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Cover photo: Anzalduas Dam in Hidalgo County. Photo courtesy of the Texas Water Development Board.

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Commentary: The price Texas pays for Mexico's water debt

Carlos Rubinstein [1, 2]

Editor's Note: The opinion expressed in this commentary is the opinion of the individual author and not the opinion of the Texas Water Journal or the Texas Water Resources Institute.

Abstract: The Lower Rio Grande Valley of Texas is not only a cultural gem but also a significant contributor to our state's economy. Since the region is largely dependent upon the Rio Grande for its water supply, it is critical that those states and nations with which we share common borders comply with state, federal, and international agreements regarding the river. Since the early 1990s, Mexico has consistently failed to meet its obligations to the treaty signed in 1944 that allocates waters in the lower reach of the Rio Grande. Mexico's repeated failure to comply with the treaty has caused severe economic hardship to Texas communities and farmers. Despite numerous efforts, Mexico continues to resist entering into a productive discussion and commitment to honor the treaty. A meaningful resolution to this issue will require active participation from the U.S. Department of State, the White House, and Texas officials.

Keywords: Rio Grande, compact, Mexico, Lower Rio Grande Valley

[1] Chairman, Texas Water Development Board, and former Commissioner, Deputy Executive Director, and Rio Grande Watermaster of the Texas Commission on Environmental Quality

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*Corresponding author: kathleen.ligon@twdb.texas.gov

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Terms used in paper

Descriptive name	Short name or acronym
Lower Rio Grande Valley	Valley
Texas Water Development Board	TWDB
International Boundary and Water Commission	IBWC

INTRODUCTION

In Texas, we know that when it rains, it pours. And then sometimes it doesn't rain much at all for a very long time. Our notoriously variable weather and semiarid climate necessitate long-range planning and responsible conservation, management, and development of our water resources. An important component of these efforts is reasonable and reliable cooperation with those states and nations with which we share common borders and accompanying natural resources. Sustainable development of not only the United States and Mexico border region, but also the Western states of the United States and Northwest states in Mexico, demands such cooperation.

Because of our state's notoriously flashy precipitation patterns, we must utilize reservoirs—the cornerstone of surface water management in Texas—as an important means to provide reliable water supplies in times of scarcity (Ward 2011). The basin of the mighty Rio Grande is no exception. After the introduction of large-scale irrigation and the building of the railroad around the turn of the 20th century, the Lower Rio Grande Valley (Valley) of Texas experienced spectacular development (Vigness and Odintz 2015). Early settlers of Cameron, Hidalgo, and Starr counties in particular found that the natural, unregulated flows of the river were either too low to support irrigated agriculture or so high that heavy flooding damaged towns and irrigated lands. Agricultural development, along with serious flooding, continued through the 1930s and 1940s, increasing the sense of urgency to fairly allocate and regulate the waters of the lower reach of the Rio Grande (Jarvis 2005).

Reaching an agreement on the allocation of waters in both the upper reach—from the river's headwaters in Colorado to Fort Quitman, Texas—and the lower reach—from Fort Quitman to the Gulf of Mexico—took many years. Early agreements in the 1800s and in 1906 addressed the international boundary and flows in the upper reach, but it wasn't until 1944 that the United States and Mexico agreed on allocation of the waters in the lower reach[3].

The 1944 Treaty, "animated by the sincere spirit of cordiality and friendly cooperation," called for the construction of reservoirs along the international border and allocated water in the river based on a percentage of flows from each country's tributaries (Treaty Series 994, 1944). It stipulated that one-third of the flow of the Rio Conchos, Rio San Diego, Rio San Rodrigo, Rio Escondido, Rio Salado, and Las Vacas Arroyo in Mexico (Figure 1) was allotted to the United States and required a delivery from these named tributaries in Mexico to the United States of not less than an average of 350,000 acre-feet of water annually within cycles of 5 consecutive years[4]. The treaty specified that Mexico can only deliver less than this annual average amount during a 5-year cycle in the event of an "extraordinary drought." Like the earlier 1906 Convention, the International Boundary and Water Commission (IBWC) was given the responsibility for implementing the 1944 Treaty[5]. Many of the details of implementation were left to the U.S. Department of State and the Mexican Ministry of Foreign Relations (Jarvis 2005).

New reservoirs were a key component to this agreement, greatly enhancing the ability to deliver a dependable supply of water to users in both countries (RJ Brandes 1998). Construction of Amistad Dam and Reservoir, named for the Spanish word for "friendship," began in December 1964 and was completed in November 1969. The lake surface covers 89,000 acres in southern Val Verde County. With an original conservation storage capacity of 3.5 million acre-feet[6] (TWDB 2012), Amistad is the second largest reservoir in Texas.

Work on International Falcon Reservoir, bounded by Starr and Zapata counties, began in 1951 and was completed in April 1954. Like Amistad, Falcon is a very large reservoir, ranking number 5 in the state with an original conservation storage capacity of 2.8 million acre-feet (TWDB 2012). Both Amistad and Falcon are jointly owned by the United States and Mexico and operated as a system by the IBWC, with each country having storage capacity in both reservoirs. When Amistad and Falcon are at or below conservation capacity, the release of U.S. water is at the call of the Texas Rio Grande Watermaster. Like many Texas reservoirs, Amistad and Falcon have provided flood control benefits that far exceeded the costs of their construction. Falcon Dam retained a flood shortly after it was completed in 1954, preventing catastrophic flooding in the Valley (TBWE 1958).

The importance of the waters of the Rio Grande, both historically and today, cannot be overstated. The United States' share of the combined firm yield[7] of Amistad and Falcon reservoirs is more than 1 million acre-feet, with about 87% of the

[3] The treaties and various orders have also set forth operating and accounting procedures regarding reservoir storage, river diversions, flood control, and other matters (RJ Brandes 1998).

[4] In return, Mexico received 1.5 million acre-feet of water each year from the Colorado River, which drains into Mexico at the California-Arizona border.

[5] The Texas Commission on Environmental Quality Rio Grande Watermaster is responsible for water accounting and the day-to-day operation of the water delivery system in the middle and lower basin of the Rio Grande in Texas.

[6] An acre-foot is the volume of water needed to cover 1 acre to a depth of 1 foot; it equals 325,851 gallons.

[7] Firm yield represents the maximum water volume a reservoir can provide each year under a repeat of the state's drought of record, the period of time during recorded history when natural hydrological conditions provided the least amount of water supply. For Texas as a whole, the drought of record is generally considered to be from about 1950 to 1957.

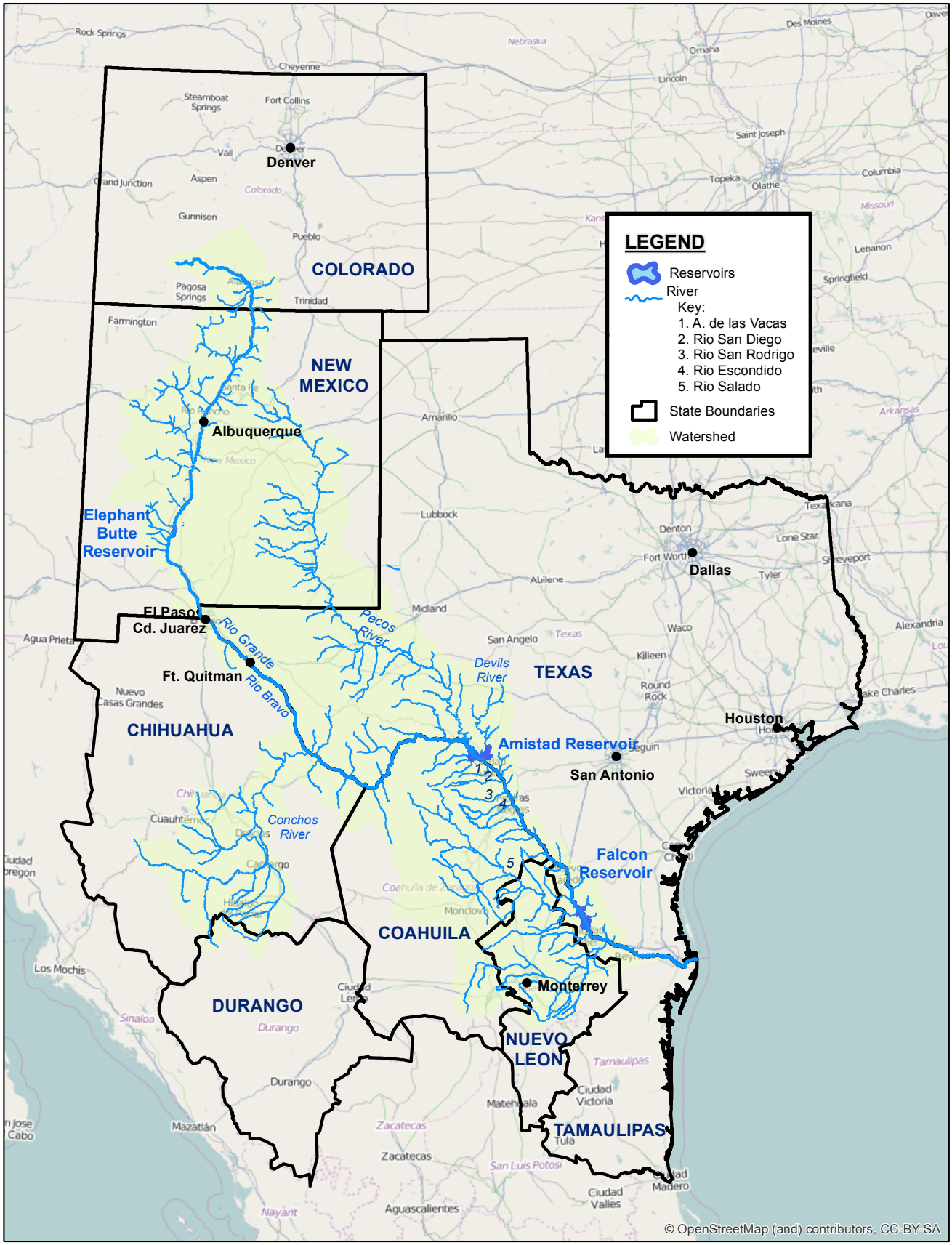

Figure 1. Rio Grande Basin.

United States' surface water rights going to Cameron and Hidalgo counties in the Valley. Surface water from the Rio Grande provides more than 90% of the region's water supply, with agricultural irrigation making up the largest share of water demands (TWDB 2012).

The Valley was a far different place in 1944 when the 2 international reservoirs were contemplated in the treaty. The total population of Starr, Cameron, Hidalgo, and Willacy counties in the 1940 census was only a little more than 200,000 (Texas Almanac 2015). Like in the early 1900s, and at the time the treaty was signed, the Valley developed around and relied upon the various irrigation districts to "lift" water from the Rio Grande and convey it to irrigated lands as well as developing municipal and industrial centers.

A notable change over the decades since the signing of the treaty is the method and extent that water supply planning is done in the state. In response to the drought of the 1950s, the Texas Legislature created the Texas Water Development Board (TWDB) in 1957 to plan to meet the state's future water needs and help communities develop adequate water supplies. In 1997, the legislature established a new water planning process based on a consensus-driven approach at the regional level.

The Rio Grande Regional Water Planning Area, delineated by the TWDB for regional water planning purposes, includes Starr, Cameron, Hidalgo, and Willacy counties in the Valley along with Jim Hogg, Maverick, Webb, and Zapata counties along the Texas-Mexico border. It is the fastest growing of the state's 16 planning regions, now home to more than 1.6 million Texans (Figure 2). The region's population is projected to increase to more than 4 million residents by 2070, with 3.2 million of those residing in the 4 counties of the Valley. As a true river delta, the Valley's economy has historically been based in agriculture but has seen recent growth in trade, services, manufacturing, and hydrocarbon production. Gross regional product quadrupled from $5.3 billion in 1970 to more than $20 billion in the 2000s (NRS Consulting Engineers 2010).

Without a reliable water supply, the region cannot sustain growth or support its current population. Since all planning is predicated on compliance with the law, it is critical that all states and nations comply with state, federal, and international agreements regarding the Rio Grande, or planning itself is futile. The following sections detail how the river is governed, how Mexico's failure to comply with the 1944 Treaty impacts this culturally and economically important region of our state, and what steps need to be taken to curb Mexico's current water deficit[8].

GOVERNANCE OF THE RIO GRANDE

Governance of the Rio Grande is a complicated matter involving not only 2 nations but also 3 U.S. states. The Rio Grande originates in southwestern Colorado and northern New Mexico where it derives its headwaters from snow melt in the Rocky Mountains. The river flows southward through New Mexico and then forms the international boundary between Mexico and Texas. The Rio Grande's total length is almost 1,900 miles, with approximately 1,248 miles making up the international boundary.

The waters of the Rio Grande and its tributaries are used for recreational, agricultural, and municipal uses. In New Mexico, Elephant Butte Dam and Reservoir, approximately 125 miles north of El Paso, can store more than 2,000,000 acre-feet of water from the Rio Grande to meet irrigation demands in the Rincon, Mesilla, El Paso, and Juarez valleys. Below Elephant Butte Reservoir, flow in the river is somewhat controlled by releases from Caballo Reservoir (Caballo Reservoir can store more than 325,000 acre-feet of water), receiving water released from the upstream Elephant Butte Reservoir in southern New Mexico. The Rio Grande's flow above Fort Quitman, Texas, is diverted for irrigation purposes at Percha, Leasburg, and Mesilla dams in New Mexico and at American Dam in Texas. Water is also diverted at the International Dam to supply irrigation demand in Mexico as stipulated by the treaty.

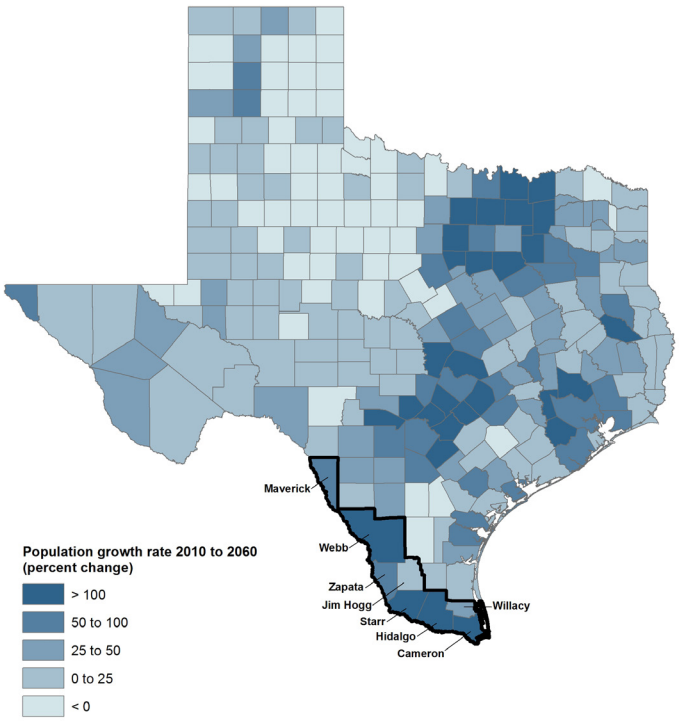

Figure 2. Projected population growth in the Rio Grande Regional Water Planning Area.

[8] While the focus on this paper is on Mexico's lack of compliance with the 1944 Treaty, New Mexico's lack of compliance with the Rio Grande Compact and the IBWC's water accounting practices at Fort Quitman are equally important issues in the Rio Grande Basin that demand attention.

Downstream from El Paso to Fort Quitman, flow in the river consists mostly of treated municipal wastewater from El Paso, untreated municipal wastewater from Juarez, and irrigation return flow. Below the El Paso-Hudspeth county line, flow consists mostly of irrigation return flow and occasional floodwater and runoff from adjacent areas. The flow from Fort Quitman to Presidio is frequently intermittent and the section is often referred to as the "Forgotten River" reach of the Rio Grande. The river becomes a permanent stream when it is joined by the Mexican tributary, the Rio Conchos, just upstream of Presidio. From Presidio downstream until it reaches Amistad Reservoir near Del Rio, the Rio Grande often lacks sufficient flow to adequately support minimum recreational, environmental, or agricultural needs (NRS Consulting Engineers 2010).

Because its waters are shared between 3 U.S. states and Mexico, a system of federal, state, and local programs and agreements has been developed to oversee the management of the Rio Grande. In addition to the 1944 Treaty, the following provide a legal framework for its management:

1906 Convention between Mexico and the United States (1906 Convention): The 1906 Convention between the United States and Mexico obligates the United States to deliver 60,000 acre-feet of water annually from the Rio Grande to Mexico at no cost and in accordance with a monthly distribution schedule from February through November. The IBWC and the Comisión Internacional de Límites y Aguas are the designated bi-national agencies that oversee the yearly delivery of international waters to Mexico. The U.S. Bureau of Reclamation calculates the allocations in coordination with the IBWC. During times of reduced water allocations to the U. S. water users, Mexico's allocation is reduced proportionally. Article IV of the 1906 Convention stipulates that "…in consideration of such delivery of water, 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[9] and Fort Quitman, Texas…"

Rio Grande Compact: Signed in 1938 between the states of Colorado, New Mexico, and Texas, the compact was ratified by the U.S. Congress and approved by the President of the United States[10]. The purpose of the compact is to equitably apportion the waters of the Rio Grande Basin above Fort Quitman and to schedule deliveries of water. The Texas Rio Grande Compact Commission administers the compact to ensure that Texas receives its equitable share of quality water from the Rio Grande as apportioned. The interstate commission is composed of 1 representative from each state:

- the State Engineer of Colorado
- the State Engineer of New Mexico
- an appointee by the Governor of Texas

Rio Grande Project: The Rio Grande Project is a federal irrigation and storage reclamation project administered by the U.S. Bureau of Reclamation. The project's primary facilities are Elephant Butte and Caballo reservoirs in New Mexico and diversion dams at the headings of main canals. The project delivers water to the Elephant Butte Irrigation District and the El Paso County Water Improvement District No. 1. The Elephant Butte Irrigation District encompasses project lands in New Mexico south of Caballo Reservoir, and the El Paso County Water Improvement District No. 1 encompasses project lands in El Paso County, Texas. Since 1941, the water improvement district has delivered water to the city of El Paso for municipal and industrial use through contracts between the district, the city, and the U.S. Bureau of Reclamation. The project also delivers water to Mexico in accordance with the 1906 Convention. Thus, the Rio Grande Project, the Rio Grande Compact, and the 1906 Convention are inextricably linked.

1944 TREATY COMPLIANCE

The provisions of the 1944 Treaty worked well for more than 50 years, even throughout the drought of the 1950s (Jarvis 2005). Since a drought in the early 1990s, however, Mexico has repeatedly—and what would appear to be also systematically—failed to meet its obligations in the 2 treaty cycles between 1992 and 2002 and is currently behind on its water deliveries in the current cycle that began October 25, 2010 and will end October 24, 2015.

As of December 20, 2014, Mexico's deficit to the United States was 270,996 acre-feet (TCEQ 2015), an amount of water that exceeds the total net water use of the city of Dallas in 2012[11] (TWDB 2015). Earlier in the current cycle, Mexico's deficit to the Rio Grande was in excess of 480,000 acre-feet. Effective awareness and direct involvement by Texas' delegation in Congress, as noted below, and state leadership have contributed in reducing the deficit to its current level. While the 1944 Treaty allows for less than average deliveries by Mexico during periods of extraordinary drought, Mexico consistently

[9] Per Article 1 of the 1906 Convention, the Mexican Canal is where the head works of the Acequia Madre, known as the Old Mexican Canal, now exist above the city of Juarez, Mexico.

[10] The treaty was ratified by the U.S. Senate on April 18, 1944, and signed by President Harry S. Truman on November 27, 1945.

[11] Estimated total net water use includes municipal, industrial, and power water use as estimated annually by the TWDB Water Use Survey.

operates the basin to deliver less than the minimum, even when extraordinary drought conditions do not exist. The term "extraordinary drought" is not defined in the treaty; however, the North American Drought Monitor includes a designation of "extreme" as the highest form of drought—conditions that have not existed in Mexico's portion of the basin since 2012.

A fundamental issue is that Mexico does not recognize the United States as a user entitled to water from the tributaries named in the treaty. Mexico has constructed an extensive system of reservoirs, many within the basin of the Rio Conchos, with combined storage capacity approximately 2.5 times the country's available conservation storage in Amistad and Falcon reservoirs. All water in these reservoirs in the interior of Mexico is allocated solely to meet Mexico's demands (NRS Consulting Engineers 2010).

Additionally, Texas continues to challenge the way Mexico and, unfortunately, some at the U.S. State Department, choose to interpret Article IV(B)(c) and the closing statement under the same Article IV that references **annual** deliveries to the Rio Grande by Mexico under the 1944 Treaty as noted below (emphasis added):

> *…(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… … 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 runoff 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…*

Texas interprets these treaty provisions as requiring a minimum annual delivery of 350,000 acre-feet, except when extraordinary drought conditions do in fact exist. To the extent that extraordinary drought conditions exist that "make it difficult" for Mexico to deliver the annual minimum contribution to the Rio Grande of at least 350,000 acre-feet, then average annual deliveries can be contemplated to make up such deficiencies. In other words, Mexico should operate its portion of the basin to deliver to the United States at least 350,000 acre-feet annually, not bet on periods of dry weather to excuse lack of compliance, and only periods of abundant rain to deliver the minimum required annual amount.

Texas has taken extraordinary steps to encourage the U.S. Department of State to engage in discussions regarding the water debt, including letters from me, former Governor Perry, Senator John Cornyn, the Texas congressional delegation, state Representative Eddie Lucio, III, and former Texas Agriculture Commissioner Todd Staples, requesting this issue be elevated to the highest levels of the federal government for resolution. During the 2013 Texas Legislative Session, House Concurrent Resolution 55 was adopted asking the federal government to resolve the issue. Congressman Filemon Vela and Senator Cornyn developed and gained adoption of additional legislation to require specific reporting from the Department of State on efforts to get Mexico to comply with the treaty.

Water officials from the United States, Texas, and Mexico have met on numerous occasions in El Paso, San Diego, and Mexico City to address these issues, but Mexico continues to resist entering into a productive and earnest discussion and commitment to honor the treaty and schedule delivery of at least the minimum amount of water on an annual basis. Members of the United States section of the IBWC and from the TWDB have developed a model based on naturalized flows that could be relied upon to better manage the basin and equitably distribute its waters. Mexico has refused to enter into any meaningful discussions regarding the model and has yet to enter into any delivery agreement or to set aside water for treaty compliance. Until the federal government engages in a more serious manner, it is expected that Mexico will continue to disregard the treaty[12].

IMPACTS OF THE WATER DEFICIT

Mexico's repeated failure to comply with the treaty has caused severe economic hardship not only to Texas farmers who rely on the river to irrigate their crops but also to cities in the Valley that rely on agricultural water deliveries to help carry drinking water to their communities. Opportunities for developing additional water supplies in the Valley are limited, mostly because few opportunities exist to increase the water supply yield of the Rio Grande. The 2006 Rio Grande Regional Water Plan recommended a number of water management strategies to meet shortages during drought, including conservation, wastewater reuse, groundwater development, and desalination; however, the river will remain an invaluable water supply resource over the 50-year water planning horizon.

[12] Previous water debt negotiations have involved not only the U.S. State Department but also presidents of the United States and Mexico.

Between 1992 and 2002, Mexico accumulated a debt of 1.5 million acre-feet of water that had a severe impact on Texas agriculture. As Mexico's water debt grew, irrigated agricultural acreage in the Valley decreased, with the number of acres of irrigated cropland in Cameron, Hidalgo, Starr, and Willacy counties falling by 14% (HRO 2002). Texas A&M University studies showed that the Valley lost nearly $1 billion in decreased economic activity and 30,000 jobs as a direct result of Mexico's failure to comply with its treaty obligations over the period from 1992 to 2002 (NRS Consulting Engineers 2010).

The impacts of the current water deficit are expected to have similar consequences, with ripple effects extending well beyond agriculture. A 2013 Texas A&M AgriLife study identified that a loss of irrigation water in the Valley endangers about 4,800 jobs and reduces agricultural output by about $395 million annually (Ribera et al. 2013).

The lack of water deliveries by Mexico has also already put the municipal water supply of several communities in Cameron, Hidalgo, and Willacy counties at risk, since transportation of raw surface water in the Valley from the Rio Grande to the end users occurs mostly through irrigation district conveyance systems. These conveyance systems are networks of mainly open canals or resacas[13] that need to be full or "charged" in order to move water through the system to both agricultural irrigation users and municipal users. When farmers are actively irrigating and irrigation water is available, this does not present any particular problem or concern. However, when irrigation water use is curtailed, many communities dependent on the Rio Grande system have to purchase "pushwater" to move water through the irrigation systems to their water treatment plants. The cost of pushwater, depending on the length and severity of conditions, can be extremely burdensome for communities. The TWDB and the Texas Department of Agriculture have recently provided financial assistance to several public water supply systems as a result of emergency water supply issues caused by drought and Mexico's lack of treaty compliance (Table 1, Figure 3)[14]. Some of these entities have come within less than a month of running out of water entirely[15].

CURBING THE DEFICIT

Allowing the current water deficit to continue and tolerating future non-compliance will have severe negative impacts on Texas. The United States has never failed to meets its obligation to deliver 1.5 million acre-feet from the Colorado River to Mexico under the same treaty; Texas is simply requesting that Mexico treat its obligation to the Rio Grande in the same manner.

There are ways to curb the deficit and for Mexico to begin meeting its delivery obligations, but such a resolution will require contributions from various sources, including direct, meaningful, and active participation from the U.S. Department of State, the White House, and Texas officials.

The following actions should be pursued:

- At minimum, Mexico should commit to not allowing the current deficit to grow beyond its current level. Mexico could ensure all of its tributaries to the Rio Grande collectively contribute an average of 958 acre-feet per day for allocation to the United States.
- Mexico needs to recognize the United States as a user of water under the treaty. Mexico should set water aside in its annual allocation processes and reservoir operation plans to deliver a minimum of 350,000 acre-feet per year on average to the United States.
- Mexico's internal and international reservoir operation plans should be modified and upstream reservoirs should be called on to address the demands of downstream reservoirs and users. While Mexico's deficit to the United States grew during the current cycle to more than 483,000 acre-feet at one point and remains at more than 270,000 acre-feet, Mexico allowed its lowermost reservoir on the Rio Conchos, the Luis Leon Reservoir, to store water well above conservation capacity. Mexico has also allowed other reservoirs on the Conchos to remain at or above conservation. A portion of this water coupled with the utilization of water from other sources, as described below, could help address the deficit and Mexico's annual average water obligation.
- Article IX of the treaty and a subsequently negotiated binding agreement called Minute 234 provide Mexico great flexibility in apportioning water to the United States. For example, the Rio San Juan, which enters the Rio Grande below Falcon Reservoir, is normally allocated 100 percent to Mexico. During the previous debt, Mexico allowed portions of this source to be allocated to the United States to the extent it could be beneficially used. This water was credited towards reducing the debt at that time. Such flexibility should continue to be pursued from this and other numerous Mexican tributaries to the Rio Grande to address the annual average delivery requirement and the current deficit. Recent actions by Mexico indicate that this flexibility remains a possibility but can only be considered if the "committed" water is reliably and predictably delivered to the Rio Grande to meet specific "called for" Texas water needs.

[13] Resacas are former channels of the Rio Grande commonly developed as reservoirs and channels for irrigation water.

[14] This list does not include projects funded through other mechanisms.

[15] The projected number of days to run out of water is based on data self-reported by the water system to the Texas Commission on Environmental Quality.

Table 1: Emergency water supply projects in the Lower Rio Grande Valley.

Public Water Supply System	Population Served	Water Supplier	Project Cost	Project Description
City of Elsa	5,660	Hidalgo Water Control and Improvement District No. 9	$1.3 million	TWDB Drinking Water State Revolving Fund assistance for construction of an emergency interconnection with Engleman Irrigation District to provide a secondary source of raw water.
City of Raymondville	11,114	Delta Lake Irrigation District	$350,000 (TDA); $3,800,000 (TWDB)	Texas Department of Agriculture Disaster Relief funding to rehabilitate well; TWDB Drinking Water State Revolving Fund for reverse osmosis, wastewater reclamation, and raw water reservoir expansion.
City of Rio Hondo	2,356	Cameron County Irrigation District No. 2	$3,793,916	TWDB Drinking Water State Revolving Fund assistance for several emergency water supply measures, including purchasing push water from Cameron County Irrigation District No. 2, constructing an emergency interconnection with the City of Harlingen, and rehabilitating the ground and elevated storage tanks at the City's water treatment plant.
East Rio Hondo Water Supply Corporation	19,904	Cameron County Irrigation District No. 2	$1,970,000	TWDB Drinking Water State Revolving Fund assistance for construction of raw water pump station and water transmission line to transfer water from Cameron County Irrigation District No. 6, a new source. Also construction of water line to eliminate bottleneck between the east and west portions of distribution system.
City of Lyford	1,973	Delta Lake Irrigation District	$350,000	Texas Department of Agriculture Disaster Relief funding for new well.

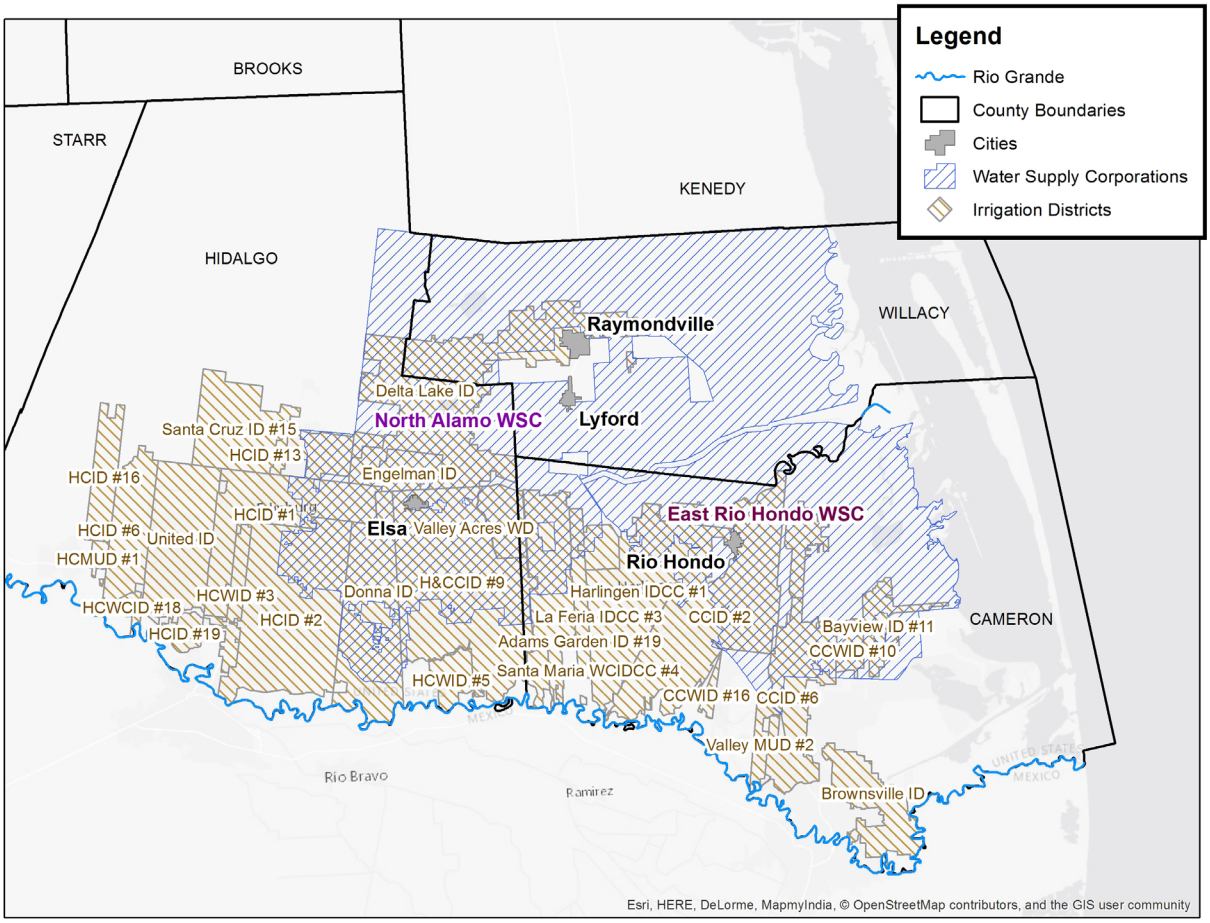

Figure 3. Water suppliers with emergency water supply projects in the Lower Rio Grande Valley.

- IBWC needs to recognize the valid challenge of how the water at Fort Quitman should be accounted. The current accounting by IBWC gives one-half of this water to Mexico, while the binding 1906 Convention clearly allocates 100% of these flows to the United States. Texas' position is that the 1944 Treaty does not grant Mexico any ownership of these flows.
- The U.S. representative of the IBWC must resolve and acquire the 78,000 acre-feet of water used to address water salinity issues created by Mexico's inadequate operation of El Morillo Drain. This is water Texas needs and has requested on numerous occasions with no resolution from the IBWC as of this writing.
- IBWC needs to take a stronger and more proactive management role in stopping illegal diversions of Texas water by Mexico in all reaches of the Rio Grande.

In the spirit of friendship and cooperation—highlighted as the original motivation of the 1944 Treaty—the highest levels of our 2 governments should come together to resolve this issue. Lack of compliance with the 1944 Treaty has become a significant bilateral irritant in the past and threatens to remain one in the future. Since water is certainly not the only natural resource to span the international border, and Mexico looks to soon begin development of its extensive oil and gas reserves, we hope that we can work cooperatively so that both of our countries can fairly share water and benefit economically from the development of our natural resources.

REFERENCES

RJ Brandes Company, Michael Sullivan & Associates, Inc. 1998. The international reservoirs operations and drought contingency planning study for the Middle and Lower Rio Grande. Prepared for the Texas Water Development Board. Austin (Texas). Contract No.: 95483142. Available from: http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/95483143.pdf

[HRO]. House Research Organization. 2002. Mexico's water debt: behind the U.S.-Mexico water treaty dispute. (Interim News). Austin (Texas): Texas House of Representatives. Number 77-7.

Jarvis G. 2005. Legal and institutional aspects of international water allocation on the Rio Grande. In: Binational Rio Grande Summit, Cooperation for a Better Future, Proceedings: Reynosa (Tamaulipas) and McAllen (Texas) [Internet]. Available from: http://glennjarvis.com/water-rights-adjudication/Legal_and_InstitutionalAspectsofInternationalWaterAllocationontheRioGrande_2005.pdf

NRS Consulting Engineers. 2010. 2011 Rio Grande regional water plan [Internet]. Rio Grande Regional Water Planning Group. Prepared for the Texas Water Development Board. Austin (Texas). Available from: http://www.twdb.texas.gov/waterplanning/rwp/plans/2011/index.asp#region-m

Ribera LA, McCorkle D. 2013. Economic impact estimate of irrigation water shortages on the Lower Rio Grande Valley agriculture [Internet]. College Station (Texas): Texas A&M AgriLife Extension. Available from: http://www.twdb.texas.gov/newsmedia/water_deficit/doc/economic-impact-LRGV.pdf

Texas Almanac. 2015. Population history of counties from 1850-2010 [Internet]. Austin (Texas): Texas State Historical Association. Available from: http://www.texasalmanac.com/topics/population

[TBWE] Texas Board of Water Engineers. 1958. Texas water resources planning at the end of the year 1958, a progress report to the Fifty-Sixth Legislature. Austin (Texas): Texas Board of Water Engineers.

[TCEQ] Texas Commission on Environmental Quality. 2015. Water shortage issue related to the Mexican water deficit [Internet]. Austin (Texas): Texas Commission on Environmental Quality. Available from: http://www.tceq.texas.gov/border/water-deficit.html

[TWDB] Texas Water Development Board. 2012. Water for Texas 2012 State Water Plan [Internet]. Austin (Texas): Texas Water Development Board. Available from: http://www.twdb.texas.gov/waterplanning/swp/2012/index.asp

[TWDB] Texas Water Development Board. 2015. Water use summary estimates, 2012 [Internet]. Austin (Texas): Texas Water Development Board. Available from: http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/index.asp

Treaty Series 994. Utilization of waters of the Colorado and Tijuana Rivers and of the Rio Grande, United States and Mexico. February 3, 1944 [Internet]. Washington D.C.: United States Government Printing Office. Available from: http://ibwc.state.gov/Files/1944Treaty.pdf

Vigness DM and Odintz M. Lower Rio Grande Valley. 2015. In: Handbook of Texas Online [Internet]. Austin (Texas): Texas State Historical Association. Available from: http://www.tshaonline.org/handbook/online/articles/ryr01

Ward GH. 2011 Water resources and water supply. In: North GR, Schmandt J, Clarkson J, editors. The impact of global warming on Texas. Austin (Texas): University of Texas.