, was home to 95,321 residents in 1990; its population is projected to nearly double by 2050, reaching 173,000. Municipal water use is expected to increase by 76 percent between 1990 and 2050, but the region's overall water use is expected to fall by more then 54 percent due to a decline in agricultural activity.

Rather than drawing

Senate Bill 1, A State Water Plan

Many of the concerns about water along the border—limited supplies, water quality problems and infrastructure needs caused by rapid population growth—exist throughout the state. The 1997 Texas Legislature responded to mounting worries about the state's water resources with Senate Bill 1, a measure combining conservation steps with new water management approaches. State lawmakers appropriated $36 million to implement the law, primarily for financial and technical assistance, enforcement, and data management and collection. Major highlights of the law include:

Water planning—The Texas Water Development Board (TWDB) will designate as many as 20 regions in the state to develop plans for maintaining water quality and quantity.

Groundwater—Groundwater conservation districts are designated as the preferred entity to manage groundwater resources.

Financial aid—A constitutional amendment approved by voters in November 1997 established the Texas Water Development Fund II by consolidating existing bond authorizations for water development, water quality, flood control, and state participation bonds into a single pool.

Small communities—Authorization for financial aid to small communities is expanded to include all systems, including private utility systems.

Data collection and dissemination—Research, data collection and dissemination, and access to natural resources data are targeted for improvement.

In 1997, Lt. Gov. Bob Bullock and House Speaker Pete Laney appointed a House-Senate Interim Committee for Water Resources Development and Management, to prepare a report on Texas' water supply needs and implementation of Senate Bill 1 for the 1999 Texas Legislature.

upon surface water or the Rio Grande, the Winter Garden region has depended on the Carrizo-Wilcox Aquifer, extending from the Rio Grande into Arkansas and parts of Louisiana and providing all or part of 60 Texas counties with water. Some 51 percent of water pumped from the aquifer was for agriculture in 1994, with 31 percent serving cities and towns.

A threat to this region's water supply may come from heavy dependence on the dwindling Edwards Aquifer, according to the TWDB. The Edwards Aquifer, sole source of water for San Antonio and an important source for eight counties, may be overused, possibly leading farmers and communities served by the aquifer to seek access to water from the Carrizo-Wilcox Aquifer.

Because they are geographically removed from the Rio Grande, two other water planning regions near the border—Lower Edwards and Coastal Bend—have water problems and needs that are distinct from neighboring regions. Home to growing urban populations, both San Antonio and Corpus Christi face concerns about adequate future water supply. San Antonio's reliance on groundwater from the Edwards Aquifer has led to lawsuits and pumping restrictions. In Corpus Christi, a pipeline from Lake Texana in Jackson County will convey fresh water to a region facing serious shortages.

Need to Plan

With populations increasing all along the border and urban communities drawing more water as agricultural needs decrease, existing water supplies and infrastructure will be increasingly challenged and probably insufficient.

In 1997, the TNRCC and the TWDB estimated that Border communities would need almost $1.5 billion in improvements to meet their water needs through 2015, but the study did not identify future water sources.[43] More than 90 percent of the Border communities in the study were small, with populations of less than 15,000. The same communities tend to have poor bond ratings or none at all. Community leaders also may have difficulty financing improvements through user fees levied on low-income residents. The communities will probably face substantial obstacles in financing vital water infrastructure, suggesting a need for state and federal financial and technical assistance.[44]

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