

Binational Río Grande Summit



Cooperation for a Better Future

Cooperación para un Futuro Mejor

Cumbre Binacional del Río Bravo

November 17-18, 2005

Reynosa, Tamaulipas & McAllen, Texas

BACKGROUND DOCUMENT

International Boundary and Water Commission
United States and Mexico



“Lasting peace will come from the careful, patient, practical solution of particular problems.”

---United States President Lyndon B. Johnson

“The factors that unite us are enough to construct a solid pedestal of enduring friendship.”

---Mexican President Adolfo Lopez Mateos

Remarks at El Paso, Texas-Ciudad Juarez, Chihuahua, September 25, 1964, regarding the Chamizal Project on the Rio Grande, which settled a longstanding boundary dispute between the United States and Mexico.

Binational Rio Grande Summit Background Document

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Acting U.S. Commissioner Carlos Marin



Mexican Commissioner Arturo Herrera Solís

Message from the Commissioners

On behalf of the Governments of the United States and Mexico, we welcome you to the Binational Rio Grande Summit. The purpose of this Summit is to convene experts and water users from both countries to provide information concerning sustainable management of the Rio Grande basin. As the lead water agency operating on both sides of the Rio Grande, the International Boundary and Water Commission, United States and Mexico, intends to use this information in development of a binational sustainable management plan for the basin. The Governments of the United States and Mexico have recognized the desirability of enhanced cooperation on drought cycle management and sustainable management on both sides of the Rio Grande and have identified the International Boundary and Water Commission as the institution to advance this goal. We welcome your participation in this Summit and we look forward to your ongoing collaboration as the Commission develops a strategy for sustainable management of the Rio Grande basin.

A handwritten signature in black ink, appearing to read "Carlos Marin".

Acting U.S. Commissioner Carlos Marin

A handwritten signature in black ink, appearing to read "Arturo Herrera Solís".

Mexican Commissioner Arturo Herrera Solís

Introduction

The purpose of this document is to provide participants in the Binational Rio Grande Summit and other interested parties with background information about the issues addressed at the Summit. This paper summarizes the Rio Grande treaties and related agreements in order to provide historical context while also citing contemporary studies. Over the past 12 years, governmental agencies, academic institutions, and non-governmental organizations have conducted significant research about the Rio Grande. Moreover, various conferences have been held to discuss current and future water demands and challenges in the basin. These activities, which provide a backdrop for the Binational Rio Grande Summit, are acknowledged and summarized in this paper.

The International Boundary and Water Commission

The International Boundary and Water Commission, United States and Mexico (IBWC), traces its history to 1889 when the two governments established a commission to address changes in the international boundary due to shifts in the channels of the boundary rivers – the Rio Grande and Colorado River. Decades later, the [Treaty Relating to the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande](#), and supplementary protocol, Nov. 1, 1944¹ (commonly referred to as the 1944 Water Treaty), greatly expanded the role of the Commission, granting it authority to distribute the waters of the boundary rivers between the two countries and to address border sanitation problems. The 1944 Water Treaty established the modern structure and mission of the IBWC – to apply the boundary and water treaties between the United States and Mexico and settle differences that arise in the application of the treaties.

The IBWC has two sections – the United States Section (USIBWC) and the Mexican Section (sometimes referred to by the Spanish acronym CILA). Each Section is headed by an Engineer Commissioner appointed by his respective president and receives funding from its own federal government. The United States Section is an independent agency that receives foreign policy guidance from the U.S. Department of State while the Mexican Section receives guidance from its own Ministry of Foreign Affairs (SRE). The IBWC is both an engineering and diplomatic agency, seeking technical and diplomatic solutions to boundary and water issues. Current responsibilities of the Commission include:

- determination and accounting for the national ownership of the waters of the boundary rivers
- salinity control
- operation and maintenance of international dams and hydroelectric power plants
- flood control, including maintenance of levees and floodways
- silt removal
- operation of international wastewater treatment plants
- water quality monitoring

¹<http://www.ibwc.state.gov/Files/1944Treaty.pdf> and <http://www.sre.gob.mx/cila/TRATADOS/TRATADO DE AGUAS 1944.pdf>

- studies, investigations, and planning related to boundary and water issues
- enhanced boundary demarcation
- solution of border sanitation problems

Decisions of the IBWC are recorded in the form of minutes, signed by the two Commissioners and attested by the Secretaries of both Sections. Following approval by the U.S. Department of State and Mexico's Ministry of Foreign Affairs, IBWC minutes enter into force as legally binding agreements of the United States and Mexico. Since 1922, the Commission has entered into more than 300 minutes dealing with such subjects as the location of the international dams authorized under the 1944 Water Treaty, development of wastewater infrastructure plans for border communities, modifications to the river channel to restore the international boundary, and demarcation of the international land boundary.

Geography and Hydrology of the Rio Grande Basin

The Rio Grande starts in the San Juan Mountains of Colorado and travels 1896 miles (3051 km) to the Gulf of Mexico at Brownsville, Texas-Matamoros, Tamaulipas. The total area within the outer rim of the Rio Grande basin is about 335,499 square miles (868,945 km²); the estimated productive area of the watershed, which yields runoff to the river, is 176,332 square miles (456,701 km²). The basin, including tributaries, covers portions of three states in the United States – Colorado, New Mexico, and Texas – and extends into five Mexican states – Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, and a small portion of Durango.

Waters in the basin are managed in two distinct regions – the Upper Basin and the Lower Basin – each regulated by a separate treaty and various interstate compacts. The Upper Basin includes the headwaters in Colorado downstream to Fort Quitman, Texas and includes New Mexico, the westernmost portion of Texas, and adjacent lands in Chihuahua. The Upper Basin is fed primarily by snowmelt from the Rocky Mountains. The Lower Basin covers the river from Ft. Quitman to the Gulf of Mexico as well as tributaries in Chihuahua, Coahuila, Nuevo Leon, Tamaulipas, Durango, New Mexico, and Texas. Downstream of Fort Quitman, the Rio Grande experiences low flow until the confluence with a Mexican tributary, the Conchos River, near Presidio, Texas-Ojinaga, Chihuahua. At this point, the Conchos River accounts for an average volume equivalent to 70% of the flow of the Rio Grande.

Other major tributaries include the Conejos River in Colorado, the Chama, and Jemez Rivers in New Mexico, the Pecos and Devils Rivers in Texas, the Salado River in Tamaulipas, and the San Juan River in Tamaulipas. Several tributaries in Coahuila – the San Diego, San Rodrigo, and Escondido Rivers and the Las Vacas Arroyo – contribute lesser volumes.

The basin includes a number of municipalities with populations in excess of 400,000: Albuquerque in New Mexico; El Paso in Texas; Ciudad Juarez and Chihuahua in Chihuahua; Nuevo Laredo, Reynosa, and Matamoros in Tamaulipas as well as the municipalities of Monterrey, Nuevo Leon; and Saltillo, Coahuila. The basin also encompasses vast tracts of farmland in both countries. Upstream of Elephant Butte Dam, which is located in Truth or Consequences, New Mexico, more than 500,000 acres (200,000 hectares) are under cultivation in Colorado and New Mexico. Downstream of the dam, more than 860,000 acres (350,000 hectares) are irrigated in the United States and some 740,000 acres (300,000 hectares) in Mexico.

RIO GRANDE BASIN



COLORADO

NEW MEXICO

BASIN BOUNDARY

TEXAS

Fort Quitman, Texas

CHIHUAHUA

GRANDE

Amistad Reservoir

RIO CONCHOS

RIO GRANDE

RIO SAN ANTONIO

RIO SAN PEDRO

RIO SALADO

RIO SAN ANTONIO

RIO CONCHOS

RIO NUECES

RIO SAN ANTONIO

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RIO CONCHOS

RIO NUECES

RIO SAN ANTONIO

RIO SAN PEDRO

RIO SALADO

RIO SAN ANTONIO

Falcon Reservoir

COAHUILA

COAHUILA

NUEVO LEON

TAMAULIPAS

MEXICO



The basin has numerous reservoirs in both countries, including 35 large reservoirs, those over 15,000 acre-feet (18.5 million cubic meters or Mm³) each in capacity. The 22 large reservoirs in the United States have a total capacity of 6.088 million acre-feet or maf (7509.7 Mm³) while Mexico's 13 large reservoirs have a capacity of 6.14 maf (7573 Mm³). The IBWC also operates two large international reservoirs on the Rio Grande -- Amistad with a capacity of 3.151 maf (3887 Mm³) and Falcon with a capacity of 2.653 maf (3273 Mm³). Among the large reservoirs, 7 have capacity in excess of .8 million acre-feet (1000 Mm³) as shown in Table 1.

Table 1, Seven Largest Reservoirs in the Rio Grande Basin

NAME	RIVER	STATE	CAPACITY MAF	CAPACITY Mm ³
Amistad	Rio Grande	Texas-Coahuila	3.151	3887
Falcon	Rio Grande	Texas-Tamaulipas	2.653	3273
La Boquilla	Conchos	Chihuahua	2.353	2903
Elephant Butte	Rio Grande	New Mexico	2.065	2547
Abiquiu	Chama	New Mexico	1.201	1481
Venustiano Carranza	Salado	Coahuila	1.122	1384
El Cuchillo	San Juan	Nuevo Leon	0.910	1123

The IBWC publishes an annual bulletin, "[Flow of the Rio Grande and Related Data From Elephant Butte Dam, New Mexico to the Gulf of Mexico,](#)"² which includes monthly reservoir storage as well as data related to streamflow, precipitation, and water quality

Convention of 1906

[The Convention between the United States and Mexico for the Equitable Distribution of the Waters of the Rio Grande,](#)³ known as the Convention of 1906, is the first water allocation treaty between the two countries; it provides for the delivery of Rio Grande water to Mexico by the United States. The treaty was made possible by the construction of Elephant Butte Dam in New Mexico by the U.S. Bureau of Reclamation, which allowed for water to be stored and released on a schedule for irrigation purposes. The treaty affects the distribution of Rio Grande

²http://www.ibwc.state.gov/html/water_accounting.html

³<http://www.ibwc.state.gov/Files/1906Conv.pdf> or [http://www.sre.gob.mx/cila/TRATADOS/\(TRATADO AGUA VALLE JUAREZ\).pdf](http://www.sre.gob.mx/cila/TRATADOS/(TRATADO AGUA VALLE JUAREZ).pdf)

water to Mexico at Ciudad Juarez, Chihuahua, water originating in the Upper Basin in the United States. The Convention of 1906 includes the following significant points:

- United States shall deliver to Mexico a total of 60,000 acre-feet (74 Mm³) of water annually to the Acequia Madre, or Old Mexican Canal
- Prescribes a monthly schedule of water deliveries
- In case of extraordinary drought or serious accident to the irrigation system in the United States, the amount delivered to the Mexican Canal shall be diminished in the same proportion as the water delivered to lands in the United States
- Delivery made without cost to Mexico
- Delivery of water is not to be construed as recognition by the United States of any claim on the part of Mexico to the waters; Mexico waives any and all claims to the waters of the Rio Grande for any purpose whatever between the head of the present Mexican Canal and Fort Quitman, Texas

To facilitate the application of the Convention, additional infrastructure was constructed, including American Dam at El Paso, Texas-Ciudad Juarez, Chihuahua which diverts water into the U.S. irrigation canal, and International Dam, 2.11 miles (3.84 km) downstream, which diverts water into the Acequia Madre. Caballo Dam was constructed 25 miles downstream of Elephant Butte Dam in 1938 to provide for storage of waters discharged from Elephant Butte during winter power generation. Additionally, the United States Section constructed the Rio Grande Canalization Project, a water delivery and flood control project covering 106 river miles (170 km) from El Paso upstream to Percha Dam, New Mexico. The United States Section continues to operate and maintain this project to ensure water deliveries to authorized users in both countries and to provide flood protection to residents in the United States.

Since the completion of American and Caballo Dams, the United States has delivered a full allotment to Mexico under the Convention of 1906 for every year except 1947, 1951-1957, 1961, 1963-1968, 1971-1972, 1977-1978, and 2003-2004. During the 2003 and 2004 irrigation seasons Mexico received only 45-46% of a full allotment. At the conclusion of the 2004 irrigation season, Elephant Butte dropped to under 5% of capacity, its lowest since 1978. Fortunately, increased snowpack during the winter of 2004/2005 and resulting flows into Elephant Butte Reservoir allowed the United States Bureau of Reclamation to issue a full water allocation to users, including Mexico, for the 2005 irrigation season.

1944 Water Treaty

Almost four decades after the first U.S.-Mexico water treaty, the two countries, their relationship undoubtedly affected by the geopolitical realities of World War II, reached agreement on a second water treaty, one that established the modern-day International Boundary

and Water Commission. The [Treaty Relating to the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande](#)⁴ covered the distribution of waters of the Rio Grande from Ft. Quitman, Texas to the Gulf of Mexico; the delivery of waters of the Colorado River to Mexico near Yuma, Arizona and San Luis Rio Colorado, Sonora; and recommendations for the equitable distribution of the waters of the Tijuana River and plans for storage and flood control works for the Tijuana River at San Diego, California-Tijuana, Baja California. It also directed the Commission to give preferential attention to the solution of border sanitation problems.

The following summarizes treaty provisions of relevance to the Binational Rio Grande Summit.

Article 3 of the treaty indicates the priorities for use of the water, stating:

“In matters in which the Commission may be called upon to make provision for the joint use of international waters, the following order of preferences shall serve as a guide:

1. Domestic and municipal uses.
2. Agriculture and stockraising.
3. Electric power.
4. Other industrial uses.
5. Navigation.
6. Fishing and hunting.
7. Any other beneficial uses which may be determined by the Commission.”

The issue of what constitutes a beneficial use has been raised by various groups interested in preserving and restoring the river’s riparian ecosystem since instream flows for the purpose of environmental conservation are not specifically identified as a beneficial use by the 1944 Water Treaty.

Article 3 goes on to state that the two Governments “agree to give preferential attention to the solution of all border sanitation problems.” The IBWC’s involvement in border sanitation problems has included construction of international wastewater treatment plants at San Diego, California; Nogales, Arizona; and Nuevo Laredo, Tamaulipas as well as technical assistance to border communities developing wastewater infrastructure plans for certification by the Border Environment Cooperation Commission.

Article 4 allots the waters of the Rio Grande between the two countries as follows:

“A. To Mexico:

- (a) All of the waters reaching the main channel of the Rio Grande (Rio Bravo) from the San Juan and Alamo Rivers, including the return flow from the lands irrigated from the latter two rivers.

⁴<http://www.ibwc.state.gov/Files/1944Treaty.pdf> or <http://www.sre.gob.mx/cila/TRATADOS/TRATADO DE AGUAS 1944.pdf>

(b) One-half of the flow in the main channel of the Rio Grande (Rio Bravo) below the lowest major international storage dam, so far as said flow is not specifically allotted under the Treaty to either of the two countries.

(c) Two-thirds of the flow reaching the main channel of the Rio Grande (Rio Bravo) from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo, subject to the provisions of subparagraph (c) of Paragraph B of this Article.

(d) One-half of all other flows not otherwise allotted by this Article occurring in the main channel of the Rio Grande (Rio Bravo), including the contributions from all the unmeasured tributaries, which are those not named in this Article, between Fort Quitman and the lowest major international storage dam.

B. To the United States:

(a) All of the waters reaching the main channel of the Rio Grande (Rio Bravo) from the Pecos and Devils Rivers, Good-enough Spring, and Alamito, Terlingua, San Felipe and Pinto Creeks.

(b) One-half of the flow in the main channel of the Rio Grande (Rio Bravo) below the lowest major international storage dam, so far as said flow is not specifically allotted under this Treaty to either of the two countries.

(c) One-third of the flow reaching the main channel of the Rio Grande (Rio Bravo) from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo, provided that this third shall not be less, as an average amount in cycles of five consecutive years, than 350,000 acre-feet (431,721,000 cubic meters) annually. The United States shall not acquire any right by the use of the waters of the tributaries named in this subparagraph, in excess of the said 350,000 acre-feet (431,721,000 cubic meters) annually, except the right to use one-third of the flow reaching the Rio Grande (Rio Bravo) from said tributaries, although such one-third may be in excess of that amount.

(d) One-half of all other flows not otherwise allotted by this Article occurring in the main channel of the Rio Grande (Rio Bravo), including the contributions from all the unmeasured tributaries, which are those not named in this Article, between Fort Quitman and the lowest major international storage dam.

In the event of extraordinary drought or serious accident to the hydraulic systems on the measured Mexican tributaries, making it difficult for Mexico to make available the run-off of 350,000 acre-feet (431,721,000 cubic meters) annually, allotted in subparagraph (c) of paragraph B of this Article to the United States as the minimum contribution from the aforesaid Mexican tributaries, any deficiencies existing at the end of the aforesaid five-year cycle shall be made up in the following five-year cycle with water from the said measured tributaries. Whenever the conservation capacities assigned to the United States in at least two of the major international reservoirs, including the highest major reservoir, are filled with waters belonging to the United States, a cycle of five years shall be

considered as terminated and all debits fully paid, where upon a new five-year cycle shall commence.”

The treaty also authorized construction of up to three international storage dams on the Rio Grande and provided general guidance to the Commission about the location, characteristics, and operating rules of the dams. Subsequent IBWC minutes defined the specifics for these projects and the Commission eventually constructed only two dams – Amistad Dam at Del Rio, Texas-Ciudad Acuña, Coahuila and Falcon Dam at Falcon Heights, Texas-Nueva Ciudad Guerrero, Tamaulipas. Moreover, the treaty directed the Commission to prepare plans for flood control works on the Rio Grande from Fort Quitman to the Gulf of Mexico and for hydro-electric power plants at the international dams.

Article 9 contemplates the possibility of extraordinary drought in one country and an abundant water supply in the other. Under this circumstance, the Commission may allow the drought-stricken country to withdraw from the reservoirs water belonging to the other country. To keep track of the waters belonging to each country, the Commission is directed to set up a system of gaging stations on the Rio Grande and measured tributaries.

The remaining articles address issues related to the Colorado and Tijuana Rivers and general provisions. Significantly, the treaty provides for the annual delivery by the United States to Mexico of 1.5 million acre-feet (1,850,234,000 cubic meters) from the Colorado River. In the event of a surplus in Colorado River waters in excess of the amount necessary to supply uses in the United States, Mexico may receive a total not to exceed 1.7 million acre-feet (2,096,931,000 cubic meters) annually. Article 10 on the Colorado River includes an extraordinary drought provision similar to that of the Convention of 1906, providing that in the event of extraordinary drought or accident to the irrigation system in the United States, the water allotted to Mexico will be reduced in the same proportion as consumptive uses in the United States are reduced.

Rio Grande Water Deliveries under the 1944 Water Treaty and Related Minutes

Following construction of Falcon Dam in 1953, the first five-year water delivery cycle under the 1944 Water Treaty ended in shortfall. To address the matter of making up any deficiency in deliveries from the six named Mexican tributaries during a five-year cycle, the IBWC in 1969 concluded [Minute No. 234, “Waters of the Rio Grande Allotted to the United States from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo.”](#)⁵ Minute No. 234 establishes, “That in the event of a deficiency in a cycle of five consecutive years in the minimum amount of water allotted to the United States from the said tributaries, the deficiency shall be made up in the following five-year cycle, together with any quantity of water which is needed to avoid a deficiency in the aforesaid following cycle, by one or a combination of the following means:

⁵<http://www.ibwc.state.gov/Files/Minutes/Min234.pdf> or <http://www.sre.gob.mx/cila/ACTAS/234.pdf>

- a. With water of that portion of the said tributary contributions to the Rio Grande allotted to the United States in excess of the minimum quantity guaranteed by the Water Treaty.
- b. With water of that portion of the said tributary contributions to the Rio Grande allotted to Mexico, when Mexico gives advance notice to the United States and the United States is able to conserve such water; and
- c. By transfer of Mexican waters in storage in the major international reservoirs, as determined by the Commission, provided that at the time of the transfer, United States storage capacity is available to conserve them.” The final resolution of the minute indicates that Mexican deliveries from its tributaries are considered satisfied to September 30, 1968.

The 1982-1987 five-year cycle also concluded in deficit but the matter was resolved by extending the length of the cycle by eight days, at which point United States storage in the two dams reached capacity, concluding the cycle. From 1972 -1992, many of the five-year cycles lasted less than five years, concluding early when U.S. storage reached capacity, in accordance with Article 4 of the 1944 treaty.

The 1992-1997 five-year cycle concluded with a shortfall of 1,024,000 acre-feet (1263 Mm³). The two countries, through their respective foreign ministries and the International Boundary and Water Commission, engaged in negotiations over a means for Mexico to repay the deficit. An issue in this discussion was whether extraordinary drought existed in the Rio Grande region during the 1992-1997 cycle. Mexico contended that due to extraordinary drought it could delay repayment until the 1997-2002 cycle, in accordance with Article 4 of the treaty. However, the United States did not concur that environmental conditions were an extraordinary drought during the entire cycle.

During the October 1, 1999 - September 30, 2000 water delivery year, the IBWC reached agreement on the transfer of 198,644 acre-feet (245 Mm³) from Mexican ownership to United States ownership in Amistad and Falcon Reservoirs. Additionally, to cover the remaining shortfall, Mexico agreed to deliver to the United States volumes of water in addition to the one-third U.S. share from the six Mexican tributaries, as considered by Minute 234. As a result of these efforts, during the 1999/2000 water delivery year, Mexico delivered 151,759 acre-feet (187 Mm³) in excess of the minimum annual average of 350,000 acre-feet (431,721,000 cubic meters) required under the treaty.

The following year, reflecting the discussions of United States President George W. Bush and Mexican President Vicente Fox, the IBWC concluded an agreement, [Minute No. 307, “Partial Coverage of Allocation of the Rio Grande Treaty Tributary Water Deficit from Fort Quitman to Falcon Dam.”](#)⁶ on Mexican water deliveries during the 2000/2001 cycle year. This agreement established the delivery by Mexico during this period of 600,000 acre-feet (740 Mm³). The minute also indicated that the two countries would “work jointly to identify measures of cooperation on drought management and sustainable management of this basin.” By the conclusion of the 2000/2001 water year, Mexico delivered 476,622 acre-feet (587.9 Mm³).

⁶<http://www.ibwc.state.gov/Files/Minutes/Min307.pdf> or <http://www.sre.gob.mx/cila/ACTAS/307.pdf>

On September 6, 2001, during President Fox's state visit to Washington, DC, the two presidents issued a joint statement, in which they referred to water issues:

“President Bush and President Fox also had a frank discussion about water resources and the importance of living up to our mutual treaty obligations in this regard. They agreed that in the future this could be well served by greater cooperation aimed at more effective watershed management and improved infrastructure, including formation of a joint advisory council.”

The following year, faced with low tributary runoff and declining storage in the international reservoirs (Amistad dropped to 25% of conservation capacity while Falcon plummeted to 7%), the IBWC, on June 28, 2002, concluded [Minute No. 308, “United States Allocation of Rio Grande Waters During the last Year of the Current Cycle.”](#)⁷ Under that agreement, Mexico transferred 90,000 acre-feet (111 Mm³) to the United States in the international reservoirs (due to calculated conveyance losses, the total amount credited was 119,000 acre-feet or 146 Mm³), contingent upon Mexico receiving inflow of at least that amount by October 26, 2002. The contingencies in Minute No. 308 were fulfilled and Mexico closed that cycle year, the last of the five-year cycle, with a total delivery of little more than half the annual average required by treaty. From October 1, 1997-September 30, 2002, Mexico delivered an average of 289,063 acre-feet (356.6 Mm³) per year.



Falcon Reservoir, 2002

⁷<http://www.ibwc.state.gov/Files/Minutes/Minute308.pdf> or <http://www.sre.gob.mx/cila/ACTAS/308.pdf>

Minute No. 308 also followed up on the recommendation of Minute No. 307 regarding cooperation on drought management and sustainable management of the basin and set the stage for the Rio Grande Summit. Part G of Minute 308 states, in part:

“1. Measures of Cooperation on Drought Management – Mexico’s National Water Commission will present to the International Boundary and Water Commission a progress report on its studies concerning drought management planning to support the Commission as a forum under which the proper authorities in each country may coordinate their respective drought management plans.

2. Sustainable Management of the Basin – The Commission took note of the desire of both Governments to convene a bi-national summit meeting of experts and waters users from each country for the purpose of providing the proper authorities and stakeholders information concerning sustainable management of the Rio Grande Basin. Taking the recommendations of the summit into account, the two Governments will consider a binational sustainable management plan for the basin.

3. International Advisory Council – The Commission, subject to provision of financial and personnel resources to each Section by the respective governments as a step to strengthen the Commission’s role in the area of sustainable management of the basin and drought management planning, will establish a forum for the exchange of information and advice to the Commission from government and non-government organizations in their respective countries.”

Other aspects of Minute No. 308 relate to support for technical improvements and modernization of irrigation infrastructure in the Rio Grande Basin; these provisions will be discussed in greater detail later in this report.

Although addressing Mexico’s deficit in Rio Grande water deliveries has been a difficult chapter for the IBWC and other participating agencies, the discussions have been productive in the sense that both countries now recognize the desirability of enhancing binational cooperation for Rio Grande management.

Aided by increased precipitation and improved Mexican storage in the international dams, negotiations starting in late 2002 were more productive, leading to transfers of significant volumes of water from Mexican ownership to U.S. ownership at the international dams, in accordance with Minute No. 234. In 2003, Mexico transferred 239,646 acre-feet (295.6 Mm³) to the United States at the international dams. In early 2004, Mexico transferred an additional 250,001 acre-feet (308 Mm³) from Amistad Dam. Table 2 shows annual water deliveries by Mexico since October 1, 1992.

During 2004, negotiations resulted in the delivery of an additional volume of 239,900 acre-feet (296 Mm³) to the United States at Anzalduas International Diversion Dam, located near Reynosa, Tamaulipas-McAllen, Texas.

Table 2, Annual Mexican Water Deliveries (October 1 - September 30)

YEAR	USIBWC DATA ACRE-FEET	MXIBWC DATA THOUSAND CUBIC METERS
92/93	296,606	365,859
93/94	169,596	209,195
94/95	74,897	92,385
95/96	60,391	74,491
96/97	124,664	153,771
97/98	120,283	148,368
98/99	165,118	203,671
99/00	501,759	618,913
00/01	476,622	587,907
01/02	181,534	223,920
02/03	399,964	493,350
03/04	911,669	1,124,531

Due to improving conditions in the basin and negotiations between the two countries to reduce the water deficit, by October 1, 2004, the pending volume had been reduced to 716,670 acre-feet (884 Mm³) and the two countries remained actively engaged in negotiations aimed at eliminating the shortfall entirely.

Over the next several months, diplomatic efforts intensified. On March 10, United States Secretary of State Condoleezza Rice announced during a trip to Mexico that the United States and Mexico had reached an understanding to eliminate Mexico's Rio Grande water deficit by September 30, 2005. The understanding, based on the recommendations of the IBWC, stipulated the necessary actions to cover the pending volumes.

On September 30, 2005, the IBWC announced that Mexico had delivered sufficient volumes to eliminate the deficit. Mexico will continue its efforts to realize water allotments to comply with its obligations for the 2002-2007 cycle.

Internal Agreements of Each Country

United States Agreements

The Rio Grande Compact – Approved in 1939 and subsequently amended, the [Rio Grande Compact](#)⁸ apportions the water of the Rio Grande upstream of Fort Quitman, Texas among Colorado, New Mexico, and Texas. Under the Compact, Colorado delivers water at the Colorado-New Mexico state line while New Mexico delivers water into Elephant Butte Reservoir for use by southern New Mexico and far west Texas. The amount of required deliveries depends on the amount of flow at key points upstream in the basin. The Compact allows for accrual of debits or credits in deliveries and regulates storage. The Compact also establishes a commission, with representatives from the three states and the United States, to administer the agreement.

The Pecos River Compact and Supreme Court Amended Decree – The [Pecos River Compact](#)⁹ between New Mexico and Texas apportions the water of the Pecos River, a Rio Grande tributary. The agreement indicates the following: provides that New Mexico shall not undertake activities to reduce the amount of water arriving in Texas to a volume less than that arriving in 1947; grants to Texas the waters from the Delaware River; provides for allotments to Texas and New Mexico of water salvaged through construction of works; apportions floodwaters at a ratio of 50-50 between the two states; and establishes the Pecos River Commission to administer the compact.

In 1988, Texas prevailed against New Mexico in the U.S. Supreme Court, asserting that New Mexico had under-delivered approximately 10,000 acre-feet/year for over 30 years. As a result, New Mexico had to pay Texas \$14 million for past under-deliveries and, under the court's amended decree, compact compliance was put under the supervision of a federal watermaster. Furthermore, New Mexico is no longer allowed to carry forward accrued debits (under-deliveries) but rather has to make up any such annual under-deliveries within a very compressed time frame.

Mexican Agreements

Agreement among the Federal Government of Mexico and Mexican State Governments – On June 5, 2002, Mexican officials signed the Agreement on the Sustainable Use of Surface

⁸http://southwest.fws.gov/mrgbi/Resources/RG_Compact/rg_compact.pdf

⁹<http://www.capitol.state.tx.us/statutes/docs/WA/content/word/wa.003.00.000042.00.doc>

Water in the Rio Grande Basin among the Federal Government and the Governments of Chihuahua, Nuevo Leon, and Tamaulipas. The goal of the agreement is to achieve a sustainable use of the Rio Grande surface water and appropriate distribution among the basin's users. The federal government is to formulate a project for regulation of the distribution of Rio Grande surface waters and to present to the state governments the volumes and sustainable surface areas of the irrigation districts. Additionally, the federal government agrees to modernize and provide technical improvements for irrigation districts in the basin. The states commit to participate in the development of the regulations for distribution of Rio Grande surface water and to work with the irrigation district users in defining the volumes and sustainable surface areas.

Rio Grande Basin Conferences and Reports

Over the past several years, governmental entities and non-governmental organizations in the United States and Mexico have organized a number of conferences related to the Rio Grande basin. What follows is a brief summary of those conferences, recommendations, and related activities identified by members of the Rio Grande Summit Planning Committee.

United States-Mexico Border Drought Workshop – In 1999, the IBWC, in conjunction with the U.S. Bureau of Reclamation, the Western Governors' Association, and Mexico's National Water Commission, convened the United States-Mexico Border Drought Workshop in El Paso, bringing together water managers from the border region in both countries. Participants discussed water management during droughts, modeling and trend analysis, and issues specific to the Rio Grande and Colorado River systems.

River Initiative 1999 Rio Grande Summit - In November 1999, the City of Brownsville, Rio Grande Institute, Co-Rio, and the General Services Administration sponsored a town meeting in support of the American Heritage River Initiative. The meeting included discussion of the Rio Grande River Noxious Plant Mitigation Project to address the problem of water hyacinth and hydrilla, exotic weeds that had infested the Rio Grande. Another topic of discussion was the Resaca Restoration Plan to deepen some of the resacas, or finger lakes, especially a seven-mile reach of Resaca de la Guerra, in order to improve fish and wildlife habitat, detain stormwater runoff, and increase the water storage capacity of the resaca for the Brownsville Public Utilities Board. Other sessions focused on efforts to develop and preserve cultural, recreational, and historical resources in Brownsville.

Rio Grande/Rio Bravo Binational Symposium – In 2000, the Rio Grande/Rio Bravo Binational Symposium: Ft. Quitman to Amistad Reservoir was held in Ciudad Juarez, Chihuahua. The primary goal of the symposium was to build on current collaboration between the United States and Mexico in addressing water resources and related issues in and around the

Big Bend area. Some 100 representatives from federal, state, and local government, academia, and non-governmental organizations from both countries were invited.

At the conclusion of the symposium, Bruce Babbitt, Secretary of the United States Department of the Interior, and Julia Carabias, Secretary of Mexico's Secretariat of Environment, Natural Resources, and Fisheries (SEMARNAP) signed a Joint Declaration for future efforts. 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, to develop a plan to implement recommendations from the symposium; 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. Following the symposium, the IBWC formed the Binational Rio Grande/Rio Bravo Ecosystem Work Group (BREW). Most recently, the group has been working toward development of a binational pilot project for salt cedar control in the Big Bend area.

Uniting the Basin – In 2000, the Rio Grande/Rio Bravo Basin Coalition sponsored the [Uniting the Basin Conference](#)¹⁰ in Ciudad Juarez, Chihuahua, with 150 attendees. Participants developed more than twenty recommendations, which included:

- Establish a binationally funded institute for research, planning, and capacity building of the basin's resources and its inhabitants.
- Develop a legal framework to facilitate binational planning, taking into consideration existing treaties.
- Price water according to its value/use.
- Balance economic considerations with cultural and environmental water needs in regional water planning efforts.
- Dedicate water for ecological purposes (obtain a legal entitlement for instream flows).
- Continue to build grassroots networks for information and communication that will provide a strong voice for implementation of the above recommendations.
- Implement environmentally compatible conservation practices; for example, a canal system using plant life for stream bank stabilization and habitat protection rather than channelized, concrete ditches.
- Encourage farmers to grow crops appropriate to an arid region.
- Continue and expand conservation easement programs and develop laws and programs that encourage conservation, like tax credits for conservation and locally-controlled water banks.

¹⁰<http://rioweb.org/PDFs/issue13engl.pdf> or <http://rioweb.org/PDFs/issue13span.pdf>

- Inventory existing information on regional planning and standardize existing data and planning processes.
- Binational planning processes should include adequate public participation.

Good Neighbor Environmental Board 4th Report¹¹ – The Good Neighbor Environmental Board, a U.S. panel established within EPA that advises the President and Congress on issues related to sustainable development for the U.S.-Mexico border region, researched water issues in 2000. In its 4th Report, the board issued a report with five key recommendations:

1. Institutionalize a border-wide watershed approach.
2. Support data-gathering and analysis that generates a clear picture of border watersheds.
3. Highlight and support water resources management practices along the border that are based on a watershed approach. Develop a Border-Region Strategic Water Plan.
4. Encourage the full participation of tribal governments, along with binational organizations, federal, state and local governments and other border groups, in developing and implementing a watershed approach.
5. Provide continued federal budgetary support for actions and programs consistent with the themes and purposes of a watershed approach for the border region.

Binational Declaration - The Rio Conchos and Lower Rio Bravo/Rio Grande – The following year, in 2001, 22 non-governmental organizations from the United States and Mexico, signed a Binational Declaration - The Rio Conchos and the Lower Rio Bravo/Rio Grande.¹² Signatories included World Wildlife Fund (Mexico and U.S.), Pronatura Noreste, Bioconservación, Rio Grande/Rio Bravo Basin Coalition, Alliance for the Rio Grande Heritage, Environmental Defense, and the Texas Center for Policy Studies. The declaration recommended that the governments adhere to the following principles in negotiating drought management and sustainable water management plans for the Conchos River and the Lower Rio Grande/Rio Bravo basins:

1. A high priority should be placed on improving water use efficiency and water quality.
2. The U.S. government should work with the Mexican government to identify and secure funding for implementing the conservation measures identified, on a priority basis.

¹¹<http://www.epa.gov/ocem/gneb/pdf/annrpt900eng.pdf> or <http://www.epa.gov/ocem/gneb/pdf/annrpt900sp.pdf>

¹²<http://www.texascenter.org/borderwater/finaldec.pdf>

3. Water conserved in the agricultural sector should be used partially to meet growing water demand in towns and cities; some of the water conserved in the agricultural, municipal and industrial sectors should be used for the water needs of ecosystems.
4. Development of the drought management and sustainable water management plans for the Rio Conchos and the Lower Rio Bravo/Rio Grande must include consideration of water for ecosystems and species.
5. Development of the drought management and sustainable water management plans for the Rio Conchos and the Lower Rio Bravo/Rio Grande must include consideration of groundwater-surface water interactions, protection of spring flows and reducing the overexploitation of aquifers in the Conchos basin, as well as the vegetation in the aquifer recharge zones.
6. The Mexican government should re-examine operating protocols for the major reservoirs on the Conchos. The overall goal of the revised operating protocols should be to meet basic human and agricultural water needs during drought, while avoiding deficit situations and avoiding even more damage to the aquatic ecosystems and riparian habitats of the Rio Conchos and the Rio Bravo/Rio Grande below the Conchos confluence.
7. The Mexican government should move swiftly to address deforestation issues in the Sierra Tarahumara.
8. The U.S. government should have a clear understanding with the Mexican government regarding water debts such that a greater problem with the ecosystems of the Rio Conchos basin is not provoked.
9. Finally, the U.S. and Mexican governments should involve, to the extent practicable, interested stakeholders on both sides of the border in the development of a drought management plan and a sustainable water management plan for the Rio Conchos and the Lower Rio Bravo/Rio Grande.

Discovering the Rio Conchos – Several of the signatories of the 2001 declaration followed up the next year with a conference, [Discovering the Rio Conchos](http://www.environmentaldefense.org/article.cfm?ContentID=2917),¹³ held in Chihuahua, Chihuahua. This conference brought together representatives of non-governmental organizations, agency officials, farmers, lawyers, scientists and others from both Mexico and Texas to discuss the current state of the Conchos River. The conference was sponsored by the Texas Center for Policy Studies and co-sponsored by World Wildlife Fund (Mexico and U.S.), ProFauna (Chihuahua), Comisión de Solidaridad y Defensa de Derechos Humanos, Consultoría Técnica, Fundación para la Conservación del Río Conchos, BioDesert, and Environmental Defense. The conference developed dozens of recommendations grouped into three themes - Agricultural Water Use, Social and Environmental Aspects, and Legal and Binational Aspects. Some of the recommendations were:

¹³<http://www.environmentaldefense.org/article.cfm?ContentID=2917>

- Reuse of treated water
- Put a realistic price on water
- Develop a water market, reflecting the real value of water
- Improve water use efficiency, but without expanding irrigated acreage
- Sustainable use of aquifers
- Protecting riparian habitat
- Binational river basin council
- Ensure water rights for the river and to maintain riverine habitat
- Acquire water for environmental uses
- Ensure participation of water users in discussions
- Reform watershed management councils
- Develop a trust for paying forest communities to manage for watershed protection
- Donate water rights for instream flow
- Recognize water quality as an issue in water quantity discussions
- Reconnect the upper and lower Rio Grande/Rio Bravo; modify operation of Elephant Butte/Caballo Dams
- Examine the operation of major Mexican reservoirs
- Increase the predictability of reservoir operations/deliveries
- Develop a binational water quality norm
- Adopt a good definition of extraordinary drought
- Modify water regulations to include ecological flows/uses

U.S.-Mexico Binational Council – In June 2002, the U.S.-Mexico Binational Council, consisting of top leaders from government, business, and academia, joined with the Center for Strategic and International Studies, the Instituto Tecnológico Autónomo de México, and the University of Texas at Austin and conducted a working group meeting in Austin, Texas. The next year, the Council released a report, *U.S.-Mexico Transboundary Water Management, the Case of the Rio Grande/Rio Bravo, Recommendations for Policymakers for the Medium and Long Term.*¹⁴ Recommendations of particular interest to the Rio Grande Summit include:

- Improve data collection, information gathering, and transparency
- Prepare early for drought conditions

¹⁴ http://www.csis.org/americas/mexico/index.php?option=com_csis_pubs&task=view&id=1062

- Encourage a balanced bottom-up approach to river basin management
- Make citizen input a priority
- Set up an IBWC binational water council
- Create a binational water market and water bank
- Improve irrigation/agricultural management, promote conservation

Border 2012: U.S.-Mexico Environmental Program - The ten-year [Border 2012 program](#)¹⁵ was presented in April 2003. With the active participation of the ten border states and U.S. tribal governments, the U.S. Environmental Protection Agency (EPA), and Mexico's Secretariat of Environment and Natural Resources (SEMARNAT) in partnership with other federal agencies, Border 2012: U.S.-Mexico Environmental Program is intended to protect the environment and the public's health in the U.S.-Mexico border region. The 1983 Agreement on Cooperation for the Protection and Improvement of the Environment in the Border Area, known as the La Paz Agreement, is the legal basis for the Border 2012 program. Border 2012 is led by National Coordinators from EPA and SEMARNAT. One of the broad goals of Border 2012 is to reduce water contamination. Two regional work groups, in New Mexico-Texas-Chihuahua and Texas-Coahuila-Nuevo Leon-Tamaulipas, are working to address water supply and water quality issues in the Rio Grande basin.

Rio Grande Watershed Federal Coordinating Committee – In late 2002, U.S. Congressman Silvestre Reyes of El Paso formed the Rio Grande Watershed Federal Coordinating Committee, a consortium of 11 federal agencies from the United States that have jurisdiction in the watershed. The group meets regularly to explore information-sharing and collaborative projects.

Biannual American Heritage River Initiative Meeting - In November 2003, the American Heritage Rivers Program and the Rio Grande/Rio Bravo Basin Coalition organized the Biannual American Heritage River Initiative Meeting, "Our Texas Treasure: The Mighty Rio Grande," held in El Paso, Texas. The Rio Grande was designated an American Heritage River in 1998 by the White House. The objectives of the American Heritage Rivers initiative are natural resource and environmental protection, economic revitalization, and historic and cultural preservation. Through this program, the federal government of the United States supports community-based efforts to preserve, protect, and restore heritage rivers and their communities. At the 2003 meeting, presenters covered various themes including restoration, park and trails projects, water planning and funding for infrastructure, sustainable development, and eco-tourism.

¹⁵<http://www.epa.gov/usmexicoborder/org.htm>

Agricultural Production Trends and the Future of the Trans-boundary Rio Grande Basin Conference – Another event in 2004, the [Agricultural Production Trends and the Future of the Trans-boundary Rio Grande Basin Conference](#),¹⁶ sponsored by Environmental Defense and the Woodrow Wilson International Center for Scholars-Mexico Institute, was held in San Antonio, Texas. The purpose of the conference was to bring together a group of experienced practitioners and researchers from both the U.S. and Mexico to examine key trends in the basin’s irrigated agriculture, with a focus on the Conchos River and the Lower Rio Grande Valley. Another objective of the conference was to inform the IBWC’s Rio Grande Summit.

According to the Conference Proceedings, irrigated agriculture accounts for 80-90% of surface water diversion in the trans-boundary portion of the Rio Grande basin. Three of the basin’s major irrigated crops are pecans, sugar cane, and alfalfa; production of these water-intensive crops is unlikely to decrease in the near-term. Observations by the conference conveners suggest that governments must make significant investments and provide more technical assistance to help producers reduce water use and become competitive and efficient. Simply increasing the price of water used in irrigation is complex and politically difficult. The perennial nature of the three major crops makes conversion to other, less water-intensive crops more difficult; however, with financial and technical assistance, these conversions are possible. Governments, agricultural producers, academic institutions, and non-governmental organizations should find more opportunities to promote cross-border exchanges among agricultural and natural resources experts and to promote irrigation technology transfer.

2004 Valley Water Summit – On February 27, 2004, leaders in the Lower Rio Grande Valley of Texas organized the [Valley Water Summit - Taking Action on Water Supply Issues](#)¹⁷ in Harlingen. Sponsors included water user groups, water utilities, engineering firms, municipalities, and others. A survey of participants determined that there was overwhelming consensus on:

- Establishing regional partnerships and cooperative financing mechanisms among all stakeholder groups that include enhancing community understanding of the vital importance of water issues and coordinating for federal and state funding
- Improving efficiency of water delivery systems, particularly by rehabilitating canal infrastructure and instituting on-farm conservation measures
- Resolving treaty issues to enhance the reliability of water supplies

¹⁶http://www.environmentaldefense.org/documents/4047_FinalAGConference.pdf

¹⁷http://www.valleywatersummit.org/downloads/VWS_summary.pdf

2005 Valley Water Summit - On February 23, 2005, water utilities, municipalities, irrigation districts, engineering firms, and others sponsored a second Valley Water Summit¹⁸ in Harlingen, Texas, featuring U.S. Senator John Cornyn of Texas as keynote speaker. Officials from the USIBWC and other local, state, and federal water managers were also featured speakers. Five work sessions focused on specific technologies, processes, or concepts and their potential applications for helping resolve water supply problems. During these work sessions, participants discussed desalination of brackish groundwater, improved on-farm irrigation technology, constructed wetlands and water reuse, municipal water conservation, and public-private partnerships to create projects for the public benefit that continue to sustain growth, foster development, and are financially attractive. For each of these concepts, participants identified strengths, barriers, information needs, and who needs to be involved to move forward.

Good Neighbor Environmental Board 8th Report - The Good Neighbor Environmental Board returned to the topic of water for its Eighth Report to the President and Congress, “Water Resources Management on the U.S.-Mexico Border,”¹⁹ released in early 2005. The report included recommendations related to institutions, data, and strategic planning: 1) Institutions. Clarify current responsibilities held by U.S.-Mexico border-region institutions responsible for managing its water resources. Identify jurisdictional gaps and overlaps. Interpret missions to reflect changing circumstances, and leverage opportunities for stronger cross-institutional collaboration. 2) Data. Develop and sign formal U.S.-Mexico border-region water resources data agreements. Such agreements should support the collection, analysis and sharing of compatible data across a wide range of uses so that border-region water resources can be more effectively managed. The report states that a new IBWC Minute on regular transfer of water data may be the best way to institutionalize regular water data exchange along the border. 3) Strategic Planning. Implement a five-year U.S.-Mexico border-region integrated water resources planning process. Using a stakeholder-driven watershed approach, address immediate concerns in critical areas while pursuing collaborative longer-term strategies.

4th World Water Forum - The 4th World Water Forum, a joint venture organized by the World Water Council and the Mexican Government, is scheduled for March 2006 in Mexico City. The main theme is *Local Actions for a Global Challenge*. The organizers of the 4th Forum share the belief that, regardless of their root causes, water related problems have their greatest impacts at the local level. As a result, local actions are key for generating concrete results. The intention of the IBWC is to present the recommendations of the Binational Rio Grande Summit at the 4th World Water Forum.

¹⁸<http://www.valleywatersummit.org/>

¹⁹<http://www.epa.gov/ocem/gneb/gneb8threport/gneb8threport.pdf> or http://www.epa.gov/ocem/gneb/gneb8threport/gneb8threport_sp.pdf

Conference Themes – What the conferences and their recommendations tell us is that there is significant interest among many sectors in improving water management in the Rio Grande Basin. Recurring themes include support for enhanced binational cooperation, data and technology exchange, water conservation, public participation, and development of tools, institutions, and funding mechanisms to advance binational planning efforts.

Issues on the Binational Rio Grande Summit Agenda

In developing the agenda for the Binational Rio Grande Summit, a committee of experts from both countries identified subject areas of greatest interest including Legal and Institutional Aspects, Environment and Water Quality, Binational Basin Management, and Financing. This section of the paper will briefly outline some of the principal issues identified for these subject areas.

Legal and Institutional Aspects

The Summit planning committee discussed the importance of presenting at the start of the conference the existing legal framework, which has been discussed in previous sections of this paper. The following mentions legal instruments in Mexico.

Mexico's National Water Law - On April 29, 2004, the official decree was published to enact reforms, additions, and deletions to the [National Water Law](#)²⁰ which had been in effect in Mexico since December 1992.

The National Water Law is established by Article 27 of the Constitution of the United Mexican States with regard to national waters; it is observed throughout the country; its provisions are matters of public order and social interest with the objective of regulating the exploitation and use of waters, their distribution and control, as well as the preservation of their quantity and quality in order to achieve sustainable development.

The law is applicable to all national waters, whether surface water or groundwater, in addition to the Mexican marine zones, as much for conservation and quality control, without diminishing the jurisdiction or concession that could govern the latter ones.

The modifications ratify the authority and administration of the Mexican Federal Executive in matters of national waters and its inherent public property, yet promote, in a fundamental manner, actions with state and municipal governments. They establish that the coordination, realization, and administration of water resource management actions, by basin or hydrologic region, will be done through the Basin Councils with the participation and commitment of the three levels of government, the users, private individuals, and community organizations.

²⁰<http://portal.semarnat.gob.mx/semarnat/portal>

Environment and Water Quality

Invasive Species – Invasive aquatic and riparian species are a particular concern in the Rio Grande basin. Several exotic plants have infested areas in and along the Rio Grande and its tributaries, displacing native vegetation and negatively impacting water quality and water quantity.



Water Hyacinth

In the Lower Rio Grande, water hyacinth (*Eichhornia crassipes*) and hydrilla (*Hydrilla verticillata*) have posed a particular challenge in recent years. These weeds grow in the river channel itself, choking flow, decreasing the efficiency of water deliveries, and creating stagnant pools of water. According to the Lower Rio Grande Watermaster for the State of Texas, during the 2002 irrigation season, 20-25% additional water, amounting to 7,000 acre-feet per week, was released from the storage dams as “push water” so that water could flow past the dense weed blockage and reach its intended destinations. A three-pronged binational approach to combat the infestation has involved mechanical harvesting, application of herbicide, and release of weed-eating fish and insects such as carp and hydrilla fly. Higher flows coupled with the introduction of grass carp (*Ctenopharyngodon idella*), also known as white amur, have effectively cleared the weeds in the downstream reaches near the Gulf of Mexico. However, by 2005 the infestation had significantly worsened farther upstream, in the area from Falcon Dam downstream to Anzalduas Dam (near McAllen, TX - Reynosa, Tamaulipas).

Another species of concern is salt cedar (*Tamarix* spp.). This tree, which can reach 25 feet in height, has infested many miles along the banks of the Rio Grande, displacing cottonwoods, willows, and other native species. The 577-mile (928 km) long segment of the Rio

Grande from Fort Quitman to Amistad Dam as well as two tributaries, the Pecos and Conchos Rivers, have been particularly affected. Salt cedar uses more water than native plants and releases salt into the environment, with potentially negative impacts on water quality.

In the area of Del Rio, Texas, giant rivercane (*Arundo donax*) has infested San Felipe Creek, a Rio Grande tributary. Like salt cedar, giant rivercane has a high rate of evapotranspiration and displaces native vegetation, disrupting the riparian ecosystem. It also increases flood risk by breaking away during high flows, creating potentially devastating blockages downstream.



Salt Cedar has infested the river downstream of El Paso, TX - Cd. Juarez, Chih.

Water Quality Studies – In 1992, field work began for the first of three phases of the Rio Grande Toxic Substances Study. The study was authorized by [Minute No. 289, “Observation of the Quality of the Waters along the United States and Mexico Border,”](#)²¹ signed in 1992. The IBWC coordinated the study in partnership with other entities including the Texas Commission on Environmental Quality, Texas Parks and Wildlife Department, Texas Department of Health, U.S. Environmental Protection Agency, National Park Service, U.S. Bureau of Reclamation, Mexico’s National Water Commission, and the Mexican Ministry of Social Development. The study analyzed the potential for toxic substances in water, sediment, and fish tissue. [Phase I](#)²²

²¹<http://www.ibwc.state.gov/Files/Minutes/Min289.pdf> or <http://www.sre.gob.mx/cila/ACTAS/289.pdf>

²²http://www.ibwc.state.gov/EMD/BS_RegPresToxSubs.pdf

covered the entire trans-boundary reach of the Rio Grande. [Phase II](#)²³ included more complete monitoring of segments of concern identified from the Phase I findings. [Phase III](#),²⁴ published in 2004, focused on sites and contaminants most likely to impair water quality in the areas of El Paso, Texas-Cd. Juarez, Chihuahua and Presidio, Texas-Ojinaga, Chihuahua. Phase III aimed to identify stressors on human health and aquatic life by assessing habitat conditions, land use, physical, chemical, and biological data. The study found that chemicals in the Rio Grande, sediment, and fish tissue do not pose an immediate threat to human health or aquatic life

The IBWC also released a report detailing results of an intensive monitoring effort in the Laredo, Texas-Nuevo Laredo, Tamaulipas area, [“Binational Study Regarding the Intensive Monitoring of the Rio Grande Waters in the Vicinity of Laredo, Texas and Nuevo Laredo, Tamaulipas Between the United States and Mexico, November 6-16, 2000.”](#)²⁵ The objectives of the study were to: 1) make a comparative analysis of water quality conditions in the Rio Grande; 2) enhance permanent water quality programs; and 3) measure the beneficial water quality effects of the Nuevo Laredo International Wastewater Treatment Plant (NLIWTP), which began operation in 1996. The study documents some ongoing water quality concerns in the Rio Grande while, at the same time, demonstrating the highly effective treatment of sewage provided by the NLIWTP.

Mexico’s National Water Commission (CNA) evaluates water quality data and assigns a Water Quality Index (ICA), which grades water at various levels – unacceptable, strongly contaminated, contaminated, acceptable, and excellent. According to CNA, during low Rio Grande flow, the ICA ranges from unacceptable to acceptable. Between Ciudad Juarez, Chihuahua and Ciudad Acuña, Coahuila, the river is characterized as strongly contaminated while the segment from Ciudad Acuña to the Gulf of Mexico is classified as contaminated. During low flow conditions, the Conchos River is rated as unacceptable. Water pollution is linked to development of cities, industrial development, and technical advances in farming, aggravated by the absence of wastewater treatment.

[The Texas Clean Rivers Program for the Rio Grande](#)²⁶ – Undertaken by the USIBWC and its partners under contract with the State of Texas, the [Clean Rivers Program](#) is a water quality monitoring program in the Texas portion of the Rio Grande basin. Some 80 stations are routinely monitored on the Rio Grande, Devils and Pecos Rivers, and San Felipe Creek. The program monitors for numerous parameters, including bacteria, salinity, and heavy metals.

²³ <http://www.sre.gob.mx/cila/SusToxRBFase%202%20Vol-II.pdf>

²⁴ <http://www.ibwc.state.gov/PAO/CURPRESS/2004/RGToxicStudy.pdf>

²⁵ http://www.ibwc.state.gov/EMD/Nuevo_Laredo/Binatl_Study_NL_Pub.pdf or http://www.sre.gob.mx/cila/Monitoreo_Laredo.pdf

²⁶ <http://www.ibwc.state.gov/CRP/Welcome.htm>

Exceedances of state water quality standards for salinity and bacteria have been identified as particular areas of concern in some segments of the Rio Grande.

Deforestation – Mexico’s National Water Commission (CNA) reports that practically all forests in the Mexican portion of the Rio Grande basin have experienced deforestation, leading to soil erosion, reduction of biodiversity, and possible worsening of drought impacts. Deforestation also leads to reduced infiltration and aquifer recharge, greater intensity of floods, and increased volume of sediments in reservoirs, reducing storage capacity. By contrast, soil conservation boosts productivity and the soil’s ability to retain water. CNA reports that the best way to avoid possible negative changes in hydrological flows is to maintain existing natural forests. (CNA, Programación Hidraulica Regional Priorización de Acciones Detalladas 2002-2006 VI Gerencia Regional Río Bravo).

According to a [2000 report by the Commission of Solidarity and Defense of Human Rights \(COSYDDHAC, A.C.\) and the Texas Center for Policy Studies](#),²⁷ logging and resulting deforestation in the Sierra Tarahumara of Chihuahua in the Conchos River basin have caused erosion, reducing the filtration of rainwater into the aquifers and affecting water quantity and quality.

[The Sierra Madre Alliance](#),²⁸ which studies logging issues and impacts in the Sierra Madre Occidental region of the Mexican states of Chihuahua, Durango, and Sonora, states that long-term impacts of deforestation in the region include increased flooding, increased siltation of reservoirs, and lower stream flows in the dry season. In addition to soil erosion caused by lack of tree cover, logging roads built on steep slopes and logging practices whereby timber is dragged down-slope rather than along contours further contribute to erosion. Forest management practices have also caused degradation of aquatic habitat, with a number of fish species considered endangered or threatened due to logging.

Biological Diversity and Threatened and Endangered Species – The Rio Grande Basin is home to dozens of species considered threatened or endangered by the U.S. Fish and Wildlife Service - species as diverse as the bald eagle (*Haliaeetus leucocephalus*), Gulf Coast jaguarundi (*Herpailurus (=Felis) yagouaroundi cacomitli*), star cactus (*Astrophytum asterias*), Mexican long-nosed bat (*Leptonycteris nivalis*), Rio Grande silvery minnow (*Hybognathus amarus*), Walker’s manioc (*Manihot walkerae*), and black-footed ferret (*Mustela nigripes*). Various agencies and nongovernmental organizations in both countries are involved in efforts to protect wildlife and habitat. Of note, the Lower Rio Grande/Rio Bravo Ecosystem Group, involving state and federal agencies in Texas and Tamaulipas, developed a Binational Ecosystem Management Plan and a habitat map to identify wildlife corridors along the Texas-Tamaulipas border and 60 miles (100 km) north and south of the Rio Grande.

²⁷<http://www.texascenter.org/publications/forestry.pdf>

²⁸<http://www.sierramadrealliance.org/sierra-pol-ecol/Deforestation.pdf>

In 1999, the United States Fish and Wildlife Service (FWS) finalized the Recovery Plan for the Rio Grande Silvery Minnow, an endangered fish currently found only in the Middle Rio Grande in New Mexico, from Cochiti Dam to Elephant Butte Reservoir. The primary goals of the Recovery Plan are to stabilize and enhance populations of silvery minnow and its habitat in the Middle Rio Grande Valley and reestablish the silvery minnow in at least three other areas of its historic range.

The FWS intends to prepare an Environmental Assessment regarding a proposal to reintroduce the endangered Rio Grande silvery minnow into part of its historic range in the Rio Grande in the Big Bend area of Texas. The FWS is proposing to establish an experimental population area that would allow the minnow to be reintroduced while also minimizing the restrictions and regulatory burdens on landowners, water users, and other stakeholders. The United States Section of the International Boundary and Water Commission is a cooperating agency in preparation of the Environmental Assessment.

Binational Basin Management

In Mexico, water management is handled by the federal government through federal law while the United States grants management and regulatory authority to the states. For this reason, this section of the report includes separate descriptions for the U.S. states.

Mexico – Through CNA, Mexico has developed mid- and long-term planning documents. The Regional Hydraulic Program for Region VI Rio Bravo covers 2001-2006 while the long-term plan discusses goals through 2025. Region VI Rio Bravo includes 141 municipalities in the river basin in the states of Chihuahua, Coahuila, Durango, Nuevo Leon, and Tamaulipas, with the largest portion in Chihuahua and Coahuila.

The region has a variety of water problems, including overexploitation of aquifers; reduction in water availability; deficits in potable water, sewage, and sanitation coverage; unhealthy conditions for residents; environmental pollution and degradation; deterioration in the quality of waterbodies; flooding; and drought

CNA is the only federal agency authorized to administer national waters and is therefore in charge of planning efforts at the national and regional level. CNA has also set up Basin Councils, which include the three levels of government, water users, and organizations of civil society to formulate and execute programs and actions to improve water administration, develop water infrastructure and services, and preserve the basin's resources. Additionally, there are auxiliary groups with special expertise, such as the Technical Groundwater Committees and a commission focused on the Conchos River basin.

The Consultative Water Council, comprised of civil society, advises public agencies and CNA in particular. It has five work groups: 1. Economy and Finances; 2. Legal Framework; 3. Communication, Education, and Training; 4. Technology and Development; 5. Environmental.

CNA's vision for 2001-2025 offers general objectives such as:

- prioritizing actions that lead to efficient and sustainable water use

- strengthening fora for public participation
- updating water pricing and promoting establishment of water markets
- integrated sanitation
- legal security, affecting control of extractions and discharges
- decentralization of water administration, strengthening state and municipal agencies

Additionally, the program identifies specific immediate actions for various planning subregions. These actions include strengthening Basin Councils and Commissions, promoting efficient water use in specific irrigation districts, controlling overexploitation of certain aquifers, and controlling contamination from heavy metals and due to municipal discharges.

Region-wide activities that are required include:

- Support irrigation district self-sufficiency
- Strengthen water user associations
- Study and develop processes for appropriate irrigation coverage
- Reuse treated wastewater in irrigation
- Make various improvements to irrigation systems, provide technical assistance for agricultural water development
- Adjust dam operations to jointly maintain surface and groundwater

In the National Hydraulic Program 2001-2006 (PNH) the following objectives and strategies for the Region VI Rio Bravo were defined based on national priorities:

- Substantially increase efficiency of agricultural water use
- Reduce the amount of unmetered potable water in large cities and improve coverage and quality of basic services in medium cities
- Establish and restore the balance in over-exploited aquifers

For the mid-term, the following is proposed:

- Administer the Conchos River basin as an integrated part of the Rio Grande basin and achieve fair distribution among different users
- In accordance with Minute 307, work jointly with the United States to identify measures of cooperation for drought management and sustainable management of the basin
- Direct investment to boost water use efficiency with the goal of covering the remaining debt.

The program also includes specific regional goals for 2001-2006:

- Increase potable water coverage to 96%
- Increase sewer service coverage to 90.4%
- Collect and treat 81.9% of wastewater
- Provide potable water service to 75.4% of the rural population
- Increase the percentage of irrigated land with efficient irrigation systems to 1.7%
- Consolidate the Rio Grande Basin Council by no later than 2003

These activities are consistent with the Mission of the Rio Grande Region: Manage and preserve national water, define and diffuse technical, social, and legal characteristics about the resource in order to achieve sustainable use in harmony with the committed participation of society, attending to that established in the Law of National Waters and the 1944 Water Treaty.

In Mexico's entire northern border region, the growth rate is expected to be 2.7% per year, resulting in a regional population increase from 7 million in 2000 to 13.8 million in 2025. Almost 46% of northern border residents reside in the states of Baja California and Sonora; that is, outside of the Rio Grande basin. The current trend for total water demand in the northern border region indicates an increase of 7.4% in 25 years, projecting that by 2025, demand will reach a total of 12,384 Mm³. Per capita water availability will be reduced by 50% in the next 25 years. The region of Ciudad Acuña-Piedras Negras-Nuevo Laredo is expected to see an increase in urban demand of 140% while the Reynosa-Matamoros area will see a 115% rise in urban demand by 2025, areas that rely on the Rio Grande for their water supply.

Water for Texas, Rio Grande Region – The Texas Water Development Board in 2002 prepared a report, [Water for Texas](#),²⁹ which includes sections from each of the state's 16 regional water planning groups, including the Region M Rio Grande Region, covering Texas counties adjacent to the Rio Grande from Maverick County to Cameron County. Projected total water needs by 2050 are about 832,583 acre-feet/year (1027 Mm³). To meet the needs over the 50-year planning horizon, capital costs for water management strategies are estimated at \$930 million. To address irrigation needs, the Region M Planning Group recommends agricultural water conservation through improvements to the conveyance and distribution system, and other agricultural improvements. The plan also recommends controlling noxious weeds, maximizing use of those waters not accounted for by treaty between the U.S. and Mexico, and restoring the river's historic channel between Fort Quitman and the City of Presidio to increase the flows reaching this planning area. The group strongly recommended that the U.S. Government take all necessary and appropriate actions to ensure Mexico's full compliance with the terms of the treaty allocating and governing water on the river.

Water for Texas, Far West Texas Region – The [Far West Texas region](#)³⁰ covers Texas counties on the U.S.-Mexico border from El Paso County to Terrell County. The total needs by 2050 are about 417,260 acre-feet/year (515 Mm³). The estimated capital costs of recommended water management strategies for meeting needs over the 50-year planning horizon are \$941.5 million, including \$716 million for the long distance transport of groundwater from rural counties to El Paso. Other recommended strategies include conservation savings in irrigation, reuse, desalination, and expanded use of local groundwater.

²⁹http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2002/FinalWaterPlan2002.asp

³⁰http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2002/FinalWaterPlan2002.asp

Rio Grande Watermaster Program, State of Texas – In the lower part of the basin in Texas, a unique state management system has been implemented. The Rio Grande Watermaster of the Texas Commission on Environmental Quality (TCEQ) is responsible for allocating, monitoring, and controlling the use of surface water in the Rio Grande Basin from Fort Quitman to the mouth of the Rio Grande, covering approximately 1600 water right accounts. Releases of United States water held in storage at Amistad and Falcon Reservoirs are ordered by the watermaster and coordinated with the IBWC, which operates the dams.

Water rights for the Lower Rio Grande of Texas were 100% adjudicated in the 1960s. All water rights have a maximum annual allowable, but because the total legal demand for water always exceeds the supply, only the highest priority uses receive the full amount of their water right. The following are the weighted priorities: 1) Domestic Municipal and Industrial (DMI) uses (highest priority); 2) operational; 3) carry over balances for irrigation water accounts.

Based on this priority system, the watermaster divides United States waters into three pools: 1) water reserved for municipal uses to cover one year's average municipal diversions, which accounts for 225,000 acre-feet (277.5 Mm³); 2) operational uses in the amount of 75,000 acre-feet (92.5 Mm³) to ensure delivery of water even in periods of low flow and drought; and 3) the lowest priority pool, reserved for agricultural interests, consisting of leftover water after the other two pools have been established.

Water right holders within the Middle and Lower Rio Grande can sell their water right to other users in the same area, under certain conditions. Among the conditions -- sales can only be approved between the same type of use (for example, irrigation water can only be sold to another irrigation water right holder) and all sales must be approved by the TCEQ.

Paso del Norte Region – The Paso del Norte Water Task Force, consisting of managers from water agencies and other experts from the Las Cruces, NM-El Paso, TX-Ciudad Juarez, Chihuahua region, prepared [a water planning document in 2001](#).³¹ This document outlines water projects planned for the Paso del Norte Region. The Task Force Goals are to identify water issues of the highest priority to the region, promote the sharing of information and ideas, convene fact-finding groups to study selected issues and disseminate their findings, keep abreast of progress being made by others, and submit policy recommendations to appropriate authorities in Mexico and the United States.

In [a news release announcing the availability of the report](#),³² Task Force Co-chair Nestor Valencia stated, “The basic problem in the Paso del Norte is the combination of rapid population growth and increasingly scarce water supplies in a semi-arid climate. Since the water supply is shared among the states of New Mexico, Texas and Chihuahua, to find a solution to the problem, urban and agricultural water users from all three areas need to work together.”

³¹http://www.sharedwater.org/en/Projects/Reports/water_taskforce_report_rev1.pdf or http://www.sharedwater.org/en/Projects/Reports/water_taskforce-spanish.pdf

³²http://www.sharedwater.org/News/ArchivedNews/pr_0108.htm

The report also reaches some conclusions:

- **There are gaps in information needed for planning.** Different entities treat different data sets in different ways. No consensus on how agricultural water use will be affected in the future by continued urban growth. Gaps about water sources in the region and gaps in understanding of brackish water intrusion into existing groundwater sources. Decline of water quality needs to be addressed on a regional level. Water allocation has ignored natural habitat and environmental impacts. Lack of understanding among various municipal and irrigation water entities.
- **Water entities face many common challenges and issues.** These include incorporating interests of other water uses from different jurisdictions into their planning, increased urban water use, and the likelihood of future water transfers from agricultural to urban use.
- **Regional coordination in water planning is needed for the region.** Water entities have operated independently of each other, employing various methodologies. More sustainable use of shared water resources can be achieved through increased coordination of water management.

State of Colorado – Colorado administers water according to the prior appropriation doctrine (first in time, first in right). To assist Colorado in meeting its commitment to New Mexico and Texas under the Rio Grande Compact and to assist the United States in meeting its commitment to Mexico under the Convention of 1906, Congress authorized the San Luis Valley Project in Colorado. This project includes infrastructure to deliver water to the Rio Grande and a reservoir to store water. The [Colorado Water Conservation Board](#),³³ created to protect and develop state waters, has a number of major programs such as water supply planning and finance, management, water supply protection, and conservation and drought planning.

Colorado and New Mexico – In this region, the U.S. Bureau of Reclamation manages a number of major reservoirs, ensuring delivery of water. The Bureau carries out its work in close coordination with the Rio Grande Compact Commission and the International Boundary and Water Commission.

State of New Mexico – The Office of the State Engineer (OSE) and the Interstate Stream Commission (ISC) are separate but companion agencies charged with administering the state's water resources. The agencies have power over the supervision, measurement, appropriation and distribution of almost all surface and ground water in New Mexico, including streams and rivers

³³<http://cwcb.state.co.us/>

that cross state boundaries. The [State Water Plan](#)³⁴ was adopted by the Interstate Stream Commission in December 2003. Some of the statewide objectives of this plan are ensuring future water supply, developing water resources to expand supply, promoting conservation and drought planning, and providing for habitat preservation and river restoration. New Mexico needs to make a substantial investment to increase water supplies to meet future needs; treatment of brackish water, wastewater treatment and reuse, and aquifer storage and recovery will be explored.

Water rights adjudications -- comprehensive legal proceedings to determine the rights of individuals to use the state's public waters -- have only been completed for 20% of the state and two tribes. Pending Rio Grande adjudications include the claims of 19 Pueblos and Tribes as well as 58,000 current water rights defendants, including some 18,000 defendants in southern New Mexico, involved in active ongoing adjudication covering approximately 60% of the state.

Clearly, completion of the adjudications is many years away. In the meantime, however, several years of drought have highlighted the need for New Mexico to better administer the available water supply in the near term, particularly in light of increasing demands. To that end, in 2003 the New Mexico State Legislature enacted statute 72-2-9.1 clarifying the State Engineer's authority to administer water allocations using the best available information. The State Engineer has since designated the Lower Rio Grande and the Lower Pecos (both in New Mexico) as two top priority Water Master Districts for implementation of this Active Water Resource Management initiative. Under this initiative, the State Engineer has employed Water Masters, directed installation of metering and measuring devices, promulgated general statewide Active Water Resource Management rules and regulations, and is currently in the process of developing basin-specific rules and regulations to begin regulating actual water use in conformance with the prior appropriation doctrine and making use of the "best available" information about individual users' water rights.

In 2005, the New Mexico State Legislature enacted the Strategic Water Reserve. Under this act, the Interstate Stream Commission can acquire water, water rights, and storage to: (1) assist with compliance with compacts and court decrees; and (2) to assist the state and water users in water management efforts for the benefit of endangered aquatic and obligate riparian species or in a program intended to avoid the listing of additional species. The ISC is currently in the process of developing regulations for implementation of this legislation.

The ISC is also in the process of implementing a historic settlement among water users in the Lower Pecos basin. Under the terms of the settlement, a long-running adjudication suit is settled and the state will purchase 18,000 water-righted acres. The purchased acreage will be fallowed and the associated water rights will be transferred to augmentation wells for delivery into the Pecos River for meeting Pecos River Compact obligations within the time frames required by the Supreme Court's Amended Decree. Over time, the need to use the augmentation wells is expected to decrease and flows in the Pecos River in southern New Mexico are expected to stabilize at levels that will allow compact compliance on an ongoing basis.

³⁴<http://www.ose.state.nm.us/water-info/NMWaterPlanning/2003StateWaterPlan.pdf>

Texas Water Bank – The [Texas Water Bank](#)³⁵ was created by the 73rd Texas Legislature through Senate Bill 1 as a mechanism to allow for and assist in the voluntary transfer of water rights between willing buyers and sellers. The transfer may be either temporary or permanent, and in most instances, will require a permit modification from the Texas Commission on Environmental Quality. The Bank is managed by the Texas Water Development Board, which facilitates the marketing and transfer of water and water rights through the provision of information describing availability and needs for water in the State. In mid-2005, 7 deposits and 17 sellers were listed on the Texas Water Bank web site, including 5 in the Rio Grande basin; depositors or sellers are those interested in selling their water right or a portion of that right or temporarily leasing the use of water under that right. The site also listed two entities interested in buying water rights, none in the Rio Grande basin.

Aging Water Infrastructure and Conservation Projects – As pressure has increased on water supplies in the basin, water managers in both countries have paid closer attention to weaknesses in the current distribution system, such as pipes and canals that are old or poorly maintained or facilities that lack the efficiencies built into modern systems.

According to CNA, Mexican hydrological communities along the United States-Mexico border (including those to the west of the Rio Grande basin) have a low rate of efficiency in potable water service with losses averaging around 35%. In the area of Ciudad Acuña-Piedras Negras-Nuevo Laredo, losses are 42% while in Reynosa-Matamoros, they reach 39%. Irrigation efficiency is 37% in the border region where the agricultural sector accounts for 92% of water use. To combat these problems, Mexican water managers are implementing various strategies, including installing meters, charging users based on amount of water used, raising tariffs to fund improvements, and improving irrigation infrastructure to increase efficiency.

In the United States, poor efficiency, especially for irrigation, is also a concern. In many areas, the irrigation district infrastructure is antiquated. The Donna, Texas irrigation district operates a pump station with a century-old steam engine. In the Elephant Butte Irrigation District (EBID) in New Mexico, the distribution system is some 75 years old. Irrigation district efficiencies in the U.S. portion of the Rio Grande basin vary considerably; some districts report efficiency of 40% while others reach 75%+. The State of New Mexico Water Plan states that aging infrastructure “results in tremendous water loss through leakage.”

In the 1990s, the United States Section of the IBWC constructed the Rio Grande American Canal Extension in El Paso, Texas, extending and replacing a canal built in the 1930s with an expanded concrete-lined canal. The project was designed to benefit the El Paso County Water Improvement District #1 by conserving an estimated 20,000 acre-feet (24.67 Mm³) per year.

³⁵<http://www.twdb.state.tx.us/assistance/waterbank/waterbankmain.asp>

Since late 2002, the Border Environment Cooperation Commission (BECC), backed by funds from the North American Development Bank (NADB), has certified numerous water conservation projects in the Rio Grande basin in both the United States and Mexico, projects with combined potential savings in excess of 300,000 acre-feet (370 Mm³). The Donna and Elephant Butte Irrigation Districts are among the beneficiaries. Their projects are typical; in addition to constructing a new pumping station, the Donna district will replace open canals with pipes. EBID will replace open, unlined, earthen irrigation laterals with 48-inch diameter aluminized steel pipe, boosting efficiency from 45% to as much as 65%. Similar projects are being implemented in a number of other irrigation districts in the Lower Rio Grande Valley of Texas.

In the case of Mexico, special attention has been placed on [projects in the Conchos River Irrigation District in Delicias, Chihuahua](#)³⁶ due to the important role of the Conchos River in replenishing Rio Grande flow downstream of Fort Quitman. This irrigation district has surface water rights to more than 760,00 acre-feet (941 Mm³) and covers an area of 173,000 acres (70,000 hectares). The multi-year Project for Modernization and Technical Improvements to the Delicias Irrigation District is estimated to provide annual water savings of 300,000 acre-feet (370 Mm³) upon completion, increasing the overall efficiency in the use of irrigation water from 33% to 55%. Project components include:

- Canal lining and upgrades
- Build, install and rehabilitate control and metering structures in the canals.
- Rehabilitate roads and drains.
- Install modern irrigation systems to improve water use in each parcel.
- Land grading.
- Install interparcel drainage systems to recover salinized soils and/or soil affected by shallow water tables.
- Promote a water culture among users.
- Train utility officials and technical staff.
- Establish and maintain updated water metering and agriculture information systems.

The IBWC took note of the value of the Delicias Irrigation District improvements to the overall well-being of the Rio Grande, referring to them in Minute No. 309. A description of Minute No. 309 follows.

³⁶http://www.cocef.org/aproyectos/ExcomRioConchos2002_10_17ingfinal.htm or http://www.cocef.org/aproyectos/ExcomRioConchos2002_10_17espfinal.htm

Minute No. 309 – Minute No. 309,³⁷ signed July 7, 2003, satisfies the requirements of an earlier agreement, Minute No. 308, which called upon the IBWC to provide observations with respect to the estimated volumes of water saved by the Mexican conservation projects and identify necessary measures to ensure the conveyance of the saved waters to the Rio Grande.

Minute No. 309 notes that once the conservation projects in the Delicias irrigation district and others planned in the Lower Rio Conchos and Rio Florido districts are completed in 2006, an additional estimated volume of 321,043 acre-feet (396 Mm³) will be conveyed to the Rio Grande annually. While the projects are being constructed, less water will be transferred. Completion of the conservation projects is contingent upon the availability of funds. Releases of the conserved volumes from Mexican Dams on the Conchos River will begin in January of each year. The actual volume conveyed to the Rio Grande will vary depending on rainfall, storage, and irrigation releases in the Conchos Basin.

The agreement also provides for IBWC field inspections to view construction and progress of works, verify the efficiencies and savings obtained, and observe the measures necessary to ensure conveyance of the saved volumes to the Rio Grande. The IBWC has conducted two field inspections – one each in 2003 and 2004. Unfortunately, project implementation has been progressing slowly and no significant water transfers have yet been made.

The total investment contemplated for the Mexican conservation projects is more than 1.5 billion pesos (approx. 149 million dollars) of which 40 million dollars is being funded by the North American Development Bank's (NADB) Water Conservation Investment Fund.

Information Technologies – New information technologies are assisting water managers in the basin. The United States Section of the IBWC recently upgraded 55 gaging stations in the United States, including 53 in the Rio Grande basin, which has allowed the United States Section to provide near real-time streamflow, reservoir storage, and precipitation information on the agency's web page at http://www.ibwc.state.gov/html/rio_grande.html. The Mexican Section also provides reservoir storage information on its web page at <http://www.sre.gob.mx/cila/>.

The Center for Research in Water Resources of the University of Texas at Austin, under contract with Mexico's National Water Commission and the State of Texas, developed a Geographic Information System for the Rio Grande basin, which includes complete hydrological information from the binational basin.

The Paso del Norte Watershed Council³⁸ has applied new information technologies in its efforts to achieve a healthy watershed in the Rio Grande sub-basin between Elephant Butte Dam and Fort Quitman, Texas. The Council, which serves in an advisory capacity to the New Mexico-Texas Water Commission, has participants from area universities, municipal

³⁷<http://www.ibwc.state.gov/Files/Minutes/Min309.pdf> or <http://www.sre.gob.mx/cila/ACTAS/309.pdf>

³⁸<http://www.pdnwc.org/>

governments, state and federal agencies, non-governmental organizations, the USIBWC, and Mexican agencies. The Council has recently developed a Coordinated Water Resources Database & GIS to coordinate, compile, and provide timely Internet access to information for use by water management organizations, stakeholders, and scientists. The project was undertaken through collaboration of university scientists, and the cooperation of federal and state agencies, irrigation districts, and water management and user organizations. Financial support was provided by the El Paso Water Utilities and U.S. Army Corps of Engineers. This project is supporting Council efforts to coordinate restoration and enhancement activities in the watershed, to foster communication and collaboration to make the best use of limited resources, and to ensure both ecosystem and economic sustainability in the region.

Computer modeling and electronic databases are increasingly providing valuable management tools. For example, the Colorado Water Conservation Board in conjunction with the [Colorado Division of Water Resources](#)³⁹ has developed the [Rio Grande Decision Support System \(RGDSS\)](#)⁴⁰ to assist in making informed decisions regarding historic and future use of water in the Rio Grande basin. This system provides comprehensive databases; data and models to evaluate alternative water development and administration strategies; a functional, integrated system that can be maintained and upgraded by the state; and information sharing among government agencies and water users.

Another management tool is the [Upper Rio Grande Water Operations Model \(URGWOM\)](#),⁴¹ a reservoir and river simulation model. URGWOM started in 1996 as a collaboration between the United States Bureau of Reclamation, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Geological Survey, the USIBWC, and the U.S. Bureau of Indian Affairs, with assistance provided by other state and local agencies and organizations. The model will incorporate the Rio Grande basin rivers and reservoirs from the Colorado-New Mexico border to Fort Quitman, Texas. The primary purpose of the model is to facilitate more efficient and effective management of water in the Upper Rio Grande Basin. URGWOM will provide a completely linked computer model of this part of the basin to provide daily data for use in multi-agency water operations for accounting, forecasting, planning, predicting daily flows, storage, and other information throughout the system. It will also include a large electronic data collection assembled and available for use by others. URGWOM uses the RiverWare modeling software, customized to fit the Rio Grande basin.

Technology is also being applied in Mexico's water management and conservation programs, including installation of water meters, gaging stations, and automated controls, part of the coordinated effort to boost efficiency for municipal and agricultural users.

³⁹<http://water.state.co.us/>

⁴⁰<http://cdss.state.co.us/overview/>

⁴¹<http://www.spa.usace.army.mil/urgwom/>

Groundwater Availability and Interaction with the River – According to CNA, recharge exceeds groundwater extraction overall in Region VI Rio Bravo where recharge is 4 maf (5082 Mm³) per year and extraction is 3.36 maf (4145 Mm³). Nonetheless, CNA has identified a number of specific aquifers in Region VI as warranting immediate action due to overexploitation. These include the Monclova, Jiménez-Camargo, Cuauhtémoc, and Saltillo aquifers. Another concern is water quality. While most of the aquifers in the region have adequate water quality for their intended use, salinity is a problem in some areas due to excessive freshwater pumping. These regions include the Lower Rio Grande, the area of Ciudad Juarez, Nadoros, south of Monclova, and Cuatrociénegas.

Six aquifers in the Rio Grande basin span the international boundary – Coastal Lowlands Aquifer, Texas Coastal Uplands Aquifer, Edwards-Trinity Aquifer, Presidio Bolson, Hueco Bolson, and Mesilla Bolson. Although significant binational study and modeling of the Hueco and Mesilla Bolsons has been conducted through an effort coordinated by IBWC, data gaps remain for these and other transboundary aquifers. The United States Geological Survey (USGS) has proposed a ten-year study of the transboundary aquifers to determine their boundaries, volumes of water, and water quality.

The USGS Mesilla Basin Monitoring Program and Rio Grande Seepage Investigations conducted in southern New Mexico illustrate the strong connection between the Rio Grande and groundwater in the study area. During the 2003 drought, irrigation deliveries of Rio Grande water were cut by about two-thirds. When irrigation deliveries stopped, the river went dry in the Las Cruces area and shallow groundwater monitoring near the river showed a drastic decline in the groundwater level. By the same token, observations show that as soon as there is water in the river, the groundwater levels go up. Reduced surface water deliveries during the 2003 drought also led to a significant increase in shallow ground-water pumpage to meet irrigation demand, resulting in significant groundwater declines in the shallow water table. Similar declines were noted during the drought period of the 1950s.

USGS studies show that 97% of the recharge to the aquifer in the Mesilla Valley is from surface water – Rio Grande seepage, irrigation canal seepage, and infiltration of applied irrigation water. During the drought, reduced aquifer recharge from low surface water supplies and increased aquifer discharge from additional well pumpage have resulted in declines in the shallow water table and a net loss from aquifer storage. In the 1950s drought, the groundwater levels bounced right back once the drought ended. Although river-groundwater actions have been studied in this part of the basin, in many areas the hydraulic connection between the surface water system and the aquifers is not well understood.

Water for the Environment – In many parts of the basin, surface water is fully allotted for agricultural, municipal and industrial, and other productive applications. At times, this leaves little or no water in the river as there is no right to instream flow or water for habitat preservation.

Over the past several years, nongovernmental organizations have begun to iterate an interest in providing water for environmental uses such as ensuring instream flow or restoring riparian habitat. Some have suggested that there should be a legal right for in-river flows.

In 2001, the Texas Center for Policy Studies presented a paper to the World Wildlife Fund, *[Legal and Institutional Framework for Restoring Instream Flows in the Rio Grande: Fort Quitman to Amistad](#)*.⁴² The paper states, "...Texas regulations and statutes do provide for some protection of water for instream flow especially in the course of environmental assessment and review on a specific permit or permit amendment application. Nevertheless, most of the specific statutory language deals with protection of freshwater inflows to bays and estuaries. There is some controversy over whether instream flow can qualify as a beneficial use for water rights permitting purposes, and no institutional process for how an instream flow permit would be exercised *in practice*." The report mentions the Texas Water Bank and the Texas Water Trust as possible means for acquiring water for instream flow.

According to the paper, other legal means for providing protection for instream flow might include the Endangered Species Act to secure instream flow to sustain endangered species and their habitat or the National Wild and Scenic River designation which covers nearly 200 miles of the Rio Grande from the Coahuila-Chihuahua state line to the Terrell-Val Verde County line.

The paper states that in Mexico there are various legal frameworks that could possibly apply to restore instream flow. These include establishment of Zonas de Veda or Prohibited Zones where the use of surface or groundwater cannot be maintained or increased without affecting sustainable development or inducing negative economic or ecological effects. The Mexican government could also decree federal reserved water rights which can be used for environmental purposes as well as power generation and municipal water needs.

Downstream of Ft. Quitman, Texas the report states that there are three ways that water might be provided. These include by removing salt cedar, an invasive riparian species that consumes significant volumes of water, and by releases from the Conchos River. Another option is to get water via El Paso by purchasing or leasing water from an existing claim above Ft. Quitman. However, this possibility raises complicated legal questions about whether such a right could be obtained and maintained as instream flow for any significant distance.

The Alliance for the Rio Grande Heritage published a document in 2003, *[A Framework for a Restoration Vision for the Rio Grande, Hope for a Living River](#)*,⁴³ which focuses on the river from its headwaters to Candelaria, Texas, 74 miles (119 km) upstream of the confluence with the Conchos River. The document outlines opportunities for restoring the Rio Grande under existing conditions as well as a more visionary approach that looks beyond existing legal constraints.

For example, under existing conditions, the purchase of floodplain or floodplain conservation easements from willing sellers could be a tool to preserve important areas. Better grazing management can also improve riparian conditions. Water conservation and purchase of water rights or land with water rights for environmental purposes are additional measures. The visionary scenario offers recognition of environmental water as a beneficial or authorized use

⁴²<http://www.texascenter.org/publications/instreamflow.pdf>

⁴³<http://www.worldwildlife.org/wildplaces/cd/pubs/VisionReport.pdf>

under state and federal law. Additionally, the report notes, water could be made available for restoration by significantly altering current storage practices such as by storing water underground or in reservoirs with lower evaporation rates.

Other restoration opportunities identified in the document include restoring sinuosity to the channel, lowering the floodplain to allow the channel to flood more frequently, and replacing invasive species with native vegetation. To effect a system-wide restoration effort, the report recommends establishment of a non-profit institution, the Rio Grande Restoration Task Force, with a Board of Directors to include both U.S. and Mexican representatives.

A March 2003 report, *[Water for River Restoration: Potential for Collaboration between Agricultural and Environmental Users in the Rio Grande Project Area](#)*,⁴⁴ commissioned by World Wildlife Fund, recommends allowing private groups to purchase water rights from farmers. This would allow environmental organizations to acquire water and use it as needed for ecological purposes. Farmers could increase income simultaneously with environmental restoration. World Wildlife Fund is interested in working with Elephant Butte Irrigation District to create an environmental water bank in southern New Mexico.

The New Mexico Strategic Water Reserve Act provides a mechanism by which water, water rights, and storage space can be acquired for certain environmental purposes when needed to assist in water management efforts for the benefit of endangered aquatic and obligate riparian species or in a program intended to avoid the listing of additional species as threatened or endangered. The water, water rights, and storage can be donated, leased, or purchased.

In 1997, the State of Texas established a mechanism for voluntary transfer of water rights for environmental purposes. The Texas Water Trust was created as part of the historic water reform law, Senate Bill 1, as a way to protect river instream flows, water quality, fish and wildlife habitat, or bay and estuary inflows. Another benefit is that it provides river flow for recreational activities such as boating and fishing. The trust is part of the Texas Water Bank described earlier in this report. Donations to the Water Trust are tax deductible as charitable contributions. In 2003, the Texas Water Trust received its first donation – 1,236 acre-feet (1.52 Mm³) to provide water for fish and wildlife in the Rio Grande.

During the 2005 legislative session, the Texas Senate passed Senate Bill 3 to authorize the Texas Commission on Environmental Quality to use state water to meet the needs for freshwater inflows to affected bays, estuaries, and instream uses, including those in the Rio Grande basin. Additionally, the bill recognizes environmental flows as high priorities in the water management process and establishes a manner for integrating environmental flow standards into the regional water planning and water permitting process. It also establishes an environmental flows commission, stakeholder committees, and a science advisory committee to address environmental flow issues. Although the bill passed the Senate, the legislative session ended before the full House could vote on the bill.

The Colorado Water Conservation Board has an instream flow water rights program that provides for the appropriation of water flows to preserve the natural environment to a reasonable degree but these are relatively junior water rights. The CWCB can accept interests in water

⁴⁴http://worldwildlife.org/wildplaces/cd/pubs/PhilKing_report.pdf

rights to preserve or improve the environment. Local governmental entities can also appropriate flows for recreational uses such as rafting.

Financing

Funding Needs – In determining water funding needs for the Rio Grande Basin, various sources provide helpful information. These reports detail needs by state, by the entire U.S.-Mexico border region, or the U.S. or Mexican portion of the border region. What can be derived from the estimates is that long-term funding needs for water and wastewater projects in the Rio Grande basin reach into the billions of dollars while the cost of addressing short-term needs reaches into the hundreds of millions of dollars.

In Colorado's Rio Grande basin, population is expected to reach 62,700 by 2030, an increase of 35% over 30 years.⁴⁵ Municipal and industrial demand is expected to increase 25% to 21,700 acre-feet (26.7 Mm³) in the Colorado portion of the basin. Rio Grande diversions for irrigated agriculture in Colorado exceed 1.6 million acre-feet (1973 Mm³) but the number of acres under irrigation is expected to decline statewide as municipal demands increase. Planned municipal water projects are expected to cover much of the future water demand in the coming years. Funding sources in Colorado include federal agencies, the State of Colorado, and local entities, such as water providers and conservation districts.

New Mexico's State Water Plan notes several challenges that must be addressed. These include meeting new federal drinking water standards, which require additional treatment; prolonged drought; demands of endangered aquatic species; and increased wildfires, which threaten watersheds important for water supplies. The plan notes that hundreds of millions of dollars must be invested in water conveyance projects in order to meet future demand.

In the State of Texas water plan, capital costs for water management strategies for the 50-year planning horizon exceed \$1.87 billion for the two planning regions covering counties adjacent to the Rio Grande.

According to the U.S. EPA's Status Report on the Water-Wastewater Infrastructure Program for the U.S.-Mexico Borderlands,⁴⁶ near-term water and wastewater infrastructure needs for the Rio Grande basin along the U.S.-Mexico boundary expressed in U.S. dollars total \$264 million, including \$42 million in the United States and \$222 million in Mexico. Long-term needs are \$1.644 billion, broken down as \$517 million U.S. and \$1.065 billion in Mexico.

A 1999 study of border-wide environmental infrastructure needs by the Southwest Consortium for Environmental Research and Policy and the Border Environment Cooperation Commission identified \$564 million (U.S. dollars) in water infrastructure needs, \$196 million in the U.S. and \$368 million in Mexico, as well as \$2.51 billion in wastewater needs, \$1.739 billion in the U.S. and \$771 million in Mexico.

⁴⁵http://cwcb.state.co.us/SWSI/Report/Exec%20Summary_11-15-04.pdf

⁴⁶<http://www.epa.gov/OW-OWM.html/mab/mexican/usmexrpt/final1b2.pdf>

In 2001, the [North American Development Bank](#) projected five-year grant needs for water and wastewater infrastructure projects at \$943 million (U.S. dollars) border-wide.⁴⁷

Mexico's National Water Commission (CNA) projects that Mexico's northern border region will need to invest \$39,200 million pesos in water projects from 1999-2025, with 40% of that funding for potable water, 24% for irrigation improvements, and 30% for sewer and sanitation projects. CNA also breaks down funding needs by region. Table 3 lists needs in the zones that include the Rio Grande basin.

Table 3, CNA northern border water and wastewater investment needs by zone and time frame (in millions of pesos)

Zone	Short 2000-2006	Medium 2007-2015	Long 2015-2025	Total
Chihuahua	1,984	2,321	1,931	6,236
Acuña-Piedras Negras-Nuevo Laredo	2,071	3,319	2,805	8,195
Lower San Juan Irrigation District 026	1,036	874	215	2,125
Reynosa- Matamoros	2,166	3,374	3,019	8,559
TOTAL	7,257	9,888	7,970	25,115

Funding Sources – To implement proposed water projects in the Rio Grande basin, various funding sources are available including monies from state and federal government, bi-national institutions, and multinational sources. Some of these sources are described below.

CNA has identified various funding sources for short-term (2000-2006) investment in water projects in Mexico's entire northern border region as follows: federal government (18%), state government (15%), U.S. EPA (15%), utility operators or credit (34%), and irrigators (18%). The plan also contemplates water tariff increases in some regions.

[Banobras](#),⁴⁸ Mexico's development bank, was established by the federal government to finance infrastructure and public services. Banobras operates credit schemes that have been used

⁴⁷http://www.nadb.org/Reports/publications/eng/Five_Year_Outlook.pdf

⁴⁸<http://www.banobras.gob.mx/>

by water agencies such as the Infrastructure Investment Fund (FINFRA), which seeks to maximize the multiplier effect of federal resources by mixing them with private investment. The objectives of Banobras include financing projects for state government, municipalities and decentralized organizations; promoting private investment and financing infrastructure and public service projects; and strengthening financial and institutional capabilities of local government.

The International Boundary and Water Commission has funded sanitation and water storage/conservation projects in the border region.

In the United States, the U.S. Departments of Agriculture and Housing and Urban Development have provided funding for water and wastewater systems in border colonias. U.S. border communities can also borrow funds from tax-exempt bond markets or state revolving funds. Recognized border tribal governments receive infrastructure funding directly or through the Indian Health Service.

The United States Environmental Protection Agency (EPA) has provided subsidies for water and wastewater projects. EPA places these funds into the Border Environment Infrastructure Fund (BEIF) administered by NADB. BEIF-funded projects in Mexico require compliance with eligibility criteria such as BECC certification of projects, transboundary impact, and provision of an equal match of Mexican funds. Due to funding limitations, criteria were recently applied for prioritizing projects for eligibility to receive funds. EPA also has the Project Development Assistance Program (PDAP), used for providing grants for preliminary engineering and design studies needed to apply for certification by the Border Environment Cooperation Commission (BECC).

The New Mexico Finance Authority (NMFA) currently manages a number of grant and loan programs for water and wastewater projects, including several federal funding programs in conjunction with the New Mexico Environment Department's Drinking Water Bureau. The Legislature also appropriates money on an annual basis for individual projects. The New Mexico Water Trust Board (WTB) was created to prioritize and fund water projects. The intent of the WTB legislation was to provide a substantial funding source to match federal funds for large water projects. The legislation also created the Water Trust Fund and the Water Project Fund (which would receive interest from the Water Trust Fund). No money has yet gone into the Water Trust Fund, which would require a substantial endowment to generate adequate annual funding. New Mexico dedicates 10% of the Severance Tax Bond Proceeds to the Water Project Fund, generating an average of \$10 million per year.

The Texas Water Development Board (TWDB) provides loans to local governments for projects related to water supply and conservation, water quality, and wastewater treatment, among other water projects. Both grants and loans are available for the water and wastewater needs of the state's economically distressed areas. TWDB financial assistance programs are funded through state-backed bonds, a combination of state bond proceeds and federal grant funds, or limited appropriated funds. The TWDB's Clean Water State Revolving Fund (CWSRF) offers low-interest loans to finance costs associated with the planning, design, construction, expansion or improvement of wastewater treatment facilities, wastewater recycling and reuse facilities, collection systems, stormwater pollution control projects, and nonpoint source pollution control projects. The TWDB also administers the Drinking Water State

Revolving Fund (DWSRF), providing low-interest loans for financing public drinking water systems.

The North American Development Bank (NADB) is another important funding institution. Created under the auspices of the North American Free Trade Agreement, the [NADB](#)⁴⁹ is an international financial institution established and capitalized in equal parts by the United States and Mexico for the purpose of financing environmental infrastructure projects in the border region. All NADB-financed environmental projects are certified by the Border Environment Cooperation Commission (BECC); projects related to potable water supply, wastewater treatment, or municipal solid waste management are the primary focus of the Bank's activities. The NADB's mission is to serve as a binational partner and catalyst in communities along the U.S.-Mexico border in order to enhance the affordability, financing, long-term development, and effective operation of infrastructure that promotes a clean, healthy environment for the citizens of the region.

In 2002, the NADB Board of Directors established the Water Conservation Investment Fund with a total of \$80 million (U.S. dollars), \$40 million for projects in each country. NADB selected 20 U.S. projects to receive funding, including 16 in the Rio Grande basin (including the EBID and Donna Irrigation District Hidalgo County #1 mentioned previously). The Mexican government invested its share of the NADB funds in the Irrigation District 005 Delicias project in Chihuahua.

The [Inter-American Development Bank \(IDB\)](#)⁵⁰ supports economic and social development and regional integration in Latin America and the Caribbean. It does so mainly through lending to public institutions, but it also funds some private projects, typically in infrastructure and capital markets development. The IDB is owned by its 46 member countries, including the United States and Mexico.

The [World Bank's](#)⁵¹ mission is to fight poverty and improve the living standards of people in the developing world. It is a development bank which provides loans, policy advice, technical assistance and knowledge sharing services to low and middle income countries to reduce poverty. In 2003, the World Bank approved the Integrated Irrigation Modernization Project for Mexico. The main objective is to improve the competitiveness of irrigated agriculture and the efficiency of irrigation water use. In the 1990s, the World Bank was involved in a Water Resources Management Project in Mexico to: 1) promote conditions for environmentally sustainable, economically efficient, and equitably allocated use of water resources in Mexico; 2) support the integrated comprehensive management of water resources; and 3) increase the benefits and reduce the risk related to existing hydraulic infrastructure. Secondary objectives related to groundwater conservation, water quality, improved water resources planning, and water rights administration.

⁴⁹<http://www.nadb.org>

⁵⁰<http://www.iadb.org/>

⁵¹<http://www.worldbank.org/>

Other water projects in the basin have been funded through public-private partnerships. Examples of these include the Ciudad Juarez, Chihuahua wastewater treatment plants and the City of Laredo, Texas water service.

In addition to the funding sources listed above, local governments, water utilities, private companies, and irrigation districts continue to make significant investment in water infrastructure in the border region. These investments have targeted irrigation district conservation projects, municipal water supply projects, industrial pre-treatment efforts, and water reclamation plants, among others.

Conclusion

The intent of presenting this document in advance of the Binational Rio Grande Summit is to provide participants with useful background information so that they have a knowledge base of the most relevant aspects of conditions in the basin and of the efforts undertaken by both countries separately and jointly. The information presented here is only a starting point, to be complemented by the presentations and work group discussions at the Summit itself, in order to develop recommendations for the sustainable management of the Rio Grande basin. These resources combined will enable those with an interest in the Rio Grande basin to work together more effectively in the future to craft strategies for the basin's well-being for the next generations.