THE RIO GRANDE/RIO BRAVO WATER DELIVERIES UNDER THE 1944 TREATY: A COMPENDIUM OF IDEAS

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RWP

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Disclaimer: Opinions expressed are solely those of the author, interviewees, or third-party authors, and do not represent the views or positions of the USIBWC, the Mexican Section of the IBWC (MXIBWC), or the International Boundary and Water Commission (IBWC).

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Appendix A Rio Grande Chronology of Key Events

Appendix B Colorado River Chronology of Key Events

List of Abbreviations

Abbreviation	Descriptive Name
AF	acre feet
AF/yr	acre feet of water per year
BOR	Bureau of Reclamation
Cfs	cubic feet per second
CILA	Comisión Internacional de Límites y Aguas
Cms	cubic meters per second
CONAGUA or CNA	Comisión Nacional de Agua
CRWUA	Colorado River Water Users Association
cu/ft	cubic feet
CTOH	Comité Técnico de Operación de Obras Hidráulicas (Hydraulic Works Operation Technical Committee)
EPA	U.S. Environmental Protection Agency
IAP	Fundación Gonzalo Río Arronte I.A.P.
IBWC	International Boundary & Water Commission
Km	Kilometer
km2	square kilometers
LBJ School of Public Affairs	Lyndon B. Johnson School of Public Affairs
m3	cubic meters
MNWP	Mexican National Water Program
MW	Megawatt

MXIBWC	The Mexican Section of the International Boundary & Water Commission
NADBank	North American Development Bank
NGO	Non-governmental organization
Ppm	parts per million
SRE	Secretaria de Relaciones Exteriores
Region M	Texas water planning Region M (Regional Water Planning Area)
REPDA	Registro Público de Derechos de Agua
RGJV	Rio Grande Joint Venture
RGRWA	Texas Rio Grande Regional Water Authority
TCM	Thousand Cubic Meters
TDS	Total Dissolved Solids
Texas A&M NRI	Texas A&M University Natural Resources Institute
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
TX	State of Texas
USDA	United States Department of Agriculture
USGS	United States Geological Survey
U.S.	United States of America
USIBWC	The United States Section of the International Boundary & Water Commission
WMS	Water Management Strategies
WWF	World Wild Fund

"Considered in the light of previous treaties relating to the use of water from international streams for various purposes, it is not improbable that the [1944 Treaty]...may come to be regarded as the most important of its kind in the history of the world, both in the range and scope of its provisions and in its social and economic significance. It is more than a mere division of water between the two countries; it provides the administrative machinery and the principles for international cooperation in the development of these water sources."

Dr. Charles A. Timm, Division of Mexican Affairs, U.S. Department of State, March 25, 1944[1]

1 Dr. Charles A. Timm, article published in Department of State Bulletin, Vol. X, No. 248–Publication 2089 (March 25, 1944), quoted in *Memorandum Relating to Powers and Duties of International Boundary and Water Commission, United States and Mexico, as Proposed by Pending Treaty*, by Robert W. Kenny, then-Attorney General of California, p. 15 (July 31, 1944), Attachment 1 to this paper. Dr. Timm was one of the architects of the 1944 Treaty; Attorney General Kenny critiqued the Treaty provisions in the memorandum before the Treaty was ratified.

PART I

Introduction: The Challenges of Water Deliveries

The iconic river that defines the border between the United States and Mexico, called the Rio Grande in the United States and the Rio Bravo in Mexico, is a shared water subject to a 1944 bilateral water treaty ("the 1944 Treaty") and other bilateral agreements, as well as the laws of the U.S., Mexico, and the states of each country. It is one of the most water-stressed systems in the world.[2] In the 1944 Treaty, the United States and Mexico, "animated by the sincere spirit of cordiality and friendly cooperation which happily governs the relations between them"[3] established water delivery obligations for each nation for the Rio Grande (Rio Bravo) from Fort Quitman, Texas, to the Gulf of Mexico.

Under the 1944 Treaty, Mexico is obligated to deliver to the United States not less, "as an average amount in cycles of five consecutive years, than 350,000 acre-feet (AF)(431,721,000 cubic meters) annually"[4], for a total of 175,000 AF in a cycle. The 1944 Treaty provides that " [i]n the event of extraordinary drought... any deficiencies existing at the end of the aforesaid five-year cycle shall be made up in the following five-year cycle."[5]

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2 *See, e.g., Water Scarcity in the Rio Grande/Bravo Watershed: Challenges and Solutions–Results of Binational Rio Grande/Bravo Water Forum (Nov. 7-8, 2017)* https://awsassets.panda.org/downloads/rgb_forum_technical_report_2018_eng.pdf.

3 The 1944 Treaty between the United States and Mexico, *Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande* ("1944 Treaty"), Par. 1, http://ibwc.gov/FIles/1944Treaty.pdf .

4 *Id*. at Art. 4B(c), p.10. An acre-foot of water is approximately 326,000 gallons, or enough to cover an acre of land.

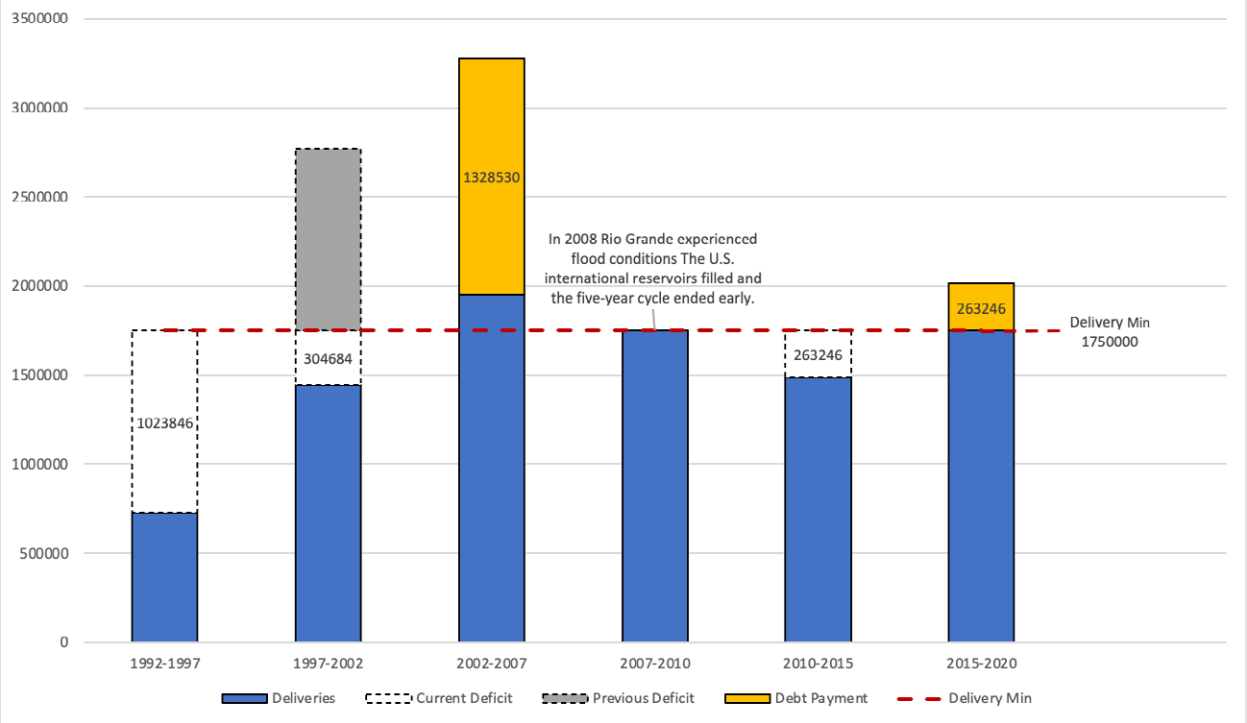
5 *Id*. at Art.4B(d), p.11. Cycles are typically, but not always, five years long. The Treaty provides that when the International reservoirs are filled

For the most part, this delivery plan has worked to the benefit of both countries for almost eight decades.[6] But since 1992, Mexico has not met its Rio Grande delivery obligations three times within the five-year cycles, ending those cycles in deficits in 1992-1997, 1997-2002, and 2010-2015.[7] Those deficits were carried over to the following consecutive cycles, and all were paid.

There also were shortfalls in the average minimum annual deliveries of 350,000 AF toward the end of the 2002-2007 and 2015-2020 cycles that were addressed very close to the end of those five-year cycles–in one, within two months, and in another, within three days.

The result has been unpredictability in the deliveries of Rio Grande water for the United States, impacting water users in both Mexico and the United States. Deliveries can be affected by a number of complex factors, including drought, water scarcity, political considerations, and extreme weather.

Here is a graph illustrating the deliveries between 1992-2020. Deficits that originated within three of the five-year cycles since 1992 are shown in white; a carry-over deficit in 1997-2002 is gray; and debt payments are shown in orange. Note that in the 2002-2007 cycle, Mexico delivered more than the 175,000AF mandated by the 1944 Treaty.



Graphic 1: Deliveries from cycles beginning in 1992 through 2020

Source: Author

with the required amount of delivery water (175,000AF) due to the U.S. within a cycle (a result of extreme weather events), that cycle ends and a new cycle begins. Shorter cycles occurred in 2007-2008 and in 2008-2010 due to extreme weather events.

6 There was a deficit in 1953-1958 due to drought, which was made up in the following five-year cycle of 1958-1963. See Minute 234 https://www.ibwc.gov/Files/Minutes/Min234.pdf.

7 The U.S. and Mexico differ as to how cycles are defined and labeled. The cycles identified here reflect the USIBWC labels and run year to year from September 1 to October 30.

Here is a chart describing the deficits at the end of the three cycles, and the shortfalls within cycles that resulted in two close calls, since 1992:

Rio Grande water delivery close calls and misses since 1992

Cycle Years	Delivery Status	Resolution
1992-1997	Deficit of 1,023,846 AF at the end of the 1992-1997 cycle	Deficit from 1992-1997 was rolled over to the following 1997-2002 five-year cycle
1997-2002	In the 1997 -2002 cycle there was a shortfall of 304,684 AF at end of 4th year (2001); The cycle ended in 2002 with that deficit plus the deficit from 1992-1997 of 1,023,846 AF, for a total deficit of 1,328,530	Deficit from 1992-1997 and 1997-2002 was paid fully in 2005 by agreement
2002-2007	An agreement in 2005 resolved the carry-over deficit from 1997- 2002, but a shortfall remained of about 350,000 AF two months before end of 2002-2007 cycle	Mexico completed the 2002-2007 deliveries in the last two months of 2007 and the cycle ended without a deficit
2007-2009	In 2008, the Rio Grande experienced flood conditions originating in the Conchos River, a Mexican tributary	The U.S. conservation capacity at the two international reservoirs filled and the five-year cycle ended early. A new cycle began in 2010
2010-2015	Deficit of 263,246 AF at the end of the 2010-2015 cycle	Deficit was rolled over to 2015-2020 cycle, and Mexico paid off the debt within 3 months (by January 25, 2016)
2015-2020	A new shortfall accumulated in the 2015-2020 cycle and remained until three days before the end of the cycle in 2020	3 days before the end of the 2015-2020 cycle, Mexico agreed to transfer the volumes of Mexican water stored in Amistad and Falcon required to end the cycle without a deficit

The 1944 Treaty is an extraordinary achievement among binational treaties in its complexity, and has enjoyed general acceptance by stakeholders for almost eight decades, as evidenced by the resolution of many disputes through Minutes to the Treaty without conflict.[8] Mexico and the United States have a mutual interest to provide greater predictability and reliability in Mexico's deliveries annually, and to minimize the risk for carryover of deficits to the following consecutive cycle. To that end, the International Boundary and Water Commission (IBWC) has stated a goal to enter into a Minute by the end of 2023 to begin furthering greater predictability and reliability.[9]

The challenges posed by the shared waters of the Rio Grande are more than merely academic. The Rio Grande is the lifeblood to agriculture and to the wider economies of metropolitan areas in the Rio Grande Basin, which are growing. Scarce water in the Rio Grande Basin has serious economic consequences in both Mexico and the United States. An annually growing population in the Rio Grande Basin, reflecting population growth worldwide, exacerbates the water challenges.[10]

The United States Section of the International Boundary and Water Commission (USIBWC) commissioned this white paper on June 2, 2022 for assistance in gathering information for the further dialogues and studies needed to negotiate a Minute that begins to address these challenges. The purpose of the white paper is not to mandate any particular recommendations or solutions, but to serve as a foundation–a starting place–for the critical discussions needed going forward between the countries to create the Minute that they hope to complete in 2023, and beyond.[11]

Mexico and the United States have a mutual interest in greater predictability and reliability in Mexico's water deliveries.

This white paper considers these questions: What are the challenges the parties and stakeholders face now as they consider a Minute to address more predictable and reliable water deliveries on the Rio Grande below Fort Quitman to the Gulf of Mexico? What are the solutions stakeholders have proposed? What lessons can be learned from the successes and challenges faced on the Colorado River by the United States and Mexico that can inform implementing water deliveries on the Rio Grande?

A rich background of custom, culture, science, and law is reflected in the shared activities by Mexico and the United States, two nations with over 170 years of coordination and cooperation surrounding the Rio Grande, a binational and boundary water. While this white paper provides information about the current situation and tasks at hand, the heart of it is the information learned from a series of interviews from June through October, 2022 with 55 key individuals across diverse stakeholders from the United States and Mexico. Those interviews, plus numerous stakeholder discussions in that time period between the Commissioner of the USIBWC and individuals, and meetings devoted to the Rio Grande

8 Stephen Mumme, *The U.S.-Mexico Water Treaty as a Constitutional Document*, Rice University's Baker Center for Public Policy, (March 2019) https://watercenter.colostate.edu/wp-content/uploads/sites/91/2019/10/Mumme_1994-Treaty-Const-Doc-2019-2.pdf.

9 See Minute 325, *Measures to End the Current Rio Grande Water Delivery Cycle Without a Shortfall, to Provide Humanitarian Support for the Municipal Water Supply for Mexican Communities, and to Establish Mechanisms for Future Cooperation to Improve the Predictability and Reliability of Rio Grande Water Deliveries to Users in the United States and Mexico*, https://ibwc.gov/FIles/Minutes/Min325.pdf. Under the 1944 Treaty, disputes and new developments can be resolved by the IBWC through agreed-upon interpretations of the Treaty called Minutes.

10 See Rodney Gomez, Luis Guajardo & Edna Ely-Ledesma, *It Is time to recognize the Rio Grande Valley as a rising borderland metropolis*, Rice University, Kinder Institute for Urban Research, Urban Edge (June 15, 2022), https://kinder.rice.edu/urbanedge/it-time-recognize-rio-grande-valley-rising-borderland-metropolis.

11 While the USIBWC commissioned this paper, the views reflected are the author's and do not represent positions of the USIBWC, MXIBWC, or the IBWC.

issues, resulted in over 100 hours of discussion to explore the Rio Grande deliveries and what might be done to improve the predictability and reliability of water deliveries.

One of the USIBWC's goals in pursuing a white paper was to broaden the scope of stakeholder engagement in considering the challenges and potential ways forward on the Rio Grande. The issues stakeholders identified in discussions over the summer and fall of 2022 shaped the content of this paper.

The remainder of this paper summarizes the physical and scientific background on the Rio Grande ecosystem and species, describes certain applicable law relevant to the discussion, reports on the water delivery issues, concerns, challenges and Colorado River lessons learned identified by stakeholders, and gathers the potential solutions that have been suggested over the past 20 years to further predictable, reliable water deliveries. Appended are timelines for the Rio Grande and the Colorado River; a reference list for further reading; a proposal from NGO stakeholders for consideration; and selected original documents not readily available, and provided with permission.

Managing the Rio Grande may be among the most difficult environmental issues we face, but its underlying challenges are not unique. And like all rivers, water users at the top of the system can restrict the availability of water to those users at the bottom of the system. This remains a challenge on the Rio Grande despite the 1944 Treaty.

PART II

The Rio Grande Physically, Demographically, and Historically

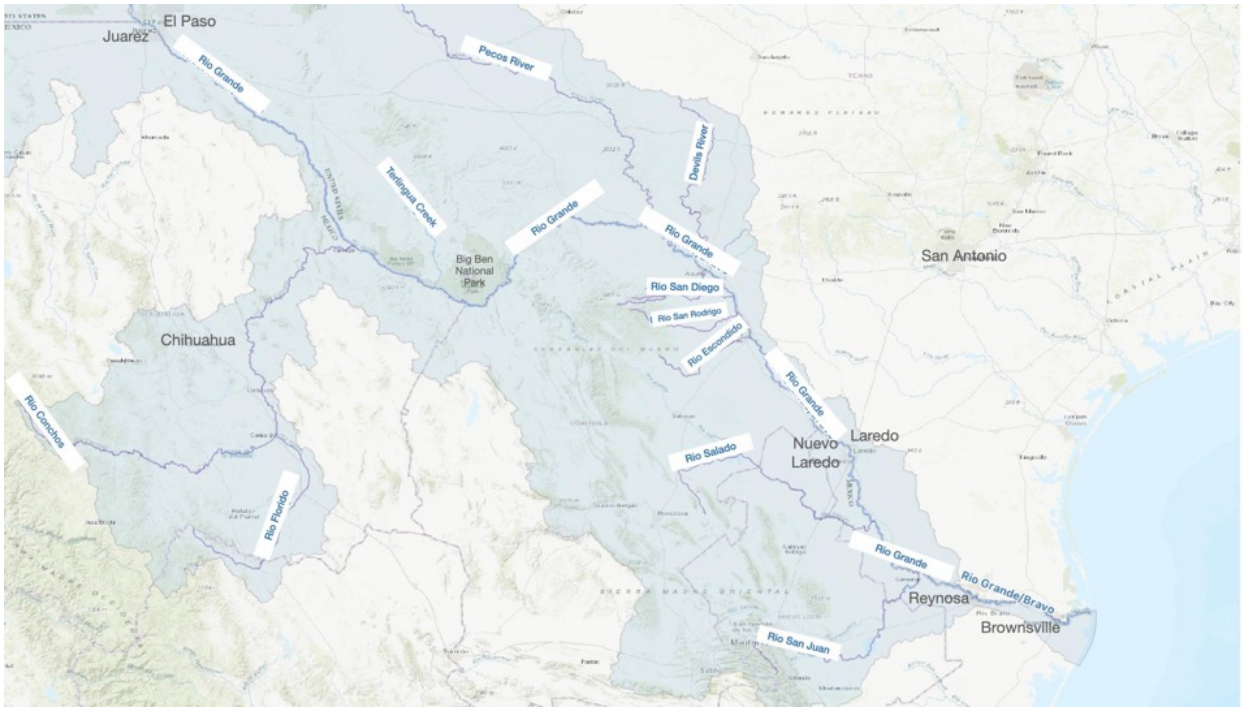


Figure 1: Lower Rio Grande Basin Map Source: Author
Source: USIBWC

A. The Physical River–Location, Species, and Environment

The Rio Grande, known in Mexico as Río Bravo or Río Bravo del Norte, is the fifth longest river in North America. The total length of the river is about 1,990 miles (3,060 km). Starting as a snow-fed mountain stream more than 12,588 feet (3,700 meters) above sea level in the San Juan Mountains of southwestern Colorado, the Rio Grande flows to the southeast and south for 175 miles (280 km) in Colorado, southerly for 470 miles (760 km) across New Mexico, and southeasterly for 1,255 miles (2,020 km) between the U.S. state of Texas and the Mexican states of Chihuahua, Coahuila, Nuevo León, and Tamaulipas, forming the border between the United States and Mexico on its way to the Gulf of Mexico. That last reach, the basin formed in southern Texas and northern Mexico from Fort Quitman to the Gulf, is the focus of this white paper.

1. The Watershed and Endangered Species

The Rio Grande Watershed comprises nearly 1.9 million acres (3,060 km) and several types of habitats, including deserts, wetlands, mountains, and subtropical coastal regions. The Rio Grande Basin supports over 407 vertebrate species[12]. It is the critical habitat for the Rio Grande silvery minnow, the Texas hornshell mussel, and the southwestern willow flycatcher, designated as endangered under the U.S. Endangered Species Act. It is home to bird-watchers and fishermen.

The Rio Grande crosses four physiographic ecoregions in Texas beginning with the Trans-Pecos, then the Edwards Plateau, flowing into the South Texas Plains and finally the tip of the Gulf Coast Prairies and Marshes.[13]

Above: Texas Hornshell
Photo: Texas A&M NRI

Above: Willow Flycatcher
Photo: USDA

12 National Park Service, 2020. The Rio Grande: The Lifeblood of the Desert, Big Bend National Park, Texas, U.S. https://www.nps.gov/bibe/learn/nature/riogrand.htm.

13 G. Griffith, S. Bryce, J. Omernik, A. Rogers, Ecoregions of Texas, pp. 24-35 (2007) http://ecologicalregions.info/htm/pubs/TXeco_Jan08_v8_Cmprsd.pdf

2. Plants and Invasive Species

The dominant tree species found in the Basin are the mesquite (*Prosopis laevigata*), ebony (*Ebenopsis ebano*), huisache (*Acacia farnesiana*), cedar elm (*Ulmus crassifolia*), anacua (*Ehretia anacua*), hackberry (*Celtis Laevigata*), Mexican ash (*Fraxinus berlandieriana*), and tepehuaje (*Lysiloma acapulcensis*). The area supports several varieties of cacti, including the prickly pear (Opuntia engelmannii). Plants from the lily family, such as the yucca (*Yucca spp.*), occupy vast areas.

Invasive species including salt cedar (*Tamarix*) and Giant Reed (Arundo donax) are also found. Salt Cedar consumes high volumes of water and creates large deposits of salt in the soil, negatively altering the habitat along the Rio Grande.[14] The Giant Reed,which negatively impacts biodiversity and ecological processes, is considered one of the greatest threats to the health of the riparian ecosystem in the southwestern United States.

Above: Salt Cedar (*Tamarix*)
Photo: Texas USGS

Above: Giant Reed (*Arundo donax*)
Photo: USGS

Another invasive species in the Basin is the Water hyacinth (Eichhornia crassipes), a free-floating perennial invasive aquatic plant native to South America that has naturalized in much of the southern United States. Hyacinth is considered one of the most aggressive aquatic weeds. This plant outcompetes and displaces native plants, depletes oxygen levels in water and affects infrastructure by blocking irrigation canals and clogging waterways. Water hyacinth populations decrease the flow of the river, making it more stagnant. Water hyacinth floats on the water's surface blocking out sunlight and impairing a river's ecosystems.

14 U. Jahrsdoerfer, S. E., and D. M. Leslie, Jr.,*Tamaulipan brushland of the Lower Rio Grande Valley of South Texas: description, human impacts, and management options.* U.S. Fish Wildlife. Service., Biol. Rep. (1988) https://apps.dtic.mil/sti/pdfs/ADA322826.pdf.

Chemical, biological, and mechanical control methods have been insufficient to manage water hyacinth. Its aggressive growth rate has proven that no one single method is effective. The best alternative is to prevent it from entering freshwater bodies and manage the nutrient concentration in the water.

The last invasive species of note in the Basin is the Hydrilla or water thyme (Hydrilla verticillata). It is a submerged aquatic plant native to Southeast Asia and Australia. It is resilient to freezing and drought. The Hydrilla forms dense mats on the water surface, lowers dissolved oxygen in water, restricts native plant growth, and hinders water flow. Like the Hyacinth, no single management method has been found effective to control the Hydrilla. Biological control agents (insects) as well as sterile carp have been released in the Lower Rio Grande Valley west of McAllen, TX, and east to Brownsville with some positive effect.[15]

Between Fort Quitman and Presidio, the riverbed of the Rio Grande is often dry due to the diversion of water in the upper basin by both the U.S. and Mexico. (The 1906 Convention[16] established that the U.S. shall deliver water to Mexico in the upper basin to Juarez in the El Paso region). Irrigation and flood control structures have also dramatically altered the natural hydrograph. In many areas this causes the encroachment of invasive riparian species, including salt cedar, which in turn has reduced flows through uptake and evapotranspiration.[17]

15 P. Soti, J. Goolsby, & A.Racelis, *Agricultural and Environmental Weeds of South Texas and their Management. Subtropical Agriculture and Environments,* 71, 1–11(2020) https://scholarworks.utrgv.edu/cgi/viewcontent.cgi?article=1017&context=bio_fac.

16 *Convention Between United States and Mexico Equitable Distribution of the Waters of the Rio Grande* (May 21, 1906) https://www.ibwc.gov/Files/1906Conv.pdf

17 Texas Invasive Species Institute, *Giant Reed (Arundo donax)*,Texas Invasive Species Institute Inventory (2014) http://www.tsusinvasives.org/home/database/arundo-donax..

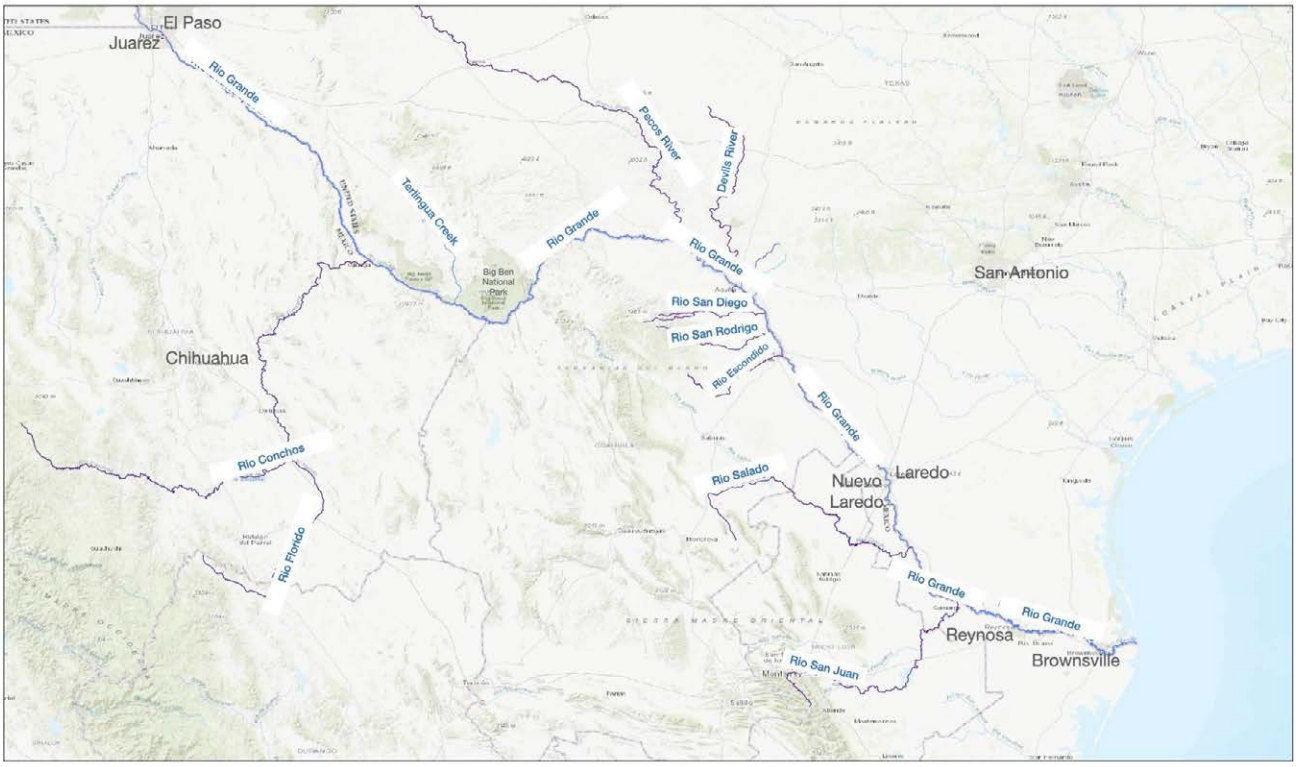


Figure 2: Lower Rio Grande Main Tributaries

Source: Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS

3. Tributaries of the Rio Grande /Rio Bravo

In Mexico, the Rio Conchos[18], Rio Salado, and Rio San Juan are the largest tributaries of the Lower Rio Grande Basin. The Rio Conchos drains over 26,000 square miles and flows into the Rio Grande near the town of Presidio, Texas, about 350 river miles upstream of Amistad Reservoir. The Rio Salado has a drainage area of about 23,000 square miles and discharges directly into Falcon Reservoir. The Rio San Juan has a drainage area of approximately 13,000 square miles and enters the Rio Grande about 36 river miles below Falcon Dam near Rio Grande City, Texas.

In the United States, the main tributaries of the Rio Grande are the Pecos and Devils Rivers. The Texas portion contributing to the Lower Rio Grande Basin encompasses approximately 54,000 square miles, 8,100 square miles of which are "closed" sub basins that do not contribute flows to the Lower Rio Grande Basin. The Pecos and Devils Rivers are the principal tributaries of the Lower Rio Grande Basin. Both rivers flow into Amistad Reservoir.[19]

18 For an in-depth look at how the 1993 drought has impacted the Rio Conchos, see Rodrigo Israel Gonzalez-Velazquez and Jose Luis Castro-Ruiz, *Water Management in the Rio Conchos Basin: Impacts on Water Deliveries Under the 1944 Treaty*, Texas Water Journal, Vol. 13, No. 1, pp.47-63 (November 22, 2022).

19 U.S. Department of the Interior, *Lower Rio Grande Basin Study,* ES2-ES3 (2013) https://www.usbr.gov/watersmart/bsp/docs/finalreport/LowerRioGrande/LowerRioGrandeExecutiveSummary.pdf.

Depending upon annual rainfall patterns, 69 to 86 percent of the water in the Rio Grande downstream from Presidio flows from the Rio Conchos, a tributary which originates in the Sierra Madre of western Chihuahua in Mexico. The Rio Conchos joins the Rio Grande near Ojinaga, Chihuahua and Presidio, Texas.[20]

The Rio Grande Basin cuts across every major aquifer in Texas apart from the Ogallala and the Seymour. Five major aquifers are found in the Texas portion of the Basin: the Bolson, Edwards-Trinity, Edwards, Carrizo-Wilcox, and Gulf Coast. Minor Texas aquifers in the Rio Grande Basin include Igneous, Yegua-Jackson, and local aquifers of varying quantity and quality.[21]

B. Regional History Shapes the Rio Grande Basin

Stakeholder acceptance is fundamental to the success of any treaty, and the 1944 Treaty has enjoyed extraordinary acceptance for almost eight decades, as evidenced by the resolution of many disputes through Minutes to the Treaty. Those with an interest in the subject of any treaty must view the governance that the treaty offers as both adequate and suitable. The tone and nature of binational water relations between the United States and Mexico depend in part on the effectiveness of efforts to resolve water tensions and to improve cooperative management of shared rivers like the Rio Grande.

Binational water relations and the work of the IBWC also are shaped by the broader U.S.-Mexico relationship. This broader relationship is determined by many factors, including historical governance,22 current trade, immigration, and efforts to enhance border security, including construction of a border wall or fencing– issues that may have little to do with water or water deliveries. These issues are beyond the scope of this paper. [23]

20 National Park Service, The Rio Grande: The Lifeblood of the Desert, Big Bend National Park, Texas, U.S. (2020) https://www.nps.gov/bibe/learn/nature/riograndе.htm.

21 Texas Parks & Wildlife, The Rio Grande River Basin, Texas, U.S. pp.5-8 (2021) https://tpwd.texas.gov/business/grants/wildlife/cwcs/media/docs/rivers/riograndе2.doc

22 For summaries of the history of Mexico, see Ruben R. Barrera and Dan A. Naranjo, Bridge Over Troubled Waters: Resolving the Rio Grande(Rio Bravo) Water Dispute, St. Mary's Law Journal, Vol.47, pp. 464-470, (2016)https://www.langleybanack.com/wp-content/uploads/2016/07/Ruben-Barrera-Water-Article.pdf.

23 For a discussion of these factors and how they may be affecting relations between the U.S. and Mexico, see Mexico: Background and U.S. Relations, Congressional Research Service, May 2, 2019, https://crsreports.congress.gov/product/pdf/R/R42917/47.

C. IBWC Operational Components on the Rio Grande Below Fort Quitman

There are seven dams on the Rio Grande operated under the jurisdiction of the IBWC –the American, Amistad, Anzalduas, Falcon, International, Morelos, and Retamal dams. The American, International, and Morelos dams are above Fort Quitman and are not discussed in this paper. The Amistad, Falcon, Anzalduas, and Retamal Dams are below Fort Quitman and each is described below.

In addition, the Morillo Drain, constructed in Tamaulipas, Mexico between 1967 -1969 by the IBWC to address salinity levels, is described below.

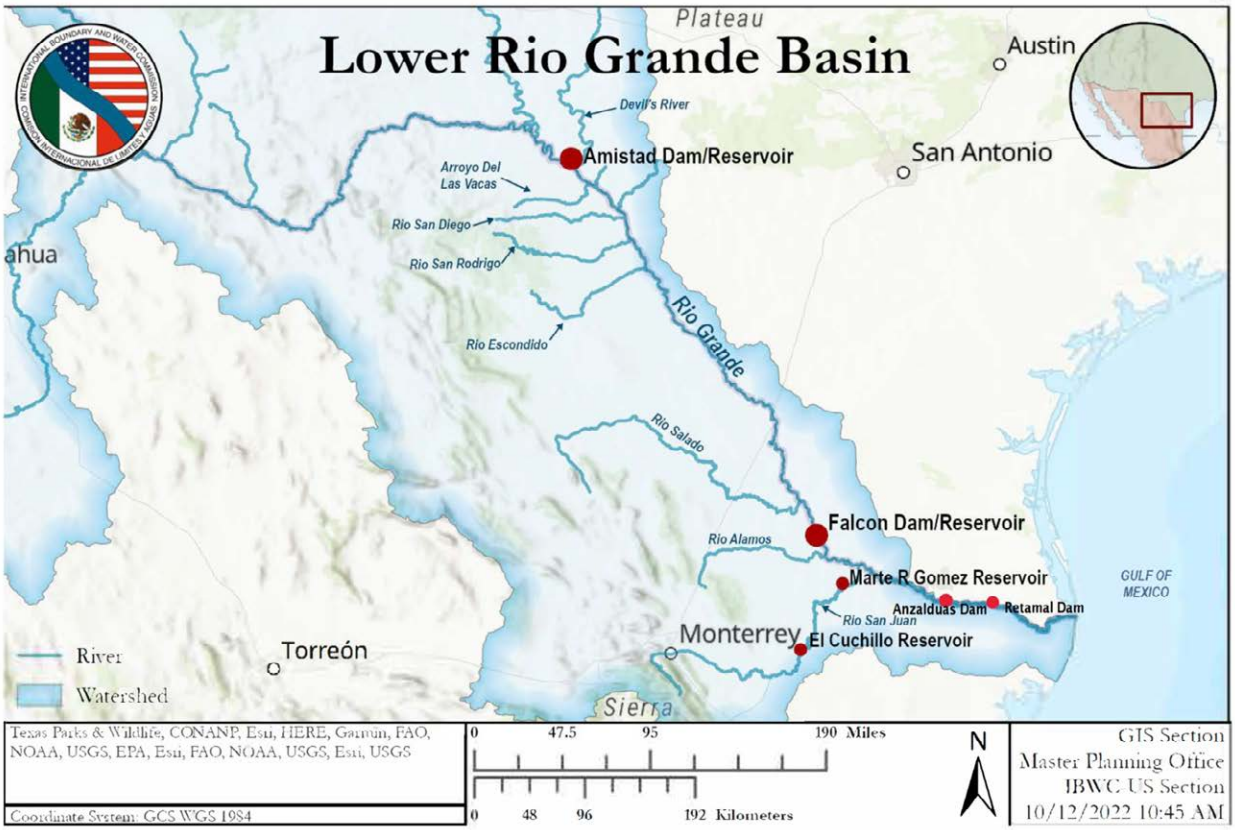


Figure 3: Lower Rio Grande Basin Dams
Source: USIBWC

1. The Amistad, Falcon, Anzalduas, and Retamal Dams

a. Amistad Dam

The Amistad Dam was dedicated in 1969 and is the largest of the storage dams and reservoirs built on the international reach of the Rio Grande. This international dam provides flood control and water conservation storage for the benefit of the United States and Mexico. The 6.1 mile (10 km) long and 254 feet (77.4 meters) high structure and its components are operated and maintained jointly by the U.S. and Mexican Sections of the IBWC.

Photo: Amistad Dam
Source: USIBWC

Amistad Dam has 16 radial or tainter gates[24] capable of releasing 1,507,000 cubic feet per second (42,670 cms). The reservoir impounded by the dam extends up the Rio Grande approximately 75 miles, has a surface area of 65,000 acres (26,300 hectares), and a total conservation storage capacity of 3,275,532 acre feet (4,040,325 Thousand Cubic Meters or TCM). Amistad Dam water reserves are allocated to the U.S. and Mexico. The U.S. water reserves in the Amistad Dam are 1,840,849 acre feet (2,270,663 TCM) and Mexico water reserves are 1,434,683 acre feet (1,769,662 TCM). The dam has a conservation elevation of 1,117 feet (340,462 meters).

In addition to flood control and water conservation, the Amistad Dam generates hydroelectric power through four turbines which can generate 132 MW. The dam also stores Rio Grande water that reaches the Del Río/Ciudad Acuña area.

b. Falcon Dam

Photo: Falcon Dam
Source: USIBWC

24 A tainter gate is a type of radial arm floodgate used in dams and canal locks to control water flow. They are used to manage large flow or storage applications.

Falcon Dam is located between Starr County in Texas and the city of Nueva Ciudad Guerrero in the Mexican state of Tamaulipas. The built structure of Falcon Dam is a 150 ft (46 m) high and 26,294 ft (8,014 m) long earthen embankment dam. The Falcon Dam created the Falcon International Reservoir that has a volume of 2,646,817 acre feet (3,264,813 TCM) and a surface area of 87,400 acres (354 km2). The Falcon Dam has six radial or tainter gates capable of releasing 456,000 cubic feet (12,912 cms) per second and has a conservation elevation of 301.2 feet (91.805 meters).

As with the Amistad Dam, the Falcon Dam's main function is to regulate the flow of international waters to maximize beneficial use of these waters through flood control, conservation, and generation of hydroelectric power. To maximize water availability to the U.S. and Mexico for agricultural, private and industrial use and to minimize flood damage, the dam serves as a control point for flood releases of internationally-owned waters. The Falcon Dam has six turbines that provide power to two different hydroelectric power plants, one in Mexico and the other in the U.S.,[25] with a total installed capacity of 63 MW.

25 U.S. International Boundary and Water Commission (USIBWC)(2022). Falcon Dam https://www.ibwc.gov/Files/Falcon_Brochure.pdf

c. Anzalduas and Retamal Diversion Dams

Photo: Anzalduas Dam
Source: USIBWC

Anzalduas Dam is a diversion dam located in Hidalgo County, Texas, approximately 11 river miles (17.7 km) upstream the McAllen - Hidalgo International Bridge between Hidalgo in the state of Texas and Reynosa in the Mexican state of Tamaulipas. The dam has been fully operational since 1960. The Dam's main purpose is to divert the U.S. share of floodwaters to the Rio Grande U.S. interior floodway. It also facilitates the diversion of water by Mexico into Mexico's main irrigation canal[26](Anzalduas Canal) and supplies water to users in both countries downstream. The Anzalduas dam has 6 gates that can release 36,303.48 cu ft per second (1,028 cms).

26 U.S. International Boundary and Water Commission (USIBWC)(2022). Diversion Dams https://www.ibwc.gov/mission_operations/diversion_dams.html

Photo: Retamal Dam
Source: CILA

Retamal Dam is a diversion dam located near Donna, Texas–Rio Bravo, Tamaulipas. It has been in operation since 1975. Retamal Dam has 3 gates and serves two flood control purposes. On the Mexican side, Retamal enables the diversion of 105,000 cubic feet per second (2,973 cms) into Mexico's Rio Grande interior floodway. In the border area of Brownsville-Matamoros, Retamal Dam limits flood flows to a safe capacity of 20,000 cfs (566 cms) on the Rio Grande[27].

27 U.S. International Boundary and Water Commission (USIBWC)(2022). Diversion Dams https://www.ibwc.gov/mission_operations/diversion_dams.html.

2. The Morillo Drain

In 1965, increased salinity levels in Rio Grande waters were considered a risk to local communities, threatening drinking water as well as local agricultural activities. The IBWC addressed the issue in Rio Grande Minute 223 and found that the principal source of the increase in water salinity was the contribution of water from the Morillo Drain, which contains a high level of salinity.

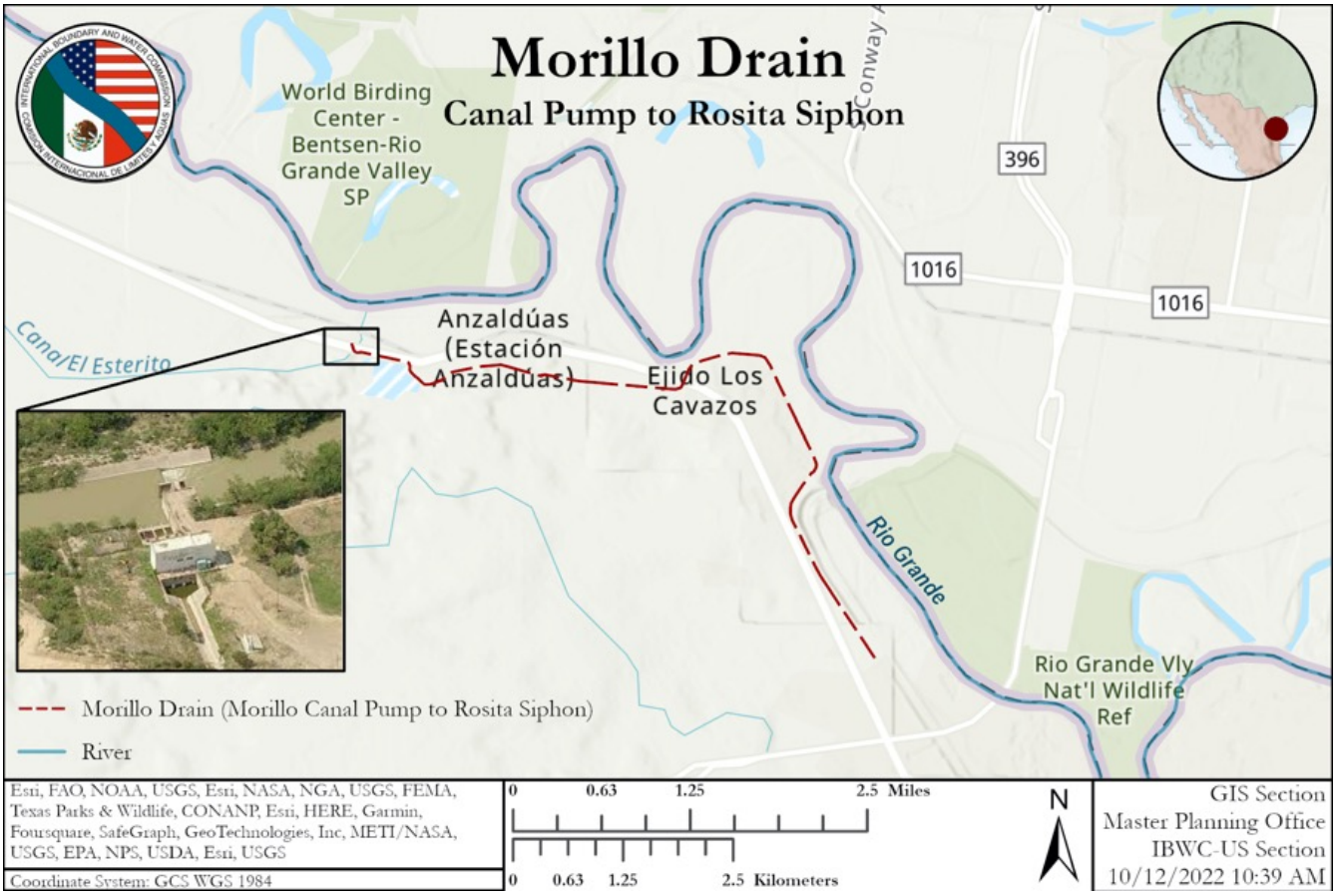


Figure 4: Morillo Drain Canal
Source: USIBWC

Even though the water from the Morillo Drain increases the volume of lower Rio Grande waters, it does not increase the waters' beneficial value. On the contrary, it diminishes that value. The source of salty water in the Drain is irrigation water run-off from Mexican farmland. To address this problem, the IBWC built a canal (or drain) 24 miles (37 km) long, with a capacity of 106 cfs (3 cms). The canal discharges the Morillo Drain waters to the Gulf of Mexico. The project also uses existing agricultural drainage infrastructure in Mexico. It was financed in equal parts by both countries.

Under Minute 223, all the repairs or additional work to improve the operation of the canal must be approved by the IBWC, with costs covered in equal parts by both countries. To date, there have been four Rio Grande Minutes (224, 269, 282, and 303) focusing on maintenance and repair projects in the

Morillo Drain.

During recent years, farmers on both sides of the border, as well as users of the Rio Grande in this area, have expressed their concern about the high levels of salty water affecting their fields and the urgent need to perform maintenance work on the Morillo Drain. Stakeholders from both the U.S. and from Mexico interviewed for this paper reported current concerns about salinity.

In 2016, CONAGUA conducted an extensive analysis of alternatives for beneficial use of the agricultural return waters from the Morillo Drain. The waters were found to have a high total dissolved solids ("TDS") content circulating through the network of drains, some of which discharge to the Rio Grande. The study looked at alternatives that included drilling wells and mixing with groundwater, mixing with treated wastewater, mixing with water from surface water lagoons near the Morillo Drain, and the use of U.S. infrastructure for water desalination. None of these alternatives were viable, due to high salinity and cost.

A second study of the Morillo Drain operation was carried out in 2019. The study focused on alternatives to improve the flow and salinity of the canal through more modest improvements to the canal infrastructure. The study divided the canal into its 8 reaches and analyzed the costs of improving flow to 106 cfs (3 cms) and alternatively to 141 cfs (4 cms). Improvements found needed in the individual reaches varied. They included narrowing the channel, adding concrete linings, repairing existing concrete, sediment removal, raising sidewalls, replacing pipes at the same or higher gradients, and in one area adding a velocity dissipator. The total estimated costs based on 2019 estimates, adjusted for inflation to 2022, are $7.8 million (138 million pesos) to attain 3 cubic meters per second, and $25.8 million (493 million pesos) to attain 4 cubic meters per second.[28]

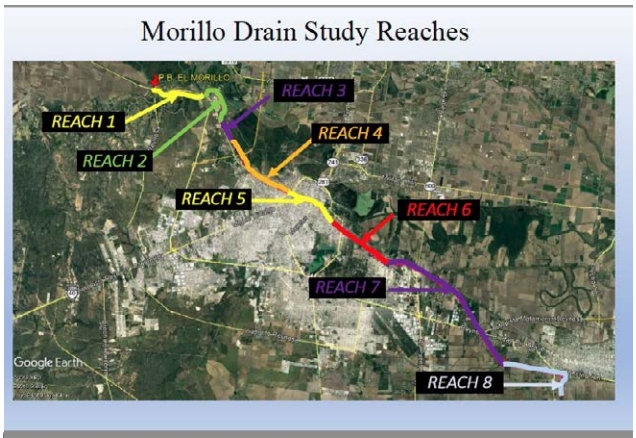


Figure 5: Morillo Drain Reaches)
Source: USIBWC

Overview

REACH	LENGTH (ML)	COST FOR 3 CMS	COST FOR 4 CMS
1	2.29	2,838,298.63	3,021,179.03
2	1.70	47,493.50	1,080,615.73
3	0.53	515,386.48	521,471.81
4	3.97	136,434.13	2,480,242.74
5	2.3	69,705.94	3,817,464.10
6	2.74	1,591,174.79	12,728,273.46
7	6.71	1,855,659.86	1,548,422.00
8	4.23	748,600.88	613,818.03
TOTAL=	**24.47**	**$ 7,802,754.22**	**$25,811,486.89**

- Costs include 16% IVA
- Costs from 2019 estimate + 2.4% inflation (2020, 2021) + 18.5% inflation (2022)
- $20.46 MXN/$1USD

Figure 6: Morillo Drain Project Overview
Source: USIBWC

28 *See Executive Study: Morillo Drain and Pump Station*, 2022, Attachment 3 to this paper.

Another project previously proposed by both USIBWC and MXIBWC is to construct a desalination plant to treat the waters of the Morillo Drain. A 2016 study looked at construction of a plant with a capacity of 115 cubic feet per second (3.26 cubic meters per second). Plant operation would lower Drain salinity, currently at 3,000 to 4,000 ppm, to 1,000 ppm and would recover 83,503 acre-feet per year (103 million cubic meters). This amount represents nearly 24% of the minimum annual average delivery volume to the United States under the 1944 Water Treaty[29].

The study for the Morillo Drain desalination project has not been formally presented by the IBWC or incorporated in a Minute. The estimated cost in 2016, including the desalination plant and associated conveyance lines, was $40 million at $250 per acre-foot (824 million pesos).

3. The Current Water Situation

a. The Rio Grande Basin Study (2013)

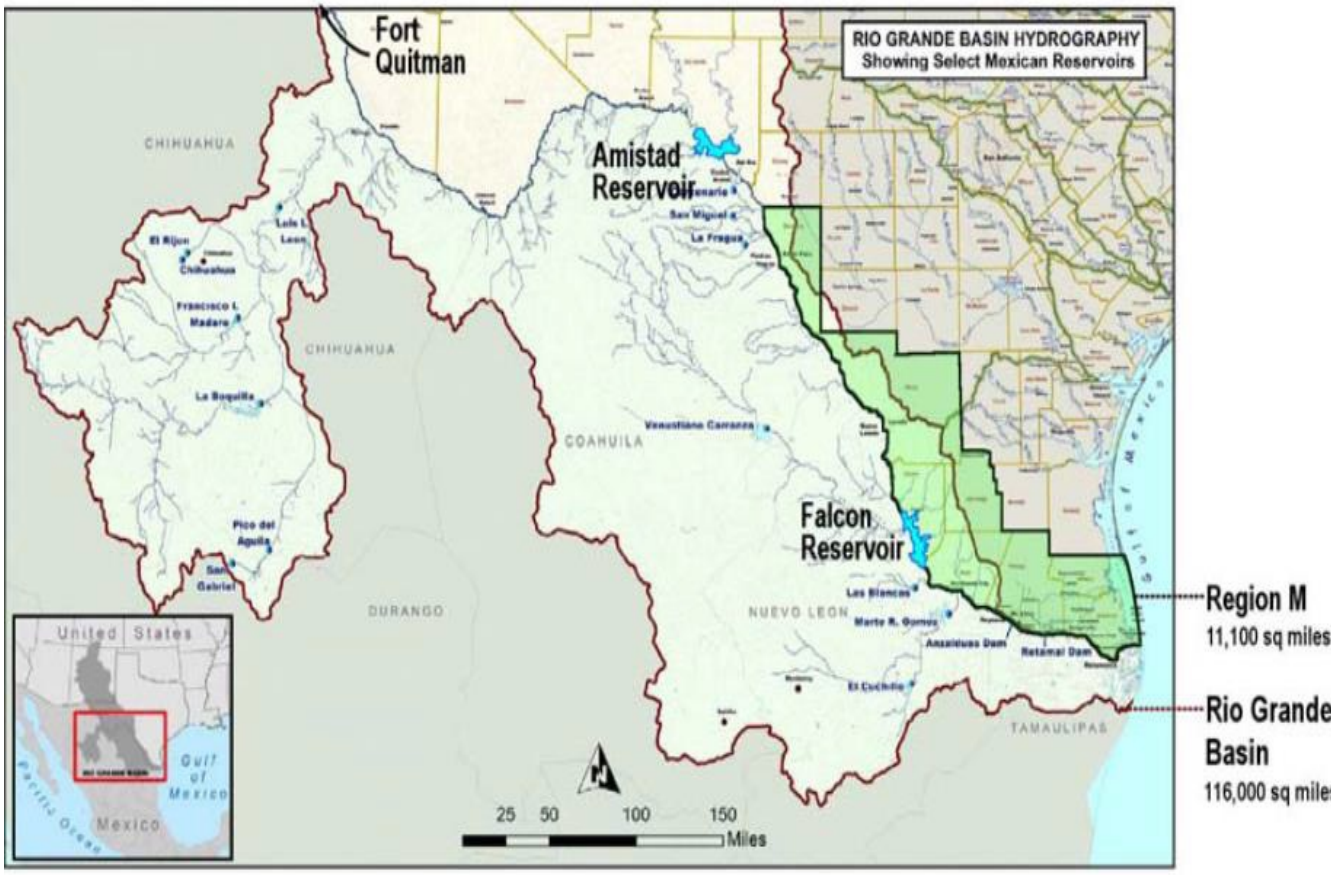


Figure 7: Lower Rio Grande Basin Study Area
Source: Lower Rio Grande Basin Study

29 See in Attachments: "Analysis of the Alternatives for Beneficial Use of the Agricultural Return Waters from the Morillo Drain," April 21, 2016.

In 2013, the Bureau of Reclamation ("BOR" or "Reclamation") and the Texas Rio Grande Regional Water Authority ("RGRWA") with its 53 member entities, in collaboration with other Texas water and environmental agencies, presented a Basin Study which evaluated the impacts of climate variability and potential change on water supply imbalances within an eight-county region (State of Texas water planning Region M) along the U.S./Mexico border in south Texas.

The 2013 Basin Study covered four elements: projections of water supply and demand; the analysis of existing water and power infrastructure and operations; the development of appropriate adaptation and mitigation strategies to meet future water demands; and a tradeoff analysis of the strategies identified and findings and recommendations as appropriate.

i. Projections of Water Supply and Demand– 2013 Basin Study

The projections of water supply and demand within the Rio Grande Basin included an assessment of risks to the water supply related to climate change as defined in section 9503(b)(2) of the SECURE Water Act.[30] The study found that climate change is likely to increase the water shortage in an area where the frequency of water supply shortages is already severe. The increase in temperatures, decrease in precipitation, and increase in evapotranspiration are the principal effects of climate change identified.

ii. Analysis of the existing water and power infrastructure operations

In the analysis of how the existing water and power infrastructure and operations will perform in the face of changing water realities, climate change was estimated likely to increase the water shortage by an additional 86,438 acre feet (106,600 thousand cubic meters) of water per year (ac-ft/yr). The 2013 Basin Study also considered population growth and found that the population in the eight-county region is expected to grow from 1.7 million in 2010 to 4.0 million in 2060, resulting in the need for an additional 592,000 ac-ft/yr (730,200 thousand cubic meters per year) , or about a 35% increase of the total water demand. Both climate change and population growth are expected to impact the reliability of deliveries to all users dependent on Rio Grande water through irrigation systems.

iii. Development of appropriate adaptation and mitigation strategies

The third element of the 2013 Basin Study focused on the development of appropriate adaptation and mitigation strategies to meet future water demands. The planning constraints considered that 78% of the watershed that feeds the Falcon and Amistad Reservoirs, which in turn supply the water for the study area, is in Mexico. The 2013 Basin Study notes that Mexico has not always fulfilled its water delivery obligations under the 1944 Treaty due to drought and its own competing uses for tributary waters. On this matter, the planning objective considered that effects of climate change and the increase

30 The Science and Engineering to Comprehensively Understand and and Responsibly Enhance Water Act "(SECURE Water Act), 42. U.S.C. 109B, https://www.govinfo.gov/app/details/USCODE-2011-title42/USCODE-2011-title42-chap109B. Its purpose is to provide authority for federal water and science agencies to work together and with states and local water managers to plan for threats to water supplies and secure water resources. Statement of Michael L. Connor, Commissioner, Bureau of Reclamation, U.S. Department of the Interior, Before the Subcommittee on Water and Power Committee on Natural Resources, United States Senate, The WaterSMART Program and the Implementation of the Secure Water Act, (March 16, 2010) https://www.doi.gov/ocl/hearings/111/SECUREWaterAct_0316109 . The SECURE Water Act funds basin studies like the Rio Grande Basin Study of 2013.

in demand, both in Mexico and in the United States, add more complexities to the reliability of the Rio Grande, in an area in which the demand already exceeds the availability of resources.

Groundwater was also considered as one of the planning constraints. In this case groundwater is determined by the characteristics of the water available. In the study area, 80% of the wells yield only brackish supplies according to the Region M Plan, and brackish groundwater is lower in demand. The state of Texas has 35 municipal water facilities that desalinate brackish groundwater. Other uses of brackish groundwater are related to hydraulic fracturing processes.

The 2013 Basin Study presented the following goals:

- Reduce dependency on the Rio Grande.
- Preserve existing water rights.
- Preserve downstream flows for irrigation/push water/environmental reasons.
- Contain actions that are within the reasonable control of study sponsors.

The Texas 2010 Region M Plan,[31] endorsed by the State of Texas and incorporated into the State Water Plan, was considered as part of the Basin Study. The 2010 Region M Plan recommended a portfolio of Water Management Strategies ("WMS") to ameliorate supply imbalances in the study area. Based on the Basin Study findings and the relationship between the 2010 Region M Plan and the Basin Study, the planning objectives focused on developing a set of Water Management Strategies that were evaluated under the criteria of effectiveness, acceptability, completeness, and efficiency.

The 2010 WMS considered three areas. The first is the role of conservation. The State Water Plan contains two conservation-based WMS for the study area:

> **Advance water conservation**: The most feasible advanced conservation methods included public information, school education, and the installation of higher efficiency residential clothes washers.
>
> **On-farm and Irrigation System Water Conservation:** This strategy offers a large potential to reduce the volume of water used for irrigation in agriculture. Technologies and methods currently available for on-farm water conservation include conversion to plastic pipe, low energy precision application, irrigation scheduling using an evapotranspiration network, drip irrigation, metering, unit pricing of water, use of water efficient crops, and other options.

31 The 2021 Region M Plan, including the process used to create regional and state plans in Texas every five years, is described in more detail below in this paper. The 2021 Plan is the most current Region M Plan.

The second area considered includes strategies that received further evaluation. The strategies were evaluated under the criteria of effectiveness, acceptability, and completeness. Strategies include:

Reuse Water:

- **Effectiveness:** It is an effective way to utilize existing reliable supply streams of water and alleviate the supply imbalance.
- **Acceptability**: Protects downstream flows and water rights.
- **Completeness**: It is within the reasonable control of the study partners via existing financial, managerial, and engineering mechanisms.

Brackish Groundwater Desalination:

- **Effectiveness**: Reduces dependency on the Rio Grande by developing a new water source
- **Acceptability**: Protects downstream flows and water rights. Existing brackish desalination plants in the study area have demonstrated that they can be built within regulations, policies, and environmental law.
- **Completeness**: It is within the reasonable control of the study partners via existing financial, managerial, and engineering mechanisms.

Seawater Desalination:

- **Effectiveness**: Reduces dependency on the Rio Grande by developing a new, reliable water source.
- **Acceptability**: Protects downstream flows and water rights. Existing seawater desalination plants in the United States have demonstrated that they can be built within regulations
- **Completeness**: It is within the reasonable control of the study partners via existing financial, managerial, and engineering mechanisms.

Fresh Groundwater Development

- **Effectiveness**: Reduces dependency on the Rio Grande by developing a new water source that can be located throughout the desired areas.
- **Acceptability**: Protects downstream flows and water rights. Existing wells technology is proven.
- **Completeness**: It is within the reasonable control of the study partners via existing financial, managerial, and engineering mechanisms.

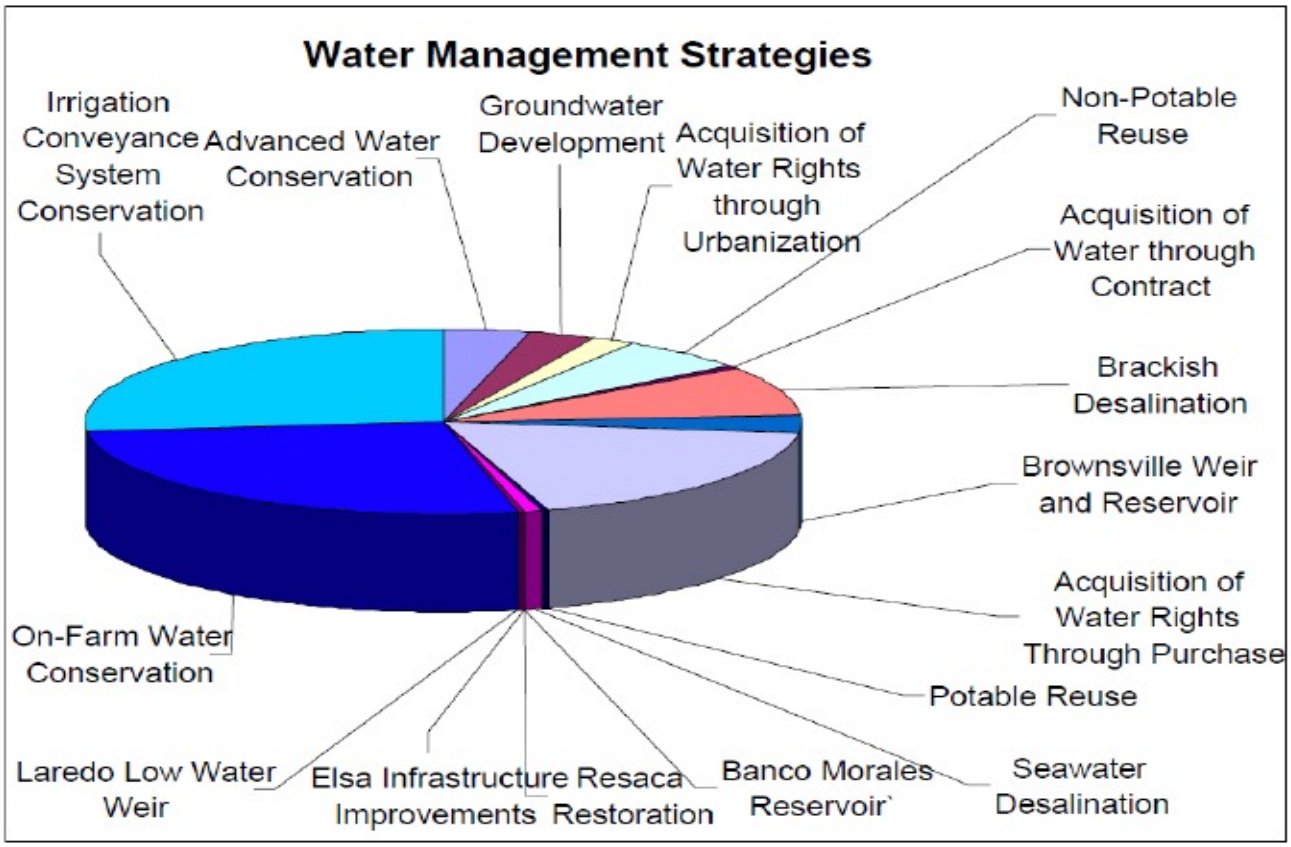


Figure 8: Relative portions of future water supply strategies from 2010 Region M Plan.
Source: Lower Rio Grande Basin Study

The last area of consideration for the WMS is the "Implications for International Cooperation." The current situation of decreasing runoff and streamflow in Mexico's arid north bordering the Rio Grande threaten not only Mexican irrigation and food production but also Treaty-obligated deliveries to the Rio Grande. That is why the Basin Study suggested strategies that can be considered good examples of proactive climate change adaptation strategies that also meet the international cooperation goals. These strategies also alleviate future competition for waters that are largely sourced from Mexico and are vulnerable in terms of both climate change and increased demand from both sides of the river.

iv. A tradeoff analysis of the strategies identified

Because of the scope of the study, the characterization is limited and intended only as a starting point for the evaluation of the WMS. However, after the evaluation process, the Basin Study presented Brackish Groundwater Desalination to be the strategy best suited for a more detailed investigation.

v. A New Basin Study?

The Rio Grande Basin Study was completed a decade ago. Some stakeholders have suggested that the Rio Grande water delivery efforts might benefit if the Rio Grande Basin Study was revisited and updated, particularly in light of the increased speed of climate change impacts that have been seen in the Colorado River region, and with the benefit of the 2021 Region M Plan. A new study could consider groundwater issues and developments since 2013. It could also include Mexico, and incorporate their water supply projections, basin studies, and climate change research.

4. Water Conservation

Texas completed the most recent State Water Plan in 2021, including a 2021 Region M Plan. The 2021 Region M Plan continues the conservation themes discussed in the 2010 Region M Plan.

a. Texas Conservation Efforts in the Rio Grande Basin

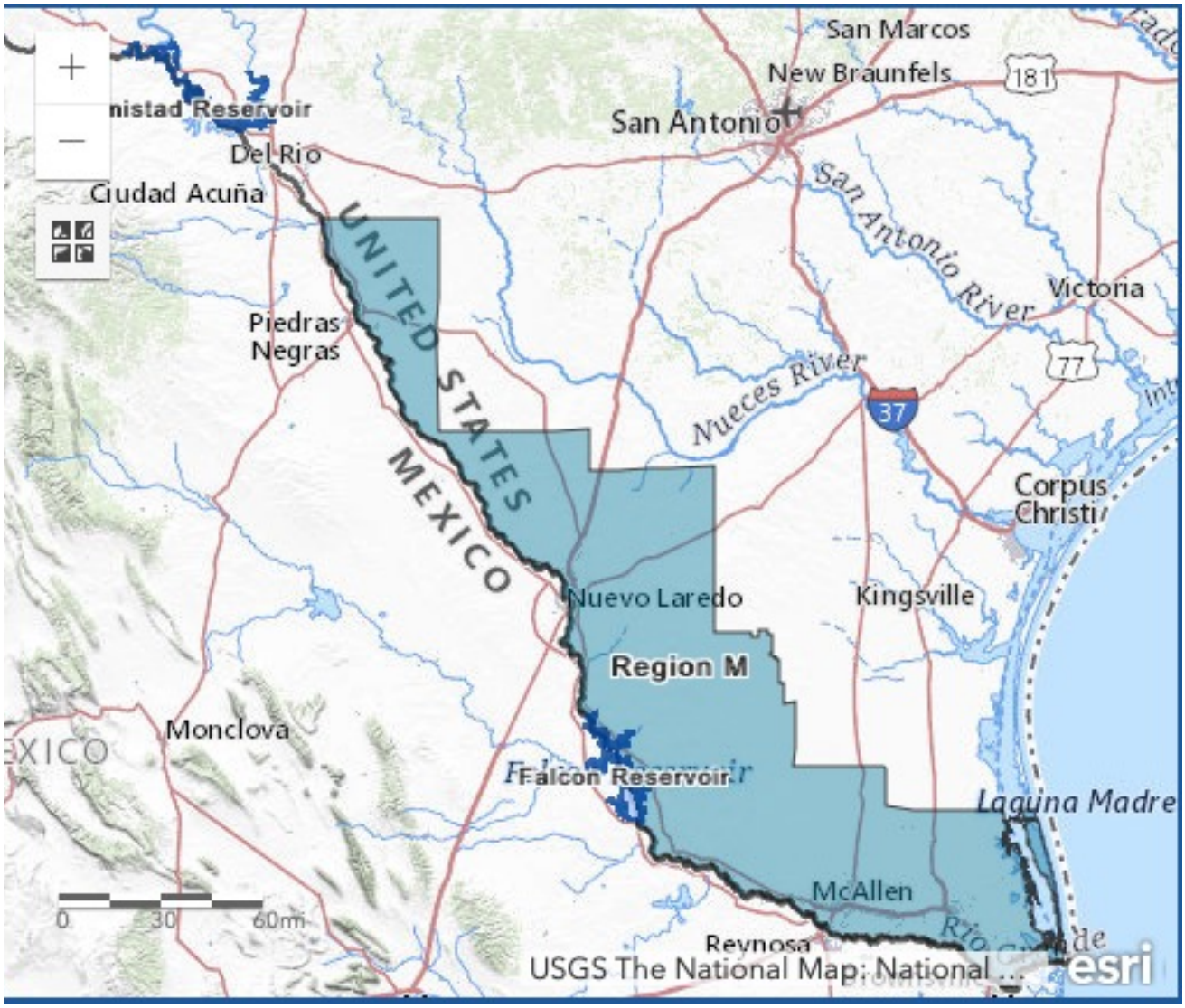


Figure 9: Region M map
Source: Rio Grande Regional Planning Group

	Decade	2020	2030	2040	2050	2060	2070	Change
	Population	**1,961,000**	**2,379,000**	**2,795,000**	**3,212,000**	**3,626,000**	**4,029,000**	***105%***
Existing supplies	Surface water	828,000	828,000	826,000	825,000	826,000	826,000	***0%***
	Groundwater	55,000	55,000	56,000	56,000	56,000	56,000	***2%***
	Reuse	13,000	14,000	14,000	14,000	14,000	15,000	***15%***
	Total water supplies	**896,000**	**898,000**	**895,000**	**896,000**	**897,000**	**897,000**	***0%***
Demands	Municipal	307,000	365,000	423,000	483,000	544,000	605,000	***97%***
	County-other	9,000	9,000	11,000	12,000	14,000	15,000	***67%***
	Manufacturing	4,000	5,000	5,000	5,000	5,000	5,000	***25%***
	Mining	17,000	16,000	15,000	13,000	10,000	10,000	***-41%***
	Irrigation	1,427,000	1,381,000	1,335,000	1,290,000	1,244,000	1,198,000	***-16%***
	Steam-electric	15,000	15,000	15,000	15,000	15,000	15,000	***0%***
	Livestock	5,000	5,000	5,000	5,000	5,000	5,000	***0%***
	Total water demand	**1,784,000**	**1,797,000**	**1,809,000**	**1,822,000**	**1,837,000**	**1,853,000**	***4%***
Needs	Municipal	32,000	65,000	111,000	167,000	227,000	287,000	***797%***
	County-other	4,000	4,000	6,000	7,000	9,000	10,000	***150%***
	Manufacturing	1,000	1,000	1,000	1,000	1,000	1,000	***0%***
	Mining	7,000	6,000	5,000	4,000	5,000	5,000	***-29%***
	Irrigation	889,000	844,000	798,000	753,000	707,000	662,000	***-26%***
	Steam-electric	5,000	5,000	5,000	5,000	5,000	5,000	***0%***
	Total water needs	**937,000**	**924,000**	**926,000**	**937,000**	**953,000**	**970,000**	***4%***
Strategy supplies	Municipal	63,000	123,000	187,000	252,000	308,000	366,000	***481%***
	County-other	4,000	5,000	7,000	8,000	11,000	12,000	***200%***
	Manufacturing	<500	1,000	1,000	1,000	1,000	1,000	***0%****
	Mining	2,000	2,000	1,000	1,000	1,000	1,000	***-50%***
	Irrigation	70,000	81,000	92,000	102,000	111,000	121,000	***73%***
	Steam-electric	2,000	8,000	8,000	8,000	8,000	8,000	***300%***
	Total strategy supplies	**141,000**	**219,000**	**296,000**	**372,000**	**440,000**	**508,000**	***260%***

Note: Total values in this table are presented as rounded actual total values rather than the sum of rounded values to provide consistent referencing of total values. Calculated percent change is based on rounded values.

** Percentage based on change from the earliest decade with volumes ≥500 acre-feet per year.*

Figure 10: Table of population and existing supplies, demands, needs and strategies 2020-2070
Source: Texas Water Development Board

The 2021 Region M Plan projects that 970,000 acre-feet (1,196,500 TCM) of water will be needed by 2070 to meet needs. The Plan estimates that municipal and agricultural conservation will account for 54% of the 2070 strategy volumes. There are 131 projects recommended at a total cost of $1.8 billion. Surface water development, including storage, makes up 26% of the 2070 strategy volumes, and desalination of groundwater and seawater make up 4%.[32] Conservation strategies were recommended for every municipal water group that had a need or water use greater than 140 gallons a day. Conveyance conservation measures were recommended for all 27 irrigation districts.

32 Id. at Summary M-3.

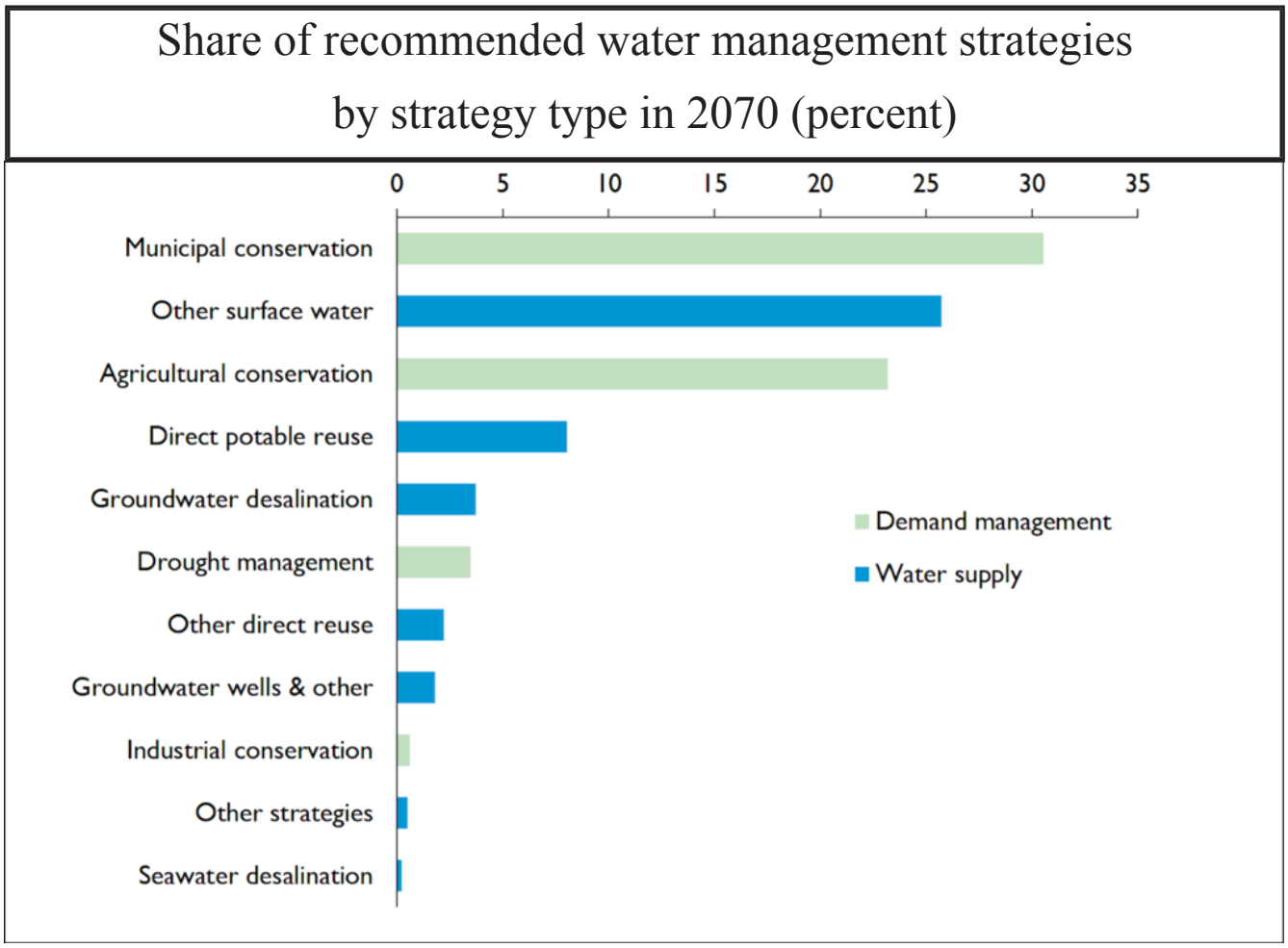


Figure 11: Graphic of Share of recommended water management strategies by strategy type in 2070
Source: Texas Water Development Board

b. Mexico's Conservation Efforts in the Rio Bravo Basin

The Mexican National Water Program ("MNWP") is a "Special Program" derived from the National Development Plan. Under the National Water Law, the program is updated every four years by CONAGUA.

The MNWP establishes the priority objectives, strategies, and specific actions to achieve goals that will contribute to the fulfillment of the Environment and Natural Resources Sectorial Program. The MNWP is formulated in response to the priorities demanded by social welfare and economic development, without endangering the ecological balance. Among its objectives are the preservation of the natural base and the protection of the health of the population and of the ecosystems against water scarcity or contamination of water resources.

The 2020-2024 MNWP proposes the following actions to improve the conservation of Mexican hydrological systems:

1. Promote the conservation, restoration, and the administrative reorganization of the basins, mainly focusing on high basins.
2. Regulate rainwater harvesting systems to avoid affecting third parties.
3. Develop strategies to maintain ecological flows in rivers and wetlands to strengthen the hydrological cycle.
4. Regulate the extraction of stone materials and the construction of works on nationally-owned assets.
5. Promote the protection of aquifer recharge zones and encourage induced recharge.

The MNWP includes other actions that are not within the category of conservation but are also related to the conservation of water sources. These actions address the reduction of diffuse pollution associated with agrochemicals; control of pollution derived from extractive activities and solid waste disposal; modernization and training in hydro-agricultural infrastructure and water management; improving the communication and information related to water within different dependencies of the public administration and civil society; and strengthening programs and actions against drought.

The National Water Law divides the administration of water resources into Regional Basins, and establishes that each basin must have its own Regional Basin Water Program which should be aligned to the objectives of the MNWP.

In the 2021-2024 Regional Plan for the Rio Bravo Basin, conservation issues are divided in two areas: Hydrological Sustainability and Environmental Sustainability.

In Hydrological Sustainability, the plan establishes two objectives:

1. Make available up-to-date water and hydrological balances of the Rio Bravo Basin and availability projections that consider the variability conditions of the region under climate change.
2. Implement efficiency improvement plans for each type of user in the basin.

In Environmental Sustainability, the plan also establishes two objectives:

1. Identify vulnerable ecosystems due to water availability.
2. Implement management, restoration, and conservation plans for the Rio Bravo Basin.

The MNWP has been prepared since the approval of the National Water Law in 1993.

In official CONAGUA publications, it is possible to find information about investment in water infrastructure, sanitation, and more recently, in instrumentation for hydrological and meteorological measurements. Although the MNWP addresses water efficiency and environmental conservation, many of the actions in this field are also carried out by the Secretaries of Environment, Development, and Agriculture among others. The following Table is from the Mexican Secretariat of Natural Resources and Water:

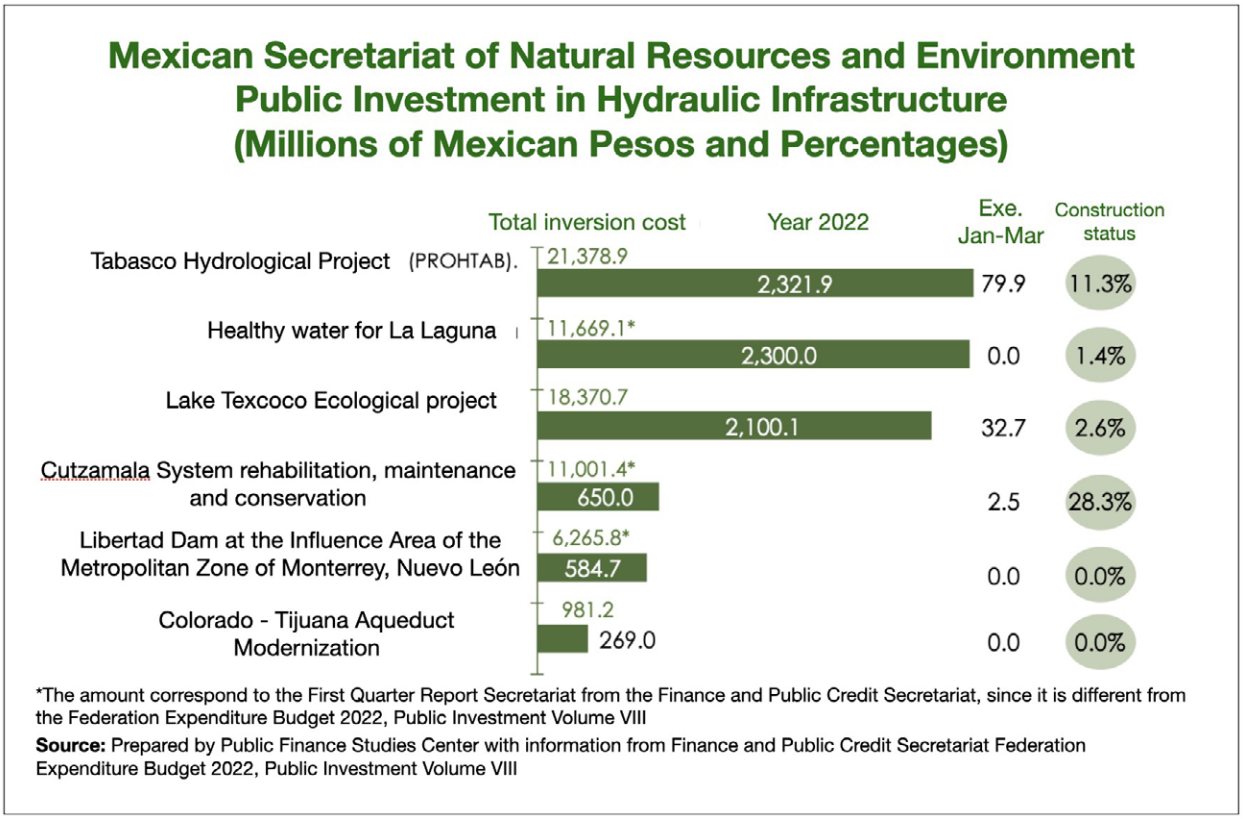


Figure 12: Graphic of Mexican public investment water and hydraulic infrastructure for environmental purposes

Source: Mexican Secretariat of Natural Resources and Environment

As to public-private partnerships, the World Wildlife Fund (WWF), the Gonzalo Río Arronte Foundation and CONAGUA established the "Alliance for Water Management in Hydrographic Basins of Mexico" in 2004. This is considered the most extensive project in the Mexican Rio Bravo Basin[33]. In its first stage, the program developed pilot projects for the rational use of water in the upper basin of the Conchos River, located in the Sierra Tarahumara, State of Chihuahua.

The broad objective of the program is focused on strengthening policies, laws, and regulations; promoting studies on the amount of water used by different sectors and its quality; supporting the application of efficient irrigation methods; raising awareness among stakeholders in each basin; communicating the lessons learned through workshops and forums, and replicating the water management model in other priority basins.

One of the achievements of the program was the establishment of Inter-Institutional Working Groups with the participation of various stakeholders in the area, together with the Government of the state of Chihuahua and Federal Delegations. In 2005, after a series of workshops, the group presented the "General Strategy for the Conchos River Basin" which aims to achieve stabilization and/or reversal of the deterioration of aquatic ecosystems in the Conchos River Basin. The strategy also considers the improvement in the quality of life of the populations that depend on this river as a fundamental objective.

According to information provided by WWF, since 2005 different projects have been initiated in the Conchos River Basin within the framework of the strategy. Under the Rio Conchos Project, WWF, with local communities and stakeholders have worked on irrigation improvements in the Delicias district; restoring natural protected areas at Pegüis Canyon and Pandeño Springs; and a Conchos trout conservation project[34].

In 2019, the Mexican NGO, Pronatura Noreste A. C., produced a study entitled Priority Sites for the Conservation of Aquatic Ecosystems in the Rio Bravo Basin, which included participation of a group from the Basin Council of the Rio Bravo specializing in ecosystem conservation. The study describes the priority aquatic sites in the territory of the Río Bravo Basin Council and the state of Nuevo León. The Rio Bravo Basin Council and Pronatura Noreste seek to contribute to knowledge about the importance of these ecosystems and the threats that put their ecological balance at risk, as well as to provide a guide for the authorities to carry out the appropriate actions for ecosystem management and regulation in the face of any imminent action of modification or alteration[35].

These partnerships and work groups illustrate the kinds of possible stakeholder collaboration that might benefit the Rio Grande.

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33 WWF México website Alianza WWF-Fundación Gonzalo Río Arronte I.A.P. https://www.wwf.org.mx/que_hacemos/programas/programa_agua/alianza_wwf_fgra22/ .

34 WWF Mexico, The Rio Conchos Project https://assets.wwf.org.uk/downloads/4779fieldreport3.pdf . The WWF and the IAP partnership, alongside the Interinstitutional work groups, have also worked in promoting new legislation concerning water conservation. These organizations, together with CONAGUA, have promoted the adoption of a Mexican Ecological Flow Standard. This type of regulation could be part of the New Federal Water Law. That law is still under development.

35 Consejo de la Cuenca del Río Bravo, *Sitios Prioritarios para la Conservación de Ecosistemas Acuáticos de la Cuenca del Río Bravo* (2019) https://www.cuencariobravo.org/sitios-prioritarios-para-la-conservaci%C3%B3n-de-los-ecosistemas-acu%C3%A1ticos-de-la-cuenca-del-r%C3%ADo-bravo.

PART III

Pertinent Law of the Rio Grande Below Fort Quitman

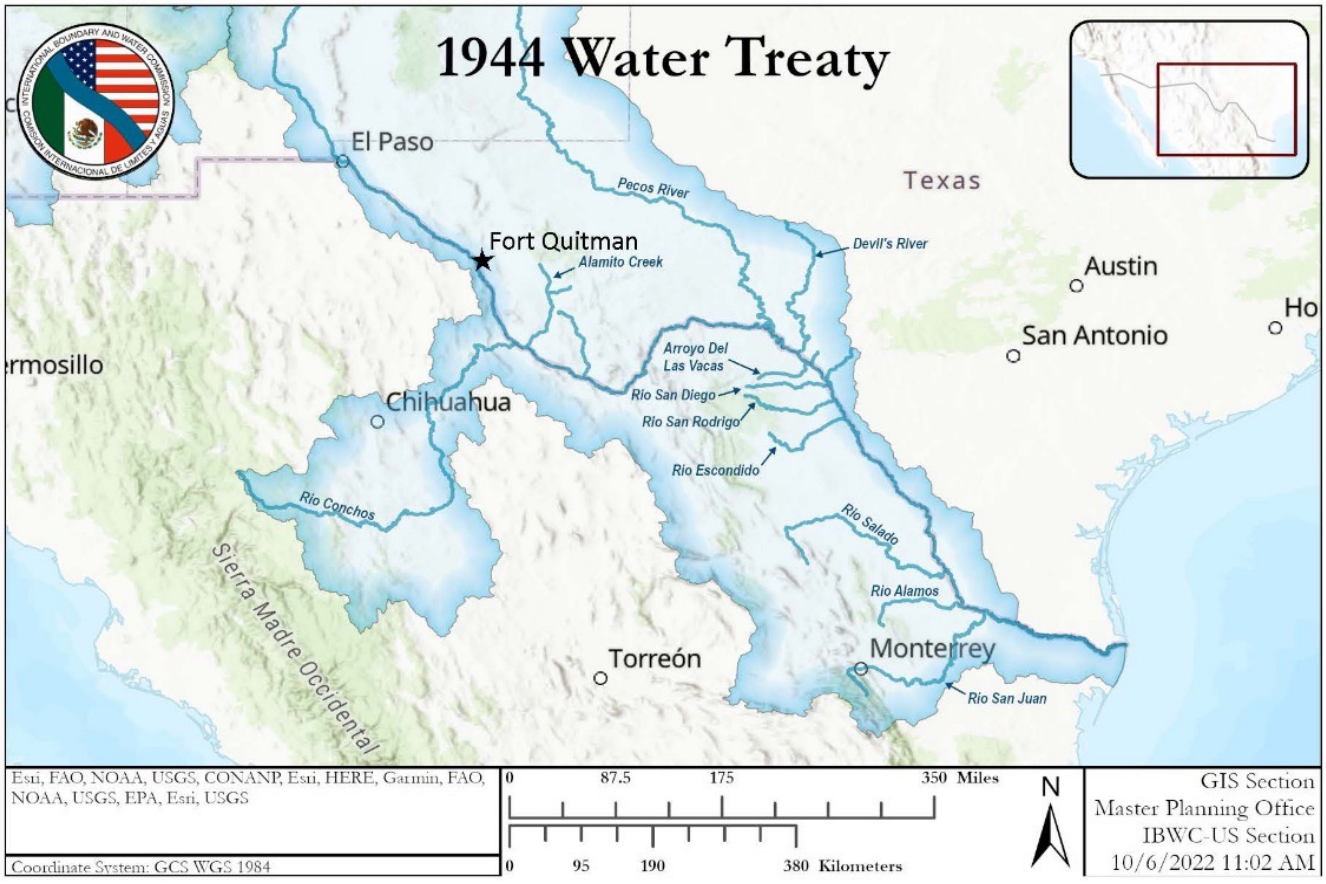

Figure 13: 1944 Water Treaty map
Source: USIBWC

A. The 1944 Treaty

The 1944 Treaty between the United States and Mexico, entitled "Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande"[36], allocates between the United States and Mexico the waters of the Rio Grande from Fort Quitman to the Gulf of Mexico, and the Colorado and Tijuana Rivers further to the west. This white paper is limited to consideration of the Rio Grande waters allocated under the 1944 Treaty, which was put into place

considering that the utilization of these waters for other purposes [than navigation, addressed in prior agreements] is desirable in the interest of both countries, and desiring, moreover, to fix and delimit the rights of the two countries with respect to the waters of … the Rio Grande (Rio Bravo) from Fort Quitman, Texas, United States of America, to the Gulf of Mexico, in order to obtain the most complete and satisfactory utilization thereof. [37]

In the 1944 Treaty, the name of the "International Boundary Commission" (created by the Convention of 1889 between the countries[38]) was changed to the "International Boundary and Water Commission" (IBWC or Commission) and this international entity was given the authority to apply and enforce the Treaty provisions.[39]

The binational International Boundary and Water Commission administers the 1944 Treaty and other binational agreements, and develops rules and issues proposed decisions, called "Minutes", to resolve river-related disputes and interpret and implement the 1944 Treaty. The IBWC's mission is to apply the rights and obligations that the United States and Mexico have assumed under treaties and binational agreements, and "to do so in a way that benefits the social and economic welfare of the peoples of the two sides of the boundary and improves relations between the two countries."[40]

The IBWC is made up of two distinct sections--the U.S. Section (USIBWC) and the Mexican Section (MXIBWC); when acting together as the IBWC, they have the authority to interpret and implement the 1944 Treaty.

The IBWC is an international entity made up of two distinct sections: the United States Section of the International and Boundary Water Commission (USIBWC), and the Mexican Section, the Comisión Internacional de Límites y Aguas (MXIBWC, sometimes referred to colloquially as CILA), each headed by an Engineer-Commissioner appointed by his or her respective country's president. When acting together, USIBWC and MXIBWC make up the IBWC, which has the authority to interpret and implement the 1944 Treaty and other binational agreements.

36 1944 Treaty https://ibwc.gov/Files/1944Treaty.pdf.

37 *Id*. The 1944 Treaty also establishes obligations for the Colorado and Tijuana Rivers.

38 Convention between the United States and Mexico, Water Boundary, March 1, 1889 https://ibwc.gov/Files/TREATY_OF_1889.pdf.

39 *Id*. at Art.2,p.5.

40 U.S. International Boundary and Water Commission (USIBWC)(2022) https://ibwc.gov/About_Us/About_Us.html.

The United States Section, USIBWC, is also a U.S. federal government agency headquartered in El Paso, Texas, and operates under the foreign policy guidance of the U. S. Department of State. It is the USIBWC that commissioned this paper.

The IBWC was designated as a Public International Organization by Executive Order 12467.[41] That designation does not extend to the USIBWC when it is acting on matters "within its exclusive control, supervision or jurisdiction, or within the sole discretion of the United States Commissioner, pursuant to international agreements in force with the United Mexican States, statute or other authority." [42] Thus the USIBWC sometimes acts as a U.S. federal government agency, and sometimes as a Public International Organization, depending upon the issue and circumstances.

The Mexican Section, MXIBWC, is under the administrative supervision of the Mexican Ministry of Foreign Affairs (SRE) and is headquartered in Ciudad Juarez, Chihuahua, Mexico.

USIBWC responsibilities are astonishingly broad, especially considering its comparatively small size and resources.[43] Those responsibilities include a unique mandate to implement the 1944 Treaty. USIBWC facilitates binational water deliveries; maintains dams and international reservoirs, wastewater treatment plants and floodwater projects; and has responsibility for other ongoing projects with U.S. federal stakeholders on transportation, infrastructure, and binational projects and studies along the International Boundary with Mexico.

Photo: Signing of 1944 Treaty
Source: USIBWC

41 *See* 49 Fed. Reg. 8229 (March 2, 1984).

42 *Id*.

43 See Department of State and Foreign Affairs 2022 budget https://www.whitehouse.gov/wp-content/uploads/2021/05/sta_fy22.pdf, and 2023 Department of State congressional Budget Justification, pp.12, 57 https://www.state.gov/wp-content/uploads/2022/03/FY-2023-Congressional-Budget-Justification_Final_03282022.pdf.

1. Key Treaty Provisions

The 1944 Treaty authorized the joint construction and operation of three international storage dams on the Rio Grande within eight years of the date of the Treaty, resulting in the completion of Falcon Dam in 1953, downstream of Laredo, Texas, and Amistad Dam in 1969, upstream from Del Rio, Texas.[44] A third dam was not constructed.

Water in the Rio Grande is allocated between the two countries under Article 4 of the 1944 Treaty.

Article 4A allocates 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 land irrigated from the latter two rivers.
>
> (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) 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.[45]

Article 4B of the 1944 Treaty allocates 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, Goodenough 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.

44 See, id., at Art. 5, pp. 11-12.

45 *Id*. at Art. 4A, pp.8-9.

> (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.[46]

In recognition of the fact that, historically, the Mexican tributaries named in Article 4B(c) of the 1944 Treaty contributed a substantial amount of the normal and flood flows to the Rio Grande for downstream users in both countries, Mexico agreed to an annual minimum allocation to the U.S. of 350,000 acre-feet (431,721,000 cubic meters), averaged over a five-year cycle. As noted in Minute 234, the Article 4B(c) deliveries are intended to be delivered when "the United States may be able to satisfactorily utilize those volumes of water, which is feasible only if the means of storing them are available."

In contrast, on the Colorado River, Mexico is allocated an annual quantified amount of U.S. derived waters, guaranteed to Mexico by Article 10(a) of the Treaty "of 1,500,000 acre-feet (1,850,234,000 cubic meters) to be delivered in accordance with the provisions of Article 15 of this Treaty."[47] This difference reflects in part the hydrologic differences between the two rivers: the Colorado relies heavily on snowpack, while the portion of the Rio Grande governed by the 1944 Treaty relies heavily on seasonal hurricanes, torrential rains and the resulting flooding.

In the event of "extraordinary drought or serious accident", [48] the 1944 Treaty also provides different obligations for each country on the Rio Grande and on the Colorado River.

On the Rio Grande, the two countries agreed that "in the event of an extraordinary drought or serious accident" to the Mexican reservoir systems on the named Mexican tributaries, deficiencies could rollover to be made up in the following consecutive delivery cycle. Specifically, the 1944 Treaty provides:

> 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.[49]

In contrast, for U.S. deliveries of water from the Colorado River, Article 10(b) of the 1944 Treaty provides for proration of reductions in both countries:

In the event of extraordinary drought or serious accident to the irrigation system in the United States, thereby making it difficult for the United States to deliver the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) a year, the water allotted to Mexico under subparagraph (a) of this Article will be reduced in the same proportion as consumptive uses in the United States are reduced.[50]

46 *Id*. at Art. 4B, pp.9-10.

47 *Id*. at Art. 10(a), p.21.

48 *Id*. at Art.4B, p.11.

49 *Id*.

50 *Id*. at Art. 10(b), pp. 21-22.

This difference in dealing with drought conditions in the Lower Reach on the Rio Grande and on the Colorado was specifically emphasized by President Roosevelt in his message to the U.S. Senate requesting approval of the 1944 Treaty. The address included a message from Secretary of State Cordell Hull:

> [I]t should be noted that the Treaty provides that, in case of drought or serious accident to the hydraulic works in the United States, deliveries of Colorado River water to Mexico will be curtailed in the same proportion as uses in the United States are reduced, and that, if for similar reasons Mexico cannot provide the minimum 350,000 acre-feet from its measured tributaries of the Rio Grande, the deficiency is to be made up from these tributaries during the following 5-year cycle. [51]

If a five-year cycle on the Rio Grande ends with a Mexican water deficit, the repayment of the deficit is to occur during the following cycle.[52]

In summary, here are the key Rio Grande allocation provisions of the 1944 Treaty related to allocations, delivery amounts, cycles, and deficits:

1. The allocation of Rio Grande waters in the Lower Reach to each country is specifically defined by an accounting of water reaching the Rio Grande from each of the contributing tributaries in the Rio Grande Basin in both the U.S. and Mexico.

2. Mexico is required to provide an annual average minimum amount of 350,000 acre-feet (431,721,000 cubic meters) for a total of 1,750,000 acre-feet (2,158,605,000 cubic meters) over a five-year period from the named Mexican tributaries.

3. In the event of "extraordinary drought or hydraulic accident making it difficult for Mexico to provide the 350,000 acre-feet (431,721,000 cubic meters) minimum annual average amount from run-off in the named Mexican tributaries, the deficit is to be made up during the following five-year cycle." The term "run-off" in this context is considered as the amount of diffused natural surface waters from rainfall or spring flow that flow into streams and ultimately into storage reservoirs before any use of those flows.

4. For water accounting purposes, a cycle terminates if U.S. conservation storage capacity in the two international dams, Amistad and Falcon, is reached, triggering a new five-year cycle of accounting. U.S. conservation storage is considered filled when the U.S. share of water in storage in both Amistad and Falcon reservoirs reaches full storage levels at the amounts set out in Minutes. This has occurred in the past during wetter periods with regular runoff, and also when floodwaters filled the two reservoirs, resulting in cycles of less than five years (for example, in 2008-2010).

Permissible sources of water credited to deliveries under the 1944 Treaty are discussed separately below.

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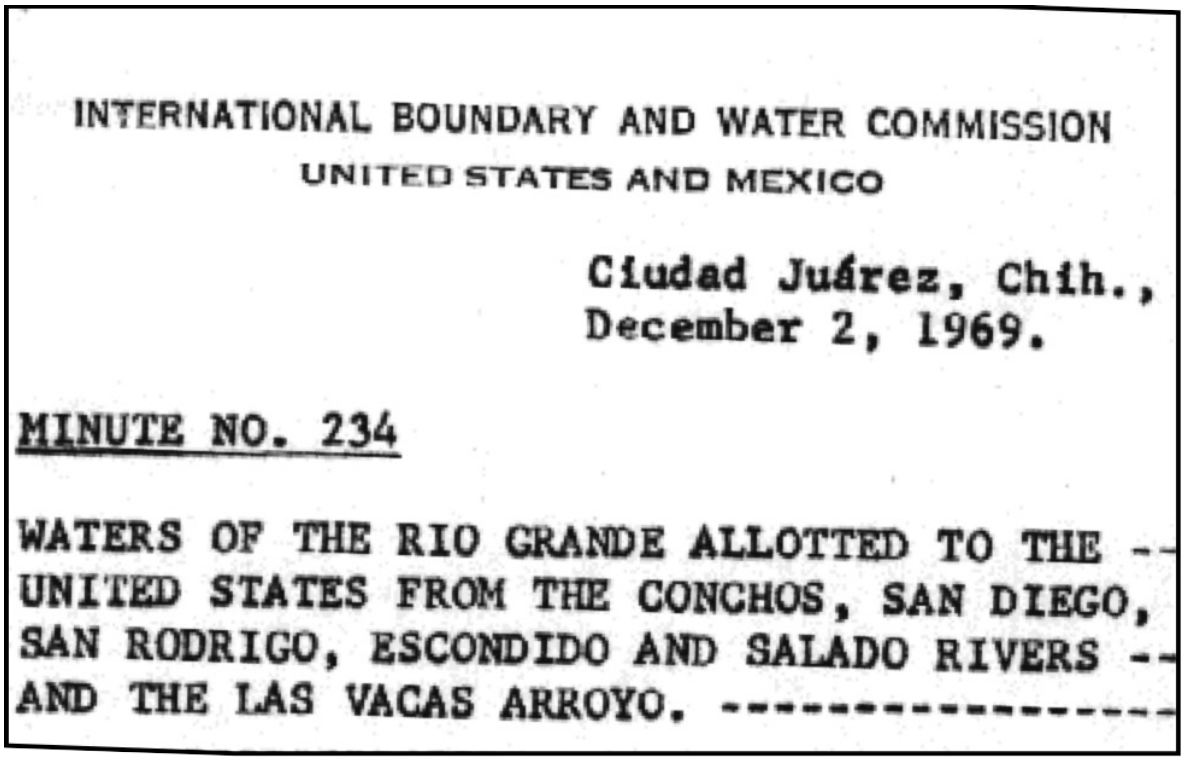
51 See Message from the President of the United States transmitting the Treaty, February 15, 1944, U.S. Senate, 78th Congress, 2d Session, Executive A.

52 *Id*., Art. 4B at p.11.



INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

Ciudad Juárez, Chih.,
December 2, 1969.

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. ----------

Photo: Minute No. 234 cover page
Source: USIBWC

2. Minutes Give the U.S. and Mexico Flexibility in Treaty Interpretation and Enforcement

The U.S. (USIBWC) and Mexican (MXIBWC) Sections of the IBWC are responsible for applying the water allocation provisions of the 1944 Treaty, and many details involved in the implementation of the 1944 Treaty were left for later determination by the two governments acting in concert as the IBWC. For example, Article 5. of the 1944 Treaty, authorizing construction of three international dams and reservoirs, expressly provides that one or more of the stipulated dams may be omitted, and "others than those enumerated may be built, in either case as may be determined by the Commission, subject to the approval of the two Governments…handled by or through the Department of State of the United States and the Ministry of Foreign Relations of Mexico."

Article 24 of the 1944 Treaty, assigning the IBWC its powers and duties, provides for enforcement authority in paragraph (c), stating that " each Commissioner shall invoke when necessary the jurisdiction of the courts or other appropriate agencies of his country to aid in the execution and enforcement of these powers and duties." [53] The IBWC Commissioners (U.S. and Mexico) have the legal authority from their respective governments to enforce the Treaty provisions through the courts and agencies in their respective countries.

53 1944 Treaty, Art. 24(b), pp.42-42 https://ibwc.gov/Files/1944Treaty.pdf.

The IBWC is expressly given the power and duty in Article 24(d) " to settle all differences that may arise between the two Governments with respect to the interpretation or application of this Treaty, subject to the approval of the two Governments." [54] In cases in which the Commissioners do not reach an agreement, Article 24(d) provides that "they shall so inform their respective governments reporting their respective opinions and the grounds therefor and the points upon which they differ, for discussion through diplomatic channels and for application where proper of the general or special agreements which the two Governments have concluded for the settlement of controversies." [55]

Thus, the U.S. and Mexico Commissioners are given the authority to resolve all disputes under the Treaty, and to enforce the Treaty provisions in their respective countries subject to the approval of the two governments acting through the U.S. State Department and the Ministry of Foreign Relations of Mexico.

The 1944 Treaty provides that the approval of agreements between the two countries is evidenced and recorded through Minutes signed by both Commissioners and attested by the Secretaries of each country, with copies forwarded to each government within three days after being signed. If the topic of the Minute is one that does not require the specific approval of both governments, and either government fails to communicate to the IBWC its approval or disapproval of the decision within thirty days from the date of the Minute, then the Minute in question is considered to be approved by that government. If either government disagrees, and an agreement is then otherwise reached by the two governments regarding the matter, that agreement is carried out by the Commissioners.[56]

3. Key Rio Grande Minutes

Six Rio Grande Minutes are of particular interest when considering Rio Grande water deliveries under the 1944 Treaty: Minutes 234, 293, 307, 308, 309, and 325. These Minutes span the years 1969-2020. In 1969, as a result of drought in the 1950's, the two countries clarified in Minute 234 how the payment of deficiencies at the end of a five-year cycle would be made in the following consecutive cycle during drought, and defined the five-year cycles for the period up to 1969. The 1944 Treaty provisions then worked well for about 50 years, until 1995, when an emergency situation due to low flows and subsequent low storage levels in the Amistad reservoir threatened Mexico's domestic water supply. Since 1995, drought and deficiencies in certain cycles have driven several other Minutes. Here is a list of the key Rio Grande Minutes:

- **Minute 234:** *"Waters of the Rio Grande allotted to the U.S. from the Conchos, San Diego, San Rodrigo, Escondido, and Salado Rivers and the Las Vacas Arroyo",* December 2, 1969
- **Minute 293**: "*Emergency Cooperative Measures to Supply Municipal Needs of Mexican Communities Located Along the Rio Grande Downstream of Amistad Dam"*, October 4, 1995
- **Minute 307:** "P*artial Coverage of Allocation of the Rio Grande Treaty Tributary Water Deficit From Fort Quitman to Falcon Dam"*, March 16, 2001

54 *Id*. at Art. 24(d), p. 43.

55 *Id*.

56 See *Id* d. at Art. 25, pp.44-45.

- **Minute 308:** "*United States Allocation of Rio Grande Waters During the Last Year of the Current Cycle"*, June 28, 2002
- **Minute 309**: *"Volumes of water saved with the modernization and improved technology projects for the irrigation districts in the Rio Conchos Basin and measures for their conveyance to the Rio Grande"*, July 3, 2003
- **Minute 325:** "*Measures to End the Current Rio Grande Water Delivery Cycle Without a Shortfall, to Provide Humanitarian Support for the Municipal Water Supply for Mexican Communities, and to Establish Mechanisms for Future Cooperation to Improve the Predictability and Reliability of Rio Grande Water Deliveries to Users in the United States and Mexico"*, October 21, 2020

Each of these Minutes is discussed below.

a. Minute 234 (1969)

Minute 234,"Waters of the Rio Grande allotted to the U.S. from the Conchos, San Diego, San Rodrigo, Escondido, and Salado Rivers and the Las Vacas Arroyo"[57] was approved in 1969 following the completion of Amistad Reservoir. It addresses the waters of the Rio Grande allocated in Article 4 to the United States from the Conchos, San Diego, San Rodrigo, Escondido, and Salado Rivers, and the Las Vacas Arroyo, all in Mexico.

In Minute 234, the IBWC agreed that the first five-year cycle began in October 1953, when Falcon Dam began operation, and the Rio Grande annual water volumes during each five-year cycle after 1953 through 1968 were agreed upon. The IBWC also agreed in the Minute that there was a 476,461 acre-feet deficiency declared during the five-year cycle of October 1, 1953 to September 30, 1958, when the drought of the 1950's was experienced, and that the deficiency was made up during the October 1, 1958 through September 30, 1963 five-year cycle. In the 1963-1968 cycle the U.S. received 32,270AF more than the average 350,000 AF per year requirement. Accordingly, the Commission agreed that the Treaty provisions of Article 4 were considered satisfied through September 30, 1968.

The Minute further addressed how repayment of a deficiency in a five-year cycle would be considered in the future, stating:

> 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:

57 Minute 234, https://www.ibwc.gov/Files/Minutes/Min234.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.[58]

Minute 234 tracks the language in the 1944 Treaty stating that any deficiency in the first five-year cycle "shall be made up in the following five-year cycle." The Minute further assures compliance with the Treaty in the following five-year cycle by requiring that the deficiency be made up in the manner agreed upon, "together with any quantity of water which is needed to avoid a deficiency in the aforesaid following cycle..." Thus, repayment of a prior five-year cycle deficiency does not impact the minimum requirement in the second five-year cycle where repayment is made.

b. Minute 293 (1995)

Due to low flows in the Rio Grande upstream of Amistad Reservoir beginning in 1992, in 1995 Mexican storage levels in the international reservoirs at Amistad and Falcon reached a low level, requiring an emergency agreement between the two countries to assure that there would be no adequate water for domestic uses in Mexico. Minute 293, "Emergency Cooperative Measures to Supply Municipal Needs of Mexican Communities Located Along the Rio Grande Downstream of Amistad Dam", was signed on October 4, 1995, and became effective on November 8, 1995.[59] In the Minute, the United States agreed to loan waters to Mexico under certain circumstances, due to a period of short water supply on the Rio Grande below Fort Quitman.

By the end of the five-year cycle ending October 2, 1997, there was a deficit of 1,023,849 acre-feet in Mexico deliveries. By September 30, 2001, at the close of the fourth year of the second five-year accounting cycle, the deficiency was 1,303,818 acre feet.

Minute 293 allowed Mexico to divert and use waters allotted to the United States from the Conchos for domestic and municipal needs, if U.S. stored water remained at certain levels and Mexico's stored waters dropped to certain levels due to continued lack of precipitation. Mexico would be required to repay this loan of water to the reservoirs when its stored water levels increased. Minute 293 remained in effect for 18 months (through April, 1997). No loan was made because it was not needed due to rainfall in Mexico.

58 *Id*. at pp.2-3.

59 Minute 293, https://www.ibwc.gov/Files/Minutes/Min239.pdf.

c. Minute 307 (2001)

During the 1997-2001 cycle , representatives of both countries met to resolve Mexico's delivery deficit of 1,023,849 acre feet from the prior cycle. Minute 307, "*Partial Coverage of Allocation of the Rio Grande Treaty Tributary Water Deficit From Fort Quitman to Falcon Dam"*, was agreed to at a meeting of the two Governments at the Department of State in Washington on March 16, 2001. The IBWC Commissioners noted discussions by U.S. President George W. Bush and Mexican President Vicente Fox Quezada held a meeting in Guanajuato, Mexico on February 16, 2001. At the Guanajuato meeting the U.S. asked Mexico to provide to the U.S. a volume of 600,000 acre feet of water through July 31, 2001. Mexico agreed in Minute 307.[60]

To support the agreement in Minute 307, IBWC Principal Engineers provided data estimating that rainfall runoff to the Rio Grande from unmeasured Treaty tributaries, plus one-third of the runoff from the six Mexican tributaries, plus expected releases from Venustiano Carranza 2Dam, were expected to total 594,250 acre-feet by July 31, 2001 under the most positive scenario, and 494,533 acre-feet under a more conservative estimate.

In Minute 307, Mexico and the U.S. stated "it is necessary to agree to a contingency plan" in the event Mexico would not be able to deliver the 600,000 acre-feet of water by July 31, 2001:

> This contingency plan could consider in the first case [the more positive scenario], the extension of assignment of the unmeasured tributaries through September, which could be feasible to meet the United States request. In the second case [the more conservative scenario], consideration could be given to covering the shortfall through September 30 with waters from the Luis L. Leon, La Fragua, Centenario and San Miguel Dams. [61]

The two countries also agreed that they would continue further discussions on the deficit reduction, to arrive at a plan on additional measures that would be taken before the end of 2001, identifying measures of cooperation on drought management and sustainable management of the Rio Grande Basin to prevent a recurrence of deficit.

After a limited amount of water was transferred by Mexico by contributing its 50% share of unmeasured tributary flows pursuant to Minute 307, lawsuits were brought by water users in the State of Tamaulipas against MXIBWC and CONAGUA to enjoin them from making these transfers. Downstream Mexican users contended that the transfers violated the provision of the 1944 Treaty, arguing that Mexico's deficits are to be repaid from waters from the Rio Conchos and other tributaries named and measured in the Treaty, and not from unmeasured tributaries. These lawsuits were dismissed by Mexican courts.

Mexico did not provide the 600,000 acre feet contemplated by Minute 307, and no plan was completed by December 31, 2001, to repay the 1,023,849 acre-feet deficit by October 2002.

60 See Minute 307, https://www.ibwc.gov/Files/Minutes/Min307.pdf.

61 *Id*.

d. Minute 308 (2002)

On June 28, 2002, the IBWC addressed the 2001 deficit in Minute 308,"United States Allocation of Rio Grande Waters During the last Year of the Current Cycle",[62] after meetings between U.S. President George W. Bush and Mexican President Vicente Fox Quesada, in Monterrey, Nuevo Leon, on March 20, 2002, and in Washington, D.C. on June 6, 2002. In Minute 308, the two governments recognized that the additional funding for projects in the Basin would result in conserved waters in Mexico, stating that water conserved in the projects on the Rio Conchos and the other tributaries in the 1944 Treaty will be dedicated to "...ensure their conveyance to the Rio Grande." [63]

Minute 308 outlined various conditions of flows to that date, and forecasts of flows, and provided for financing by both governments for improvements in the irrigated areas in the Basin, and further collaboration to collect and share data.

Both governments committed to water accounting to reduce the ongoing deficit, and to establish a forum for the exchange of information, and to encourage the flow of information to the IBWC from governmental and non-governmental organizations in their respective countries. The Commission noted the interest of both governments to convene a binational summit on drought planning and sustainable management of the Rio Grande Basin.

e. Minute 309 (2003)

Minute 309, "Volumes of water saved with the modernization and improved technology projects for the irrigation districts in the Rio Conchos Basin and measures for their conveyance to the Rio Grande," July 3, 2003, addressed conservation projects funded by the North American Development Bank (NADB or NADBank) and the estimated volumes of water saved by the projects in Mexico. The projects were intended "to modernize and improve the technology of Irrigation Districts and units in the Rio Grande Basin making them sustainable and taking the necessary measures to ensure the conveyance of the saved waters to the Rio Grande." [64]

Minute 309 provides for:

- Investment in irrigation conservation projects in Mexico in the Conchos basin
- Submission of an annual report by Conagua on the volumes conserved as a result of the projects, and the status of the projects
- Transfer of the conserved volumes to the Rio Grande annually beginning in January.

Under the 1944 Treaty, the U.S. is entitled to 1/3 of the volumes arriving in the Rio Grande, which would include this conserved water.

Under Minute 309, interest held by NADBANK belonging to both countries was refunded to each country ($40 million to each). This money was designated to fund water efficiency projects in Mexico in exchange for water deliveries from the projects to be made annually to the United States. [65]

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62 Minute 308, https://www.ibwc.gov/Files/Minutes/Minute308.pdf.

63 *Id*.

64 Minute 309, https://www.ibwc.gov/Files/Minutes/Min309.pdf.

65 *Id*.

Mexico and the U.S. disagreed on several aspects of the implementation of Minute 309. On funding, Mexico became concerned that the U.S. did not provide additional appropriations in FY 2004 and FY 2005 as had been discussed to support irrigation conservation projects in Mexico. The U.S. viewed additional funding as under consideration, but due to budgetary limitations, the funding was not forthcoming.

Mexico and the U.S. differed on when the volumes should be transferred. The U.S. wanted volumes to be transferred beginning in January per Minute

309, a period when, according to the U.S. analysis, conveyance losses are less. Mexico wanted releases piggybacked with irrigation releases later in the year, taking the position that conveyance losses are less then. The countries also disagreed on which country would bear conveyance losses.

Mexico also proposed that it only needed to transfer water under Minute 309 when needed to fulfill the 5-year cycle deliveries and that Minute 309 deliveries should not constitute an additional contribution by Mexico of volumes above those required by the Treaty.

The Minute 309 experience frustrated both U.S. and Mexico stakeholders. And as a result, some stakeholders have since pushed back against any proposals suggesting that the U.S. fund conservation projects in Mexico to enhance water supply for both countries.

Deficits between 2002 and 2020 were satisfied in following cycles by supplementing delivery of flows to the Rio Grande from Mexico's stored water in the Reservoirs pursuant to Minute 234; by one flood conservation level fill which resulted in a start of new five-year cycle; and by flows from tributaries downstream of Falcon Dam by special agreements among the U.S., Mexico, and Texas.

f. Minute 325 (2020)

In June, 2020, Mexico had a shortfall for the 2015-2020 cycle two months before the end of the cycle, leading to concern that the cycle could end in a deficit. The Governor of Texas delivered a letter of protest to the USIBWC Commissioner about Mexico's deficiency in fulfilling its water delivery obligations to the U.S. under the Treaty by the October 24, 2020 deadline.[66] The countries discussed a plan that involved CONAGUA delivering obligated Treaty water to the United States by releasing Mexican water stored in Mexican reservoirs in the Conchos River Basin. Chihuahua farmers learned of this plan in September and protested, resulting in a tragic fatality at one of the protests. The farmers' concerns and the interviews conducted in 2022 about the protests are discussed in detail below as part of the Gurley Report.[67]

The U.S. and Mexico struck a last-minute agreement on October 21, 2020, three days before the end of the cycle, to address the shortfall in Minute 325, "Measures to end the current Rio Grande water delivery cycle without a shortfall, to provide humanitarian support for the municipal water supply for Mexican communities, and to establish mechanisms for future cooperation to improve the predictability and reliability of Rio Grande water deliveries to users in the United States and Mexico".[68]

66 The letter is available at https://www.tceq.texas.gov/downloads/border/1944-water-treaty/062920-texas-governor-to-ibwc.pdf/view.

67 Vanda Felbab-Brown, *Not dried up: US-Mexico water cooperation* (2020) https://www.brookings.edu/blog/order-from-chaos/2020/10/26/not-dried-up-us-mexico-water-cooperation/.

68 Minute 325, https://ibwc.gov/Files/Minutes/Min326.pdf.

Minute 325 established that Mexico would end the five-year October 25, 2015–October 24, 2020 water delivery cycle without a shortfall by transferring volumes of stored Mexican water to the United States. Mexico was concerned that the transfer would impact the municipal supply for its communities downstream of Amistad Dam if rain conditions did not improve to increase the Mexican storage at the international reservoirs. Article 4 of the Mexican Constitution guarantees the right to water for personal and domestic use.[69] Thus, in keeping with Article 9 of the 1944 Treaty,[70] Minute 325 provides in Resolution 2:

> In the event that, as a result of the transfer described in Resolution 1, Mexican storage at the Amistad and Falcon International Reservoirs reaches a storage volume of zero or is insufficient to cover one month of municipal needs for urban use in Mexico downstream from Amistad Dam, the United States, for humanitarian reasons, will negotiate with Mexico the terms for potential temporary use of U.S. water for Mexico's minimum municipal water needs downstream from Amistad Dam. This Resolution will no longer apply when Mexico's combined storage in the Amistad and Falcon International Reservoirs reaches a volume of 129,714 acre-feet (160 million cubic meters) or on October 31, 2021, whichever occurs first. [71]

While the water delivery agreement in Minute 325 was greeted positively as an end to a shortfall, stakeholders in both countries also had concerns about it. In Texas, the water came after the peak irrigation demand of July-September, reducing its value to irrigators. In Mexico, Chihuahua farmers protested depletion of a reservoir to fulfill Mexico's Treaty obligations. Downstream in the state of Tamaulipas, various municipalities and farmers expressed concern that they considered their water supply transferred to the United States.

Minute 325 included two other provisions to emphasize "the importance of establishing a framework for cooperation to develop tools to improve water management in the Rio Grande basin."[72] The Minute established two IBWC work groups:

This framework will include a Rio Grande Hydrology Work Group with technical experts from both countries to enhance information exchange, develop a binational Rio Grande model, and use the model as a tool to analyze water management scenarios, including scenarios related to potential future water conservation projects. The efforts of the Rio Grande Hydrology Work Group will be overseen by the Rio Grande Policy Work Group, whose members will include experts in policy matters related to water management and/or international relations.[73]

Minute 325 referenced Minute 308, dated June 28, 2002 (discussed above), noting that 308 called for increased data exchange between the two countries regarding management of the hydrological system, and emphasized "the importance of sharing information in a timely fashion regarding Mexico's annual operating plan for the Rio Grande Basin, showing allocations to Mexican users and compliance with Treaty deliveries to the United States. [74]

69 *Id*. at p.1, par.3.

70 *Id*. at p.2, par.1.

71 *Id*. at p.3, Resolution 2.

72 *Id*. at p. 2, par.4.

73 *Id*.

74 *Id*. at par.5, pp. 2-3.

Finally, Minute 325 stated "the goal of developing a Minute prior to December 2023 that would provide increased reliability and predictability in Rio Grande water deliveries to users in the United States and Mexico."[75] This white paper is part of the background work by USIBWC to establish the "framework of cooperation" described in Minute 325.

B. Pertinent U.S. Water Law

Water ownership, quality, distribution, and management in the United States is governed by a complex web of overlapping laws at the federal, state, and local level, and includes statutes, regulations, case law, and common law at each level of government, plus treaty rights of Native Americans, and international treaties. Broadly, water law can be divided into two substantive areas: rights to use water, and restrictions on pollution of water.

The U.S. federal government plays a significant role in the law of interstate and international waters, and in building and managing large water infrastructure. Federal statutes also govern water quality and drinking water, through pollution control.

Each state has its own laws for surface and groundwater. Generally, state property law grants the right to use water rather than own it. For purposes of considering the Rio Grande from Fort Quitman to the Gulf of Mexico in this white paper, Texas water law is the relevant U.S. state law.

A brief summary of applicable U.S. and Texas law follows.

1. U.S. Water Law

While surface water ownership and allocation is primarily governed by each state's laws, water quality and drinking water is regulated in the first instance by federal statutes that are largely implemented through the states. Native American tribal water rights are governed by the Federal Reserved Water Rights Doctrine, which states that when the federal government sets aside land for a particular purpose, it also sets aside sufficient water for that purpose.[76] Under the same doctrine, the National Park Service secures water rights as necessary to provide water for staff and visitors and to protect water resources.[77] Disputes between states regarding water ownership and allocation must be taken to the U.S. Supreme Court under Article III of the U.S. Constitution. [78]

Water quality in the U.S. is primarily regulated under the Clean Water Act (CWA or Act).[79] The Clean Water Act prohibits a discharge of a pollutant by any person into a water of the United States without a permit. Penalties for discharging without a permit apply per day, per penalty.[80] Most states have qualified under the statute and regulations to issue permits under the CWA permitting program, as part of the cooperative federalism that underlies the CWA.

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75 *Id*. at par. 4, p. 2.

76 *See Winters v. United States,* 207 U.S. 564 (1908) (water rights existed by necessary implication at the time the reservation was reserved.)

77 See *Arizona v. California*, 373 U.S. 546 (1963) (extended reserved water rights for non-reservation purposes and held that Congress has the power to reserve water for particular purposes when it sets aside federal lands).

78 See, e.g., *Texas v. New Mexico*, 138 S. Ct. 954 (2018). Article III, Section 2 of the U.S. Constitution provides that the jurisdiction of the U.S. Supreme Court extends "to controversies between states."

79 Clean Water Act, 33 U.S.C. Section 1251 et seq., https://www.epa.gov/laws-regulations/summary-clean-water-act.

80 See *Federal Register,* 87 FR 1676 (1/12/22), https://www.govinfo.gov/content/pkg/FR-2022-01-12/pdf/2022-00349.pdf.

The Environmental Protection Agency (EPA) is primarily responsible for implementing and enforcing the CWA. The U.S. Army Corps of Engineers has primary responsibility for the Section 404 permitting program, regulating discharges of dredge or fill material into jurisdictional wetlands. Section 404 permits issued by the Corps are subject to oversight and veto by EPA. [81]

What constitutes a "water of the United States" (also referred to as "navigable water") defines the jurisdiction of the CWA, including the prohibition to discharge pollutants and the requirements to meet a number of other regulatory programs under the Act that standards for national water programs under the Act that include water quality standards for defined water bodies, technology controls for certain industries, and spill cleanup standards. While the CWA is now 50 years old, the jurisdictional definition of "waters of the United States" has been the subject of numerous rule-makings, intense debate, and litigation over the past 20 years. The latest rule, signed December 29, 2022,[82] is currently being challenged in federal court.[83] The challenges to each of the various definitions put forward have centered around whether each has been sufficiently inclusive to meet the provisions of the CWA, or overinclusive and therefore outside the agencies' authority.

In addition to the CWA, the Safe Drinking Water Act (SDWA) [84]is designed to protect the quality of drinking water in the U.S. It regulates all waters actually or potentially designed for drinking use, whether surface water or groundwater. Under the SDWA, EPA establishes minimum standards to protect tap water and requires all owners or operators of public water systems to comply with those standards. As with the CWA, state governments can be approved to implement SDWA rules for EPA. EPA also establishes minimum standards for state programs to protect underground sources of drinking water from possible contamination through injections of underground fluids.[85]

Other U.S. federal laws affecting water include the Coastal Zone Management Act; the Endangered Species Act; the Marine Protection, Research, and Sanctuaries Act; and the North American Wetlands Conservation Act. [86]

2. Water Law in Texas

Texas, unlike most other western states in the U.S., has a statewide regulatory program for surface water only, and not for groundwater. Groundwater and surface water are treated separately under Texas law. [87] In Texas, surface water is considered property of the State, while groundwater and the right to capture groundwater is considered the property of the owner of the surface and treated much like a mineral or oil and gas.

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81 See Section 404 of the Clean Water Act: Permitting Discharges of Dredge or Fill Material https://www.epa.gov/cwa-404.

82 *Revised Definition of "Waters of the United States,* 88 FR 3004 (January 18, 2023) https://www.federalregister.gov/documents/2023/01/18/2022-28595/revised-definition-of-waters-of-the-united-states.

83 *State of Texas, et al. v. EPA, et al.,* Civil Action No. 323-cv-17 (January 18, 2023), https://www.texasattorneygeneral.gov/sites/default/files/images/press/Texas%20WOTUS%20Complaint.pdf?utm_content=&utm_medium=email&utm_name=&utm_source=govdelivery&utm_term=.

84 SDWA, 42 U.S.C. Section 300(f) et seq. (1974).

85 For more information, see Summary of the Safe Drinking Water Act, https://www.epa.gov/laws-regulations/summary-safe-drinking-water-act.

86 Coastal Zone Act Management Act, 16 U.S.C. 1451 (1972) (especially Section 6217, Coastal Nonpoint Source Pollution Control Program); Endangered Species Act, 16 U.S.C. Section 1631 et seq. (1973); Marine Protection Research and Sanctuaries Act, 33 U.S.C. Section 1411 et seq. (1972); North American Wetlands Conservation Act, 16 U.S.C. Section 4401 (2017).

87 Groundwater in Texas is owned by the landowner and subject to the "rule of capture". Although the intersection between groundwater and surface water both in the field and in the law are critical to an understanding of water scarcity generally, binational groundwater issues affecting boundary waters are beyond the scope of this paper.

Surface water in Texas, while owned by the state, is held by the state in trust for the public. Surface water is defined as "water under ordinary flow, underflow, and tides of every flowing river, natural stream, lake, bay, arm of the Gulf of Mexico, and stormwater, floodwater, or rainwater of every river, natural stream, canyon, ravine, depression, and watershed in the state."[88]

Texas surface water is governed by the doctrine of prior appropriation–first in time is first in right.[89] In Texas, the first person to receive a permit to put water to beneficial use has the senior water right, superior to all water rights holders given rights after that senior right is granted. Even in a water shortage, the senior rights holder is entitled to its share before others can receive theirs. The most senior water right holder in Texas ultimately is the state, the owner of the surface water.

There is one subcategory of surface water that is treated differently in Texas, and that is diffused water–water on the surface that has not entered the watercourse. Diffused water includes water flowing over the ground from falling rain or melting snow. Once diffused water reaches a watercourse, it becomes state-owned surface water– transformed legally from private property to public property.

The definition of a "watercourse" therefore is significant. A watercourse is a channel, with a well-defined bed and banks, in which water flows as a stream and has a permanent source of supply.[90] It is not necessary that water always be present to satisfy the "permanent source of supply" requirement. The determinative question for the existence of a "permanent source of supply" is the utility of the water supply for agriculture and other beneficial purposes. Texas holds the waters of navigable streams in trust for the public and, therefore, they are subject to appropriation.

Two entities have responsible for surface water in Texas: The Texas Commission on Environmental Quality (TCEQ), and the Texas Water Development Board (TWDB). Each is discussed below.

Figure 15: Texas Commission on Environmental Quality and Texas Water Development Board Logos
Sources: TCEQ, TWDB

88 Texas Water Code Section 11.021.

89 In the U.S, three different systems have developed to define the rights of private persons in water. The first is the riparian doctrine, which developed in the water-abundant eastern U.S. and limits the use of water only to those landowners adjacent to rivers, streams, or other water bodies. The second is prior appropriation, discussed above in the context of Texas law. The third is a hybrid system, which has been adopted by a handful of states, applying aspects of both the riparian doctrine and prior appropriation.

90 *Hoefs v. Short,* 114 Texas 501, 273 S.W. 785 (1925).

a. The Texas Commission on Environmental Quality (TCEQ)

The Texas Commission on Environmental Quality (TCEQ) is the environmental agency for the state. TCEQ administers water rights in Texas. Under certain circumstances, individuals can apply for a permit for water rights to TCEQ. The permit allows a nonpossessory right of use of water — it does not grant ownership. It is a "usufructuary" right.

i. Permitting

Permits are granted to individuals for the following uses:

- Domestic and municipal uses
- Agricultural uses
- Industrial uses
- Mining and recovery of minerals
- Hydroelectric power
- Navigation
- Recreation and pleasure
- Public parks
- Any other beneficial use[91]

To grant a permit, TCEQ must find that "there is unappropriated water available" and that "the permit is consistent with the State Water Plan and relevant Regional Water Plans."[92]

A surface water right is recognized as a property right in Texas, and the interest in the use of the water may be sold, leased, or transferred to another person. Transfer can occur with a sale of land, or separately.[93]

91 See Texas Water Code 11.023-24.

92 *Id*. at Section 11.134.

93 *Id*.

Figure 15: Texas Watermaster Areas
Sources: TCEQ

ii. Rio Grande Watermaster

TCEQ may on its own initiative divide the state into water divisions to administer adjudicated water rights. The Commission's executive director then appoints and supervises a watermaster and advisory committee for each division.[94] There are currently four watermasters: for South Texas; for the Rio Grande (below Amistad); for the Conchos River; and for the Brazos River.[95] Generally, a watermaster divides the water of the streams (or other sources of supply) within the watermaster area, based on the adjudicated water rights, and regulates controlling works and diversion works in times of shortage to protect existing water rights and to prevent waste and any diversion, storage, or use in excess of adjudicated rights.[96]

The Rio Grande Watermaster administers water rights in the Rio Grande Basin, from Fort Quitman to the Gulf of Mexico. In the Rio Grande Basin above Lake Amistad (the Upper Rio Grande), water rights are managed using a "first in time, first in right" priority system, as they are in other parts of Texas. Water rights in the Middle and Lower Rio Grande are served by the Falcon-Amistad reservoir system. Water below Lake Amistad is allocated on an account basis. Priority is given to all municipal accounts, which means that at the beginning of each year the storage balance for each municipal account resets to its full authorized water-right amount.

94 Texas Water Code, Sections 11.325-.326.

95 Map of Texas Watermaster Areas on TCEQ website, https://www.tceq.texas.gov/permitting/water_rights/wmaster.

96 Texas Water Code, § 11.327, § 11.454; see also id. § 11.3271 (outlining powers and duties particular to the Rio Grande Watermaster).

The municipal priority is guaranteed by the monthly reestablishment of a municipal reserve in the system of 225,000 acre-feet, which is equivalent to one year of average diversions for all municipal demands below Amistad for Texas users.[97] TCEQ also establishes a 75,000 AF operating reserve, necessary to cover losses of water charged to the United States. These losses are the result of seepage, evaporation, and conveyance; emergency requirements, and adjustments of amounts in storage as needed after finalization of the IBWC's provisional computations. [98]

In contrast, irrigation accounts must rely on balances that are carried forward, as irrigation accounts are not reset at the beginning of the year. Each month the watermaster determines how much unallocated water assigned to the United States is contained in the Falcon-Amistad system. If surplus water is identified in a given month, it is allocated to the irrigation accounts. When water is used, it is subtracted from the respective account by type of use from the account's usable balance.

The Rio Grande Watermaster duties include coordinating releases and diversions; monitoring stream flow, reservoir levels, and water use within the basin; enforcing compliance with water rights; and responding to complaints.[99]

Photo: Rio Grande at Santa Elena Canyon, Big Bend National Park TX.
Blog Traveling with Tom

97 TCEQ Rio Grande Watermaster Program, https://www.tceq.texas.gov/permitting/water_rights/wmaster/rgwr.

98 TCEQ, Operation of the Rio Grande, Section 303.21 at https://www.tceq.texas.gov/assets/public/legal/rules/rules/pdflib/303c.pdf. The 75,000 AF reserve is reduced to 48,000 AF when negative allocations are required.

99 TCEQ Rio Grande Watermaster Program, supra.

iii. Environmental Flows in Texas

The traditional prior appropriation doctrine considered water left to preserve instream flows, or for the benefit of bays and estuaries, to be water wasted. The doctrine encouraged use and consumption of such flows in spite of their environmental, aesthetic, or economic value. Until 2007, protection of environmental flows in Texas generally had been handled on a permit-by-permit basis.

In 2007, Texas Senate Bill 3 directed the State, for the first time, to develop and adopt comprehensive environmental-flows standards for the state's major river and bay systems, using a science-advised stakeholder process to help define each system's flow needs.[100] These Basin and Bay Stakeholder Committees and Expert Science Teams were also charged with recommending strategies to meet basins' defined environmental-flow needs to the extent they would not be met by restrictions on new permits.

TCEQ developed rules that adopt environmental flow standards (a schedule of flow quantities) for each river basin/bay system in Texas, as the basis for determining the amount of unappropriated water (with an assigned priority date) to satisfy downstream instream flow needs or freshwater inflow needs for affected bays and estuaries. These standards essentially create a 'floor' below which water should not be appropriated. TCEQ has opted to establish environmental flow standards rather than set asides for environmental flow needs.

Texas adopted environmental flow standards for the Rio Grande in 2014.[101] The standards contain a schedule of flow quantities for subsistence flows, base flows, and high flow pulses at defined measured points.[102]

Section 11.0235 of the Texas Water Code sets out the state's policy regarding environmental flows, in order to maintain the biological soundness of the state's rivers, lakes, bays and estuaries. Although the TCEQ may not issue new permits for instream flows dedicated to environmental needs or bay and estuary inflows, it may approve an application to amend an existing water right to change the use or add such a use.[103]

TCEQ must consider the applicable environmental flow standards in its water rights permitting and include any necessary protective conditions. Any new or amended water right that increases the amount of water authorized must include a provision allowing the TCEQ to adjust conditions in the water right to provide for protection of instream flows or freshwater flows in compliance with applicable flow standards. State water set aside by TCEQ for freshwater inflows and instream uses may be made available temporarily for "other essential beneficial uses" if the Commission finds that an emergency exists that cannot practically be resolved in another way.

Some stakeholders have suggested that the Rio Grande is overallocated in Texas, as it is in Mexico. One indication they point to is the lack of prosecution of abandoned water rights. Texas Water Code Section 11.030 provides that "[i]f any lawful appropriation or use of state water is willfully abandoned during any three successive years, the right to use the water is forfeited and the water is again subject to appropriation." Stakeholders report that reassignment of forfeited water rights is rare.

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100 Senate Bill 3, Texas 80th Legislature, 2007.

101 TCEQ website at https://wayback.archive-it.org/414/20210527224027/https://www.tceq.texas.gov/assets/public/legal/rules/rules/pdflib/298h.pdf .

102 *Id*. at Section 298.510.

103 Texas Water Code, Section 11.0237.

b. Texas Water Development Board ("TWDB") and Region M

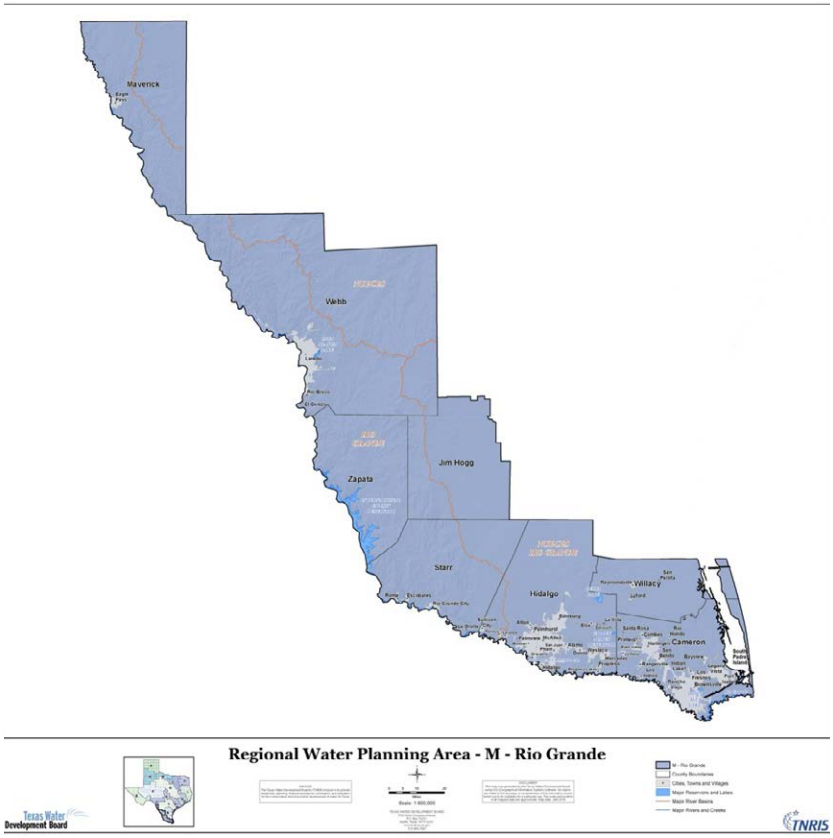

Figure 16: Texas Regional Water Planning Area - Region M
Source: Texas Water Development Board

The Texas Water Development Board (TWDB) is the State's lead water planning and infrastructure financing agency. "To ensure adequate and affordable water supplies to withstand future droughts", TWDB is responsible for administering the regional water planning process. It prepares and adopts the state water plan every five years. The state water plan considers a 50-year horizon, taking into account changes in population, water supplies, technological improvements, economic shifts, project viability, and state policy.[104]

Water plans have been prepared on a five-year cycle since 1997 for 16 regional water planning areas. The next State Water Plan is slated for 2026. Regional plans are prepared by regional planning groups supported by the TWDB. Population projections, water demand projections, and existing water supplies are considered. Each planning group then identifies potential shortages under droughts of record conditions, recommends water management strategies with cost estimates to address potential shortages, and identifies the socioeconomic impacts to the region of not addressing the identified water needs.

104 TWDB https://www.twdb.texas.gov/waterplanning/index.asp.

The state and regional water plans are comprehensive and detailed, and result in valuable planning documents for the regions and the state. Some stakeholders express concern, however, that in evaluating water supply during the process, some Texas regions do not take into account climate change data; that type of analysis has been unavailable to the smaller, less populous regions.

Socioeconomic impact analysis considers the way insufficient water supplies would negatively impact existing business and industry as well as ongoing economic efforts in Texas. It also looks at how unreliable water can disrupt activities in homes, schools, and government and endanger public health and safety. Impact factors analyzed include utility tax loss, utility revenue loss, job loss, population loss, and tax loss. TWDB gathers data annually in a water use survey from entities using groundwater, surface water, and reclaimed water supplies for non-personal uses, and estimates current and future water use for the State Water Plan.

The Rio Grande (M) Regional Water Planning Area (Region M) includes 8 counties in the middle and lower Rio Grande Valley in Texas. Over 60% of Region M is within the Rio Grande Basin. [105] The 2021 Region M Plan[106] estimates that about 7% of the State's 2020 population resided in Region M. Between 2020 and 2070, the population is projected to increase approximately 105 percent, and water demands to increase 4%. The Region M Plan estimates that Region M does not have enough water supplies to meet demands through 2070. Most of the projected water needs in Region M are associated with irrigation. In drought, Region M was projected to need 937,000 acre-feet of water in 2020, and 970,000 acre-feet by 2070.Most recently the Rio Grande Region M Planning Group recommended a mix of water management strategies and projects that would provide less water than is required to meet future needs. The 293 strategies and 131 projects would provide 508,000 acre-feet of additional water supply by 2070 at a total capital cost of $1.8 billion.

The TWDB also administers the Texas Water Bank, which includes the Texas Water Trust. [107] The Bank, created in 1993, provides information describing availability and needs for water in the State to facilitate the voluntary marketing and transfer of water and water rights. Transfers may be temporary or permanent and usually require a permit modification from TCEQ. The Trust holds water rights for environmental purposes. With approval from TCEQ, water rights held in the Trust are not subject to cancellation or forfeiture, for a specified time by contract or in perpetuity, offering the opportunity to acquire water rights for environmental purposes though donation, lease, or purchase.

105 Summary of the 2021 Rio Grande (M) Regional Water Plan athttps://www.twdb.texas.gov/waterplanning/swp/2022/docs/2021_RegionalSummary_M.pdf .

106 2021 Rio Grande (M) Regional Water Plan http://www.twdb.texas.gov/waterplanning/rwp/plans/2021/#region-m.

107 Texas Water Bank https://www.twdb.texas.gov/waterplanning/waterbank/index.asp.

C. A Summary of Mexico Law

1. Mexican Water Law is Governed By Mexico Federal Law

The Mexican Federal Water Law (Ley Federal de Aguas)(1992) established the integral administration of water resources by CONAGUA as the sole water authority. It also established a legal framework related to water allocations and concessions, with the objective of eliminating bureaucratic practices that hinder the process for allocation of new concessions. Finally, the law created the Public Registry of Water Rights, to give protection to accredited water users and to allow the transfer of rights and changes to the use of water.

The Water Law was updated in 2004, to resolve the then-current water governance crisis in the country and address issues that had not been considered, such as water efficiency and environmental damages related to water, and to review the legal framework of water concessions.

The modifications made also were aimed initially towards the decentralization of the water sector. After revisions, the structure of the control organisms remained the same, with the new addition of the "Organismos de Cuenca" or River Basin Councils. The Councils act as the organization that integrates all of the water stakeholders in the basins, but do not have decision-making capacity.

The Constitutional amendment of 2012 established in its Article 4 that water for personal consumption is a human right of all the inhabitants of Mexico. This reform triggered the need to modify the Federal Water Law to include mechanisms that guarantee this right. The transitory provisions of the constitutional reform established a term of 365 days to have a new Federal Water Law. (That term expired more than 9 years ago without any changes to the law.)

The Law had facilitated the processes to obtain concessions for water in the industrial and agriculture sectors. From 1993 to January 2020, 515,648 concessions were granted[108] in Mexico.

Under the 2004 amendments, CONAGUA continues to be a body of the executive branch, and the states have little decision-making power on issues related to water. This centralization has been viewed as one of the barriers to the implementation of the law, as CONAGUA lacks the institutional capacity to complete functions in aspects such as surveillance, inspections and sanctions on water use. CONAGUA also lacks funds to carry out the fulfillment of the objectives.

Between 2015 and 2018, the Mexican Congress worked on a bill for the new Federal Water Law. Two projects were presented, one prepared by the legislative body and the other through a citizen initiative[109].

The congressional draft bill included a new water administration plan with modifications to concessions; comprehensive risk management (floods and droughts); new regulation of public services; and the distribution of competencies between the Federal government, states, and municipalities. The proposal did not address community water management.

108 Ortiz Rendón G. El Marco Jurídico del Agua en México, pp. 40-46, https://www.ri.unam.mx/contenidos/evolucion-y-perspectivas-del-marco-juridico-del-agua-en-mexico-nuevos-retos-y-oportunidades-para-la-gestion-integrada-5026153?c=nw3oMM&d=false&q=-*:*&i=2&v=1&t=search_0&as=0

109 Dominguez Serrano J. La Propuesta de Ley General de Aguas en México: Dos visiones diferentes, la de la autoridad y la de la sociedad organizada. (2018) https://www.cepal.org/sites/default/files/events/files/presentacion_de_la_sra._judith_dominguez_serrano.pdf.

The citizens' initiative proposed the creation of a new water authority, through which all decisions, including budget and appointments, should be made; explicit recognition and protection of the natural resources of indigenous people and their preferential treatment for the management of these resources; citizen control of water utilities; and a zero-pollution policy.

The congressional bill was submitted to a vote. However, the lack of consideration of the citizen initiative caused uneasiness in the population and was broadly questioned by the media and the public. For this reason, the congressional law was put on hold.

Current President Manuel Lopez Obrador promised that the new Federal Water Law would be approved during his term. In 2021, a "Draft Proposal of Opinion and Articles for General Water Law" was presented. This proposal was prepared by academics, lawyers, and experts within various sectors. The proposal includes some of the issues proposed by the citizen initiative in 2015, focusing mainly on the participation of the Federal Government, the states, Mexico City, the municipalities and territorial demarcations, indigenous peoples, and communities to guarantee the human rights associated with water.

Currently, a new bill is not being discussed in the legislature. The current drought in some states of northern Mexico, mainly in Nuevo León, has led to new executive decrees from the executive branch aimed to relieve the water emergency.

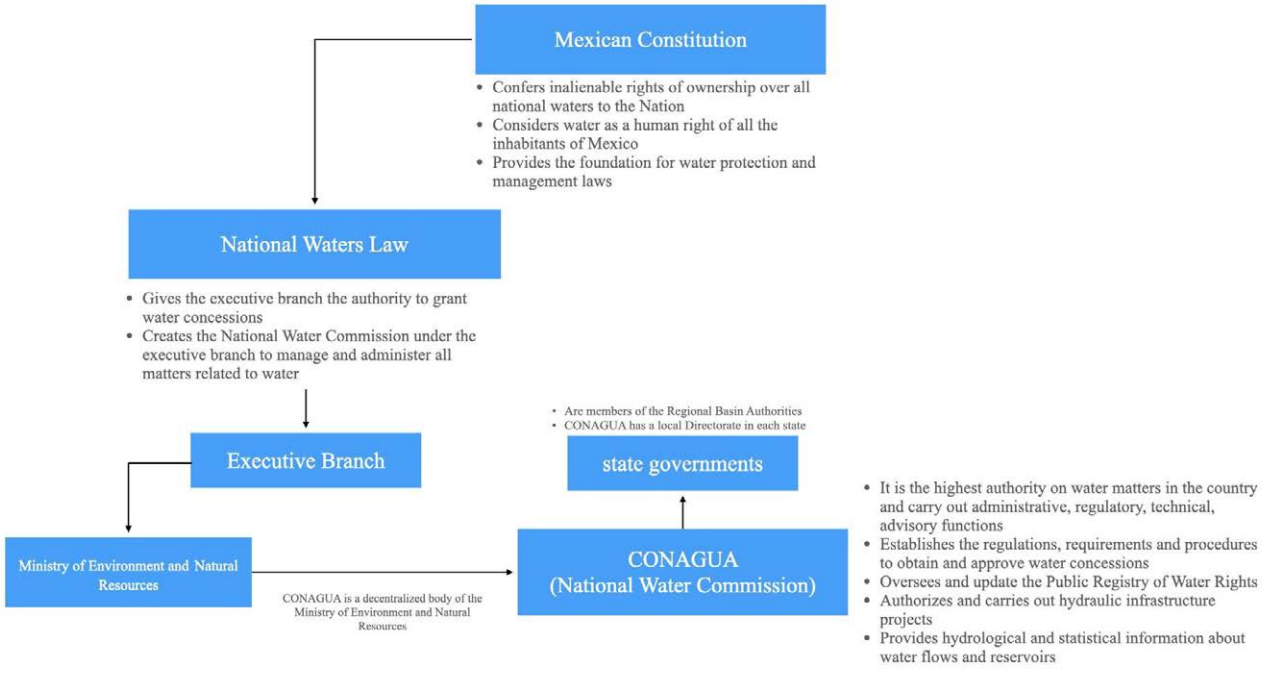

Figure 17: Mexican Water Law System
Source: Author

2. Concessions in Mexican Water Law

For practical purposes, the uses of water in Mexican law are separated into two groups. The first is types of consumptive uses, which include agriculture, public supply, self-sufficient industry, and thermoelectric plants. The second group is non-consumptive use, which includes hydroelectric and ecological conservation. According to CONAGUA, as of 2018, 60.8% of the water for consumptive use in Mexico came from surface sources (rivers, streams, lakes, and dams), and the remaining from groundwater. Of the total volume allocated for consumptive grouped uses, as of 2018, 75.7% corresponded to agriculture[110].

To obtain water rights or concessions, interested parties must refer to the provisions of Mexico's Federal Water Law. Before the regularization process initiated with the Federal Water Law of 1992, the rights for the use of water were exclusively issued by the President of the Nation through decrees. Due to the lack of an administrative system or process for obtaining concessions, it is estimated that in 1992 there were more than 300,000 water users, but only 2,000 concessions had been issued[111].The 1992 Federal Water Law stated that the concessions had a duration of 5 to 50 years and that the volumes of water conceded or assigned to users must be registered in the Public Registry of Water Rights (Registro Público de Derechos de Agua hereinafter REPDA).

The reform of the Federal Water Law in 2004 established that the term of the concession or assignment for the use of national waters will not be less than five nor more than thirty years. The reform also modified the categories of water uses to consumptive and non-consumptive uses.

3. Water Allocation

CONAGUA oversees water allocations to the Irrigation Districts.

In Mexico, the irrigation districts are areas defined by CONAGUA that have irrigation infrastructure developed by the federal government. These districts are distributed along the territory. The infrastructure in the districts include water storage facilities, diversions structures, pumping plants, wells, canals, and roads, among others. Each irrigation district has several registered users, which can be individuals or associations. Organizationally, each irrigation district has a civil association of users that is formed by elected members of the area where the irrigation districts are located. The associations each design an irrigation plan, approved by CONAGUA, which sets the quotas of cubic meters of water in a given period[112]. To date there are 86 irrigation districts in Mexico[113] of which 13 are located in the Rio Bravo Hydrologic Region.

Since 2012 there are also irrigation units that, unlike the irrigation districts, cover an area of less than 500 hectares with small irrigation works. The irrigation units do not have a formal organization structure. The irrigation units are supervised by CONAGUA, and their users manage them. The main

110 Comisión Nacional del Agua, 2018. Estadísticas del Agua en México Chapter 1, 2. https://sina.conagua.gob.mx/publicaciones/EAM_2018.pdf (Accessed on Aug. 25).

111 Cantú M, Garduño H. 2003, Administración de Derechos de Agua Experiencias, Asuntos Relevantes y Lineamientos. México. Pp. 107- 117 available at: https://revistas-colaboracion.juridicas.unam.mx/index.php/derechos-humanos-emx/article/view/24207/21668

112 Sistema Nacional de Información del Agua (SINA) https://sina.conagua.gob.mx/sina/tema.php?tema=distritosriego.

113 Sistema Nacional de Información del Agua (SINA) https://sina.conagua.gob.mx/sina/tema.php?tema=distritosriego.

purpose of these units is to protect the interests of indigenous or vulnerable communities[114].

Under the Mexican Law of National Waters, new concessions may not be granted for a period less than 5 years, and have a maximum duration of 30 years[115]. Concession beneficiaries may also request an extension to extend the concession five years before it expires. The extension of a concession can be up to the same duration as the original concession. Stakeholders interviewed for this paper pointed out that CONAGUA allocates water annually, based on historic data that could be 5 or more years old and so concessions may not accurately reflect the current allocations or availability of water, resulting in over-allocation.

The assignment of a concession as well as the cost per cubic meter of water is determined according to the Availability Zone. The Availability Zones are designated by CONAGUA and refer to the availability of water resources in the area. Zone 1 is considered to have the greatest scarcity and Zone 4 has the greatest availability of water. The type of Availability Zone not only determines the value per cubic meter of water, but it is also a determining variable for the approval of a new concession and the type of permit. CONAGUA also considers the National and Regional Hydrological Plan to determine the number of new concessions and renewals that will be allowed during the established period.

The cost per cubic meter of water varies according to the Availability Zone and the type of user. The value is calculated on each thousand cubic meters of water for water destined for use in homes, communities, federal entities, and municipalities, as well as for concessions to entities that will provide water purification services for domestic use. The rates are determined according to the scales in the Availability Zone chart. In cases where the established usage limit of 300 liters per inhabitant per day is exceeded, a new rate scale will be applied. The usage limit, currently 300 liters per inhabitant, is determined with the information provided by the Population and Housing Census carried out every 10 years[116].

State	Irrigation District Name
Chihuahua	005 Delicias, Chih.
Chihuahua	009 Valle De Juárez, Chih.
Chihuahua	042 Buenaventura, Chih.
Chihuahua	089 El Carmen, Chih.
Chihuahua	090 Bajo Río Conchos, Chih.
Chihuahua	103 Río Florido, Chih.
Chihuahua	113 Alto Río Conchos, Chih.
Coahuila	006 Palestina, Coah.
Nuevo León	004 Don Martin Coah. y N.L .
Nuevo León	031 Las Lajas, N. L.
Tamaulipas	025 Bajo Río Bravo, Tamps.
Tamaulipas	026 Bajo Rio San Juan, Tamps.
Tamaulipas	050 Acuña - Falcón, Tamps.

Figure 18: Irrigation Districts in the Rio Bravo Basin (Mexico)
Source: Sistema Nacional de Información del Agua

114 Pedroza Gonzalez E, Hinojosa Cuéllar G. 2013. Manejo y distribución del agua en distritos de riego. Breve introducción didáctica pp. 10. Available at http://hdl.handle.net/20.500.12013/1711

115 Ley de Aguas Nacionales y su reglamento. 2017 Article 24 pp. 55 at https://www.diputados.gob.mx/LeyesBiblio/pdf/LAN.pdf

116 Ley Federal de Derechos: Disposiciones Aplicables en Materia de Aguas Nacionales 2021, pp. 14-18 access link: https://www.gob.mx/cms/uploads/attachment/file/635527/CGRF-1-21_LFD_VF.pdf

In the case of surface or underground water that is destined for agricultural production, the concessionaires pay a single rate for each cubic meter that exceeds the volume granted to each irrigation district. Mexican Federal Law also establishes the cubic meter rate for water transfer operations according to the Availability Zone. The other categories of concessions, as well as the payment for water use according to the Availability Zone, are defined in the Federal Law of Rights in Matters of National Waters.

The Rio Grande Basin has 13 Irrigation Districts (7 in Chihuahua; 1 in Coahuila; 1 in Nuevo León; 1 in Coahuila and Nuevo León; 3 in Tamaulipas).

As well as the other Irrigation Districts in Mexico, the Irrigation Districts in the Rio Grande Basin have a predetermined allocation of water volume assigned by CONAGUA. For the 2022-2023 cycle, the volumes of water allocated for each Irrigation Districts have not yet been defined. Once this has occurred, the Annual Irrigation Operational Plan for the Rio Grande Basin will be prepared.

4. Water Rights and Markets

The Mexican Federal Water Law establishes the conditions ("market rules") under which the rights to use water can be transferred[117]. Thus, the law establishes in Mexico a "regulated market" of water use rights. That is to say, the right of use may be transferred, but not the ownership of the water, given the legal nature of the resource as an asset owned by Mexico, inalienable (it is not subject to sale, acts of commerce or guarantee/ mortgage) and imprescriptible (its property status as owned by the state does not change).

To mitigate the problems of scarcity and conflict resulting from national and regional development, the law created two mechanisms to transfer water rights and assignments. The first established the possibility of transferring the water use rights in accordance with the provisions of the law and its regulations. The second established the possibility of a direct intervention of the federal government for reasons of public interest, through the regulation of the use of surface and underground waters.

The 1992 reform gave way to a "regulated market for water rights" under the strict supervision of CONAGUA. In this sense, the approach of the 1992 Federal Water Law was to require prior authorization from CONAGUA as the main conditioning factor to transfer or modify a water concession. The sole exception is for cases in which it is a simple change of owner and the conditions established in the original title of concession remain the same.

The 1992 law explicitly restricted the transfer of groundwater rights separately from the land. The 1997 reforms to the regulations of the law made it possible to exchange water use rights separately from the right to land ownership in the areas that CONAGUA designates.

The reform to the Federal Water Law of 2004 introduced many changes regarding the transfer of water rights. Before the reforms of 2004, it was expressly established that, for uses other than agriculture, transfers could be partial, total, definitive or temporary. The reform eliminated the temporary transfer concept and introduced the possibility of transmitting water discharge permits.

117 Mexican Federal Water Law Chapter V: Transfer of Water Concessions Titles, ART. 33: Concession titles for the exploitation, use or exploitation of national waters, legally in force and established in the Public Registry of Water Rights, as well as Discharge Permits, may be transferred in full or in part, based on the provisions of this Chapter and those additional provisions provided by the Law and its regulations. See also Mexican Federal Water Law Chapter V: Transfer of Water Concessions Titles, ART. 33 to 37.

In the case of a change of owner, in 2004 a more restrictive condition was established than the one established in 1992. To change ownership, a written request must be submitted to CONAGUA, who will issue the corresponding agreement of acceptance or not, and will add the registration in the Public Registry of Water Rights[118].

Additionally, CONAGUA may definitively or temporarily establish specific entities through which regulated transfer operations are permitted. These legally constituted bodies are known as "water banks." The functions and regulations of the water banks were established in accordance with the existing regulations[119].

Despite the existence of legally constituted water banks, their functions have not developed beyond being a service and information resource for those interested in transferring their rights[120].

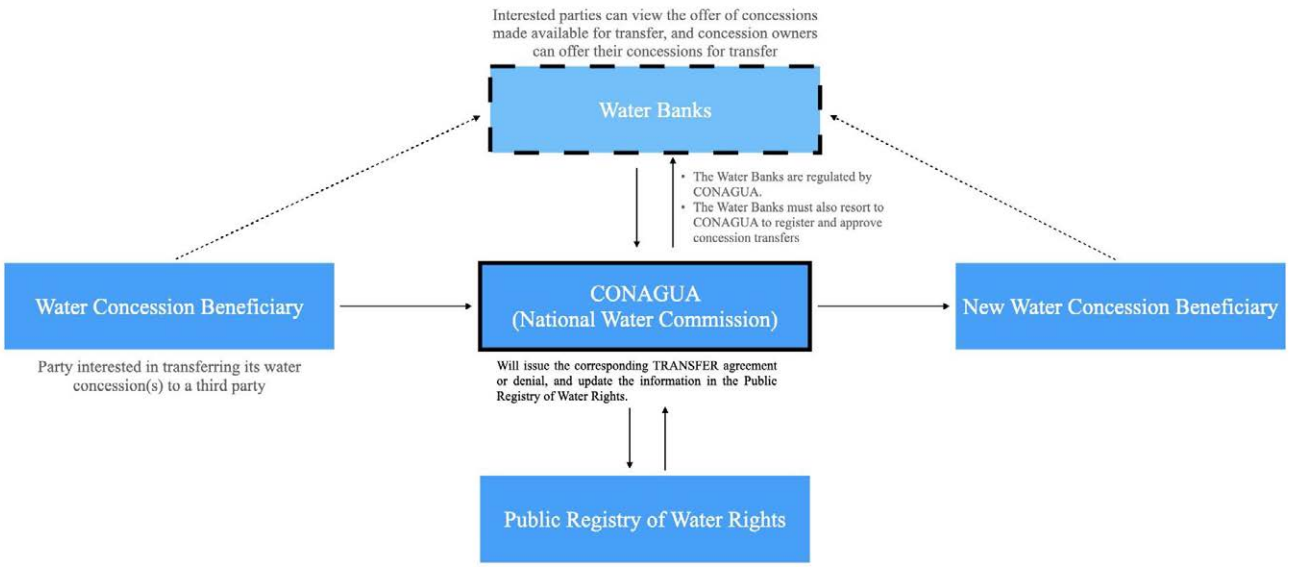

Figure 19: Mexican Water Concessions Transfer System
Source: Author

118 Ley de Aguas Nacionales y su reglamento. 2017 Article 33 pp. 69 - 70.

119 Ley de Aguas Nacionales y su reglamento. 2017 Article 37 BIS pp. 71.

120 Red Mexicana de Cuencas, 2021. Los bancos de agua en México: entre la escasez, la clandestinidad y la contaminación hídrica, https://remexcu.org/index.php/blog/260-los-bancos-de-agua-en-mexico-entre-la-escasez-la-clandestinidad-y-la-contaminacion-hidrica.

Photo: Presa El Cuchillo (Nuevo León, México)
Source: Mural Newspaper, credits: José Villasaez

5. Mexican Dam Operations

According to the Mexican National Water Information System, there are 181 dams in the country, which are overseen by the national water authority, CONAGUA. When the purpose of the dam is to obtain hydroelectric energy, the Mexican Federal Electricity Commission also has oversight authority. The operation and maintenance of each dam is carried out by the entities that either have ownership rights (in cases when the investment is private), permits, or agreements for the use or concession of the dams.

Public entities such as CONAGUA, CILA, federal states, basin authorities, municipalities, or other state agencies may be responsible for the construction, operation, and maintenance of the dams. The dams may also be built and operated by private or public-private entities, communities, users' associations, irrigation units, and individuals and legal entities that have a concession or assignment granted by the water authority[121].

The standard that regulates the safe operation of dams was established in 2015 with the participation of the public and private sector. The Center for Disaster Prevention, National Electricity Commission, the Secretary of Government, and CONAGUA represented the public sector. The College of Civil Engineers of Mexico, the Mexican Committee of Large Dams, and the National Autonomous

121 Official agreement to identify those responsible for the operation of dams (2015)https://dof.gob.mx/nota_detalle.php?codigo=5144313&fecha=27/05/2010#gsc.tab=0.

University of Mexico represented the private sector. The Safe Dam Operation Norm does not contain any references to any procedures, requirements, or prior authorizations needed for the release of water from dams[122].

Article 9 of the Mexican Federal Water Law establishes that in cases of emergency or national interest, CONAGUA may intervene in the operation of the dams, either for the purpose of discharging water, controlling floods, or conserving water[123].

The Hydraulic Works Operation Technical Committee (CTOH) is a technical body of CONAGUA in charge of studying, forecasting, and analyzing the state and evolution of hydrometeorological and hydrological conditions. The CTOH also studies the changes in weather conditions and events related to water resources and their possible effects, to establish policies and actions that are adequate and sustainable, in the operation of dams and other hydraulic infrastructures[124].

The objective of the CTOH is to guarantee efficient use of national waters, including adequate management during floods and droughts. At the beginning of October or November of each year[125], for each of the main dams at which CONAGUA defines the use of stored national waters, the CTOH with the support of a multi-agency working group[126] determines the maximum volumes that may be available to cover the different water uses within an annual cycle[127].

The volumes must strictly adhere to the water concessions that are linked to the supply of drinking water (priority use) and water supply for the productive sectors (hydro-agricultural, industrial and energy), as well as other uses that can be considered priority at the time. The necessary resources of water for environmental conservation applicable in the area and basin in which they are located are also considered.

122 Mexican Norm for Safety Operation of Dams, (2015) https://www.gob.mx/cms/uploads/attachment/file/166836/nmx-aa-175-scfi-2015.pdf.

123 Ley de Aguas Nacionales y su reglamento. 2017 Articles 7 - 8 - 9 pp. 12 - 15.

124 Reglas de Operación y funcionamiento del Comité Técnico de Operación de Obras Hidráulicas de la Comisión Nacional del Agua (2022) https://www.dof.gob.mx/nota_detalle.php?codigo=5662836&fecha=30/08/2022#gsc.tab=0.

125 Depending on when the rainy season starts.

126 General Technical Subsection, Hydro-Agricultural Infrastructure Section, General Administration of Drinking Water, Drainage and Sanitation.

127 Reglas de Operación y funcionamiento del Comité Técnico de Operación de Obras Hidráulicas de la Comisión Nacional del Agua. Chapter I "Functions of the CTOH" Article 5 number XIII https://www.dof.gob.mx/nota_detalle.php?codigo=5662836&fecha=30/08/2022#gsc.tab=0.

Irrigation Districts	Concessioned Volume for Irrigation Supply Source	Programmed Volume for Irrigation (Mm^3)	% of concession	Irrigation Surface (Ha)	Programmed Irrigation Surface (Ha)	% Prog. Sur V. Irrigation Surface
005 Delicias y 113 Alto Río Conchos	1,238.36	593.862	47.96	84,186	43,754	51.97
009 Valle de Juárez	193.379	86.329	44.64	20,567	6,949	33.79
042 Buenaventura	110.31	83.085	75.32	7,702	4,180	54.27
089 El Carmen	177.9	160.682	90.32	13,137	10,715	81.56
090 Bajo Río Conchos	79.551	50.529	63.52	8,079	4,381	54.22
103 Río Florido	109.809	97.019	88.35	8,189	5,100	62.28
Subtotal Chihuahua	**1,909**	**1,072**		**141,860**	**75,079**	
006 Palestina	48.438	43.756	90.33	12,897	2,918	22.63
004 Don Martín	171.074	0	0	15,612	0	0
031 Las Lajas	24	24	100	4,122	2,054	49.84
Subtotal Coahuila y Nuevo León	**244**	**68**		**32,631**	**4,972**	
025 Bajo Río Bravo	1,183.70	0	0	202,549	0	0
026 Bajo Río San Juan	599.62	553.8	92.36	75,338	72,637	96.41
050 Acuña Falcón	31.702	4	12.62	14,024	2,000	14.26
Subtotal Tamaulipas	**1,815**	**558**		**291,911**	**74,637**	

Figure 20: 2021 – 2022 volumes to be extracted from diversion dams and deep wells approved by the CTOH and the Rio Bravo Basin Organization.

Source: CONAGUA

CONAGUA posts publicly their Technical Committee Meetings that establishes dam operations for the country every Tuesday[128]. The dams are structurally limited for use as flood control; the outlet works were not explicitly designed for large releases in excess of the needs of its users for irrigation. The outlet works may also be directly connected to irrigation canals for the district itself, further limiting its ability to be used for flood regulation. It is not until conservation capacity is reached that the dams are physically capable of releasing water to the main stem of the tributary.

Data is exchanged daily on the status of Mexico's and U.S. reservoirs and during emergencies, the USIBWC and the MXIBWC communicate with their respective operators or emergency managers as well as jointly to manage any flood waters.

Water is not released from the dams for Treaty deliveries per se, and often releases are made after storm events with little notice to downstream users in Texas. It appears that conserved waters in the dams may be held back for Mexican users. The U.S. is not a user in the system. Stakeholders commented that the dams on the Rio Conchos and the international dams on the Rio Grande are operated in coordination with each other.

128 Example of a weekly Operational Notice from the Mexican Hydraulic Operation Technical Committee can be found at https://www.gob.mx/conagua/prensa/informe-semanal-del-comite-tecnico-de-operacion-de-obras-hidraulicas-323915.

PART IV

Concerns and Challenges Expressed by Stakeholders in Interviews

A. The Interview Methodology Resulted in Candid, Constructive Conversations Across Stakeholders and Sectors

The linchpin of this white paper is the information obtained through interviews across an inclusive range of individuals and key stakeholders from the U.S. and Mexico, shedding light on the successes and shortcomings of the current regime for water deliveries between the two. To encourage open discussion and sharing of opinions, participants were interviewed individually with the understanding that they would not be identified without their prior permission, according to the "Chatham House Rule". [129]These terms of engagement fostered a trusted environment to understand and consider the complex problems facing stakeholders, and generated frank discussion about possible solutions to consider.

Initially, 25 stakeholder interviews were contemplated, from across sectors in both the United States and Mexico, including current and former officials and representatives from federal and state governments, water districts, irrigation districts, academia, and non-governmental organizations, as well as lawyers and scientists. Others were added as a result of those conversations and

129 The Chatham House Rule provides that when a meeting is held under the Rule, participants are free to use the information received but may not identify the speaker or affiliation of the speaker or any other participant in the meeting. It is used in debates and discussion panels on controversial topics, to encourage open discussion of complex problems. The Rule is named after the UK Royal Institute of International Affairs, based in Chatham House, London, where it originated in 1927. See www.chathamhouse.org.

recommendations. All told, 55 individuals were interviewed between June 21 and October 24, 2022, some in person and others virtually. Each discussion lasted at least an hour, some longer. For the most part, the participants were individuals who have devoted significant portions of their professional lives considering and addressing the many water challenges in the Rio Grande/Rio Bravo basin.

All those interviewed were supportive of the USIBWC's white paper effort, and many expressed approval that the USIBWC was initiating conversations that both allowed an array of voices to be heard and focused on possible solutions. They were generous with their time and open about sharing information and their views.

The interviews were not formal, scripted, or recorded. They resulted in free-ranging discussions with leading water professionals around three open-ended questions, as applicable to their individual experience and expertise:

1. What do you see as the potential challenges to predictable and reliable Rio Grande water deliveries under the 1944 Treaty?
2. What can we learn from the Colorado River experience, particularly with Minutes 319 and 323, that may provide lessons that can be applied successfully on the Rio Grande under the 1944 Treaty?
3. What ideas or solutions would you suggest as a way forward to help overcome the potential challenges facing us on the Rio Grande?

The interviews were undertaken not to foster an outcome or decision but to provide a foundation for discussions within the IBWC process and among stakeholders, as the IBWC begins its consideration of a Minute. The goal was to gain valuable insights and to begin breaking down barriers among stakeholders, which will be critical going forward to address the Rio Grande issues.

B. There is Agreement Across Stakeholders on Several Factors that Will Promote Reaching Solutions

A number of factors that came out of the conversations suggest that, while stakeholders currently may disagree about how best to meet the challenges of water scarcity and delivery, there is agreement on a number of points that can form the basis for meaningful discussions and, ultimately, solutions.

First, and most important, stakeholders agree on a defined problem-- water scarcity and delivery-- and there is keen interest on all sides to address it. Not having a structure for delivery that supports water certainty is a perceived problem in the U.S. and in Mexico that both sides want to resolve. No one needs to be convinced that this is a serious issue. To that end, both sides have as a goal to create a Minute by the end of 2023 to begin addressing the issue. There also is heightened public awareness of the need to address water scarcity, making it somewhat easier to seek cooperation to address it, and to obtain funding.

Second, several stakeholders pointed out that there is structure defined and in place, through the IBWC, to provide the leadership needed to address water scarcity and water deliveries, and the Commissioners are exercising that leadership. Leadership is a critical component needed to address any complex issue. Other organizations, including other pertinent government organizations, NGOs, and private parties, also have a great interest in addressing water scarcity, operational certainty, and the health of the system, contributing to leadership.

Third, the parties have almost 80 years of experience under the 1944 Treaty, and it generally has worked for them, allowing them to reach solutions as issues arose. New situations now must be addressed under the Treaty, to be sure, but there is no suggestion from stakeholders that the Treaty itself is a problem (although some wondered whether a treaty could be reached in the current political climate if one did not already exist.)

Fourth, international law generally, and the 1944 Treaty specifically, provides the opportunity for flexibility in addressing the issues that "hard" law, with its prohibited and regulated activities, does not. Article 25 of the 1944 Treaty gives the two countries the authority to interpret and implement the Treaty through Minutes, adapting to changing conditions and facts without the need to revisit and amend the Treaty when there is no clear provision in the Treaty addressing the issue. Minutes offer the opportunity for comparatively quick adjustments needed when the two countries agree. Some International law experts view the 1944 Treaty as one of the most flexible and adaptive binational treaties globally due to the Minute provision.[130]

Finally, the science and modeling needed to address water issues is getting better and better, and more information is available to the parties than ever before to consider when crafting solutions. And the existence of IBWC International Working Groups, and the authority to create additional groups as needed, will promote the communication required to reach a solution.

All these factors bode well for successful future discussions to identify solutions that the parties can support.

130 Stephen Mumme, Innovation and Reform in Transboundary Resource Management: A Critical Look at the International Boundary and Water Commission, United States and Mexico, *Natural Resources Journal*, 33(1), 93-120(1993); Regina Buono and Gabriel Eckstein, Current Challenges in the Rio Grande/Rio Bravo Basin: Old Disputes in a New Century, (2022)https://scholarship.law.tamu.edu/cgi/viewcontent.cgi?article=2625&context=facscholar

C. There is Also Agreement Across Stakeholders that the Single Biggest Challenge to a Possible Solution is Lack of Trust

Both sides express a lack of trust, and note a lack of the kinds of relationships and communications that foster solutions. Concerns across stakeholders include a perceived lack of sharing of information about how systems are operated, recent past failures of deliveries, different views on what a reading of the Treaty requires – when deliveries must be made, where the water can come from, who gets "excess" water – all furthering a lack of trust between the parties.

1. U.S. Stakeholders' Trust Concerns

There is a lack of understanding articulated on the U.S. side about how Mexico operates its system and releases water, and doubt that Mexico has been forthcoming with details about operations and water availability. Some U.S. interviewees believe that information is not being shared; others think that the information is not being gathered and analyzed. The lack of information in either case encourages mistrust.

The resulting lack of trust by some in the U.S., and particularly water users in Texas, has been exacerbated by historical delivery issues. Under Minute 309, as described above in this paper, interest held by NADBANK belonging to both countries was refunded to each county ($40 million to each). This was to fund water efficiency projects in Mexico in exchange for water deliveries from the projects to be made annually. Mexico did not continue to provide water annually, however, and expressed the view that, as they interpreted the Minute 309 language, annual water deliveries were not required. Mexico's perspective is that the $40M was theirs, and they were only required to make up the deficiency in that one water cycle. Afterwards, the water from the efficiency projects was to remain theirs. The U.S. understood, differently, that the water resulting from the efficiency projects was to continue to meet Treaty delivery requirements to the U.S. in perpetuity.

The lack of trust is further exacerbated by Mexico's relatively recent failures to meet delivery obligations under the Treaty. Mexico met its delivery obligations between 1944 and 1994. The drought from 1994 to 2003 created difficult circumstances for Mexico's farmers in northern Mexico, resulting in a lack of water deliveries into the Rio Grande. The issue was ultimately resolved by transferring Mexican water in the two international reservoirs to the U.S., plus a hurricane that provided additional water in 2005. The second shortfall occurred in the 2010-2015 cycle. A 216,250 acre-feet deficit carried over to the 2016-2020 cycle, and was resolved at the eleventh hour (three days before the cycle ended) by Minute 325, which provided in part that Mexico would transfer its stored water in Amistad and Falcon reservoirs to meet its delivery obligations. Mexico therefore ended the 2020 cycle without debt for deliveries.

U.S. interviewees are united in voicing concern and frustration about the lack of predictable and reliable deliveries and the tension this unpredictability creates. U.S. Stakeholders voiced concern in interviews that Mexico tries to "game the system" by relying on hurricanes to make up for inconsistent annual deliveries. U.S. stakeholders view this reliance on extreme weather events as an indication that Mexico is ignoring the language in the Treaty that requires average annual deliveries of 350,000 acre-feet.

2. Mexico Stakeholders' Trust Concerns

On the Mexico side there is also a lack of understanding as to the operations of the water system on the U.S. side (particularly operations in Texas). Those interviewed from Mexico expressed the same concern about lack of information about water operations that the U.S. expressed about Mexico, sometimes in the same words – information is not forthcoming and there is a lack of trust. Most Mexico interviewees noted that in Mexico, legal authority regarding surface and groundwater sits in a single federal agency, which simplifies finding solutions and is viewed by some as a superior approach to U.S. water law, which varies from state to state and provides for shared authority over water at the federal and state level that can be complex.

But there is also a perception that, because the U.S has more governmental resources than Mexico, the U.S. is in a better position in some ways to address water scarcity than is Mexico. Interviewees from both sides of the border point out that many of Mexico's farmers consider any water available as belonging to them. Local and community efforts to address water issues lack funding and resources, making decentralized participation difficult at best. There is less information and understanding about Treaty obligations at the local level as a result.

Both sides agree that trust issues must be addressed to reach a solution to water deliveries, through better exchange of information and more frequent contact between the parties to build relationships, an effort that requires time.

D. Disagreements about the Meaning of Certain Treaty Provisions

Contributing to the lack of trust between the parties are disagreements among stakeholders over the decades about the following questions under the 1944 Treaty:

- Is the delivery requirement from Mexico to the United States 350,000 acre-feet a year?
- What is the definition of "extraordinary drought?"
- Can delivery obligations be carried over to a second five-year cycle or even a third, and how does a carry-over impact delivery obligations for the next cycle?
- What water can be applied towards Mexico's delivery obligations?
- What do Minutes 308 and 309 require?

Each of these questions is discussed below.

1. 350,000 acre-feet annually?

Among other obligations, the 1944 Treaty requires Mexico to deliver

> [t]o the United States … (b) 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.[131]

The IBWC aggregates Mexico's deliveries to the United States over a five-year cycle, with 350,000 acre-feet as an average annual goal for monitoring and managing the deliveries within a cycle. Cycles are typically five years long, but under the 1944 Treaty, if two of the major international reservoirs (Amistad Dam and Falcon Dam) are filled with water belonging to the United States, the five-year cycle ends, all delivery obligations are considered met, and a new five-year cycle begins.[132]

Mexico stakeholders expressed concern that if Mexico delivers annually, and extreme storms follow, they have essentially "over-delivered" and deprived Mexican water users of water that is rightfully theirs.

Some U.S. stakeholders, frustrated by the unpredictability of deliveries from year to year, have argued that the 350,000 acre-feet provision is an annual requirement–or ought to be. The plain language of the 1944 Treaty does not support an argument that the 350,000 acre-feet annually is a requirement, and agreement from Mexico would be necessary to treat it as one–an unlikely outcome. A few stakeholders suggested that perhaps the 1944 Treaty should be renegotiated on this point, also generally viewed as unlikely. A handful also suggested that Colorado River deliveries to Mexico by the U.S. should be linked to Mexico's Rio Grande deliveries to the U.S., a suggestion that is not supported by the construct and provisions of the Treaty, or by most Rio Grande stakeholders.

2. What does "extraordinary drought" mean?

Under the 1944 Treaty, if Mexico does not meet its minimum Rio Grande delivery obligations in a five-year cycle (1.75 million acre-feet, or 2,158,605,000 cubic meters), with an average of 350,000 acre-feet annually) due to extraordinary drought, the deficiency "existing at the end of the aforesaid five-year cycle shall be made up in the following five-year cycle." [133] The Treaty does not define "extraordinary drought", and it is not defined in any Minute. If the countries dispute whether there was an "extraordinary drought," the 1944 Treaty provides for dispute resolution and, if necessary, negotiation through diplomatic channels.[134]

The countries have not invoked dispute resolution to define "extraordinary drought." In stakeholder interviews, however, some U.S. stakeholders expressed concern about whether and to what extent an

131 1944 Treaty, Art. 4B.

132 1944 Treaty, Art. 4B.

133 *Id*.

134 *Id*. at Art. 24(d).

"extraordinary drought" was the cause for unreliable and unpredictable deliveries. They pointed to concerns that the agricultural community in Mexico does not acknowledge, or at least fully understand, Mexico's delivery obligations under the 1944 Treaty, and considers the water "theirs". These stakeholders suggest that Mexico uses "extraordinary drought" as an intentional management plan to ensure that they do not overdeliver taking into account sudden storm events.

Stakeholders from both countries expressed the view that Mexico treats U.S. deliveries as a lower priority than meeting Mexico's water use demands (and in contrast to the U.S. delivery of water from the Colorado River required under the 1944 Treaty in specific amounts annually.)

Other U.S. stakeholders suggested that because of political pressures in Mexico from the agricultural community, "extraordinary drought" may be suggested to allow Mexico roll over delivery obligations to the next cycle, in situations where deliveries might have been made instead with more robust water management techniques in place, or an acceptance of limitations on water available for use and expansion in light of the 1944 Treaty obligations.

3. Differing Views of Treaty Requirements: Boquilla Dam and Minute 325

a. Protest at Boquilla Dam

The perception that small farming communities in Mexico have a different understanding of the 1944 Treaty obligations is borne out in part in a series of interviews conducted in 2022 in Mexico by Phil Gurley, then a Master's candidate at the University of Texas at Austin LBJ School of Public Affairs.[135]

In 2020, after the Mexican government announced the delivery of 100 billion gallons of water to the United States by October 24 of that year under the Treaty, protesting farmers took over Boquilla Dam. The protest took place amid increasing demands for payment from U.S. officials. At the time, Mexico was deficient on its water delivery obligations in the second consecutive five-year cycle.[136]

135 Gurley Phil, "Qualitative Coding Analysis: Primary Research from Chihuahua Mexico". His complete report is attached to this paper with permission as Attachment 3.

136 The Washington Post Sep. 14, 2020. "Mexican farmers occupy dam to stop water payments to the United States." Link to publication: https://www.washingtonpost.com/world/the_americas/us-mexico-water-dam-farm-protest/2020/09/13/dddb85e8-f3bb-11ea-999c-67ff7bf6a9d2_story.html (accessed on Sep. 9, 2022)

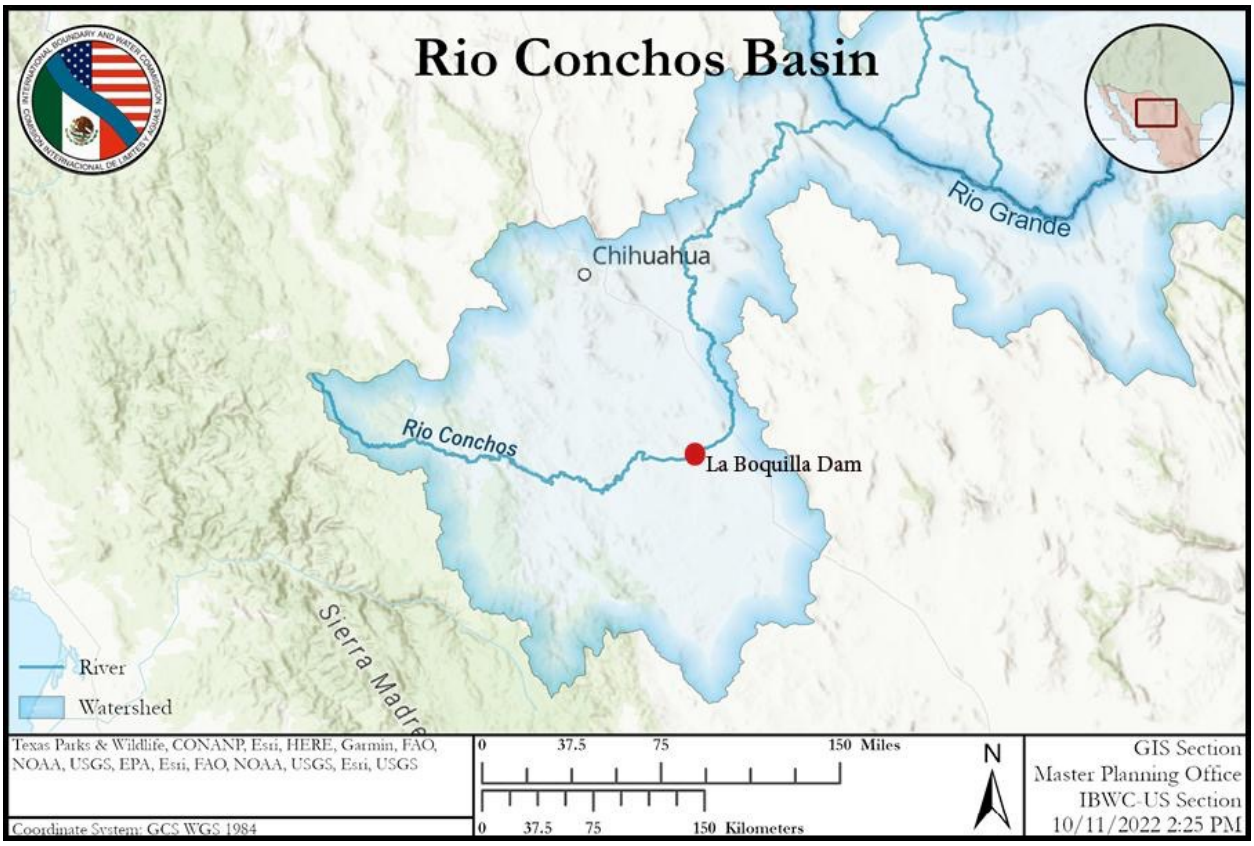

Figure 21: Rio Conchos Basin
Source: USIBWC

Boquilla Dam is on the Rio Conchos in Chihuahua, built in 1910 with a capacity of 2,307,915 AF (2,846,782 TCM) forming Lake Toronto. The dam works as an irrigation and flood control system and a hydroelectricity generator[137].

The Chihuahua farmers saw this water delivery as a direct threat to their livelihoods, claiming that their harvest would suffer and production would be diminished without the water supply. The farmers had also been affected by drought conditions and scarce rain, as 2020 was one of the driest years in the last three decades.

Tension erupted in February of 2020 when about 2,000 farmers and protesters took over Boquilla Dam. In September the protest turned violent after the Mexican national guard was sent to put an end to the unrest. One woman was shot and died during the confrontation, and others were injured, but the protesters remained in control of the dam. Generators at the dam were set on fire, leading to a massive power blackout in the Chihuahua region[138].

137 Sistema Nacional de Información de Agua: Presa de la Boquilla description and information available at: http://sina.conagua.gob.mx/sina/tema.php?tema=presasPrincipales and https://presas.conagua.gob.mx/inventario/tgeneralidades.aspx?DSP,750.

138 *The Washington Post* Sep. 14, 2020. M*exican farmers occupy dam to stop water payments to the United States*, https://www.washingtonpost.com/world/the_americas/us-mexico-water-dam-farm-protest/2020/09/13/dddb85e8-f3bb-11ea-999c-67ff7bf6a9d2_story.html.

The situation came to an end when the U.S. and Mexico struck a last-minute agreement in Minute 325, "Measures to end the current Rio Grande water delivery cycle without a shortfall, to provide humanitarian support for the municipal water supply for Mexican communities, and to establish mechanisms for future cooperation to improve the predictability and reliability of Rio Grande water deliveries to users in the United States and Mexico."[139] Minute 325 provided that Mexico would end the five-year cycle of October 25, 2015–October 24, 2020 without a shortfall by transferring volumes of Mexican water stored in Amistad and Falcon International Reservoirs to the United States. If, as a result of this transfer, the Mexican storage was insufficient to cover one month of municipal needs in Mexico downstream from Amistad Dam, the United States, for humanitarian reasons, would negotiate with Mexico the terms for potential temporary use of U.S. water to meet Mexico's minimum municipal water needs downstream from Amistad Dam.

b. The 2022 Gurley Report: Results of Interviews in Chihuahua, Mexico

The perception that small farming communities in Mexico have a different understanding of the 1944 Treaty obligations is borne out in part in a series of interviews conducted in 2022 in Mexico by Phil Gurley, then a Master's candidate at the University of Texas at Austin LBJ School of Public Affairs.[140] In March 2022, conducted a qualitative coding analysis to understand the current situation of drought in the basin of the Rio Conchos River and how low water allocations are affecting farmers. On March 15-19, 2022, he conducted 12 interviews with a diverse range of Mexican stakeholders in Chihuahua that included university researchers, farmers, agricultural leaders, elected officials, and state government officials.

Questions covered a variety of issues, including economic development, farm operations, irrigation and water distribution, climate change, and solutions and outlook. The Gurley Report interviews reflect that severe water shortages are a main concern for the farmers in the Rio Conchos Basin. Farmers recognized tensions with the Mexican government but also acknowledged that the government is a necessary partner for addressing water issues they face. Interviewees expressed interest in having a voice in water distribution. As to the Treaty, the Report states that "Overall, most interviewees agree there is no tension between Mexico and the U.S. regarding water, but that the struggle is Mexico's to fix."[141]

On issues related to water use and allocations, all the Gurley interviewees agreed that there were problems on how the water was being allocated. According to the data, 50% of the interviewees from Mexico identified the outdated irrigation system as a cause of the problem, and the other 50% saw CONAGUA´s low water allocations and unbalanced water use permits as causes for water scarcity in the irrigation districts. About 83% of respondents saw the drilling of unsanctioned wells as the most pressing issue. The government, and in this case CONAGUA, as the highest water authority in the country, was at the center of some of these issues because water administration in Mexico is so highly centralized.[142]

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139 Vanda Felbab-Brown, 2020, Not dried up: US-Mexico water cooperation https://www.brookings.edu/blog/order-from-chaos/2020/10/26/not-dried-up-us-mexico-water-cooperation/.

140 Gurley Phil, *Qualitative Coding Analysis: Primary Research from Chihuahua Mexico* (March 22, 2022). His complete report is attached to this paper with permission as Attachment 3.

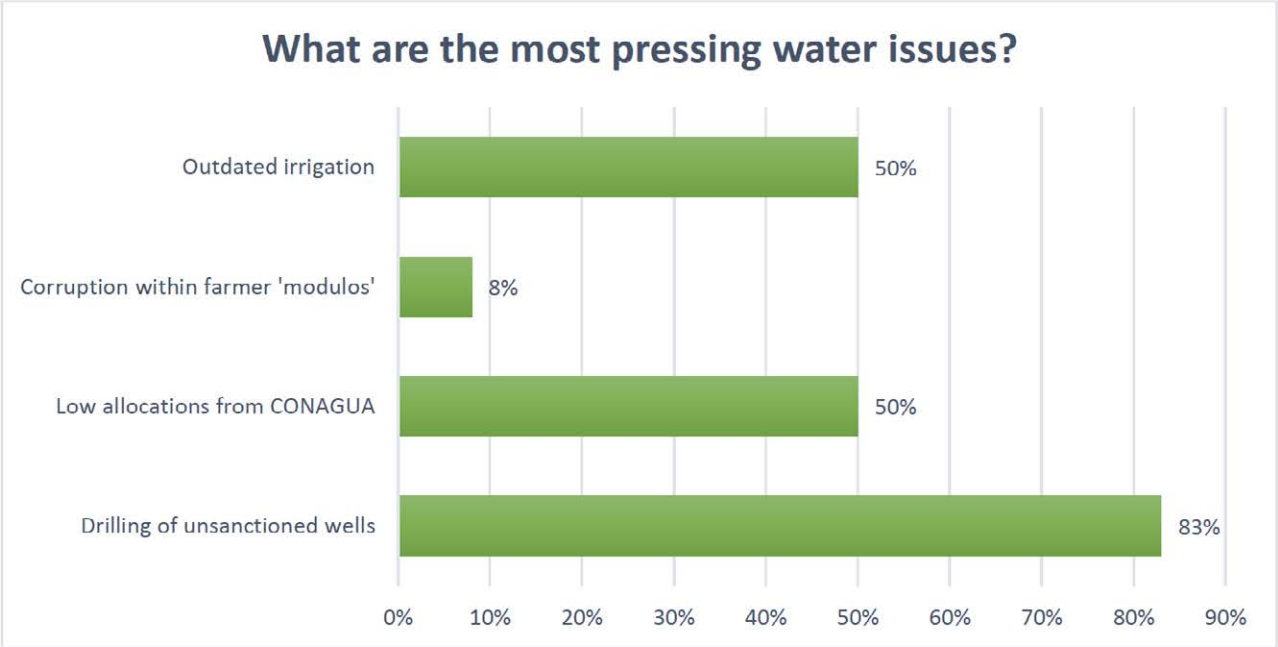
141 *Gurley Report, supra* at p. 15.

142 *Gurley Report, supra,* Fact Sheet: Primary Research from Chihuahua Mexico pp. 2-4

Answers obtained in the Gurley interviews reflect a distrust between the farmers and government institutions, as well as the government's lack of control, sanctioning actions, and limited field staff. These factors are perceived as having a direct and negative impact on the water allocation, distribution, and use[143].

The Gurley interviewees did not generally agree on the substitution of crops. Some farmers acknowledged that they needed less water-intensive crops, but the low prices for traditional crops such as alfalfa and vegetables were causing them to move towards more profitable but also more water intensive activities, such as nut tree farming. According to the last agricultural survey in Chihuahua, tree nut crops represent less than 2% of the overall farming activities there. However, tree nut crops produce significant economic value in the lower Rio Conchos Basin, as they are the number one crop in economic value in the district of Juarez, number two in the districts of Chihuahua and Ojinaga, and number four in Las Delicias. If these crop substitution trends continue, they will likely further increase pressure on the water supply.

143 Felbab-Brown, 2020. *Not dried up: US-Mexico water cooperation.* https://www.brookings.edu/blog/order-from-chaos/2020/10/26/not-dried-up-us-mexico-water-cooperation/



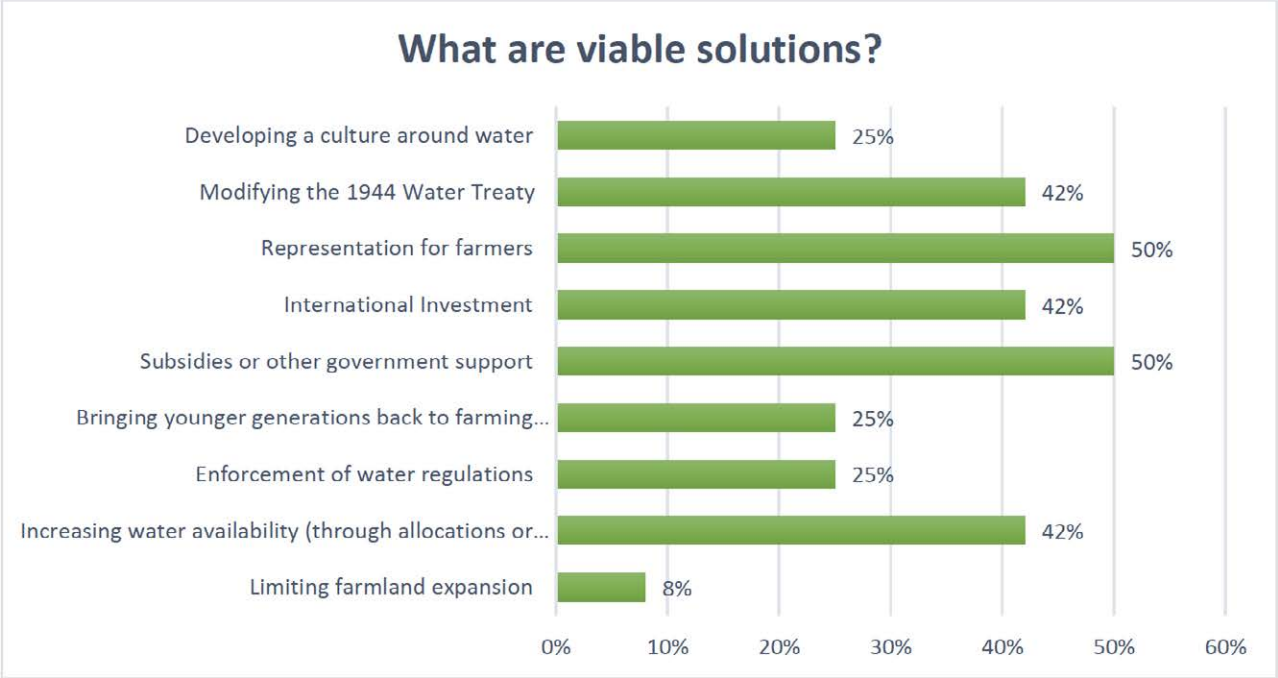


Figure 22: Gurley Report graphic of key takeaways from Primary Research and interviews in Chihuahua, Mexico

Source: Phil Gurley

4. Carry-over of delivery obligations from cycle to cycle

The Article 4 provision of the 1944 Treaty providing that deficits due to "extraordinary drought" may be rolled over to the next five-year cycle has raised at least two questions among stakeholders: (1) how many cycles may be used to carry over a deficit? and (2) during a cycle following a previous cycle that ended in a deficit, must that second cycle's new delivery requirements also be met? These questions have persisted, resurfacing periodically when, as now, drought creates water scarcity in the basin.

In 1969, the IBWC adopted Minute 234, which provides in part 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 … 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 … ." Mexican and U.S. stakeholders disagree on what Minute 234 means and how it can be implemented. Some Mexican stakeholders interpreted Minute 234 to require that only the deficit incurred must be repaid during the following five-year cycle, deferring the second cycle obligations to the next (third) five-year cycle. The U.S. stakeholders maintained that deficits carried over must be repaid concurrently in the second five-year cycle and in addition to the new obligations arising in that cycle. Stakeholders cite this difference in interpretation as an example of the reasons for continuing mistrust by the parties.

In 2020, the parties were facing a deficit that had carried over from the 2010-2015 cycle into the 2016-2020 cycle. Three days before the end of the 2020 cycle, IBWC signed Minute 325, which provided that Mexico would fulfill its obligations by transferring water stored in the Amistad and Falcon reservoirs to the United States in an amount needed to end the deficit. Minute 325 provided for consideration of humanitarian support from the U.S. to Mexico should the reservoir transfer negatively impact Mexico's ability to guarantee the right to water for personal and domestic use under Article 4 of the Mexican Constitution. As to rolling over deficits to subsequent cycles, Minute 325 states:

> The Commissioners observed that, in accordance with Article 4 of the United States-Mexico Treaty for Utilization of Waters of the Colorado and Tijuana Rivets and of the Rio Grande (1944 Water Treaty), Mexico shall deliver Rio Grande water to the United States in cycles of five years. They also referred to 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," dated December 2, 1969, which states that in the event of a deficiency at the end of a cycle of five consecutive years, '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…' The Commissioners observed that the October 25, 2010 — October 24, 2015 cycle ended with a shortfall, which Mexico paid back in full on January 25, 2016. *Given Minute 234's requirement that two back-to-back cycles may not end in a deficiency, and in light of the previous cycle's deficiency, Minute 234 requires Mexico to deliver sufficient water to avoid a shortfall at the conclusion of the October 25, 2015 — October 24, 2020 five-year cycle.*

Minute 325, par. 2, 2020 (emphasis added). So in Minute 325, the IBWC reiterated the meaning of Minute 234 – deficits cannot be carried over to a third cycle, and the new requirements of that cycle must also be met – although the years of disagreement on this point continue to be a source of distrust among some stakeholders.

5. What water can be applied to delivery obligations?

Another difference of interpretation raised by interviewees centers around which tributary waters can be applied toward Mexico's water delivery obligations to the United States, and particularly questions about the use of Rio San Juan water. [144]

Article 4 (B) of the 1944 Treaty requires delivery "to the United States … (b) One-third of the flow reaching the channel of the Rio Grande (Rio Bravo) from the Conchos, San Diego, Dan Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo, provided that this third shall not be less, as an average amount of cycles of five consecutive years, than 350,000 acre-feet (431,721,000 cubic meters) annually." [145] The San Juan is a named tributary in Article 4 of the 1944 Treaty, and is designated as an inflow river allocated 100% to Mexico. Article 4 of the Treaty states "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."

Under Article 9 of the Treaty, Mexico can agree to assign rights to water from the San Juan. Article 9 provides:

> (e) The Commission shall have the power to authorize temporary diversion and use by one country of water belonging to the other, when the latter does not need it or is unable to use it, provided that such authorization or the use of such water shall not establish any right to continue to divert it. [146]

Diversions of any water from the Rio Grande, including those from San Juan inflows, must be accounted for by the IBWC and credited to the appropriate country. Article 9 also allows the IBWC to authorize either country to divert and use water not belonging to that country, if the use will not cause injury and can be replaced at some other point on the river. Diversions that are not replaced result in a penalty. The IBWC is required to keep records under Article 9 of the waters belonging to each country through its gauging system, and provide reports with information on diversions and consumptive uses.

In addition, Minute 234 provisions also allow these water deliveries during a cycle that begins with a debt.[147]

In 2005, deliveries of San Juan water were credited to address in part a water debt that had been carried over from the 1997-2002 cycle.[148] At the end of the 2010-2015 cycle, a deficit of 263,246 AF was carried over to the 2015-2020 cycle. Mexico agreed to provide San Juan water to address the shortfall and in January of 2016, just three months into the new cycle, Mexico paid off the debt from the 2010-2015 cycle.

Although crediting San Juan water guarantees the availability of more water, some U.S. stakeholders

144 For a contemporaneous discussion of the 2015 considerations to use San Juan water, see the memorandum *Texas Utilization of San Juan Water and the Equitable Distribution of These Inflows*, dated August 2015, by Carlos Rubenstein, Attachment 4 to this paper, provided by and used with permission of the author (hereinafter "*Rubenstein Memorandum*"). Mr. Rubenstein served as the Texas Rio Grande Watermaster (2000-2009), the Commissioner of the Texas Commission on Environmental Quality (TCEQ)(2009-2013), and the Chairman of the Texas Water Development Board (2013-2015).

145 1944 Treaty, Art. 4B.

146 *Id*. at Art. 4.

147 Minute 234, *supra*, at Section 2.(d); see *Rubenstein Memorandum* at 1.

148 *Rubenstein Memorandum* at 5.

interviewed hold that only water from the six named tributaries in Article 4(c) of the 1944 Treaty (the Conchos, San Diego, San Rodrigo, Escondido, and Salado Rivers and the Las Vacas Arroyo) can be credited toward Mexico's delivery obligations. These stakeholders oppose any new effort to accept San Juan water as delivered water for Treaty purposes, arguing that it is too generous to Mexico and allows Mexico to circumvent obligations for delivery of the named tributary water. They also argue that the six tributaries are named for a reason – they are upstream of the reservoirs and can be captured and managed by the international dams. And there is concern that Mexico wants to deliver from the San Juan when it is wet in the Lower Rio Grande, and Texas farmers cannot put the water to use.

Some stakeholders interviewed express concern that the use of the flows from downstream tributaries that are not named tributaries in Article 4A(c) of the Treaty in the accounting of Mexico water deliveries, has the effect of depriving the reach of the Rio Grande below the delivery points of the named tributaries (including the Big Bend area) of the benefit of such flows. Those stakeholders are also concerned that use of waters from these downstream tributaries adversely affects other water accounting details that are damaging to lower reach water rights holders below Falcon Reservoir.

Other stakeholders interviewed support using downstream tributary water. Their view is that in drought, some water is better than no water in the lower Rio Grande, even if the upper reach is deprived of water from the Conchos. They point out that the 1944 Treaty Article 9(e) provides flexibility regarding sources of water and that the water should be accepted, particularly considering these dry times. To them, any water from the San Juan leaves much-needed water in the Falcon and Amistad reservoirs. They argue that San Juan water can be managed with the Anzalduas Dam regulating reservoir, and that the source of the water that sits in Anzalduas Dam shouldn't matter– it goes to Texas users in fulfillment of the 1944 Treaty obligations. Some U.S. stakeholders argue that the water quality from the San Juan is poor while other U.S. stakeholders assert the water is of good quality.

Using San Juan water increases the amount of water available to Texas users in the near term, increasing also the likelihood that Mexico will meet the minimum annual average volume of the 1944 Water Treaty. Using San Juan water provides more "wet water" to the U.S. than other sources because San Juan water is credited where it is diverted by U.S. users. Deliveries from other Mexican tributaries are credited at the Rio Grande confluence, resulting in potentially significant conveyance and evaporation losses before being put to beneficial use.

As discussed above in the discussion of the Gurley Report, assignment of Mexico's water has been a point of sensitivity for some Mexico stakeholders, particularly farmers. They hold that they are the sole owners of water rights in this tributary as it is allocated 100% to Mexico under the 1944 Treaty, and oppose using that water for Treaty deliveries.

Overall, while some U.S. stakeholders view the flexible delivery schedule from Mexico under the Treaty as too generous to Mexico, as noted above, there is no question that some Mexico stakeholders see Mexico's water delivery requirements as too generous to the United States.

6. Deliveries under Minutes 308 and 309 not met

In 2002, the IBWC was searching for a creative way to make a dent in the water delivery debt that existed at that time. Minute 308, signed in 2002, proposed construction of projects for three Rio Conchos irrigation districts over a period of four years, resulting in water savings generated annually on average of an estimated 321,043 acre-feet (396,000 TCM). Mexico proposed a capital investment of $1,535 million pesos between 2002-2006. Minute 309, passed in 2003, provided that the saved volumes of water from these conservation projects would be transferred to the Rio Grande, and taken into account to help meet annual average deliveries and applied to cover shortages in a previous cycle.

These Minutes were created in response to a looming deficit on Mexico's water deliveries, and at the time they were agreed to they were considered an innovative partial solution to Mexico's water debt. The U.S. and Mexico, as described above in detail, disagreed on the details of implementation. Although this arose in the 2003 timeframe, it lingers as another basis for the lack of trust still mentioned today by stakeholders interviewed.

All these disagreements over the meaning of the Treaty and the Minutes have contributed to the feeling of mistrust between the U.S., and particularly Texas, and Mexican stakeholders.

E. Past Exclusion of Environmental Flows and NGO Participation is A Concern to Stakeholders

1. The Importance to Stakeholders of NGO Participation and Environmental Flows Considerations

Stakeholders from both countries voiced their concern about the historic lack of NGO participation in Rio Grande deliberations, echoing a chief criticism that has been made over the last decades by commentators and academics, even those otherwise admiring of the many successes and accomplishments by the IBWC under the 1944 Treaty.

The Colorado experience, described in more detail below, has cemented this view. There, for the first time, NGOs participated in the developments of 319 and 323, and were viewed as a key piece of the success of those outcomes. Rio Grande stakeholders support greater involvement of NGO representatives, and Colorado River stakeholders recommend it. That inclusion has already begun earlier this year with U.S. domestic meetings with USIBWC and binational meetings with IBWC culminating in proposals from the Rio Grande Joint Venture, described below and attached to this paper as Attachment 2.

2. Recommendations from the Rio Grande Joint Venture to the USIBWC

The Rio Grande Joint Venture ("RGJV") is a 50-member public-private partnership of state and federal agencies and non-governmental organizations from both the U.S. and Mexico. The RGJV works with technical teams with representation from organizations based in the Rio Grande Basin, as well as land and water stewards, corporations, universities, and other conservation partners. Their work focuses on ensuring that the ecosystems across the binational region support diverse communities of plants, wildlife, and people into the future. The RGJV partnership intends to build on an adaptive ecosystem

management for strategic habitat conservation, and their previous studies, including "A Vision for the Big Bend Reach of the Rio Grande/Río Bravo" and the "Conservation Assessment for the Big Bend/ Río Bravo Region."[149]

In August 2022, the Rio Grande Joint Venture presented a paper with proposals and recommendations to the USIBWC, titled Building a Binational Framework for Adaptive Management Rio Grande/ Bravo from Fort Quitman to the Gulf of Mexico, discussing actions that would help implement the objectives of Minute 325. RGJV seeks to establish mechanisms for future cooperation to improve the predictability and reliability of Rio Grande water deliveries to users in the United States and Mexico through sustainable management aimed at supporting ecosystem functions. A summary of five proposals of activities were presented; these proposals are also called "actions" in the paper.

The first proposed action is to implement a process to include stakeholders in both the U.S. and Mexico to establish specific goals for managed flows. This proposal aims to create environmental flows that would aim to establish base flows, allow sediment transport, improve water quality, and when possible, create a spring pulse flow. This environmental flow would be considered within the provisions of the 1944 Treaty.

For the second proposed action, the RGJV suggests a nature-based approach to sediment management. The report states that this would help move sediment through the system, increase channel capacity, reduce flooding, and improve water quality and wildlife habitat. The RGJV report included proposed strategies, such as the restoration of native riparian vegetation, the deployment of low-tech, process-based methods to slow the movement of water and retain sediment in the tributaries, and the reduction of non-native riparian vegetation through environmentally friendly techniques, including biocontrol.

The third proposed action is to develop and implement an adaptive management program, which would consist of establishing an interdisciplinary, adaptive management work group under a new minute to the 1944 Treaty. This group would evaluate functional flows, vegetation management, and other activities that impact the Rio Grande ecosystem and its ability to improve the predictability and reliability of water deliveries to users in the United States and Mexico.

Proposal four addresses the issue of aquifers and groundwater, considering that groundwater already contributes to the river flow, and therefore the water deliveries under the 1944 Treaty. This proposed action focuses on the transboundary aquifer that provides base flow to the Rio Grande and its tributaries. It calls for further research on the impact of groundwater on the Rio Grande system and an evaluation to determine the ways water quality and quantity can be improved through various methods.

Finally, the fifth proposal is to take actions that facilitate communication between the two sections of the IBWC and stakeholders for the purpose of coordination of water management operations and to include information about dates and times of managed flows from reservoirs within the system, including dam releases in the tributaries. The RGJV points out that this action will allow researchers to plan and execute monitoring studies of the impact of releases and to inform adaptive management, plan river restoration actions for the right time and space, provide technical information for states, municipalities, and protected areas, and benefit local economies that depend on river recreation tourism.

149 See Jeffery Bennet, Mark Briggs, and Samuel Sandoval Solis, *Aquatic and Riparian Habitats, Conservation Assessment for the Big Bend Rio Bravo Region* https://watermanagement.ucdavis.edu/files/9113/9863/2362/Bennett_Briggs_and_Sandoval-Solis_2014_Aquatic_and_Riparian_Habitats.pdf.

F. Security and Unauthorized Use Impact Water Availability

Several stakeholders interviewed, from Mexico and from the U.S., identified water siphoning and unauthorized use in Mexico as a challenge to the U.S.-Mexico water management of water deliveries, with "canal riders" receiving payment to divert additional water to farmers in Mexico. (U.S. and Mexican stakeholders acknowledged that there is also unauthorized use in the U.S.) Little hard data is available on unauthorized use of water, and no interviewees were able to quantify the issue or provide details on the problem. But news reports surface from time to time, with varying degrees of reliability, that suggest water stress in Mexico is being exacerbated by unauthorized use.[150]

Historically, IBWC has attempted to quantify unauthorized diversions from the main stem and estimate and account for them in the ownership calculations under the 1944 Treaty, coordinating between the Watermaster's office and the MXIBWC If it is verified that a suspected diverter is unauthorized, a correction in the accounting for that reach can be made if necessary. These quantifications are limited and done on a case-by-case basis.

Unauthorized use can take many forms. In some instances, it can be a matter of a permitted user failing to pay dues and depleting water over its allocated quotas. In other instances, unauthorized users engage in water theft–siphoning off water in particular localities and illegally selling it at inflated prices to users that can include agriculture, industry, residents, and small farmers. Illegal users can siphon off water from lakes, rivers, and creeks, particularly in rural areas, using water trucks, pipelines, and lookouts. The water is used for their own activities and is brokered to others at a price. Reports include water caches constructed in remote areas that are hard to reach and are hidden from above, evading drones.

Of course, unauthorized use can take place anywhere, including both sides of the Rio Grande, and can only be addressed by enforcement of usage rules and water payment. Effective enforcement is a difficult challenge that requires technological innovation, resources, and political will.

A related security issue mentioned by stakeholders is the effect illegal activity has on the ability to monitor projects in Mexico. Under the 1944 Treaty, any water-related infrastructure in a country, even if the structure is international in designation and use, is in the sole control of that country, subject to reporting and reasonable inspection rights to support construction, payout schedules, and operational agreements. [151] Some projects in Mexico are now in areas that the U.S. Department of State deems unsafe for U.S. citizens to visit, resulting in the use of drones and photographs being substituted for inspections.

150 *Not dried up;* US-Mexico water cooperation, supra.

151 1944 Treaty, Art. 2.

PART V

A Comparison: Lessons from the Colorado River Experience

Photo: Colorado River
Source: Water Education Foundation

The Colorado River had been a source of conflict between the U.S. and Mexico, and among the seven U.S. Basin States–Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming–for over a hundred years.[152] But the IBWC's more recent experience over the past two decades, successfully addressing shortage and environmental challenges on the Colorado River, provides insight into a potential way forward on the Rio Grande.

It is important to note that, at the outset with the All-American Canal lining resulting in seepage loss into Mexico, the relationship between the U.S. and Mexico was tense. The parties entered into a series of Minutes, incrementally, to rebuild the relationship. Colorado River Minutes 316, 317, and 318[153] were important small steps in this effort to build cooperation and trust, and a necessary foundation before the larger, cutting-edge concepts in Minute 319, a pilot, could be negotiated.[154] The parties, including the states and federal governments of both countries, NGOs, water and irrigation districts, and the IBWC, worked together on Colorado River Minutes 319 and 323[155], officially establishing several binational working groups that focused on discrete practical problems that affect compliance with the 1944 Treaty.

With the IBWC's leadership, stakeholders adopted a collaborative approach to resolving problems across the watershed. While the specific resolutions for these two giant rivers may differ, the elements that made collaboration achievable on the Colorado River can be applied to the Rio Grande.

Both rivers are over-allocated in Mexico and the U.S.; are in regions that suffer from drought; and face growing demands from expanding municipalities, populations, and agricultural activities. Climate change is a big stressor, resulting in increased evapotranspiration from the rivers (water surface evaporation, soil moisture evaporation, and water vapor emission from plant surfaces.)

A fundamental difference between the rivers is their locations: 97% of the Colorado River basin is in the United States. With different state laws applying to ownership and regulation of U.S. water, many of the disputes over Colorado River water supplies for most of the past century arose from state allocation issues among the Seven Basin States–Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming . But even with the central federal control of water in Mexico, Mexican stakeholders interviewed report that disputes exist among Mexico's states as well, most notably Chihuahua and Tamaulipas. And issues also have arisen between the United States and Mexico over water quality, availability, and conservation.

The Colorado and the Rio Grande also differ hydraulically. The Colorado relies heavily on snow pack, while the Rio Grande relies on hurricanes and extreme storm events. As a result, where the Colorado is managed through purposeful planned releases through an Annual Operating Plan for the basin made possible by a significant system storage, the Rio Grande is managed almost reactively based on stored volumes through the winter and unpredictable storms in the spring and summer.

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152 For a discussion of the history of governance on the Colorado River, see Robert Glennon and Peter Culp, "The Last Green Lagoon: How and Why the Bush Administration Should Save the Colorado Rver Delta," *Ecology Law Quarterly*, Vol. 28, p.903 (2002), available at https://lawcat.berkeley.edu.

153 Colorado River Minutes 316, 317, and 318, at https://ibwc.gov/Files/Minutes/Minute_316_w_JR.pdf ; https://ibwc.gov/Files/Minutes/Minute_317.pdf; and https://ibwc.gov/Files/Minutes/Min_318.pdf.

154 Colorado River Minute 319, https://ibwc.gov/Files/Minutes/Minute_319.pdf.

155 Colorado River Minute 323, https://ibwc.gov/Files/Minutes/Min323.pdf.

Colorado River Minute 319, which expired in 2017 and was replaced by Minute 323, went a long way toward addressing many of these issues on the Colorado River. This section explores the similarities and differences in 1944 Treaty provisions for the Colorado River and the Rio Grande, the provisions of Minutes 319 and 323, and the stakeholder perspectives on why and how those minutes were accomplished, to explore how those lessons can shed light on a way forward on the Rio Grande.

A. THE COLORADO RIVER UNDER THE 1944 TREATY

1. The Colorado River was Unknowingly Overallocated from the Start Under the 1944 Treaty

The Colorado River with its tributaries flows through the Seven Basin States and forms the border between the Mexican states of Baja California Norte and Sonora, before emptying into the Gulf of California. Under the 1944 Treaty, the United States is required to deliver 1.5 million acre-feet (1,850,234,000 cubic meters) of Colorado River water annually to Mexico.

The Lower Basin States–Arizona, California, and Nevada–and Mexico are allotted a total of 16.5 million acre-feet a year as follows: California 4.4 M acre-feet, Arizona 2.8 M acre-feet, Nevada 300,000 acre-feet, and Mexico 1.5 million acre-feet. Colorado River allocations were developed based on weather patterns of the early 20th century, which it turns out were unusually wet. Shortfalls have resulted, even with the Upper Basin States–Colorado, New Mexico, Utah, and Wyoming– releasing agreed-upon amounts of water to the lower basin. The long-term shortfall has been estimated at about 3.2 million acre-feet annually. Lake Mead can hold a maximum of about 25 million acre-feet. Lake Powell, its companion reservoir upstream, holds up to about 24 million acre-feet. The total storage capacity of the Colorado River system is just under 60 million acre-feet.

The IBWC has engaged in significant efforts over the past 15 years to cooperatively manage the Colorado River's water and infrastructure, with the goal of improving water availability during drought and restoring and protecting the river ecosystems.

Stakeholders and regulators have long struggled with the results of over-allocation and drought on the Colorado River. Drought and over-allocation resulted in Lake Mead falling to a surface level of 1,075 feet, triggering the first-ever declaration of shortage on the Colorado River by the Department of the Interior on August 16, 2021. The basin states and the government now are considering action in response to the severe historic shortage due to the worst drought in 1200 years, considerations that are ongoing and beyond the scope of this paper.

2. There are Four Critical Differences Under the 1944 Treaty and Minutes Between the Colorado River and the Rio Grande Provisions

While 1944 Treaty addresses both the Colorado River and the Rio Grande (as well as the Tijuana River, which is outside the scope of this paper), the Colorado River is treated differently from the Rio Grande in these four critical respects, both under the Treaty and as amplified in Colorado River 319 and its successor 323, still in effect:

1.The U.S. must deliver "a guaranteed annual quantity of 1.5 million acre feet (1,850,234,000 cubic meters)" to Mexico (1944 Treaty, Art.10(a), emphasis added). This contrasts with the average annual delivery aggregated over a five-year period of 1.75 million acre feet for the Rio Grande. The U.S. has met the delivery obligation to Mexico annually, as required under the Treaty. (In the last couple of years, the guaranteed delivery amounts have been proportionately reduced to mirror U.S. reductions, as provided under Minute 323.) U.S. stakeholders on the Rio Grande are frustrated that Mexico is able to go into a deficit on a five-year cycle, allowing a second five years to make up the deficit, and without making consistent reliable water deliveries to the United States, while the U.S has an annual requirement to deliver Colorado River water.

2. In "extraordinary drought or serious accident to the irrigation system in the United States, thereby making it difficult for the United States to deliver" the annual quantity, Mexico agreed that its allotment "will be reduced in the same proportion as consumptive uses in the United States are reduced." [156] There is no similar provision on the Rio Grande, resulting in Mexico meeting its needs internally at the risk of running out of water in drought before Rio Grande deliveries to the U.S. can be met.

3. By practice, water deliveries from the United States to Mexico on the Colorado River are made by the U.S. on a monthly schedule of specified quantities, which Mexico requests, providing predictability and reliability to Mexico water users that is lacking on the Rio Grande deliveries from Mexico. This practice results in meeting the annual delivery requirement of the Treaty.

4. U.S. Stakeholders interviewed contend that Mexico has been treated as though it has a first priority on Colorado River water ahead of all other U.S. users in allocation of water under U.S. operational plans and protocols. They perceive that there is no similar recognition by Mexico of the U.S. as a user of Rio Grande water to set aside water in Mexico's allocation processes and reservoir operation plans to meet its 1944 Treaty water delivery obligations to the U.S. on average annually.

Rio Grande stakeholders in the U.S. perceive the distinctions between how the U.S. is handling Colorado River obligations as standing in stark contrast to Mexico's delivery of water on the Rio Grande. That perception is a key source of strife and mistrust between the parties on the Rio Grande.

156 1944 Treaty, Art. 10(b).

B. Colorado River Minute 319 Provided for the First Time Water Conservation and Environmental Restoration Funded by U.S. Entities

Minute 319 , "Interim International Cooperative Measures in the Colorado River Basin through 2017 and Extension of Minute 318 Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California", was signed on November 20, 2012. It allowed for temporary adjustments to water deliveries from the U.S. to Mexico from the Colorado River based on basin drought or surplus water conditions, joint investments to create greater environmental protection, measures to provide incentives for water conservation, and water storage for Mexico in United States upstream reservoirs. Some also view Minute 319, when taken together with two prior and related Minutes 242 and 318, as recognizing environmental uses as a beneficial use for the Colorado River basin's treaty waters.

Minute 319 provisions included the following:

- Extending provisions of Minute 318 ("Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California") to allow Mexico to defer delivery of its Colorado River water allocation while the country repaired earthquake-damaged infrastructure
- Additional U.S. deliveries of water (above the 1.5 million acre-feet annual delivery required by the 1944 Water Treaty) to Mexico when water levels are high in Lake Mead
- Reducing U.S. deliveries to Mexico during water shortage conditions in the Colorado River basin (Mexico's annual water deliveries would be reduced if Lake Mead elevations indicated shortage conditions, similar to reduction by the U.S. lower basin states; the reductions do not need to be made up)
- Creating a mechanism by which U.S. water deliveries to Mexico could be held in U.S. reservoirs for subsequent delivery when called upon by Mexico
- Continuing to address salinity concerns per Minute 242
- Implementing a pilot program of water efficiency and conservation projects in Mexico.

Under the Minute 319 pilot program, stored water was used for a pulse flow from March 23, 2014, to May 18, 2014. The goal of the pilot program's pulse flow was to improve understanding of water management alternatives for ecosystem restoration. The water releases were intended to simulate a spring flood, resulting in instream flows sufficient for the river to reconnect with its estuary, in the Sea of Cortez, for the first time in many years. The releases and the impacts on instream flow, stream topography, salinity, groundwater, vegetation, birds, and aquatic species were monitored by a binational team of experts.

The IBWC released an interim report providing preliminary results in 2016 based on data through early December 2015. The report's interim observations included the following:

- 4,000 acres of the channel and adjacent lands were inundated, resulting in connectivity from the dam to the river's estuary for the first time since 1997;
- bird diversity and abundance improved in the floodplain in 2014 and in 2015;
- active management of riparian sites would be needed for improved restoration of native riparian species; and
- more freshwater would be required to enhance the fish and zooplankton in the upper estuary.

Under Minutes 318 and 319, Mexico deferred delivery and stored some of its water under the 1944 Treaty in the Colorado system storage in Lake Mead, raising the lake's water elevation. The Bureau of Reclamation reported that related efforts, including actions under Minute 318 and Minute 319, resulted in nearly 3 additional feet of water elevation in Lake Mead at the end of 2016. These water conservation efforts contributed to keeping the projected January 1 elevations of Lake Mead higher than 1,075 feet above sea level during the life of the agreements.

Projections of a water elevation below 1,075 feet would have triggered reductions in Colorado River water deliveries to the Lower Basin States and to Mexico pursuant to Minute 319. Under Minute 319, the Lower Basin States (Arizona, California, and Nevada) would have benefited from Mexico sharing in cutbacks during basin shortage conditions.

The relationship between Mexico and the United States on the Colorado River under the 1944 Treaty contrasts with the relationship in dealing with waters in the lower Rio Grande. Based upon a "good-neighbor policy" under Minutes 318 and 319, for example, the U.S. agreed to adjust delivery schedules for 2010 through 2013 and store Mexico delivery water in Lake Mead due to infrastructure damage to Mexican irrigation facilities from the 2010 earthquake in Mexico. This is viewed by stakeholders interviewed from both countries as a breakthrough moment in the relationship between the U.S. and Mexico.

Minute 319 was termed interim and was considered a pilot program. It expired in 2017, and was replaced by Minute 323.

Photo: Minute 319 Signing Ceremony
Source: Tami A. Heilemann – Office of Communications, Interior Department

C. Colorado River Minute 323

Minute 323 ("Extension of Cooperative Measures and Adoption of a Binational Water Scarcity Contingency Plan in the Colorado River Basin") signed on September 21, 2017, extends or replaces key elements of Minute 319. It expires on December 31, 2026.

Minute 323 is a set of binational measures in the Colorado River basin that provide for binational cooperative basin water management, including environmental flows to restore riverine habitat. Minute 323 also provides that Mexico would continue to share in Colorado River cutbacks during shortage conditions in the U.S. portion of the basin, and designates a "Mexican Water Reserve" through which Mexico can delay its water deliveries from the United States and store its delayed deliveries upstream at Lake Mead, thereby increasing the lake's elevation, similar to the measures adopted under Minute 319.

Minute 323 resulted from more than two years of negotiations among federal and state authorities from both governments, with binational input from a wide range of stakeholders that included water users, scientists, academics, and nongovernmental organizations. It is based in part on provisions from Minute 319. It also contains new sections on variability of flows arriving in Mexico, and a new Binational Water Scarcity Contingency Plan.

2007 Interim Guidelines, Minute 323, Lower Basin Drought Contingency Plan, and Binational Water Scarcity Contingency Plan

Total Volumes (kaf)

Lake Mead Elevation (feet msl)	2007 Interim Guidelines Shortages		Minute 323 Delivery Reductions	Total Combined Reductions	DCP Water Savings Contributions			Binational Water Scarcity Contingency Plan Savings	Combined Volumes by Country *US: (2007 Interim Guidelines Shortages + DCP Contributions)* *Mexico: (Minute 323 Delivery Reductions + Binational Water Scarcity Contingency Plan Savings)*					Total Combined Volumes
	AZ	NV	Mexico	***Lower Basin States + Mexico***	AZ	NV	CA	Mexico	*AZ Total*	*NV Total*	*CA Total*	*Lower Basin States Total*	*Mexico Total*	***Lower Basin States + Mexico***
1,090 - 1,075	0	0	0	***0***	192	8	0	41	192	8	0	*200*	*41*	***241***
1,075 - 1050	320	13	50	***383***	192	8	0	30	512	21	0	*533*	*80*	***613***
1,050 - 1,045	400	17	70	***487***	192	8	0	34	592	25	0	*617*	*104*	***721***
1,045 - 1,040	400	17	70	***487***	240	10	200	76	640	27	200	*867*	*146*	***1,013***
1,040 - 1,035	400	17	70	***487***	240	10	250	84	640	27	250	*917*	*154*	***1,071***
1,035 - 1,030	400	17	70	***487***	240	10	300	92	640	27	300	*967*	*162*	***1,129***
1,030 - 1,025	400	17	70	***487***	240	10	350	101	640	27	350	*1,017*	*171*	***1,188***
<1,025	480	20	125	***625***	240	10	350	150	720	30	350	*1,100*	*275*	***1,375***

The Secretary of the Interior will take affirmative actions to implement programs designed to create or conserve 100,000 acre-ft per annum or more of Colorado River System water to contribute to conservation of water supplies in Lake Mead and other Colorado River reservoirs in the lower basin. All actions taken by the United States shall be subject to applicable law, including availability of appropriations.

Specific provisions of Minute 323 include:

- Extending provisions of Minute 319 to deliver additional water to Mexico when water levels are high in Lake Mead
- Extending provisions of Minute 319 to reduce deliveries to Mexico during water shortage conditions in the Colorado River basin, including additional planning, reporting, and coordination measures to reduce future risk to both countries of low elevations in Lake Mead reservoir
- A Binational Water Scarcity Contingency Plan, under which each country is required to save specified volumes of water at certain low reservoir elevations, for recovery when reservoir conditions improve
- Mexico Water Reserve, allowing U.S. Colorado River water deliveries to Mexico to be held in U.S. reservoirs in the event of potential emergencies or as a result of water conservation projects in Mexico, to be available for subsequent delivery
- Actions to address salinity concerns in connection with Minute 242
- Measures related to variability of flows arriving in Mexico
- Providing water and funding for habitat restoration and related monitoring
- Investing in water conservation and new water sources projects to allocate some of the additional water flows for environmental purposes
- Ongoing consultations for design, construction, operation, and maintenance of the All-American Canal Turnout, which eventually would need to be addressed in a separate Minute

Instead of providing for pulse flows like Minute 319, Minute 323 calls for 210,000 acre-feet of water over the course of the agreement for environmental purposes, to be provided equally by both countries and a binational coalition of nongovernmental organizations. The United States will generate its share of water for the environment solely through its commitment in Minute 323 to contribute $31.5 million over the course of the agreement for water conservation projects in Mexico, including $16.5 million anticipated to come from the Bureau of Reclamation. Although these water conservation activities will occur in Mexico, U.S. water agencies are the beneficiaries of these volumes, as they will receive a portion of the water generated in return for their monetary contributions, totaling 109,100 acre-feet of water for use in the United States.

Similar to Colorado River Minutes 318 and 319, Minute 323 will allow Mexico to defer delivery of some of its water under the 1944 Treaty and store it in Lake Mead, to be released later for delivery to Mexico. The Minute extends cooperative measures addressed in Minutes 318 and 319 on emergency storage, establishes a revolving account for Mexican water storage in the United States, and provides the opportunity to generate an "Intentionally Created Mexican Allocation" (a credited pool of Mexican storage) through additional deferred deliveries. Collectively, these elements are called "Mexico's Water Reserve".

Another major goal of Minute 323 is to establish cooperative efforts to avoid severe water shortages (amounts in addition to the commitments under Minute 319 that were extended in Minute 323). Under the Binational Water Scarcity Contingency Plan, each country has committed to save specified volumes of water at certain low reservoir conditions for later use.

Minute 319 and 323 on the Colorado River officially established binational working groups that are focused on discrete practical problems affecting treaty compliance and adopting a collaborative, whole-of-the-river (or watershed) approach to resolving problems. The working groups are widely viewed as having resulted in extensive relationships and cooperation between the parties in addressing challenges on the Colorado River. They include the following work groups on Salinity, Projects, Environmental, and Hydrology.

Minutes 319 and 323 are widely regarded as breakthrough agreements that benefitted the Colorado River after years, and on some issues, decades, of strife among the Colorado River stakeholders. Colorado River stakeholders interviewed for this paper overwhelmingly identified two factors that were critical to establishing the provisions in Minutes 319 and 323 and fostering a better working relationship on the Colorado River.

D. Stakeholders Identified Two Key Factors That Enabled the Parties to Reach Agreement on Colorado River Minutes 319 and 323

Stakeholders interviewed for the white paper were asked "what can we learn from the Colorado River experience, particularly with Minutes 319 and 323, that may provide lessons that can be applied successfully on the Rio Grande under the 1944 Treaty?" The overwhelming majority interviewed replied that there were two key factors that allowed the parties to reach the solutions in Minutes 319 and 323: (1) the establishment of trust by building relationships through committee meetings and related gatherings, and (2) the inclusion of NGO representatives in the work.

Photo: Pulse Flow Release Ceremony (Morelos Dam)
Source: IBCW

1. Building Relationships

Frequent Meetings with the Same Individuals. U.S. and Mexico stakeholders interviewed agreed that the binational committees set up by the IBWC were instrumental in developing relationships on the Colorado River that led to Minutes 319 and 323. Frequent meetings, in some cases monthly, were held that included by necessity overnights and dinners and other "off-negotiation", informal conversations that provided opportunities for attendees to get to know each other, resulting in better professional relations at meeting negotiations. Tours and dinners enhanced the interaction. The U.S. and Mexico were each encouraged to send the same individuals to meetings to promote continuity and create a sense of community. Continuity is sometimes a challenge, especially for Mexico where there is higher turnover of personnel. Meetings were kept small–ten or fewer attendees– to allow for meaningful participation and interaction.

Mexico State Participants. One innovation that developed was that the Mexican states' representatives participated in Colorado River meetings. Because water is considered owned and administered at the federal level in Mexico by CONAGUA, states had attended meetings but participation had been minimal. This evolved over time and contributed to the cooperative atmosphere, particularly with the relatively more frequent federal management changes in Mexico. The result was development of a framework for dealing with scarcity, avoiding conflict.

Time. Stakeholders who had worked on the Colorado River cautioned that the relationship building took time, some estimated over a period of five years, to really develop. They emphasized that building confidence and trust to reach agreement does not develop overnight after two or three meetings.

Incremental Steps. With a commitment of reaching an agreement on a Rio Grande Minute by the end of 2023 to address Mexico water deliveries, and the current situation of water scarcity, Rio Grande stakeholders unfortunately do not have the luxury of time to help them develop a more cooperative relationship. But the incremental steps instead–the exchange of science already underway since 2020 with the two Rio Grande working groups, the Rio Grande Hydrology Work Group and the Rio Grande Policy Work Group, established in Rio Grande Minute 325 in 2020, plus the many meetings, discussions and stakeholder interviews undertaken this year by the USIBWC, and the ideas summarized in this white paper for further consideration by the parties–all will provide a jump-start toward cooperative relationships to successfully result in a Minute to ease the Rio Grande situation now and to build on going forward.

2. Involvement of NGOs

For the first time during discussions of Minutes 319 and 323, NGOs were more involved and included in Colorado River discussions than they had been previously. Stakeholders interviewed identified NGO participation as a key positive factor in reaching agreement on the Colorado River. The focus on environmental flows naturally created an interest in their expertise. But NGO participation brought other benefits as well, identified in interviews. NGOs are knowledgeable about the local communities and what kinds of interests and needs water uses have. NGOs engage in social and economic assessments of the communities, and provide insight into what communities issues and challenges are, to shape the solutions. NGOs build trust and friendships within their communities. This contributes to better solutions, as well as solutions accepted by the local communities.

Photo: Representatives from conservation organizations stand alongside policymakers from U.S. and Mexico federal agencies at the pulse flow event on March 27, 2014.

Source: Environmental Defense Fund

E. Interviewees Suggested Several Key Provisions from the Colorado River Minutes 319 and 323 for Consideration on the Rio Grande

In addition to the suggestions for a different approach to the process based on Colorado River experience, as discussed above, stakeholders interviewed also suggested that certain aspects of the substantive provisions on the Colorado River from Minutes 319 and 323 might further predictable and reliable water deliveries from Mexico on the Rio Grande and help overcome potential challenges. Here is a summary of those suggestions, most of which were suggested by multiple interviewees, even though they were interviewed individually.

1. Create multiple additional venues for interaction among the parties and stakeholders, and cast a wide net for participation

There are already two IBWC working groups on the Rio Grande, The Rio Grande Policy Work Group and the Rio Grande Hydrology Work Group, created in Minute 325. Interviewees suggested the creation of several more under IBWC's leadership, and scheduling multiple smaller meetings to be most effective.

NGO participation from both the U.S. and Mexico is deemed essential by interviewees at this stage of water scarcity considerations. Interviewees cautioned from experience that not every stakeholder group can be represented at every scheduled meeting, or the meetings become unwieldy and unproductive due to the sheer size of the group participating. Small, frequent meetings would accomplish more, with IBWC leadership.

A new user group similar to the Colorado River Water Users Association ("CRWUA"),or a Rio Grande Symposium, perhaps spearheaded by stakeholders, could also provide an additional venue for collaboration and discussion. CRWUA is a non-profit, non-partisan organization that provides a forum for exchanging ideas and perspectives on Colorado River use and management to develop and advocate common objectives, initiatives and solutions.[157] The Colorado River Symposium is an invitation-only convening sponsored by the Water Education Foundation. [158]

2. Make Water Management Changes to Promote Certainty and Sustainability

Those interviewed suggested a number of considerations that came to mind considering the Colorado River experience that if implemented could result in greater certainty and sustainability on the Rio Grande.

First, the flexibility of water sources that under Minute 234 currently can be used in a second five-year cycle where a deficiency occurs, could be extended under a new Minute to the first year cycle. As provided in Minute 234 for the second cycle, the water that could be extended to the first cycle in a new Minute could include giving credit for water in excess of the minimum quantity allotted to the U.S. from tributaries; water allotted to Mexico from the tributaries if Mexico gives advance notice and the U.S. is able to conserve the water; and transfers of Mexico water stored in the international reservoirs if the U.S. is able to store and use them.

Second, use of San Juan water under certain drought conditions that would be defined by the parties would provide additional certainty.

Third, interviewees suggested that deliveries of water could be required from Conchos Dams to the International Dams under certain defined lake elevations, as is similarly done on the Colorado River.

157 More about CRWUA can be found at www.crwua.org.

158 More about the Water Education Foundation can be found at https://www.watereducation.org/.

3. Expand the supply of water in Mexico and the U.S. with programs, conservation, and funding.

Expansion of new water sources is critical to a long-term solution for water scarcity in the Rio Grande basin. Supply must be expanded in as many ways as feasible in both the U.S. and in Mexico. Programs could include salinity improvements and desalination projects, crop conservation, canal lining, and other proposed water conservation and storage projects, both small and large, in Texas and in Mexico. All these initiatives will require funding.

Federal and foundation money is and could be made available to fund the expansion of water supply. U.S. Federal funding is available for the Colorado River in the U.S. and Mexico through the Infrastructure Bill and the USDA to address drought through projects that provide a federal benefit, and both federal and foundation money could fund conservation in Mexico for desalination, implementation of water-saving agricultural practices, and environmental flows. These sources of U.S. Federal funding should be explored for the Rio Grande.

4. Implement environmental solutions for the Rio Grande

While somewhat longer-term in their effects, several suggestions were made to apply environmental solutions to the benefit of the river system. These actions would include eliminating invasive, high-water-consuming plant species, encouraging native water-conserving species, and providing environmental flows to begin to restore river health and better support animal and plant species. These suggestions are described in more detail above.

Possible applications of these and other suggestions from interviewees that could be considered in the development of a new Minute and in taking other additional actions on the Rio Grande are discussed below.

PART VI

Potential Actions for Further Consideration in Addressing Challenges and Developing Minutes

As the 2013 Lower Rio Grande Basin Study pointed out, climate change, aging infrastructure, and an increase in water demand due to population and industry growth are among the main factors decreasing the availability of water resources in the Rio Grande Basin system. These factors have only been exacerbated in the decade since that study. They have propelled feasibility studies for the execution of infrastructure works in different areas of the Rio Grande Basin. In addition, Colorado River Minutes 319 and 323 illustrate the need to develop new strategies and to create more work groups and broader stakeholder inclusion to give greater predictability to Rio Grande water deliveries under the 1944 Treaty.

The Colorado River experience was, and continues to be, an iterative process–building trust, educating, and working with key stakeholders over time to progress from Minute 317, to 318, to the pilot project in 319, and finally to Minute 323. Rio Grande improvements are sure to require a similar iterative route.

Here then are stakeholder suggestions as a foundation for further education, deliberation, discussion, and negotiation among stakeholders, under the leadership of the IBWC, in a future decision-making process. The first segment suggests potential areas for action now, based on discussions with stakeholders, that might feasibly be considered in Minutes. The second compiles additional stakeholder suggestions that have been made that might merit longer-term consideration by the parties as they continue to tackle the Rio Grande issues. SENTENCE 15

Potential Considerations for Future Minutes

The IBWC goal for the 2023 Minute is to begin addressing interim actions and cooperative measures for the Rio Grande/ Rio Bravo along the lines of Colorado River Minutes 317, 318, 319, and 323. Taking into account the current situation on the Rio Grande; the concerns and challenges expressed in the extensive stakeholder discussions that have taken place since June of 2022; and the USIBWC s and MXIBWC's goal to develop a Minute before the end of 2023 to begin to realize more predictable and reliable deliveries on the Rio Grande, here are points that could be considered for inclusion in the 2023 Minute and successor Minutes, grouped by infrastructure, and other actions. Compiled in the list are actions that have previously been suggested over the years, and ideas more recently raised in stakeholder interviews.

Infrastructure

1. **Consider the Morillo Drain improvemen**t project for the canal, estimated at a cost of $7.8 million (138 million pesos) to attain 3 cubic meters per second, and $25.8 million (493 million pesos) to attain 4 cubic meters per second. The cost values presented are for the year 2022.
2. **Consider a Desalination Plant to treat the waters from the Morillo Drain**, which would recover nearly 24% of the minimum annual average delivery volume to the United States under the 1944 Treaty and is estimated to cost $40 million (824 million pesos),adjusted to 2022.
3. **Falcon-Matamoros Aqueduct.** In 2008, Mexico suggested construction of an aqueduct from Falcon Dam to Matamoros, to convey the city's municipal water supply in a way that would greatly reduce conveyance losses. Currently, releases of 353 cfs or 255,000 acre-feet annually (10 cms or 315,000 TCM annually) are required to deliver 106 cfs or 77,000 acre-feet annually (3 cms or 94,600 TCM annually) to the city. Studies prepared and presented by the Tamaulipas state government mentioned that the project also would reduce conduction, evaporation, and infiltration losses. The estimated cost of the project in 2008 was $295 million dollars (6 billion pesos) for a 160 mile aqueduct that could yield 178,000 acre-feet (220,400 TCM) in saved water.
4. **Brownsville-Matamoros Weir.** In 2008,the Brownsville-Matamoros Weir was originally to be located 12.9 miles downstream of Gateway Bridge, with a capacity of 60,000 acre-feet. This original location was objected to by Mexico in favor of construction of a weir at 8.02 miles (12.9 km) downstream of the Matamoros-Brownsville International Bridge (Gateway). The project would replace the functions of the Retamal dam. The Mexican Section was concerned about potential flooding in Matamoros, and therefore would like to consider a weir at a different site that is acceptable to both countries. In response to the project concept, some stakeholders expressed concern that those flows to the Gulf of Mexico should not be impeded.

Figure 23: Rio Conchos Dams to be improved

Source: Texas Parks & Wildlife, CONANP, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Esri, USGS

5. **Improvement of existing infrastructure.** IBWC and CILA studies have addressed the construction and improvement of the existing infrastructure, including the Boquilla, Luis L. Leon, and Francisco I. Madero Dams on the Conchos River to improve their capacity so they could store additional water. Other considerations have included improving conveyance and channel capacity below outlet works of the Marte R. Gomez Dam on the San Juan to support the additional U.S. demand for San Juan water and address operational concerns of accepting San Juan water. The U.S. has expressed interest in having additional water to meet Treaty delivery obligations, perhaps in the form of a water exchange.

Other Actions

1. Provide for use of San Juan water under certain criteria, including only using San Juan water in drought, and possibly giving less than full credit against Mexico's Treaty obligations for the volume delivered, resulting in allowing the U.S. to put the water to use during drought and enhance reliability of deliveries
2. Provide Mexico the flexibility to deliver to the U.S. a greater than one-third share of six named tributary waters in the first five-year cycle, in a similar way that is currently allowed under Minute 234 in the second five-year cycle
3. Develop management criteria for releases from the Conchos, providing for releases from upstream dams on the Conchos to downstream international dams when there are storms, with release criteria tied to upstream dam levels
4. In the annual allocation process by CONAGUA, consider the U.S. as a "user" in the system--this would allow the U.S. to better plan, even if no allocation is given that year
5. Make the U.S. a priority user on the Rio Grande, and Treaty compliance for deliveries to the U.S. a first priority for Mexico, as the U.S. has done on the Colorado River for deliveries to Mexico
6. Provide a mechanism to give credit to Mexico when deliveries are made and subsequent storm events result in "over deliveries" of water, if Mexico agrees to make annual-based flow deliveries
7. U.S. and Mexican investment in water conservation projects in the Conchos River Basin with a commitment to deliver conserved volume to the Rio Grande in a way that benefits the ecosystem in the Big Bend region and water supplies for both countries
8. State of Texas or water district funds for conservation projects in the Rio Grande Basin in Mexico, with water transferred to the U.S. at Amistad or Falcon international reservoir
9. State of Texas funding for part of Mexico's share of Amistad Dam mitigation project cost, with water transferred to U.S. at Amistad or Falcon international reservoir
10. Federal funding for water conservation projects in Mexico, with conserved water released to the Rio Grande for environmental flow in the Big Bend are and regular water accounting (⅓ U.S. and ⅔ MX) at the confluence
11. State of Texas or water district funding for water conservation projects in Mexico, with conserved water released to Rio Grande; U.S> receives ⅓ share plus agreed-upon amount resulting from water conservation project

12. Update the 2013 Rio Grande Basin Study
13. Create an Environmental Work Group to look at flow, sediment, and species generally, and consider a project on environmental flows in Big Bend; consider creating additional Work Groups to address Projects, Salinity, and other topics as needed
14. Address the groundwater/surface water connection on the Rio Grande and the effects on water quality and quantity in a white paper
15. Expand sustainable water measures through education and projects that promote conservation, recycling, and reuse of water, particularly in the agricultural sector, in both countries Encourage leading stakeholders in Mexico and Texas to create a stand-alone non-profit organization for the Rio Grande akin to the Colorado River Symposium or the Colorado River Water Users Association, to convene stakeholders periodically to discuss Rio Grande challenges and solutions. Create a network of invited stakeholder committees with representatives of farmers, water users, and NGOs from both countries.
16. Other solutions that would require further study have also been identified, such as rainwater reclamation and investment in programs to improve irrigation efficiency, wastewater recovery and treatment, and crop substitution. In 2013, Lower Rio Grande Basin study also identified Brackish Groundwater Desalination as the strategy best suited to meet the region's long term water needs.

PART VII

Conclusion

While stakeholders currently may disagree about how best to meet the challenges of water scarcity and delivery, there is agreement on a number of points that can form the basis among them for meaningful discussions and, ultimately, solutions to the issue of predictable and reliable delivery of Rio Grande water by Mexico to the U.S. under the 1944 Treaty.

Several factors suggest that the parties can reach agreement over time and with more communication. Both countries agree that there are defined problems–lack of reliable water deliveries and water shortages–and are interested in addressing them. The parties have almost 80 years of experience working together to avoid serious conflict under the 1944 Treaty, and the 1944 Treaty provides them flexibility to innovate solutions. The IBWC is providing leadership to include a wide array of stakeholders and points of view. Many possible solutions to improve the situation are already being discussed and considered among the stakeholders. These factors all bode well for improvements on the Rio Grande.

Appendix A

RIO GRANDE
Chronology of Key Events

- **February 2, 1848:** Treaty of Peace, Friendship, Limits, and Settlement with the Republic of Mexico, U.S.–Mex. (hereinafter Treaty of Guadalupe Hidalgo).
- **July 29, 1882:** Convention Between the United States of America and the United States of Mexico Providing for an International Boundary Survey to Relocate the Existing Frontier Line Between the Two Countries West of the Rio Grande, U.S.--Mex. (hereinafter 1882 Boundary Convention).
- **November 12, 1884:** Convention Between the United States of America and the United States of Mexico establishing the rules for determining the location of the boundary when the meandering rivers transferred tracts of land from one bank of the river to the other (hereinafter 1884 Boundary Convention).
- **March 1, 1889:** Convention Between the United States of America and the United States of Mexico to Facilitate the Carrying Out of the Principles Contained in the Treaty of November 12, 1884, and to Avoid the Difficulties Occasioned by Reason of the Changes Which Take Place in the Bed of the Rio Grande and That of the Colorado River, U.S.-Mex. (hereinafter 1889 Boundary Convention).

- **1895:** Considering reports that the United States' westward expansion was creating water shortages, Mexico asserted that the United States was violating international law by diverting the Rio Grande excessively.
- **November. 21, 1900:** The United States and Mexico made the International Boundary Commission (IBC) permanent in 1900, extending for an indefinite period the Treaty of March 1, 1889, between the two governments known as the Water Boundary Convention.
- **May 21, 1906:** Convention Between the United States and Mexico Providing for the Equitable Distribution of the Waters of the Rio Grande for Irrigation Purposes (hereinafter Convention of 1906).
- **July 31, 1930:** Report on Rio Grande Rectification. After Minute 128 (December 21, 1928), this report suggested developing an international plan for the removal of the flood menace of the Rio Grande from the El Paso–Juarez Valley. The report in Minute 129 included a general plan to (a) straighten the present river channel, effectively decreasing it in length from one hundred fifty-five (155) miles to eighty-eight (88) miles, and confining this channel between two parallel levees and (b) constructing a flood retention dam at the only available site twenty-two (22) miles below Elephant Butte on the Río Grande to create a reservoir with storage of one hundred thousand (100,000) acre feet.
- **February 1, 1933:** The two governments agreed to jointly construct, operate and maintain, through the IBC, the Rio Grande Rectification Project, which straightened, stabilized, and shortened the river boundary in the El Paso - Juárez area.
- **February 3, 1944:** Treaty Between the United States of America and Mexico Respecting Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, U.S.-Mex. (hereinafter the 1944 Treaty). The 1944 Treaty distributed the waters in the international segment of the Rio Grande from Fort Quitman, Texas to the Gulf of Mexico, and authorized the two countries to construct, operate, and maintain dams on the main channel of the Rio Grande. The 1944 Treaty also changed the name of the IBC to the International Boundary and Water Commission (IBWC), and, in Article 3, the two governments entrusted the IBWC to give preferential attention to the solution of all border sanitation problems.
- **April 8, 1954:** Falcon Dam construction was officially completed and by October 1954 the dam's hydroelectric power station began to produce electricity.
- **June 26, 1954:** Heavy rains from Hurricane Alice caused the greatest rise on the Rio Grande since 1865. The river rose 30 to 60 feet at Eagle Pass and Laredo. An 86-foot wall of water rushed down the Pecos River; this washed out a bridge normally 50 feet above it. The International Bridge at Laredo was also washed out. Most of the death and destruction occurred in Mexico (this event is also known as The Great Acuna Flood).
- **August 29, 1963:** Convention Between the United States of America and the United Mexican States for the Solution of the Problem of the Chamizal, U.S.-Mex. The Convention resolved the 100-year-old boundary problems at El Paso, Texas/Ciudad Juárez, Chihuahua, known as the Chamizal Dispute. The Commission relocated and concrete-lined 4.34 miles of the channel of the Rio Grande to transfer 437 acres to Mexico (hereinafter Chamizal Convention of 1963).
- **November 30, 1965:** The Commission agreed on the Measures for solution of the Lower Rio Grande salinity problem (Minute 223)
- **January 23, 1967:** After the approval of the Minute 223 the Commission made Recommendations concerning the Lower Rio Grande salinity problem (Minute 224).

- **October 2, 1968:** The Rio Grande River is included as a part of the Wild and Scenic Rivers Act, giving it the protection need it to flow freely along the Big Bend National Park.
- **September 8, 1969:** Amistad Dam was officially completed. The Amistad dam is the largest of the storage dams and reservoirs built on the international reach of the Rio Grande River.
- **December 2, 1969:** The Commission stipulates that neither country may accrue a shortfall for two consecutive five-year cycles. The minute also specifies the sources that can be utilized to repay water debts: excess water from tributaries, a portion of the allotment from tributaries, and the transfer of water stored in international reservoirs, such as the Amistad and Falcon dams (Minute 234).
- **November 23, 1970:** The Treaty of 1970 resolved all pending boundary differences between the two countries and provided for maintaining the Rio Grande and the Colorado River as the international boundary. It provides procedures designed to avoid the loss or gain of territory by either country incident to future changes in the river (hereinafter Treaty of 1970).
- **May 26, 1977:** Completion of the relocations of the Rio Grande stipulated in Article I of the Treaty of November 23, 1970.
- **September 27, 1979:** The Commission made the recommendations for the solution to the border sanitation problems.
- **September 26, 1980:** Recommendations for solution of the New River border sanitation problem at Calexico, California/Mexicali, Baja Norte.
- **Aug. 14, 1983:** Agreement between the United States Of America and the United Mexican States on Cooperation for the Protection And Improvement Of The Environment In The Border Area (hereinafter La Paz Agreement of 1983).
- **July 17, 1985:** Recommendations for the First Stage Treatment and Disposal Facilities for the Solution of the Border Sanitation Problem at San Diego, California/Tijuana, Baja California (Minute 270).
- **May 13, 1987:** Joint Project for Improvement of the Quality of the Waters of the New River at Calexico, California/Mexicali, Baja California (Minute 274).
- **August 28, 1989:** Joint Measures to Improve the Quality of the Waters of the Rio Grande at Laredo, Texas/Nuevo Laredo, Tamaulipas w/ Joint Report (Minute 279).
- **November 16, 1993:** Agreement between the Government of the United States of America and the Government of the United Mexican States Concerning the Establishment of a Border Environment Cooperation Commission (BECC) and a North American Development Bank (NADB).
- **October 4, 1995:** Emergency Cooperative Measures to Supply Municipal Needs of Mexican Communities Located Along the Rio Grande Downstream of Amistad Dam. The United States agreed to loan Mexico water to alleviate the drought (Minute 293).
- From 1944 until 1994, Mexico reliably delivered its portion of water to the US, but a drought lasting from 1994 until 2003 significantly impacted Mexico's ability to transfer water, forcing the country to amass a water debt through two five-year cycles.

- **June 25, 1997:** The Commission agreed on the inclusion of the Minute 297 which encompass the Operations and Maintenance Program and Distribution of its Costs for the International Project to Improve the Quality of the Waters of the Rio Grande at Laredo, Texas-Nuevo Laredo, Tamaulipas to the Minute 279.
- **June 3, 1998:** International Boundary and Water Commission Support to the Border Environment Cooperation Commission in Development of Projects for the Solution of Border Sanitation Problems (Minute 299).
- **June 6, 2000:** The Commission met to review the Operation and Maintenance of the Jointly Financed Works for Solution of the Lower Rio Grande Salinity Problem.
- **September 25, 2000:** Memorandum of Understanding Concerning the Program of Joint Grant Contributions for Drinking Water Supply and Wastewater Infrastructure Projects for Communities in the United States - Mexico Border Area.
- **March 16, 2001:** Partial Coverage of Allocation of the Rio Grande Treaty Tributary Water Deficit from Fort Quitman to Falcon Dam. Mexico will provide to the United States 600,000 AF (740 Mm3) (Minute 307).
- **June 28, 2002:** The IBCW will account in favor of the United States of 90,000 acre feet (111 Million Cubic Meters - Mrn3) of waters assigned to Mexico in the international Amistad and Falcon Reservoirs. The Government of the United States and the Government of Mexico will urge the appropriate international funding institutions, to which they are a party, to ensure analyses and consideration of the Commission's observations concerning the water conservation projects (Minute 308).
- **July 3, 2003:** The Commission presented the Volumes of water saved with the modernization and improved technology projects for the irrigation districts in the Rio Conchos Basin and measures for their conveyance to the Rio Grande (Minute 309).
- Through a multifaceted approach including improved water efficiency, negotiation of new minutes, and presidential intervention, the conflict was resolved, and Mexico successfully paid off its debt. Increased water levels resulting from hurricanes permitted Mexico to pay off its water debt in 2005.
- Mexico has not met its obligations at the conclusion of the following four five-year cycles: 1992-1997, 1997-2002, 2002-2007, and 2010-2015.
- **April 4, 2010:** Earthquake in the Mexicali Valley, Baja California.
- **December 20, 2010:** Adjustment of Delivery Schedules for Water Allotted to Mexico for the Years 2010 Through 2013 as a Result of Infrastructure Damage in Irrigation District 014, Rio Colorado, Caused by the April 2010 Earthquake in the Mexicali Valley, Baja California (Minute 318).
- **November 20, 2012:** Interim International Cooperative Measures in the Colorado River Basin through 2017 and Extension of Minute 318 Cooperative Measures to Address the Continued Effects of the April 2010 Earthquake in the Mexicali Valley, Baja California (Minute 319)
- The Commission addresses a number of issues and concerns for Colorado River stakeholders, including extending Mexico's ability to defer deliveries under Minute 318. The minute creates mechanisms for the countries to plan for and manage water surpluses and shortages, while acknowledging the importance of providing water for environmental needs.

- **October 2010 – October 2015:** Final accounting for the 2010-2015 cycle indicated a shortfall of 15% (263,250 AF) in Mexico's water deliveries. A significant cause of the missed delivery for the five-year cycle stems from a deficit of more than 249,000 AF of the annual 350,000 AF target that occurred during the second year of the cycle—that is, deliveries from Mexico were less than 30% of the annual target for the October 2011 to October 2012 period.
- **February 24, 2016:** Mexico delivered water to the United States to pay down the debt making its final delivery on January 25, 2016.
- **September 27, 2017:** The Commission approved Minute 323, intended to continue Minute 319's cooperative management efforts including those related to environmental issues to create a more secure water future for Colorado River Basin water users. Minute 323 authorizes mutually advantageous options to give the treaty parties flexibility and facilitate longer term planning of water storage and distribution under variable climate conditions. It also provides for substantial investment in conservation projects in Mexico, in exchange for additional water allocations to the United States.
- **October 14, 2020:** La Boquilla Conflict, Mexico released water from a dammed portion of Mexico's Río Conchos destined to flow across the border to partially repay Mexico's 345,600-acre-foot water debt to the U.S. This triggered frustrated farmers and protestors in the Mexican state of Chihuahua who clashed with Mexican soldiers sent to protect the workers in La Boquilla Dam.
- **October 21, 2020:** The Commission met to establish the measures to end the current Rio Grande water delivery cycle without a shortfall, to provide humanitarian support for the Municipal Water Supply for Mexican Communities, and to establish mechanisms for future cooperation to improve the predictability and reliability of Rio Grande water deliveries to users in the United States and Mexico (Minute 325).

Appendix B

COLORADO RIVER
Chronology of Key Events

- **1848**: the Treaty of February 2, established the United States-Mexico international boundary.
- **1853:** The Treaty of December 30, modified the 1849 Treaty and established the boundary as it exists today.
- **1865:** The Federal Reclamation on the Lower Colorado River Native American lands begin.
- **1884:** The Convention of November 12 established the rules for determining the location of the boundary when the meandering rivers transferred tracts of land from one bank of the river to the other.
- **1889:** The Convention of March 1 established the International Boundary Commission (IBC) to apply the rules in the 1884 Convention and was modified by the Banco Convention of March 20, 1905, to retain the Rio Grande and the Colorado River as the international boundary.
- **1892:** Colorado River first trans basin diversion project in which the Colorado River water is transported across Continental Divide into Eastern Colorado through the Grand Ditch.
- **1902:** U.S. Reclamation Service (Bureau of Reclamation) is established.
- **1905:** Colorado River breaks through Imperial Valley Canal, creating the Salton Sea.

- **1919:** The Grand Canyon National Park is created.
- **1922:** The U.S. Supreme Court rules in Wyoming v. Colorado that appropriative water right doctrine applies regardless of state lines. The state of Wyoming brought an action against the state of Colorado to prevent the diversion of a stream system. Wyoming claimed the doctrine of prior appropriation granted them superior rights to the stream water, as they claimed the water first, and that Colorado's proposed diversion would leave them with an insufficient supply of water.
- On November 9, 1922, Delegates from the seven Colorado River Basin states met in New Mexico to discuss, negotiate and ultimately work out the compact. The compact apportioned Colorado River water between Upper and Lower Basin states and, as a result, is considered a defining document in Colorado River management. **1923:** The states ratify the Colorado River Compact except for Arizona.
- **1925:** The Metropolitan Water District of Southern California is formed with the goal of building the Colorado River Aqueduct.
- **1928:** U.S. Congress approves Boulder Canyon Project Act and 1922 Compact. This act authorized the construction of the Hoover Dam on the Colorado River and the All-American Canal to the Imperial Valley in California.
- **1929:** California passes California Limitation Act to limit the use by California of the waters of the Colorado river in compliance with the act of congress known as the "Boulder canyon project act".
- **1930:** Arizona files cases with U.S. Supreme Court trying to invalidate Boulder Canyon Project Act. Court refuses to hear cases.
- **1931:** The construction of Hoover Dam begins.
- **1937:** The transmountain water diversion system known as Colorado-Big Thompson project is authorized.
- **1940:** The All-American Canal is completed.
- **1941:** Metropolitan Water District of Southern California (MWD) completes the Colorado River Aqueduct.
- **1944:** The Treaty of February 3 for the "Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande". Under the Treaty, the U.S. will annually allocate 1.5 million acre-feet of Colorado River water to Mexico in normal years. The 1944 treaty also changed the name of the IBC to the International Boundary and Water Commission (IBWC), and in Article 3 the two governments entrusted the IBWC to give preferential attention to the solution of all border sanitation problems.
- On February 3, 1944, Arizona unconditionally ratified the compact, 22 years after it was negotiated and the negotiations for a Central Arizona Project commenced. **1946:** The Upper Colorado River Commission is established to allocate water among Upper Basin states.
- **1947:** Central Arizona Project (CAP) plans are released, this multipurpose water resource development and management project seeks to deliver Colorado River water, either directly or by exchange, into central and southern Arizona.
- The IBWC through Minute 185, Proposed an agreement relative to the emergency use of the All-American Canal for the delivery of water for use in Mexico during the 1947 irrigation season.

- The States and U.S. Congress ratified the Upper Colorado River Basin Compact.
- **1948:** The Commission approved the Minute 188 on the Agreement relative to the emergency use of the All-American Canal for the delivery of water for use in Mexico during the 1948 irrigation season.
- On May 3, 1948, the Commission approved the Minute 189 concerning the determinations as to site and design features of the main diversion structure to be constructed by Mexico on the Colorado River and work necessitated thereby for protection of United States lands.
- **1949:** Minute 191 regarding to the emergency use of the All-American Canal for the delivery of water for use in Mexico during the 1949 irrigation season.
- **1950:** Agreement relative to the emergency use of the All-American Canal for the delivery of water for use in Mexico during the portion of the calendar year 1950 until Articles 10, 11, and 15 of the Water of Treaty of 1944 become effective (Minute 194).
- **1951:** The U.S. Congress refuses to approve CAP until California and Arizona resolve their differences.
- **1952:** The Colorado Basin Storage Project (CRSP) of 1949 was questioned by the National Park Service director and conservationist which began questioning the proposed Echo Park dam. They believed that the proposed dam and reservoir would massively alter the natural scene within the Dinosaur National Monument. The Dam project was removed from subsequent legislation signed in 1956.
- **1956:** Colorado River Storage Project Act approves multiple projects in the Upper Basin including Flaming Gorge Dam and Glen Canyon Dam. Glen Canyon Dam was completed in 1963.
- **1958:** The Commission approved the Minute 208 regarding the final liquidation of costs corresponding to Mexico for Group I levee works required upstream from the Morelos Diversion Dam to protect lands within the United States against damages from such rise in flood stages of the Colorado River.
- November 28, the Minute 209 established the portion allowable to Mexico of costs of operation and maintenance of the Group I levees on the Colorado River upstream from Morelos Diversion Dam.
- **1961:** The IBCW established, via Minute 211, the manner of payment of Mexico's share of cost of construction of Group II Colorado River levees upstream from Morelos Diversion Dam.
- **1964:** The U.S. Supreme Court on Arizona v. California holds California to 4.4 million, Arizona to 2.8 million and Nevada to 300,000 acre-feet annually in normal years as provided in the Boulder Canyon Project Act.
- Minute 216 of March 18, 1964, the Commission convened on the operation and maintenance of the international plant for treatment of Agua Prieta, Sonora, and Douglas (Arizona sewage).
- On November 30, 1964, the Commission approved the clearing of the Colorado River channel downstream from Morelos Dam (Minute 217).
- **1965:** The Commission met to approve the Minute 218 about the Recommendations on the Colorado River Salinity problem.
- The Minute 220 was approved on July 16, regarding the improvement and expansion of the international plant for the treatment of Douglas, Arizona, and Agua Prieta, Sonora sewage.

- Minute 221 was approved by the Commission establishing the final liquidation of costs allocable to Mexico of construction of the south Gila levee and maintenance costs allocable to that country.
- The Commission met on November 30, to approve the emergency connection of the sewage system of the city of Tijuana, Baja California, to the Metropolitan sewage system of the city of San Diego (Minute 222)
- **1967:** Minute 225 regarding the Channelization of the Tijuana River.
- Approval of the enlargement of the international facilities for the treatment of Nogales, Arizona, and Nogales, Sonora sewage (Minute 227).
- **1968:** The CAP is included in the Colorado River Basin Project Act. The proposed Grand Canyon dam was removed after one of the biggest environmental battles in U.S. history.
- **1970:** In the Minute 236 the Commission approved the construction of works for channelization of the Tijuana River.
- The Treaty of November 23, 1970, resolved all pending boundary differences between the two countries, and provided for maintaining the Rio Grande and the Colorado River as the international boundary. It provides procedures designed to avoid the loss or gain of territory by either country incident to future changes in the river.
- **1972:** In the Minute 240 the Commission authorized the Emergency deliveries of Colorado River waters for use in Tijuana. The Commission through the Minute 241 issued recommendations to improve immediately the quality of Colorado River waters going to Mexico.**1973:** Mexico and U.S. approve the Minute 242, establishing salinity standards for water delivered to Mexico.
- The Minute 243 was amended to Minute No. 240 relating to emergency deliveries of Colorado River water for use in Tijuana.
- **1974:** More additions and modifications to Minute 240 were added in the Minute 245 regarding the emergency Deliveries of Colorado River waters for use in Tijuana.
- **1974:** The U.S. Congress approves Colorado River Basin Salinity Control Act, authorizing a desalination plant near Yuma, Arizona, and basin wide salinity control projects.
- **1976:** The Commission approved the Minute 252 which included an amendment to Minutes Nos. 240 and 245, Relating to emergency deliveries of Colorado River waters for use in Tijuana: (Mexico agrees to pay beginning October 1976 for additional costs of treatment in the U.S. of the portion of Mexico's Colorado River Treaty waters delivered through facilities in the U.S.).
- **1977:** The Commission on the Minute 256, agrees on an extension of Minutes Nos. 240, 243, 245 and 252, regarding emergency deliveries of Colorado River waters for use in Tijuana.
- Minute 258 is approved by the Commission in which they agree on the modification of the U.S. portion of the plan for the channelization of the Tijuana River.
- **1978:** Minute 259 about the extension of the effect of Minute No. 256, relating to the emergency deliveries of Colorado River water for use in Tijuana.
- **1979:** The U.S. Supreme Court appoints a special master to review additional tribal Lower Basin Colorado River water rights.

- The Minute 260 approves the extension of the effect of Minute No. 259, relating to the emergency deliveries of Colorado River water for use in Tijuana.
- **1980:** The Commission approved the Minute 263 about the extension of the effect of Minute No. 260, relating to the emergency deliveries of Colorado River water for use in Tijuana. Additional extensions of the effect of these Minutes relating emergency deliveries are addressed in the Minutes 266 and 267 in 1981 and 1982.
- **1982:** The U.S. Supreme Court appointed Master recommends that additional tribal water claims be upheld. The recommendation was rejected and the Supreme Court refuses to reopen Arizona v. California awarding federally reserved water rights to five Lower Basin tribes.
- **1984:** On-farm salinity control measures added to Salinity Control Act.
- **1985:** The Commission issued Recommendations for the First Stage Treatment and Disposal Facilities for the Solution of the Border Sanitation Problem at San Diego, California/Tijuana, Baja California (Minute 270).
- **1987:** The Minute 273 issued more recommendations for the Solution of the Border Sanitation Problem at Naco, Arizona/Naco, Sonora.
- The Commission considered options for the Joint Project for Improvement of the Quality of the Waters of the New River at Calexico, California/Mexicali, Baja California (Minute 274).
- **1988:** Upper Basin states begin a 15-year program (later extended) to protect four endangered fish.
- The Commission met to address the border sanitation problem regarding the conveyance, treatment, and disposal of sewage from Nogales, Arizona and Nogales, Sonora which exceed the capacities allotted to the United States and Mexico at the Nogales International sewage treatment plant, under Minute No. 227.
- MWD agrees to pay for water conservation measures in Imperial Valley in exchange for water conserved.
- **1990:** Conceptual Plan for the International Solution to the Border Sanitation Problem in San Diego, California/Tijuana, Baja California (Minute 283).
- **1991:** The Southern Nevada Water Authority established.
- **1992:** Grand Canyon Protection Act approved, requiring releases from Glen Canyon Dam to meet environmental, tribal, cultural, and recreational interests.
- The Commission addressed the emergency deliveries of Colorado River Waters for use in Tijuana, Baja California (Minute 287).
- The Minute 288 considers a Plan for the Long Term Solution to the Border Sanitation Problem of the New River at Calexico, California - Mexicali, Baja California
- The Yuma desalination plant begins operation at one-third capacity.
- Ten Tribes Colorado River Basin Partnership is formed.
- **1993:** The CAP declared substantially complete, delivering water to Tucson, Phoenix, Arizona farmers and American Indian Tribes.
- Yuma Desalting Plant suspends operation after 500-year flood on Gila River.
- **1994:** On the Minute 291 the Commission addressed improvements to the conveying capacity of the international boundary segment of the Colorado River.

- **1995:** The San Diego County Water Authority (SDCWA) proposed transferring water from the Imperial Irrigation District (IID).
- The Minute 294 of November 24 addressed the facilities planning program for the final solution of border sanitation problems.
- **1996:** U.S. Bureau of Reclamation adopts new operating criteria that include periodic high-flow releases into the Grand Canyon to restore riparian habitat and improve fish habitat.
- Interior Secretary orders California to implement a plan to reduce its average use of 5.2 million acre-feet of Colorado River water to "live within" its 4.4 million acre-feet annual basic apportionment.
- The Minute 295 recommends to the Commission to incorporate into Minute NO. 273, the Project Proposed by the State of Sonora for Conveyance and Treatment of Naco, Sonora Sewage Certified by the BECC on April 30 ,1996.
- The Commission through the Minute 296, recommended to the two Governments the specific distribution costs of construction, operation, and maintenance of the International Wastewater Treatment Plant (IWTP).
- **1997:** The U.S. Bureau of Reclamation publishes proposed rule for off-stream storage and recovery of Colorado River water.
- **1998:** The IID and the SDCWA boards agree to water transfer.
- International Boundary and Water Commission agrees to Support the Border Environment Cooperation Commission in Development of Projects for the Solution of Border Sanitation Problems (Minute 299).
- **1999:** Interstate banking rule allowing Lower Basin states to store water in Arizona aquifers is completed.
- **2000:** States of the Colorado River Basin negotiate the Interim Surplus Guidelines.
- The Minute 306 presented the Conceptual Framework for U.S. - Mx Studies for Future Recommendations Concerning the Riparian and Estuarine Ecology of the Limitrophe Section of the Colorado River and its Associated Delta.
- The Upper Colorado Basin receives $100 million for endangered fish recovery programs, known today as Upper Colorado River Endangered Fish Recovery Program.
- The multiyear drought of the Colorado River began.
- Arizona and Nevada agree on water banking.
- **2003:** The Minute 310 addressed the Emergency Delivery of Colorado River Water for use in Tijuana, Baja California.
- The Quantification Settlement Agreement is signed, enabling water transfer between IID and SDCWA and gradual reduction of California use to 4.4 million acre-feet.
- **2004:** The Commission issued recommendations for a secondary treatment in Mexico of the sewage emanating from the Tijuana River area in Baja California, Mexico (Minute 311).
- **2005:** The Lower Basin Multi-Species Conservation Program is signed. This is a 50-year agreement to restore 8,100 acres of habitat between Hoover Dam and the U.S.-Mexico border.

- **2006:** The U.S. Congress passes legislation to waive environmental requirements and orders the Department of Interior to proceed with the canal lining and construction of Brock Reservoir in Imperial County.
- **2007:** Seven States sign an agreement that includes Lower Basin shortage guidelines and rules to store conserved water in Lake Mead and to "equalize" storage in Lake Mead and Powell.
- The Yuma Desalting Plant starts to operate at 10 percent capacity.
- **2008:** Third experimental high-flow release from Glen Canyon Dam to study effects on beaches and endangered species.
- Minute 314 includes the Joint Report of the extension of the Temporary Emergency Delivery of Colorado River Water for use in Tijuana, Baja California.
- **2009:** The All-American Canal lining project is completed.
- **2010:** Colorado River Basin Supply and Demand Study is being conducted by the Bureau of Reclamation's Upper Colorado (UC) and Lower Colorado (LC) regions, and agencies representing the seven Colorado River Basin States1 (Basin States).
- On September 26 a 7.2 magnitude Earthquake occurred in Easter Baja California, damaging water infrastructure in the Mexicali area.
- Minute 317 covers the Conceptual Framework for U.S. Mexico Discussions on Colorado River Cooperative Actions.
- Mexico and the U.S. subsequently signed Minute 318, an interim agreement that allows Mexico to store part of its allocation in Lake Mead while repairs are made to infrastructure damaged during the April 2010 earthquake.
- Year-long Yuma Desalination Plant pilot run produces 30,000 acre-feet.
- **2011**: Brock Reservoir construction is completed.
- The Animas La-Plata water project is completed.
- **2012:** The Commission signed Minute 319, creating a binational framework to address shortages and allowing Mexico to store unused water in Lake Mead.
- The Colorado River Basin Supply and Demand Study is published.
- **2013:** Federal officials establish working groups to implement Colorado River Basin Study.
- **2014:** A pulse flow is released into the Colorado River Limitrophe (the 24-mile stretch that forms the U.S.-Mexico border) and Delta. Water flows to areas being restored by conservation groups and sets the stage for future management of what was once more than 2 million acres of riparian habitat and wetlands vital to birds and wildlife.
- **2015:** The Commission met to establish a General Framework for Binational Cooperation on Transboundary Issues in the Tijuana River Basin. This Minute marks the first Commission agreement focused on sediment and trash problems in the Tijuana River Basin, and establishes a framework of binational cooperation to address these issues. The agreement will benefit residents of both countries living in the Tijuana River Basin in the area of San Diego, California-Tijuana (Minute 320).

- **2017:** Officials with the International Boundary and Water Commission, United States and Mexico, announced the conclusion of a new Colorado River Agreement or Minute 323 about "Extension of Cooperative Measures and Adoption of a Binational Water Scarcity Contingency Plan in the Colorado River Basin." The Minute 323 dedicates 210,000 acre-feet of water over nine years for environmental restoration work in the Colorado River Delta.
- **2018:** The U.S. Bureau of Reclamation releases Tribal Water Study. It describes how tribal water use fits into the overall picture of Colorado River management, how future development of tribal water resources will alter river operations and how future development of tribal water rights will affect Basin operations.
- **2019:** The Drought Contingency Plan commits the seven Colorado River Basin states to a plan centered on the idea that all water users, not just those with junior water rights, have a stake in keeping the system whole by taking voluntary reductions on their Colorado River deliveries.
- **2021:** With the water level in Lake Mead projected to reach 1,066 feet above sea level by Jan. 1, 2022, the first-ever shortage declaration was triggered, requiring Arizona, Nevada and the country of Mexico to reduce their take of the river in 2022. California, with the largest share of the river, was not required to cut back.
- **2022:** The Commission approves the Minute 327 for the Emergency Deliveries of Colorado River Waters for use in the City of Tijuana, Baja California.
- **2022:** The water levels in Lake Mead and Lake Powell have been continuing to drop, and federal officials announce deeper water supply cuts for Arizona, Nevada, and the states of Mexico that rely on the system in 2023.

Attachment 1

Memorandum Relating to Powers and Duties of International Boundary and Water Commission, United States and Mexico, as Proposed by Pending Treaty, Robert W. Kenny, then-Attorney General of California, July 31, 1944

MEMORANDUM RELATING TO POWERS AND DUTIES OF INTERNATIONAL BOUNDARY AND WATER COMMISSION, UNITED STATES AND MEXICO, AS PROPOSED BY PENDING TREATY

JULY 31, 1944

ROBERT W. KENNY,
Attorney General
of California

MEMORANDUM RE PROTOCOL OF NOVEMBER 14, 1944, MODIFYING PROPOSED MEXICAN TREATY.

Since the attached memorandum was written, the State Department (evidently recognizing one of the fundamental errors in the treaty which it heretofore announced as a model for all future treaties), on November 14, 1944, signed and has sent to the Senate for ratification, a protocol intended to "clarify the meaning and application" of certain provisions of the treaty.

The protocol leaves unaffected the essential provisions of the treaty. It provides that works which are used only partly for performance of treaty provisions shall be operated by such federal agency as may be designated therefore by domestic law. Such duties, however, shall be performed so as to conform to the provisions of the treaty. Boundary works and those to be constructed or used exclusively for the discharge of treaty stipulations remain under the direct jurisdiciton of the International Boundary and Water Commission or of the respective section thereof.

The protocol does not go to the substance of the treaty provisions. So far as the United States is concerned, it merely authorizes performance of some of the treaty obligations by federal agencies other than the United States Section of the international commission.

The treaty obligations remain the same. The Commission still has power to construe and interpret the treaty and enforce its provisions. Other federal agencies must exercise their respective jurisdictions "in conformity with the provisions of the treaty" as construed by the Commission. The Commission is still the master.

The legislative, judicial, and administrative powers of the Commission and of the United States section thereof, remain unlimited and uncontrolled. The treaty's delegation of such powers is still perpetual and beyond the control of Congress.

The nationalization of the river systems is still inherent in the proposed treaty.

The protocol does not remedy the ills inherent in the treaty and outlined in the attached memorandum.

Following is a copy of the protocol and letters of transmission.

ROBERT W. KENNY,
Attorney General of California.

December 5, 1944.

78TH CONGRESS, 2d Session } SENATE { EXECUTIVE H

PROTOCOL SUPPLEMENTARY TO THE TREATY WITH MEXICO RELATING TO THE UTILIZATION OF THE WATERS OF CERTAIN RIVERS

MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

A PROTOCOL SIGNED IN WASHINGTON ON NOVEMBER 14, 1944, WHICH IS SUPPLEMENTARY TO THE TREATY BETWEEN THE UNITED STATES OF AMERICA AND THE UNITED MEXICAN STATES, SIGNED AT WASHINGTON ON FEBRUARY 3, 1944, RELATING TO THE UTILIZATION OF THE WATERS OF THE COLORADO AND TIJUANA RIVERS AND OF THE RIO GRANDE FROM FORT QUITMAN, TEX., TO THE GULF OF MEXICO.

NOVEMBER 24, 1944.—Protocol was read the first time and referred to the Committee on Foreign Relations and, together with the message of transmittal and the accompanying report, ordered to be printed for the use of the Senate. The injunction of secrecy was today removed from this protocol and the accompanying papers.

THE WHITE HOUSE,
November 24, 1944.

To the Senate of the United States:

With a view to receiving the advice and consent of the Senate to ratification I transmit herewith a protocol, signed in Washington on November 14, 1944, supplementary to the treaty between the United States of America and the United Mexican States relating to the utilization of the waters of the Colorado and Tijuana Rivers and of the Rio Grande (Rio Bravo) which was signed in Washington on February 3, 1944.

I also transmit for the information of the Senate a report on the protocol made to me by the Acting Secretary of State.

FRANKLIN D. ROOSEVELT.

(Enclosures: (1) Report of the Acting Secretary of State; (2) protocol, signed November 14, 1944, supplementary to treaty between United States and Mexico signed February 3, 1944.)

DEPARTMENT OF STATE,
Washington, November 22, 1944.

The PRESIDENT,
The White House.

The undersigned, the Acting Secretary of State, has the honor to lay before the President, with a view to its transmission to the Senate to receive the advice and consent of that body to ratification, if his judgment approve thereof, a protocol, signed in Washington on November 14, 1944, supplementary to the treaty between the United States of America and the United Mexican States relating to the utilization of the waters of the Colorado and Tijuana Rivers and of the Rio Grande (Rio Bravo) which was signed in Washington on February 3, 1944.

The treaty of February 3, 1944, was transmitted to the Senate by the President with his message of February 15, 1944, with a view to receiving the advice and consent of the Senate to ratification thereof. The text of the treaty and of the President's message, together with the text of the report of the Secretary of State dated February 9, 1944, have been printed in Senate Executive A, Seventy-eighth Congress, second session. The treaty was referred to the Committee on Foreign Relations of the Senate on February 15, 1944.

The purpose of the protocol is to clarify the meaning and application of those provisions of the treaty which relate to the functions and jurisdiction of the respective sections of the International Boundary and Water Commission in connection with the construction or use of works for storage or conveyance of water, flood control, stream gaging, or for any other purpose.

By its own terms the protocol is to be regarded as an integral part of the treaty of February 3, 1944, and shall be effective beginning with the day of the entry into force of the treaty, continuing effective so long as the treaty remains in force. Accordingly, after such time as the Senate may have given its advice and consent to the ratification of the treaty and protocol, the protocol should be ratified together with the treaty. It is provided in the protocol, as in the treaty, that the ratifications shall be exchanged in Washington.

Respectfully submitted.

EDWARD R. STETTINIUS, JR.,
Acting Secretary of State.

(Enclosure: Protocol, signed November 14, 1944, supplementary to treaty between United States and Mexico relating to waters of the Colorado and Tijuana Rivers and of the Rio Grande signed February 3, 1944.)

PROTOCOL

The Government of the United States of America and the Government of the United Mexican States agree and understand that:

Wherever, by virtue of the provisions of the Treaty between the United States of America and the United Mexican States, signed in

Washington on February 3, 1944, relating to the utilization of the waters of the Colorado and Tijuana Rivers and of the Rio Grande from Fort Quitman, Texas, to the Gulf of Mexico, specific functions are imposed on, or exclusive jurisdiction is vested in, either of the Sections of the International Boundary and Water Commission, which involve the construction or use of works for storage or conveyance of water, flood control, stream gaging, or for any other purpose, which are situated wholly within the territory of the country of that Section, and which are to be used only partly for the performance of treaty provisions, such jurisdiction shall be exercised, and such functions, including the construction, operation and maintenance of the said works, shall be performed and carried out by the Federal agencies of that country which now or hereafter may be authorized by domestic law to construct, or to operate and maintain, such works. Such functions or jurisdictions shall be exercised in conformity with the provisions of the Treaty and in cooperation with the respective Section of the Commission, to the end that all international obligations and functions may be coordinated and fulfilled.

The works to be constructed or used on or along the boundary, and those to be constructed or used exclusively for the discharge of treaty stipulations, shall be under the jurisdiction of the Commission or of the respective Section, in accordance with the provisions of the Treaty. In carrying out the construction of such works the Sections of the Commission may utilize the services of public or private organizations in accordance with the laws of their respective countries.

This Protocol, which shall be regarded as an integral part of the aforementioned Treaty signed in Washington on February 3, 1944, shall be ratified and the ratifications thereof shall be exchanged in Washington. This Protocol shall be effective beginning with the day of the entry into force of the Treaty and shall continue effective so long as the Treaty remains in force.

In witness whereof the respective Plenipotentiaries have signed this Protocol and have hereunto affixed their seals.

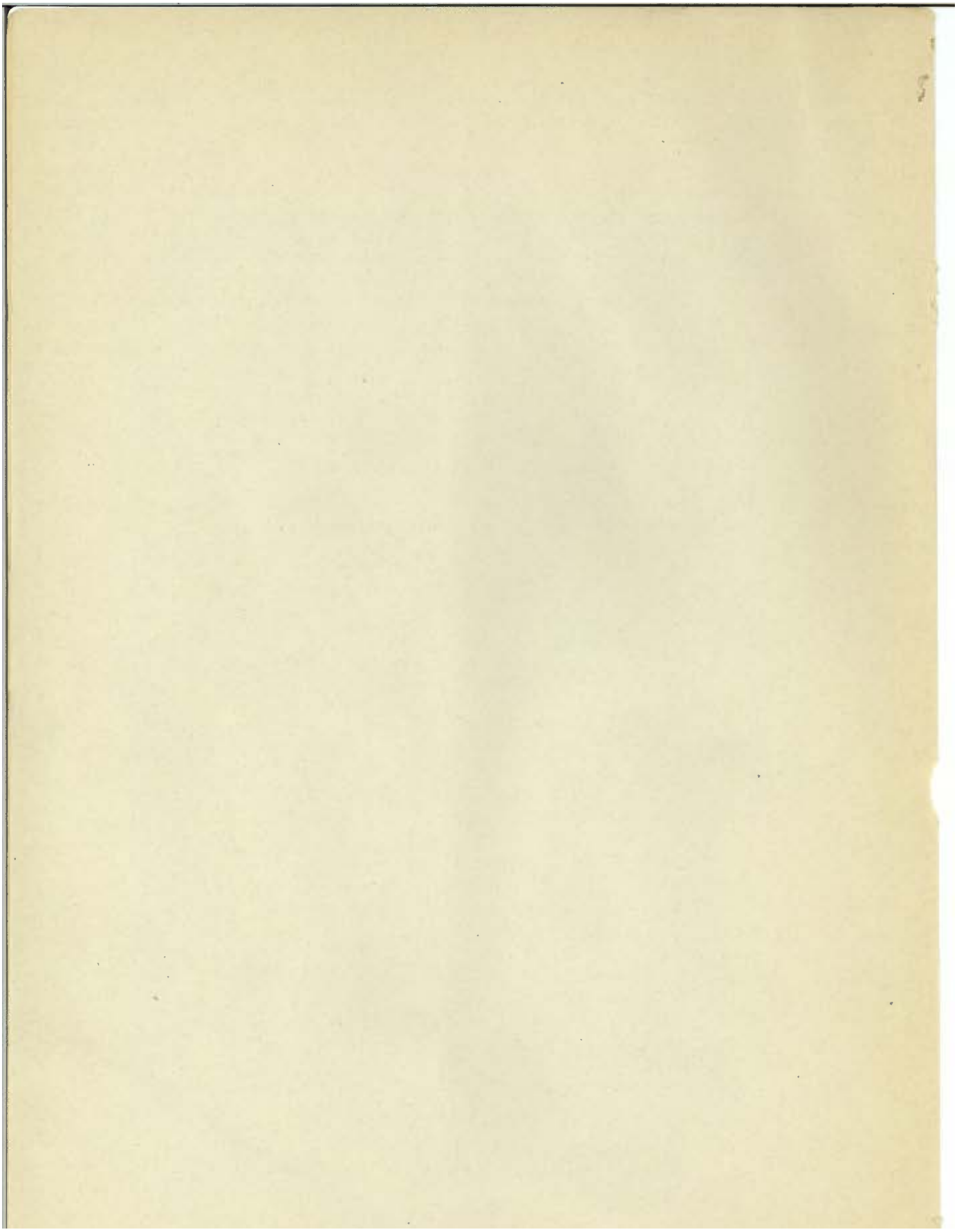
Done in duplicate, in the English and Spanish languages, in Washington, this fourteenth day of November, 1944.

For the Government of the United States of America:

E. R. Stettinius, Jr. [seal]
Acting Secretary of State of the United States of America.

For the Government of the United Mexican States:

F. Castillo Najera [seal]
Ambassador Extraordinary and Plenipotentiary of the United Mexican States in Washington.



MEMORANDUM RELATING TO POWERS AND DUTIES OF INTERNATIONAL BOUNDARY AND WATER COMMISSION, UNITED STATES AND MEXICO, AS PROPOSED BY PENDING TREATY.

I.
INTRODUCTION

There has been recommended for ratification, and now is pending before the Senate of the United States, a Treaty, signed February 3, 1944, between the United States of America and the United Mexican States, relating to the international boundary, and particularly to the waters of the Rio Grande, the Colorado River and the Tijuana River. The Treaty has been referred to the Foreign Relations Committee of the Senate and is awaiting hearing before that committee.

For convenience a copy of the treaty is appended as an exhibit.

The Treaty provides, among other things, for an "International Boundary and Water Commission, United States and Mexico." The proposed Commission would consist of two sections, a United States Section and a Mexican Section. The functions of each section are vested in an Engineer Commissioner.

The International Commission will be the permanent repository of all powers relating to international questions along the Mexican border. The Senate of the United States will have no further control of such matters.

The United States Section of the Commission will have plenary powers to commit the United States to vast expenditures. It will be free from Congressional controls and not subject to review in the courts.

The Treaty is not a temporary expedient; it is not a mere emergency delegation of authority, for a fixed time,

or subject to termination on notice. By the terms of its Article 28, the Treaty will stand until Mexico shall consent to another treaty. By this device, the Commission is forever enthroned as the supreme authority on the boundary streams, and the United States Section of the Commission is similarly enthroned in control of works in the United States which it deems connected with performance of Treaty obligations. Mistakes made in the Treaty can not be rectified later by action of the United States alone. To bring about a modification of the Treaty, it will be necessary to secure the assent of Mexico, probably at a price.

If it shall ratify the Treaty, the Senate of the United States will thereby resign forever control of all problems relating to international streams between the United States and Mexico, including all irrigation, flood control and hydroelectric works situated thereon. All such powers will be vested forever in the Commission, which, by the terms of the Treaty, is responsible only to the Department of State.

The Congress will be committed to vast expenditures to carry out projects agreed upon by the Commission. Failure to make the required appropriations will constitute a breach of the Treaty. The Congress will have no control over the capacity, character or operation of works along the boundary streams. It will have no control over places of use of, or rates charged for, electric energy that will be developed thereon, nor over the monies received from the sale of such energy.

No provision whatever is made for judicial review of any act, determination or finding of the Commission.

The Commission will have authority to fix the location, capacity and character of works on boundary streams, including hydroelectric works. The United States agrees without qualification, to construct any works that may be approved by the Commission and the State Department. Such works on boundary sections of the rivers will be operated by the Commission. The Commission will have power to make new, and as yet unspecified, agreements, and to determine numerous factual matters in a manner binding upon the two Governments. The Commission will have authority to interpret and apply the Treaty; will be the judge of its own powers; will have authority to settle, in a manner binding upon the two Governments, all disputes and differences between them.

The United States Section of the Commission, in addition to its powers as part of the International Commission, is set up as an operating agency, vested with authority to acquire, construct and operate irrigation, flood control and other works at any point in the United States on the Colorado River and on the Rio Grande. This power is not limited to boundary sections, but extends to any place in the United States at which, in its opinion (subject only to approval by the Department of State), such works are required.

The United States Section of the Commission will be an operating organization, handling hydroelectric and other works, built entirely within the United States, and, at the same time, the judge of its own powers and rights and the rights of others that might be in conflict therewith. It will not, under the circumstances, occupy the detached position that should characterize a judicial body.

It is the purpose of this memorandum to point out with more particularity the basis of the broad statements hereinabove made.

II.

PERPETUAL DURATION OF TREATY

It is provided in Article 28 of the pending Treaty that it shall enter into force on the date of the exchange of ratifications and shall continue in force until terminated by another treaty. Until and unless Mexico acquiesces in another agreement, the Treaty is perpetual. This constitutes a dangerous departure from precedent in treaties setting up commissions.

The boundary between the United States and Mexico was fixed in the Treaty of Guadalupe Hidalgo, February 2, 1848. Certain parts of the dividing line between the two countries follow the middle of the channels of the Rio Grande and the Colorado River. For the purpose of setting up certain principles to control the location of the boundary along the river channels in cases of change by accretion or avulsion, a Treaty, known as the Convention of 1884, was adopted. By the Convention of March 1, 1889, for the purpose of implementing the Treaty of 1884, the International Boundary Commission was created, the Commission being vested with power to settle boundary questions arising out of alterations or changes in the channels of the rivers.

The Convention of 1889 was written to remain in force for a period of five years from the date of exchange of ratifications. By a series of extensions, the Convention was kept alive until 1900, at which time a new agreement was made (Convention of November 21, 1900), providing that the Convention of 1889, as extended, should continue in force indefinitely, with the right, however, on the part of either contracting party to dissolve the Boundary Commission by giving six months' notice to the other and to terminate the Convention of March 1, 1889, twelve months after notice of a desire for its termination should have been given in due form by one of the two contracting parties.

Article 2 of the pending Treaty greatly amplifies the powers of the Commission created by the Convention of 1889, changes its name to that of International Boundary and Water Commission, and completely wipes out the Convention of November 21, 1900, wherein provision was made for dissolution of the Commission. Thus, the Commission with its enlarged powers and modified title, is made to continue indefinitely, and with no provision for termination other than by negotiation of a new agreement or by a summary breach.

In contrast with such permanent commission, the International Joint Commission controlling the administration of problems arising on the Canadian border (our only other land border) was set up for a five-year period, to continue thereafter until terminated by a twelve months' notice (Treaty of January 11, 1909).

All boundary commissions on which the United States is now represented are subject to dissolution by action of either of the respective Governments. In the pending Treaty, such control is lacking. We must look to Mexico for consent before terminating or changing the powers of the Commission.

The permanent nature of the Treaty, and the departure from precedent in that particular, is emphasized here because of the extensive and unprecedented powers vested in the Commission, and the United States Section thereof. By the terms of the Treaty, the Senate will forever divest itself of control over settlement of boundary problems and will forever delegate to the Commission the power to make certain new agreements. Mistakes made in the pending Treaty cannot be corrected except by trading with Mexico.

III.
CONSTITUTION OF COMMISSION

The Commission, perpetually set up by the Treaty, consists of a United States Section and a Mexican Section (Article 2). Each section has, as "members" entitled to diplomatic privileges, the Engineer Commissioner, two engineers, a legal adviser and a secretary. The authority of the Commission, however, is vested in the two Commissioners.

In addition to his functions as a member of the International Commission, the Commissioner heading the United States Section constitutes an agency in himself, for the purpose of acquiring and operating certain works within the United States. By agreement with the Mexican Commissioner he may be authorized to operate boundary works in Mexico. The converse is true of the Mexican Commissioner.

IV.
COMMISSIONER RESPONSIBLE ONLY TO DEPARTMENT OF STATE

Throughout the Treaty it will be noted that acts done, and determinations reached, by the International Commission are "subject to the approval of the two Governments." While this may appear to be a protective phrase, it must be noted that under the provisions of Article 2:

> "Wherever there are provisions in this Treaty for joint action or joint agreement by the two Governments, or for the furnishing of reports, studies or plans to the two Governments, or similar provisions, it shall be understood that the particular matter in question *shall be handled by or through the Department of State of the United States* and the Ministry of Foreign Relations of Mexico."

It thus appears that all provisions that any action or agreement shall be subject to the approval of the two Governments, mean, so far as the United States is concerned, subject to approval by the Department of State. Neither the Congress nor the Senate will have any voice in the matter.

V.
JURISDICTION AND POWERS OF INTERNATIONAL COMMISSION

The jurisdiction of the International Commission created by the Treaty extends (Article 2)

> "to the limitrophe parts of the Rio Grande (Rio Bravo) and the Colorado River, to the land boundary between the two countries, and to works located upon their common boundary, each Section of the Commission retaining jurisdiction over that part of the works located within the limits of its own country. Neither Section shall assume jurisdiction or control over works located within the limits of the country of the other without the express consent of the Government of the latter."

Within its jurisdiction so described, the Commission has powers of judicial, administrative and regulatory nature.

(a) *Judicial power.* In Article 2 of the treaty, it is provided that:

> "The application of the present Treaty, the regulation and exercise of the rights and obligations which the two Governments assume thereunder, and the settlement of all disputes to which its observance and execution may give rise are hereby entrusted to the International Boundary and Water Commission, which shall function in conformity with the powers and limitations set forth in this Treaty."

Later, in Article 24, paragraph (d), the Commission is authorized:

> "To settle all differences that may arise between the two Governments with respect to the interpretation or application of this Treaty, subject to the approval of the two Governments."

These matters are essentially judicial in character, but the courts are completely divested of jurisdiction. No provision exists for judicial review, nor could one be added other than by amendment to the Treaty.

The "disputes" and "differences," settlement of which is entrusted to the Commission, might, and in many cases necessarily would, involve the private rights of citizens and local public agencies of the United States. The United States Section of the Commission, being an operating agency would find itself in the position of adjudging private rights which might harmonize or conflict with the operation of works under its control. In neither case would it be a proper judicial body.

(b) *Administrative powers—Rio Grande.* In Part II of the Treaty, the waters of the Rio Grande are apportioned between the two countries, and in Article 5 of Part II the two Governments agree to construct such works for the conservation, storage and regulation of the river and for hydro-electric development, as may be agreed on by the Commission. (Arts. 5, 6 and 7.) It is the function of the Commission to determine the location and capacity of all works on the boundary and to allocate the capacity between the two countries. The agreement of each nation to "construct, through its Section of the Commission, such works as may be recommended by the Commission and approved by the two Governments" is without qualification or reservation. As has been pointed out (Article IX hereof), approval by the two Governments means, so far as the United States is concerned, approval by the Department of State.

By this language, the Senate signs a blank check, the amount to be filled in by the Commissioner, and to bind not only the Senate but the House of Representatives. Failure to provide the funds will be a breach of the Treaty.

No Congressional or judicial control is set up over the quantities of hydroelectric energy to be developed or the places of use of such energy or the rates to be charged therefor. The entire operation of the works and control and expenditure of the receipts therefrom will be vested in the Commission. Energy may be placed in competition with other sources of energy in the United States without restraint.

In Article 19 it is provided that:

> "the two Governments (meaning the two Departments) shall conclude such special agreements as may be necessary to regulate the generation, development and disposition of electric power at international plants, including the necessary provisions for the export of electric current."

This language contemplates transmission of energy to Mexico.

At the risk of repetition, we again point out that the delegation of vast powers to construct revenue-producing works, and control the operation thereof and the rates to be charged for the output, is perpetual in character and can never be withdrawn except by consent of Mexico.

(c) *Regulatory powers—Rio Grande.* Under Article 8, Part II, the International Commission is given complete regulatory power over (a) storage of water in international reservoirs so agreed to be built; (b) the credit to each country for inflows of water; (c) the ownership of stored water; (d) charges for reservoir losses; (e) division of charges for flood spills; (f) times and quantities of use of water. The Treaty itself, in Article 8, sets

up rules governing the matters enumerated, but it is provided that such regulations "may be modified, amended or supplemented when necessary, by the Commission, subject to the approval of the two Governments" (the two Departments).

The regulations set up in Article 8 of the Treaty are in no wise permanent. They serve merely to indicate the broad scope of the regulatory powers of the Commission. They will last only so long as the Commission permits them to last. The delegation of regulatory power on the Rio Grande is complete, and forever divests the Senate and the Congress of control.

The Commission is given power (Article 9, subdivisions (d), (e) and (f) to authorize either country to divert and use water not belonging entirely to such country when such action can be taken without injury, the Commission being the final judge of the fact.

In subdivision (g) of Article 9, it is provided that:

> "Each country shall have the right to divert from the main channel of the river any amount of water, including the water belonging to the other country, for the purpose of generating hydroelectric power * * *. The feasibility of such diversions * * * shall be determined by the Commission, which shall also determine the amount of water consumed, such water to be charged against the country making the diversion."

(d) *Powers on Colorado River.* In Part III of the Treaty, the waters of the Colorado River are apportioned between the two countries. The Commission is given power to determine when a surplus exists in the United States, and in such case to increase the allotment to Mexico without creating in that country any permanent right to the increase.

In Article 12 of Part III, the United States agrees to construct the Davis Dam and certain other works on the river. In Article 13 of Part III the Commission is directed to study, investigate and prepare plans for flood control on the Lower Colorado between Imperial Dam and the Gulf of California. Here again, "the two Governments agree to construct, through their respective Sections of the Commission, such works as may be recommended by the Commission and approved by the two Governments, each Government to pay the cost of the works constructed by it." Approval by the two Governments, so far as the United States is concerned, means approval by the Department of State—another blank check.

In Article 14, it is provided that in consideration of the use of the All-American Canal for the delivery of water to Mexico, Mexico shall pay to the United States a part of the costs incurred in the construction of Imperial Dam and the Imperial Dam-Pilot Knob section of the All-American Canal, this proportion, and the method and terms of repayment, to be determined by the two Governments (the two Departments).

(e) *Powers on the Tijuana River.* Part IV of the Treaty treats of the Tijuana River (a minor stream south of the City of San Diego). The powers of the Commission are even broader than those hereinabove enumerated on the Rio Grande and the Colorado. On the Tijuana, even the apportionment of water between the two countries is left to the Commission. The delegation of control of international problems is complete. Nothing remains for the Senate or the Congress. The entire matter will be perpetually handled by the Commission and the Department of State. Here again, the Congress is committed to provide funds for works as yet unspecified and to be determined by the Commission.

VI.

POWERS OF UNITED STATES SECTION OF INTERNATIONAL BOUNDARY COMMISSION

As has been pointed out, the United States Section of the Commission, in addition to its functions as a part of the International Commission, will exist under the Treaty as an operating agency of the United States.

> "The works constructed, acquired or used in the fulfillment of the provisions of this Treaty and located wholly within the territorial limits of either country * * * shall remain, except as herein otherwise specifically provided, under the exclusive jurisdiction and control of the Section of the Commission in whose country the works may be situated."

(Article 2)

The extent to which the United States Section of the Commission could extend its operations throughout the stream systems of the Colorado and the Rio Grande within the United States is unlimited by the Treaty. It is provided in Article 24, subdivision (b), that:

> "Each Section shall have, to the extent necessary to give effect to the provisions of this Treaty, jurisdiction over the works constructed exclusively in the territory of its country whenever such works shall be connected with or shall directly affect the execution of the provisions of this Treaty."

In Article 23 it is provided that:

> "Each Section of the Commission shall determine the extent and location of any private property to be acquired within its own country and shall make the necessary requests upon its Government for the acquisition of such property."

In the same section it is provided that:

> "Each Government shall retain, through its own Section of the Commission and within the limits and to the extent necessary to effectuate the provisions of this Treaty, direct ownership, control and jurisdiction within its own territory and in accordance with its own laws, over all real property—including that within the channel of any river—rights of way and rights *in rem,* that it may be necessary to enter upon and occupy for the construction, operation or maintenance of all the works constructed, acquired or used pursuant to this Treaty. Furthermore, each Government shall similarly acquire and retain in its own possession the titles, control and jurisdiction over such works."

The clear effect of these provisions is that the United States Section of the Commission could determine, without Congressional or judicial control, the extent to which it should construct or acquire works entirely within the United States on the stream systems of the Rio Grande and the Colorado and Tijuana Rivers. To be specific, the Commission is authorized, and in fact directed, to acquire such regulatory and diversion works as may be required, in its judgment, in the carrying out of the Treaty. This would authorize the assumption of control of works now under the control of the Bureau of Reclamation, such as Boulder Dam, and the privately owned works such as those of the Imperial Irrigation District involved in the diversion of water to Mexico under Part III of the Treaty.

Thus, the United States Section of the Commission is set up as an operating agency with extremely broad powers of perpetual duration, and is responsible only to the Department of State.

VII.

TREATY TO NATIONALIZE ALL WORKS CONNECTED WITH ITS PERFORMANCE

An examination of the powers and duties vested in the Commission and the Department of State by the pending Treaty makes it clear that it was the intention of the framers of the document, an intention which has been thoroughly carried out, to remove once and for all from the control of the Senate, settlement of international relations, so far as international rivers on the Mexican border are concerned. Once the Treaty is ratified, all such matters must be handled by the Commission and the Department of State, the function of the Congress being merely to provide the funds with which to carry on the operations of the Commission. The obligation of Congress to provide funds must be met, or the nation placed in the position of breaching its international obligations.

It is also clear that the Treaty constitutes an attempt to nationalize all works which, in the judgment of the Commission, may be in any way connected with the performance of the Treaty, and to exclude all private and local public agencies.

The intent of the framers of the Treaty was expressed in advance. Dr. Charles A. Timm, Divisional Assistant in the Division of Mexican Affairs, Department of State, and one of the authors of the Treaty, in his work entitled "The International Boundary Commission, United States and Mexico," a University of Texas publication, has this to say (pages 236-241):

> "* * * Another feature * * * is that all existing irrigation, drainage, flood control and power projects in these river systems *should be nationalized and all such future projects should be undertaken by the respective national governments. Privately owned utilities and irrigation companies should be excluded*

altogether; and present ownership, wherever it exists, by local governments should be replaced by national ownership."

Dr. Timm's ideas on nationalization are fully carried out in the pending Treaty.

VIII.
THE TREATY AS A MODEL FOR FUTURE TREATIES

In an article published in the Department of State Bulletin dated March 25, 1944 (Vol. X, No. 248—Publication 2089), Dr. Timm stated that:

> "Considered in the light of previous treaties relating to the use of water from international streams for various purposes, it is not improbable that the treaty of February 3, 1944, now awaiting action in the Senate, may come to be regarded as the most important of its kind in the history of the world, both in the range and scope of its provisions and in its social and economic significance. It is more than a mere division of water between two countries; it provides the administrative machinery and the principles for international cooperation in the development of these water resources. *As such, it may well be taken as a model for future treaties governing international streams."*

Inasmuch as our only other international boundary, where division of waters may be involved, lies along the Canadian border, Dr. Timm's declaration is a powerful intimation that it will be the effort of the Department of State to rewrite the outstanding Canadian Treaty to conform to his model.

The Canadian Treaty (signed January 11, 1909—ratifications exchanged May 5, 1910) has been in successful operation since 1910. Instead of being a permanent and

irrevocable arrangement, it was set up for a five-year term, to continue thereafter subject to cancellation by either Government upon one year's notice. It provides for an International Joint Commission consisting of three Commissioners from each Government, but the Commission has no power to acquire title to property, no power to construct or operate works or to develop or sell hydroelectric energy. Neither the Commission nor the American representatives thereon constitutes an operating agency. On the contrary, the Canadian Treaty recognizes and encourages private development of boundary streams and leaves control of such works in the several States and local governments. Before works are constructed by private parties or other agencies, on boundary streams, which will affect lands on the other side of the line, it is essential to secure the approval of the Boundary Commission. In some instances, by agreement, and with the advice and consent of the Senate, the decisions of the Commission in disputed matters may be final, the board being set up for such purposes virtually as a board of arbitration. The Canadian Treaty has given full satisfaction to the residents and water users along the Canadian border.

Dr. Timm's declaration is a warning that it is not impossible that the Department of State intends to impose upon the Canadian border a perpetual treaty creating a system of national ownership and control, not subject to termination, and entirely devoid of the checks and balances of constitutional government.

IX.
CONCLUSION

The pending treaty is an attempt to establish an agency with perpetual and unprecedented administrative, judicial and regulatory powers with no congressional controls. By the use of a treaty as the vehicle, recall by the Congress of the powers delegated is made impossible. During the next few years many treaties will be written. With the Mexican Treaty as a tempting precedent, other agencies free from judicial and Congressional control, and operating in many other fields, may find their way into our system of government. There would be no limit to the possibility of the extension of the idea. It behooves all citizens interested in the preservation of American institutions, and the checks, balances and controls that have characterized the development of our form of government, particularly the right of judicial review, to scrutinize the pending Treaty and to do all that may properly be done to defeat its ratification.

ROBERT W. KENNY,
Attorney General of California.

July 31, 1944.

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TREATY BETWEEN THE UNITED STATES AND MEXICO, RELATING TO WATERS OF THE COLORADO AND TIJUANA RIVERS AND OF THE RIO GRANDE

The Government of the United States of America and the Government of the United Mexican States animated by the sincere spirit of cordiality and friendly cooperation which happily governs the relations between them; taking into account the fact that Articles VI and VII of the Treaty of Peace, Friendship and Limits between the United States of America and the United Mexican States signed at Guadalupe Hidalgo on February 2, 1848, and Article IV of the boundary treaty between the two countries signed at the City of Mexico December 30, 1853 regulate the use of the waters of the Rio Grande (Rio Bravo) and the Colorado River for purposes of navigation only; considering that the utilization of these waters for other purposes is desirable in the interest of both countries, and desiring, moreover, to fix and delimit the rights of the two countries with respect to the waters of the Colorado and Tijuana Rivers, and of the Rio Grande (Rio Bravo) from Fort Quitman, Texas, United States of America, to the Gulf of Mexico, in order to obtain the most complete and satisfactory utilization thereof, have resolved to conclude a treaty and for this purpose have named as their plenipotentiaries:

The President of the United States of America:

Cordell Hull, Secretary of State of the United States of America, George S. Messersmith, Ambassador Extraordinary and Plenipotentiary of the United States of America in Mexico, and Lawrence M. Lawson, United States Commissioner, International Boundary Commission, United States and Mexico; and

The President of the United Mexican States:

Francisco Castillo Nájera, Ambassador Extraordinary and Plenipotentiary of the United Mexican States in Washington, and Rafael Fernández MacGregor, Mexican Commissioner, International Boundary Commission, United States and Mexico; who, having communicated to each other their respective Full Powers and having found them in good and due form, have agreed upon the following:

I—Preliminary Provisions

ARTICLE 1

For the purposes of this Treaty it shall be understood that:

(a) "The United States" means the United States of America.

(b) "Mexico" means the United Mexican States.

(c) "The Commission" means the International Boundary and Water Commission, United States and Mexico, as described in Article 2 of this Treaty.

(d) "To divert" means the deliberate act of taking water from any channel in order to convey it elsewhere for storage, or to utilize it for domestic, agricultural, stock-raising or industrial purposes

whether this be done by means of dams across the channel, partition weirs, lateral intakes, pumps or any other methods.

(e) "Point of diversion" means the place where the act diverting the water is effected.

(f) "Conservation capacity of storage reservoirs" means that part of their total capacity devoted to holding and conserving the water for disposal thereof as and when required, that is, capacity additional to that provided for silt retention and flood control.

(g) "Flood discharges and spills" means the voluntary or involuntary discharge of water for flood control as distinguished from releases for other purposes.

(h) "Return flow" means that portion of diverted water that eventually finds its way back to the source from which it was diverted.

(i) "Release" means the deliberate discharge of stored water for conveyance elsewhere or for direct utilization.

(j) "Consumptive use" means the use of water by evaporation, plant transpiration or other manner whereby the water is consumed and does not return to its source of supply. In general it is measured by the amount of water diverted less the part thereof which returns to the stream.

(k) "Lowest major international dam or reservoir" means the major international dam or reservoir situated farthest downstream.

(l) "Highest major international dam or reservoir" means the major international dam or reservoir situated farthest upstream.

ARTICLE 2

The International Boundary Commission established pursuant to the provisions of the Convention between the United States and Mexico signed in Washington March 1, 1889 to facilitate the carrying out of the principles contained in the Treaty of November 12, 1884 and to avoid difficulties occasioned by reason of the changes which take place in the beds of the Rio Grande (Rio Bravo) and the Colorado River shall hereafter be known as the International Boundary and Water Commission, United States and Mexico, which shall continue to function for the entire period during which the present Treaty shall continue in force. Accordingly, the term of the Convention of March 1, 1889 shall be considered to be indefinitely extended, and the Convention of November 21, 1900 between the United States and Mexico regarding that Convention shall be considered completely terminated.

The application of the present Treaty, the regulation and exercise of the rights and obligations which the two Governments assume thereunder, and the settlement of all disputes to which its observance and execution may give rise are hereby entrusted to the International Boundary and Water Commission, which shall function in conformity with the powers and limitations set forth in this Treaty.

The Commission shall in all respects have the status of an international body, and shall consist of a United States Section and a Mexican Section. The head of each Section shall be an Engineer Commissioner. Wherever there are provisions in this Treaty for joint action or joint agreement by the two Governments, or for the furnishing of reports, studies or plans to the two Governments, or similar provisions, it shall be understood that the particular matter in question shall be handled by or through the Department of State of the United States and the Ministry of Foreign Relations of Mexico.

The Commission or either of its two Sections may employ such assistance and engineering and legal advisers as it may deem necessary. Each Government shall accord diplomatic status to the Commissioner, designated by the other Government. The Commissioner, two principal engineers, a legal adviser, and a secretary, designated by each Government as members of its Section of the Commission, shall be entitled in the territory of the other country to the privileges and immunities appertaining to diplomatic officers. The Commission and its personnel may freely carry out their observations, studies and field work in the territory of either country.

The jurisdiction of the Commission shall extend to the limitrophe parts of the Rio Grande (Rio Bravo) and the Colorado River, to the land boundary between the two countries, and to works located upon their common boundary, each Section of the Commission retaining jurisdiction over that part of the works located within the limits of its own country. Neither Section shall assume jurisdiction or control over works located within the limits of the country of the other without the express consent of the Government of the latter. The works constructed, acquired or used in fulfillment of the provisions of this Treaty and located wholly within the territorial limits of either country, although these works may be international in character, shall remain, except as herein otherwise specifically provided, under the exclusive jurisdiction and control of the Section of the Commission in whose country the works may be situated.

The duties and powers vested in the Commission by this Treaty shall be in addition to those vested in the International Boundary Commission by the Convention of March 1, 1889 and other pertinent treaties and agreements in force between the two countries except as the provisions of any of them may be modified by the present Treaty.

Each Government shall bear the expenses incurred in the maintenance of its Section of the Commission. The joint expenses, which may be incurred as agreed upon by the Commission, shall be borne equally by the two Governments.

ARTICLE 3

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 stock-raising.
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.

All of the foregoing uses shall be subject to any sanitary measures or works which may be mutually agreed upon by the two Governments, which hereby agree to give preferential attention to the solution of all border sanitation problems.

II—Rio Grande (Rio Bravo)

ARTICLE 4

The waters of the Rio Grande (Rio Bravo) between Fort Quitman, Texas, and the Gulf of Mexico are hereby allotted to the two countries in the following manner:

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.

(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) 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,

Goodenough 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, whereupon a new five-year cycle shall commence.

ARTICLE 5

The two Governments agree to construct jointly, through their respective Sections of the Commission, the following works in the main channel of the Rio Grande (Rio Bravo):

1. The dams required for the conservation, storage and regulation of the greatest quantity of the annual flow of the river in a way to ensure the continuance of existing uses and the development of the greatest number of feasible projects, within the limits imposed by the water allotments specified.

II. The dams and other joint works required for the diversion of the flow of the Rio Grande (Rio Bravo).

One of the storage dams shall be constructed in the section between Santa Helena Canyon and the mouth of the Pecos River; one in the section between Eagle Pass and Laredo, Texas (Piedras Negras and Neuvo Laredo in Mexico); and a third in the section between Laredo and Roma, Texas (Neuvo Laredo and San Pedro de Roma in Mexico). One or more of the stipulated dams may be omitted, and others than those enumerated may be built, in either case as may be determined by the Commission, subject to the approval of the two Governments.

In planning the construction of such dams the Commission shall determine:

(a) The most feasible sites;

(b) The maximum feasible reservoir capacity at each site;

(c) The conservation capacity required by each country at each site, taking into consideration the amount and regimen of its allotment of water and its contemplated uses;

(d) The capacity required for retention of silt;

(e) The capacity required for flood control.

The conservation and silt capacities of each reservoir shall be assigned to each country in the same proportion as the capacities required by each country in such reservoir for conservation purposes. Each country shall have an undivided interest in the flood control capacity of each reservoir.

The construction of the international storage dams shall start within two years following the approval of the respective plans by the two Governments. The works shall begin with the construction of the lowest major international storage dam, but works in the upper reaches of the river may be constructed simultaneously. The lowest major international storage dam shall be completed within a period of eight years from the date of the entry into force of this Treaty.

The construction of the dams and other joint works required for the diversion of the flows of the river shall be initiated on the dates recommended by the Commission and approved by the two Governments.

The cost of construction, operation and maintenance of each of the international storage dams shall be prorated between the two Governments in proportion to the capacity allotted to each country for conservation purposes in the reservoir at such dam.

The cost of construction, operation and maintenance of each of the dams and other joint works required for the diversion of the flows of the river shall be prorated between the two Governments in proportion to the benefits which the respective countries receive therefrom, as determined by the Commission and approved by the two Governments.

ARTICLE 6

The Commission shall study, investigate, and prepare plans for flood control works, where and when necessary, other than those referred to in Article 5 of this Treaty, on the Rio Grande (Rio Bravo) from Fort Quitman, Texas, to the Gulf of Mexico. These works may include levees along the river, floodways and grade-control structures, and works for the canalization, rectification and artificial channeling of reaches of the river. The Commission shall report to the two Governments the works which should be built, the estimated cost thereof, the part of the works to be constructed by each Government, and the part of the works to be operated and maintained by each Section of the Commission. Each Government agrees to construct, through its Section of the Commission, such works as may be recommended by the Commission and approved by the two Governments. Each Government shall pay the costs of the works constructed by it and the costs of operation and maintenance of the part of the works assigned to it for such purpose.

ARTICLE 7

The Commission shall study, investigate and prepare plans for plants for generating hydro-electric energy which it may be feasible to construct at the international storage dams on the Rio Grande (Rio Bravo). The Commission shall report to the two Governments in a Minute the works which should be built, the estimated cost thereof, and the part of the works to be constructed by each Government. Each Government agrees to construct, through its Section of the Commission such works as may be recommended by the Commission and approved by the two Governments. Both Governments, through their respective Sections of the Commission, shall operate and maintain jointly such hydro-electric plants. Each Government shall pay half the cost of the construction, operation and maintenance of such plants, and the energy generated shall be assigned to each country in like proportion.

ARTICLE 8

The two Governments recognize that both countries have a common interest in the conservation and storage of waters in the international reservoirs and in the maximum use of these structures for the purpose of obtaining the most beneficial, regular and constant use of the waters belonging to them. Accordingly, within the year following the placing in operation of the first of the major international storage dams which is constructed, the Commission shall submit to each Government for its approval, regulations for the storage, conveyance and delivery of the waters of the Rio Grande (Rio Bravo) from Fort Quitman, Texas, to the Gulf of Mexico. Such regulations may be modified, amended or supplemented when necessary by the Commission, subject to the approval of the two Governments. The following general rules shall severally govern until modified or amended by agreement of the Commission, with the approval of the two Governments:

(a) Storage in all major international reservoirs above the lowest shall be maintained at the maximum possible water level, consistent with flood control, irrigation use and power requirements.

(b) Inflows to each reservoir shall be credited to each country in accordance with the ownership of such inflows.

(c) In any reservoir the ownership of water belonging to the country whose conservation capacity therein is filled, and in excess of that needed to keep it filled, shall pass to the other country to the extent that such country may have unfilled conservation capacity, except that one country may at its option temporarily use the conservation capacity of the other country not currently being used in any of the upper reservoirs; provided that in the event of flood discharge or spill occurring while one country is using the conservation capacity of the other, all of such flood discharge or spill shall be charged to the country using the other's capacity, and all inflow shall be credited to the other country until the flood discharge or spill ceases or until the capacity of the other country becomes filled with its own water.

(d) Reservoir losses shall be charged in proportion to the ownership of water in storage. Releases from any reservoir shall be charged to the country requesting them, except that releases for the generation of electrical energy, or other common purpose, shall be charged in proportion to the ownership of water in storage.

(e) Flood discharges and spills from the upper reservoirs shall be divided in the same proportion as the ownership of the inflows occurring at the time of such flood discharges and spills, except as provided in subparagraph (c) of this Article. Flood discharges and spills from the lowest reservoir shall be divided equally, except that one country, with the consent of the Commission, may use such part of the share of the other country as is not used by the latter country.

(f) Either of the two countries may avail itself, whenever it so desires, of any water belonging to it and stored in the international reservoirs, provided that the water so taken is for direct beneficial use or for storage in other reservoirs. For this purpose the Commissioner of the respective country shall give appropriate notice to the Commission, which shall prescribe the proper measures for the opportune furnishing of the water.

ARTICLE 9

(a) The channel of the Rio Grande (Rio Bravo) may be used by either of the two countries to convey water belonging to it.

(b) Either of the two countries may, at any point on the main channel of the river from Fort Quitman, Texas, to the Gulf of Mexico, divert and use the water belonging to it and may for this purpose construct any necessary works. However, no such diversion or use, not existing on the date this Treaty enters into force, shall be permitted in either country, nor shall works be constructed for such purpose, until the Section of the Commission in whose

country the diversion or use is proposed has made a finding that the water necessary for such diversion or use is available from the share of that country, unless the Commission has agreed to a greater diversion or use as provided by paragraph (d) of this Article. The proposed use and the plans for the diversion works to be constructed in connection therewith shall be previously made known to the Commission for its information.

(c) Consumptive uses from the main stream and from the unmeasured tributaries below Fort Quitman shall be charged against the share of the country making them.

(d) The Commission shall have the power to authorize either country to divert and use water not belonging entirely to such country, when the water belonging to the other country can be diverted and used without injury to the latter and can be replaced at some other point on the river.

(e) The Commission shall have the power to authorize temporary diversion and use by one country of water belonging to the other, when the latter does not need it or is unable to use it, provided that such authorization or the use of such water shall not establish any right to continue to divert it.

(f) In case of the occurrence of an extraordinary drought in one country with an abundant supply of water in the other country, water stored in the international storage reservoirs and belonging to the country enjoying such abundant water supply may be withdrawn, with the consent of the Commission, for the use of the country undergoing the drought.

(g) Each country shall have the right to divert from the main channel of the river any amount of water, including the water belonging to the other country, for the purpose of generating hydro-electric power, provided that such diversion causes no injury to the other country and does not interfere with the international generation of power and that the quantities not returning directly to the river are charged against the share of the country making the diversion. The feasibility of such diversions not existing on the date this Treaty enters into force shall be determined by the Commission, which shall also determine the amount of water consumed, such water to be charged against the country making the diversion.

(h) In case either of the two countries shall construct works for diverting into the main channel of the Rio Grande (Rio Bravo) or its tributaries waters that do not at the time this Treaty enters into force contribute to the flow of the Rio Grande (Rio Bravo) such water shall belong to the country making such diversion.

(i) Main stream channel losses shall be charged in proportion to the ownership of water being conveyed in the channel at the times and places of the losses.

(j) The Commission shall keep a record of the waters belonging to each country and of those that may be available at a given moment, taking into account the measurement of the allotments, the regulation of the waters in storage, the consumptive uses, the withdrawals, the diversions, and the losses. For this purpose the Commission shall construct, operate and maintain on the main channel of the Rio Grande (Rio Bravo), and each Section shall construct, operate and maintain on the measured tributaries in its own country, all the gaging stations and mechanical apparatus necessary for the purpose of making computations and of obtaining the necessary data for such record. The information with respect to the diversions and consumptive uses on the unmeasured tributaries shall be furnished to the Commission by the appropriate Section. The cost of construction of any new gaging stations located on the main channel of the Rio Grande (Rio Bravo) shall be borne equally by the two Governments. The operation and maintenance of all gaging stations or the cost of such operation and maintenance shall be apportioned between the two Sections in accordance with determinations to be made by the Commission.

III—Colorado River

ARTICLE 10

Of the waters of the Colorado River, from any and all sources, there are allotted to Mexico:

(a) A guaranteed annual quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) to be delivered in accordance with the provisions of Article 15 of this Treaty.

(b) Any other quantities arriving at the Mexican points of diversion, with the understanding that in any year in which, as determined by the United States Section, there exists a surplus of waters of the Colorado River in excess of the amount necessary to supply users in the United States and the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) annually to Mexico, the United States undertakes to deliver to Mexico, in the manner set out in Article 15 of this Treaty, additional waters of the Colorado River system to provide a total quantity not to exceed 1,700,000 acre-feet (2,096,931,000 cubic meters) a year. Mexico shall acquire no right beyond that provided by this subparagraph by the use of the waters of the Colorado River system, for any purpose whatsoever, in excess of 1,500,000 acre-feet (1,850,234,000 cubic meters) annually.

In the event of extraordinary drought or serious accident to the irrigation system in the United States, thereby making it difficult for the United States to deliver the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) a year, the water allotted to Mexico under subparagraph (a) of this Article will be reduced in the same proportion as consumptive uses in the United States are reduced.

ARTICLE 11

(a) The United States shall deliver all waters allotted to Mexico wherever these waters may arrive in the bed of the limitrophe section of the Colorado River, with the exceptions hereinafter provided. Such waters shall be made up of the waters of the said river, whatever their origin, subject to the provisions of the following paragraphs of this Article.

(b) Of the waters of the Colorado River alloted to Mexico by subparagraph (a) of Article 10 of this Treaty, the United States shall deliver, wherever such waters may arrive in the limitrophe section of the river, 1,000,000 acre-feet (1,233,489,000 cubic meters) annually from the time the Davis dam and reservoir are placed in operation until January 1, 1980 and thereafter 1,125,000 acre-feet (1,387,675,000 cubic meters) annually, except that, should the main diversion structure referred to in subparagraph (a) of Article 12 of this Treaty be located entirely in Mexico and should Mexico so request, the United States shall deliver a quantity of water not exceeding 25,000 acre-feet (30,837,000 cubic meters) annually, unless a larger quantity may be mutually agreed upon, at a point, to be likewise mutually agreed upon, on the international land boundary near San Luis, Sonora, in which event the quantities of 1,000,000 acre-feet (1,233,489,000 cubic meters) and 1,125,000 acre-feet (1,387,675,000 cubic meters) provided hereinabove as deliverable in the limitrophe section of the river shall be reduced by the quantities to be delivered in the year concerned near San Luis, Sonora.

(c) During the period from the time the Davis dam and reservoir are placed in operation until January 1, 1980, the United States shall also deliver to Mexico annually, of the water allotted to it, 500,000 acre-feet (616,745,000 cubic meters), and thereafter the United States shall deliver annually 375,000 acre-feet (462,558,000 cubic meters), at the international boundary line, by means of the All-American Canal and a canal connecting the lower end of the Pilot Knob Wasteway with the Alamo Canal or with any other Mexican canal which may be substituted for the Alamo Canal. In either event the deliveries shall be made at an operating water surface elevation not higher than that of the Alamo Canal at the point where it crossed the international boundary line in the year 1943.

(d) All the deliveries of water specified above shall be made subject to the provisions of Article 15 of this Treaty.

ARTICLE 12

The two Governments agree to construct the following works:

(a) Mexico shall construct at its expense, within a period of five years from the date of the entry into force of this Treaty, a main diversion structure below the point where the northernmost part of the international land boundary line intersects the Colorado River. If such diversion structure is located in the limitrophe section of the river, its location, design and construction shall be

subject to the approval of the Commission. The Commission shall thereafter maintain and operate the structure at the expense of Mexico. Regardless of where such diversion structure is located, there shall simultaneously be constructed such levees, interior drainage facilities and other works, or improvements to existing works, as in the opinion of the Commission shall be necessary to protect lands within the United States against damage from such floods and seepage as might result from the construction, operation and maintenance of this diversion structure. These protective works shall be constructed, operated and maintained at the expense of Mexico by the respective Sections of the Commission, or under their supervision, each within the territory of its own country.

(b) The United States, within a period of five years from the date of the entry into force of this Treaty, shall construct in its own territory and at its expense, and thereafter operate and maintain at its expense, the Davis storage dam and reservoir, a part of the capacity of which shall be used to make possible the regulation at the boundary of the waters to be delivered to Mexico in accordance with the provisions of Article 15 of this Treaty.

(c) The United States shall construct or acquire in its own territory the works that may be necessary to convey a part of the waters of the Colorado River allotted to Mexico to the Mexican diversion points on the international land boundary line referred to in this Treaty. Among these works shall be included: the canal and other works necessary to convey water from the lower end of the Pilot Knob Wasteway to the international boundary, and, should Mexico request it, a canal to connect the main diversion structure referred to in subparagraph (a) of this Article, if this diversion structure should be built in the limitrophe section of the river, with the Mexican system of canals at a point to be agreed upon by the Commission on the international land boundary near San Luis, Sonora. Such works shall be constructed or acquired and operated and maintained by the United States Section at the expense of Mexico. Mexico shall also pay the costs of any sites or rights of way required for such works.

(d) The Commission shall construct, operate and maintain in the limitrophe section of the Colorado River, and each Section shall construct, operate and maintain in the territory of its own country on the Colorado River below Imperial Dam and on all other carrying facilities used for the delivery of water to Mexico, all necessary gaging stations and other measuring devices for the purpose of keeping a complete record of the waters delivered to Mexico and of the flows of the river. All data obtained as to such deliveries and flows shall be periodically compiled and exchanged between the two Sections.

ARTICLE 13

The Commission shall study, investigate and prepare plans for flood control on the Lower Colorado River between Imperial Dam and the Gulf of California, in both the United States and Mexico,

and shall, in a Minute, report to the two Governments the works which should be built, the estimated cost thereof, and the part of the works to be constructed by each Government. The two Governments agree to construct, through their respective Sections of the Commission, such works as may be recommended by the Commission and approved by the two Governments, each Government to pay the costs of the works constructed by it. The Commission shall likewise recommend the parts of the works to be operated and maintained jointly by the Commission and the parts to be operated and maintained by each Section. The two Governments agree to pay in equal shares the cost of joint operation and maintenance, and each Government agrees to pay the cost of operation and maintenance of the works assigned to it for such purpose.

ARTICLE 14

In consideration of the use of the All-American Canal for the delivery to Mexico, in the manner provided in Articles 11 and 15 of this Treaty, of a part of its allotment of the waters of the Colorado River, Mexico shall pay to the United States:

(a) A proportion of the costs actually incurred in the construction of Imperial Dam and the Imperial Dam-Pilot Knob section of the All-American Canal, this proportion and the method and terms of repayment to be determined by the two Governments, which, for this purpose, shall take into consideration the proportionate uses of these facilities by the two countries, these determinations to be made as soon as Davis dam and reservoir are placed in operation.

(b) Annually, a proportionate part of the total costs of maintenance and operation of such facilities, these costs to be prorated between the two countries in proportion to the amount of water delivered annually through such facilities for use in each of the two countries.

In the event that revenues from the sale of hydroelectric power which may be generated at Pilot Knob become available for the amortization of part or all of the costs of the facilities named in subparagraph (a) of this Article, the part that Mexico should pay of the costs of said facilities shall be reduced or repaid in the same proportion as the balance of the total costs are reduced or repaid. It is understood that any such revenue shall not become available until the cost of any works which may be constructed for the generation of hydro-electric power at said location has been fully amortized from the revenues derived therefrom.

ARTICLE 15

A. The water allotted in subparagraph (a) of Article 10 of this Treaty shall be delivered to Mexico at the points of delivery specified in Article 11, in accordance with the following two annual schedules of deliveries by months, which the Mexican Section shall formulate and present to the Commission before the beginning of each calendar year:

SCHEDULE I

Schedule I shall cover the delivery, in the limitrophe section of the Colorado River, of 1,000,000 acre-feet (1,233,489,000 cubic meters) of water each year from the date Davis dam and reservoir are placed in operation until January 1, 1980 and the delivery of 1,125,000 acre-feet (1,387,675,000 cubic meters) of water each year thereafter. This schedule shall be formulated subject to the following limitations:

With reference to the 1,000,000 acre-foot (1,233,489,000 cubic meter) quantity:

(a) During the months of January, February, October, November and December of the prescribed rate of delivery shall be not less than 600 cubic feet (17.0 cubic meters) nor more than 3,500 cubic feet (99.1 cubic meters) per second.

(b) During the remaining months of the year the prescribed rate of delivery shall be not less than 1,000 cubic feet (28.3 cubic meters) nor more than 3,500 cubic feet (99.1 cubic meters) per second.

With reference to the 1,125,000 acre-foot (1,387,675,000 cubic meter) quantity:

(a) During the months of January, February, October, November and December the prescribed rate of delivery shall be not less than 675 cubic feet (19.1 cubic meters) nor more than 4,000 cubic feet (113.3 cubic meters) per second.

(b) During the remaining months of the year the prescribed rate of delivery shall be not less than 1,125 cubic feet (31.9 cubic meters) nor more than 4,000 cubic feet (113.3 cubic meters) per second.

Should deliveries of water be made at a point on the land boundary near San Luis, Sonora, as provided for in Article 11, such deliveries shall be made under a sub-schedule to be formulated and furnished by the Mexican Section. The quantities and monthly rates of deliveries under such sub-schedule shall be in proportion to those specified for Schedule I, unless otherwise agreed upon by the Commission.

SCHEDULE II

Schedule II shall cover the delivery at the boundary line by means of the All-American Canal of 500,000 acre-feet (616,745,000 cubic meters) of water each year from the date Davis dam and reservoir are placed in operation until January 1, 1980 and the delivery of 375,000 acre-feet (462,558,000 cubic meters) of water each year thereafter. This schedule shall be formulated subject to the following limitations:

With reference to the 500,000 acre-foot (616,745,000 cubic meter) quantity:

(a) During the months of January, February, October, November and December the prescribed rate of delivery shall be not less than 300 cubic feet (8.5 cubic meters) nor more than 2,000 cubic feet (56.6 cubic meters) per second.

(b) During the remaining months of the year the prescribed rate of delivery shall be not less than 500 cubic feet (14.2 cubic meters) nor more than 2,000 cubic feet (56.6 cubic meters) per second.

With reference to the 375,000 acre-foot (462,558,000 cubic meter) quantity:

(a) During the months of January, February, October, November and December the prescribed rate of delivery shall be not less than 225 cubic feet (6.4 cubic meters) nor more than 1,500 cubic feet (42.5 cubic meters) per second.

(b) During the remaining months of the year the prescribed rate of delivery shall be not less than 375 cubic feet (10.6 cubic meters) nor more than 1,500 cubic feet (42.5 cubic meters) per second.

B. The United States shall be under no obligation to deliver through the All-American Canal, more than 500,000 acre-feet (616,745,000 cubic meters) annually from the date Davis dam and reservoir are placed in operation until January 1, 1980 or more than 375,000 acre-feet (462,558,000 cubic meters) annually thereafter. If, by mutual agreement, any part of the quantities of water specified in this paragraph are delivered to Mexico at points on the land boundary otherwise than through the All-American Canal, the above quantities of water and the rates of deliveries set out under Schedule II of this Article shall be correspondingly diminished.

C. The United States shall have the option of delivering, at the point on the land boundary mentioned in subparagraph (c) of Article 11, any part or all of the water to be delivered at that point under Schedule II of this Article during the months of January, February, October, November and December of each year, from any source whatsoever, with the understanding that the total specified annual quantities to be delivered through the All-American Canal shall not be reduced because of the exercise of this option, unless such reduction be requested by the Mexican Section, provided that the exercise of this option shall not have the effect of increasing the total amount of scheduled water to be delivered to Mexico.

D. In any year in which there shall exist in the river water in excess of that necessary to satisfy the requirements in the United States and the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) allotted to Mexico, the United States hereby

declares its intention to cooperate with Mexico in attempting to supply additional quantities of water through the All-American Canal as such additional quantities are desired by Mexico, if such use of the Canal and facilities will not be detrimental to the United States, provided that the delivery of any additional quantities through the All-American Canal shall not have the effect of increasing the total scheduled deliveries to Mexico. Mexico hereby declares its intention to cooperate with the United States by attempting to curtail deliveries of water through the All-American Canal in years of limited supply, if such curtailment can be accomplished without detriment to Mexico and is necessary to allow full use of all available water supplies, provided that such curtailment shall not have the effect of reducing the total scheduled deliveries of water to Mexico.

E. In any year in which there shall exist in the river water in excess of that necessary to satisfy the requirements in the United States and the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) allotted to Mexico, the United States Section shall so inform the Mexican Section in order that the latter may schedule such surplus water to complete a quantity up to a maximum of 1,700,000 acre-feet (2,096,931,000 cubic meters). In this circumstance the total quantities to be delivered under Schedules I and II shall be increased in proportion to their respective total quantities and the two schedules thus increased shall be subject to the same limitations as those established for each under paragraph A of this Article.

F. Subject to the limitations as to rates of deliveries and total quantities set out in Schedules I and II, Mexico shall have the right, upon thirty days notice in advance to the United States Section, to increase or decrease each monthly quantity prescribed by those schedules by not more than 20% of the monthly quantity.

G. The total quantity of water to be delivered under Schedule I of paragraph A of this Article may be increased in any year if the amount to be delivered under Schedule II is correspondingly reduced and if the limitations as to rates of delivery under each schedule are correspondingly increased and reduced.

IV—Tijuana River

ARTICLE 16

In order to improve existing uses and to assure any feasible further development, the Commission shall study and investigate, and shall submit to the two Governments for their approval:

(1) Recommendations for the equitable distribution between the two countries of the waters of the Tijuana River system;

(2) Plans for storage and flood control to promote and develop domestic, irrigation, and other feasible uses of the waters of this system;

(3) An estimate of the cost of the proposed works and the manner in which the construction of such works or the cost thereof should be divided between the two Governments;

(4) Recommendations regarding the parts of the works to be operated and maintained by the Commission and the parts to be operated and maintained by each Section.

The two Governments through their respective Sections of the Commission shall construct such of the proposed works as are approved by both Governments, shall divide the work to be done or the cost thereof, and shall distribute between the two countries the waters of the Tijuana River system in the proportions approved by the two Governments. The two Governments agree to pay in equal shares the costs of joint operation and maintenance of the works involved, and each Government agrees to pay the cost of operation and maintenance of the works assigned to it for such purpose.

V.—General Provisions

ARTICLE 17

The use of the channels of the international rivers for the discharge of flood or other excess waters shall be free and not subject to limitation by either country, and neither country shall have any claim against the other in respect of any damage caused by such use. Each Government agrees to furnish the other Government, as far in advance as practicable, any information it may have in regard to such extraordinary discharges of water from reservoirs and flood flows on its own territory as may produce floods on the territory of the other.

Each Government declares its intention to operate its storage dams in such manner, consistent with the normal operations of its hydraulic systems, as to avoid, as far as feasible, material damage in the territory of the other.

ARTICLE 18

Public use of the water surface of lakes formed by international dams shall, when not harmful to the services rendered by such dams, be free and common to both countries, subject to the police regulations of each country in its territory, to such general regulations as may appropriately be prescribed and enforced by the Commission with the approval of the two Governments for the purpose of the application of the provisions of this Treaty, and to such regulations as may appropriately be prescribed and enforced for the same purpose by each Section of the Commission with respect to the areas and borders of such parts of those lakes as lie within its territory. Neither Government shall use for military purposes such water surface situated within the territory of the other country except by express agreement between the two Governments.

ARTICLE 19

The two Governments shall conclude such special agreements as may be necessary to regulate the generation, development and disposition of electric power at international plants, including the necessary provisions for the export of electric current.

ARTICLE 20

The two Governments shall, through their respective Sections of the Commission, carry out the construction of works allotted to them. For this purpose the respective Sections of the Commission may make use of any competent public or private agencies in accordance with the laws of the respective countries. With respect to such works as either Section of the Commission may have to execute on the territory of the other, it shall, in the execution of such works, observe the laws of the place where such works are located or carried out, with the exceptions hereinafter stated.

All materials, implements, equipment and repair parts intended for the construction, operation and maintenance of such works shall be exempt from import and export customs duties. The whole of the personnel employed either directly or indirectly on the construction, operation or maintenance of the works may pass freely from one country to the other for the purpose of going to and from the place of location of the works, without any immigration restrictions, passports or labor requirements. Each Government shall furnish, through its own Section of the Commission, convenient means of identification to the personnel employed by it on the aforesaid works and verification certificates covering all materials, implements, equipment and repair parts intended for the works.

Each Government shall assume responsibility for and shall adjust exclusively in accordance with its own laws all claims arising within its territory in connection with the construction, operation or maintenance of the whole or of any part of the works herein agreed upon, or of any works which may, in the execution of this Treaty, be agreed upon in the future.

ARTICLE 21

The construction of the international dams and the formation of artificial lakes shall produce no change in the fluvial international boundary, which shall continue to be governed by existing treaties and conventions in force between the two countries.

The Commission shall, with the approval of the two Governments, establish in the artificial lakes, by buoys or by other suitable markers, a practicable and convenient line to provide for the exercise of the jurisdiction and control vested by this Treaty in the Commission and its respective Sections. Such line shall also mark the boundary for the application of the customs and police regulations of each country.

ARTICLE 22

The provisions of the Convention between the United States and Mexico for the rectification of the Rio Grande (Rio Bravo) in the El Paso-Juarez Valley signed on February 1, 1933, shall govern, so far as delimitation of the boundary, distribution of jurisdiction and sovereignty, and relations with private owners are concerned, in any places where works for the artificial channeling, canalization or rectification of the Rio Grande (Rio Bravo) and the Colorado River are carried out.

ARTICLE 23

The two Governments recognize the public interest attached to the works required for the execution and performance of this Treaty and agree to acquire, in accordance with their respective domestic laws, any private property that may be required for the construction of the said works, including the main structures and their appurtenances and the construction materials therefor, and for the operation and maintenance thereof, at the cost of the country within which the property is situated, except as may be otherwise specifically provided in this Treaty.

Each Section of the Commission shall determine the extent and location of any private property to be acquired within its own country and shall make the necessary requests upon its Government for the acquisition of such property.

The Commission shall determine the cases in which it shall become necessary to locate works for the conveyance of water or electrical energy and for the servicing of any such works, for the benefit of either of the two countries, in the territory of the other country, in order that such works can be built pursuant to agreement between the two Governments. Such works shall be subject to the jurisdiction and supervision of the Section of the Commission within whose country they are located.

Construction of the works built in pursuance of the provisions of this Treaty shall not confer upon either of the two countries any rights either of property or of jurisdiction over any part whatsoever of the territory of the other. These works shall be part of the territory and be the property of the country wherein they are situated. However, in the case of any incidents occurring on works constructed across the limitrophe part of a river and with supports on both banks, the jurisdiction of each country shall be limited by the center line of such works, which shall be marked by the Commission, without thereby changing the international boundary.

Each Government shall retain, through its own Section of the Commission and within the limits and to the extent necessary to effectuate the provisions of this Treaty, direct ownership, control and jurisdiction within its own territory and in accordance with its own laws, over all real property—including that within the channel of any river—rights of way and rights *in rem*, that it may be nec-

essary to enter upon and occupy for the construction, operation or maintenance of all the works constructed, acquired or used pursuant to this Treaty. Furthermore, each Government shall similarly acquire and retain in its own possession the titles, control and jurisdiction over such works.

ARTICLE 24

The International Boundary and Water Commission shall have, in addition to the powers and duties otherwise specifically provided in this Treaty, the following powers and duties:

(a) To initiate and carry on investigations and develop plans for the works which are to be constructed or established in accordance with the provisions of this and other treaties or agreements in force between the two Governments dealing with boundaries and international waters; to determine, as to such works, their location, size, kind and characteristic specifications; to estimate the cost of such works; and to recommend the division of such costs between the two Governments, the arrangements for the furnishing of the necessary funds, and the dates for the beginning of the works, to the extent that the matters mentioned in this subparagraph are not otherwise covered by specific provisions of this or any other Treaty.

(b) To construct the works agreed upon or to supervise their construction and to operate and maintain such works or to supervise their operation and maintanance, in accordance with the respective domestic laws of each country. Each Section shall have, to the extent necessary to give effect to the provisions of this Treaty, jurisdiction over the works constructed exclusively in the territory of its country whenever such works shall be connected with or shall directly affect the execution of the provisions of this Treaty.

(c) In general to exercise and discharge the specific powers and duties entrusted to the Commission by this and other treaties and agreements in force between the two countries, and to carry into execution and prevent the violation of the provisions of those treaties and agreements. The authorities of each country shall aid and support the exercise and discharge of these powers and duties, and each Commissioner shall invoke when necessary the jurisdiction of the courts or other appropriate agencies of his country to aid in the execution and enforcement of these powers and duties.

(d) To settle all differences that may arise between the two Governments with respect to the interpretation or application of this Treaty, subject to the approval of the two Governments. In any case in which the Commissioners do not reach an agreement, they shall so inform their respective governments reporting their respective opinions and the grounds therefor and the points upon which they differ, for discussion and adjustment of the difference through diplomatic channels and for application where proper of the general or special agreements which the two Governments have concluded for the settlement of controversies.

(e) To furnish the information requested of the Commissioners jointly by the two Governments on matters within their jurisdiction. In the event that the request is made by one Government alone, the Commissioner of the other Government must have the express authorization of his Government in order to comply with such request.

(f) The Commission shall construct, operate and maintain upon the limitrophe parts of the international streams, and each Section shall severally construct, operate and maintain upon the parts of the international streams and their tributaries within the boundaries of its own country, such stream gaging stations as may be needed to provide the hydrographic data necessary or convenient for the proper functioning of this Treaty. The data so obtained shall be compiled and periodically exchanged between the two Sections.

(g) The Commission shall submit annually a joint report to the two Governments on the matters in its charge. The Commission shall also submit to the two Governments joint reports on general or any particular matters at such other times as it may deem necessary or as may be requested by the two Governments.

ARTICLE 25

Except as otherwise specifically provided in this Treaty, Articles III and VII of the Convention of March 1, 1889 shall govern the proceedings of the Commission in carrying out the provisions of this Treaty. Supplementary thereto the Commission shall establish a body of rules and regulations to govern its procedure, consistent with the provisions of this Treaty and of Article III and VII of the Convention of March 1, 1889 and subject to the approval of both Governments.

Decisions of the Commission shall be recorded in the form of Minutes done in duplicate in the English and Spanish languages, signed by each Commissioner and attested by the Secretaries, and copies thereof forwarded to each Government within three days after being signed. Except where the specific approval of the two Governments is required by any provision of this Treaty, if one of the Governments fails to communicate to the Commission its approval or disapproval of a decision of the Commission within thirty days reckoned from the date of the Minute in which it shall have been pronounced, the Minute in question and the decisions which it contains shall be considered to be approved by the Government. The Commissioners, within the limits of their respective jurisdictions, shall execute the decisions of the Commission that are approved by both Governments.

If either Government disapproves a decision of the Commission the two Governments shall take cognizance of the matter, and if an agreement regarding such matter is reached between the two Governments, the agreement shall be communicated to the Commissioners, who shall take such further proceedings as may be necessary to carry out such agreement.

VI.—Transitory Provisions

ARTICLE 26

During a period of eight years from the date of the entry into force of this Treaty, or until the beginning of operation of the lowest major international reservoir on the Rio Grande (Rio Bravo), should it be placed in operation prior to the expiration of said period, Mexico will cooperate with the United States to relieve, in times of drought, any lack of water needed to irrigate the lands now under irrigation in the Lower Rio Grande Valley in the United States, and for this purpose Mexico will release water from El Azucar reservoir on the San Juan River and allow the water to run through its system of canals back into the San Juan River in order that the United States may divert such water from the Rio Grande (Rio Bravo). Such releases shall be made on condition that they do not affect the Mexican irrigation system, provided that Mexico shall, in any event, except in cases of extraordinary drought or serious accident to its hydraulic works, release and make available to the United States for its use the quantities requested, under the following conditions: that during the said eight years there shall be made available a total of 160,000 acre-feet (197,358,000 cubic meters) and up to 40,000 acre-feet (49,340,000 cubic meters) in any one year; that the water shall be made available as requested at rates not exceeding 750 cubic feet (21.2 cubic meters) per second; that when the rates of flow requested and made available have been more than 500 cubic feet (14.2 cubic meters) per second the period of release shall not extend beyond fifteen consecutive days; and that at least thirty days must elapse between any two periods of release during which rates of flow in excess of 500 cubic feet (14.2 cubic meters) per second have been requested and made available. In addition to the guaranteed flow, Mexico shall release from El Azucar reservoir and conduct through its canal system and the San Juan River, for use in the United States during periods of drought and after satisfying the needs of Mexican users, any excess water that does not in the opinion of the Mexican Section have to be stored and that may be needed for the irrigation of lands which were under irrigation during the year 1943 in the Lower Rio Grande Valley in the United States.

ARTICLE 27

The provisions of Article 10, 11, and 15 of this Treaty shall not be applied during a period of five years from the date of the entry into force of this Treaty, or until the Davis dam and the major Mexican diversion structure on the Colorado River are placed in operation, should these works be placed in operation prior to the expiration of said period. In the meantime Mexico may construct and operate at its expense a temporary diversion structure in the bed of the Colorado River in territory of the United States for the purpose of diverting water into the Alamo Canal, pro-

vided that the plans for such structure and the construction and operation thereof shall be subject to the approval of the United States Section. During this period of time the United States will make available in the river at such diversion structure river flow not currently required in the United States, and the United States will cooperate with Mexico to the end that the latter may satisfy its irrigation requirements within the limits of those requirements for lands irrigated in Mexico from the Colorado River during the year 1943.

VII—Final Provisions

ARTICLE 28

This Treaty shall be ratified and the ratifications thereof shall be exchanged in Washington. It shall enter into force on the day of the exchange of ratifications and shall continue in force until terminated by another Treaty concluded for that purpose between the two Governments.

In witness whereof the respective Plenipotentiaries have signed this Treaty and have hereunto affixed their seals.

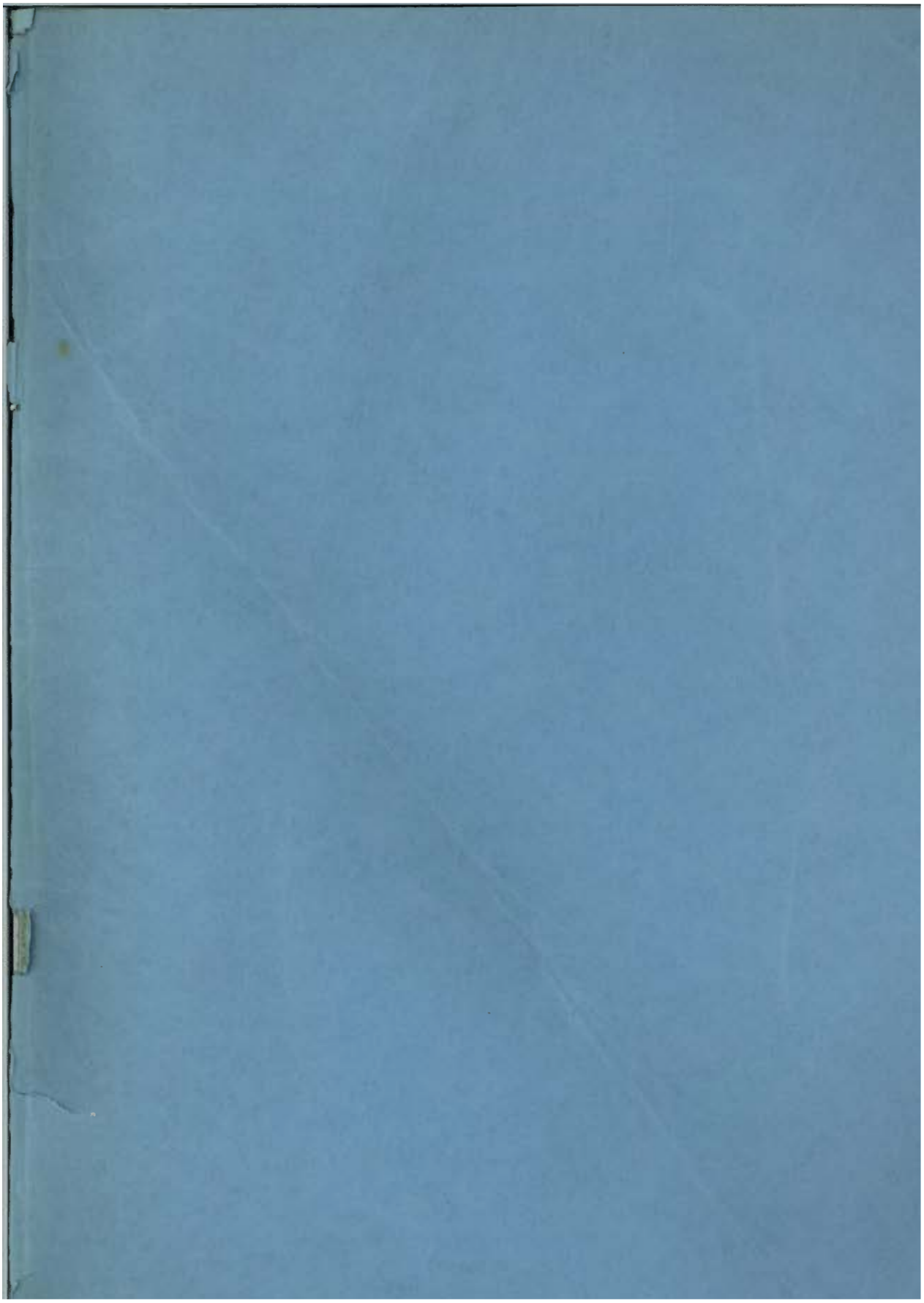
Done in duplicate in the English and Spanish languages, in Washington on this third day of February, 1944.

For the Government of the United States of America:

Cordell Hull [seal]
George S. Messersmith [seal]
Lawrence M. Lawson [seal]

For the Government of the United Mexican States:

F. Castillo Najera [seal]
Rafael Fernandez MacGregor [seal]



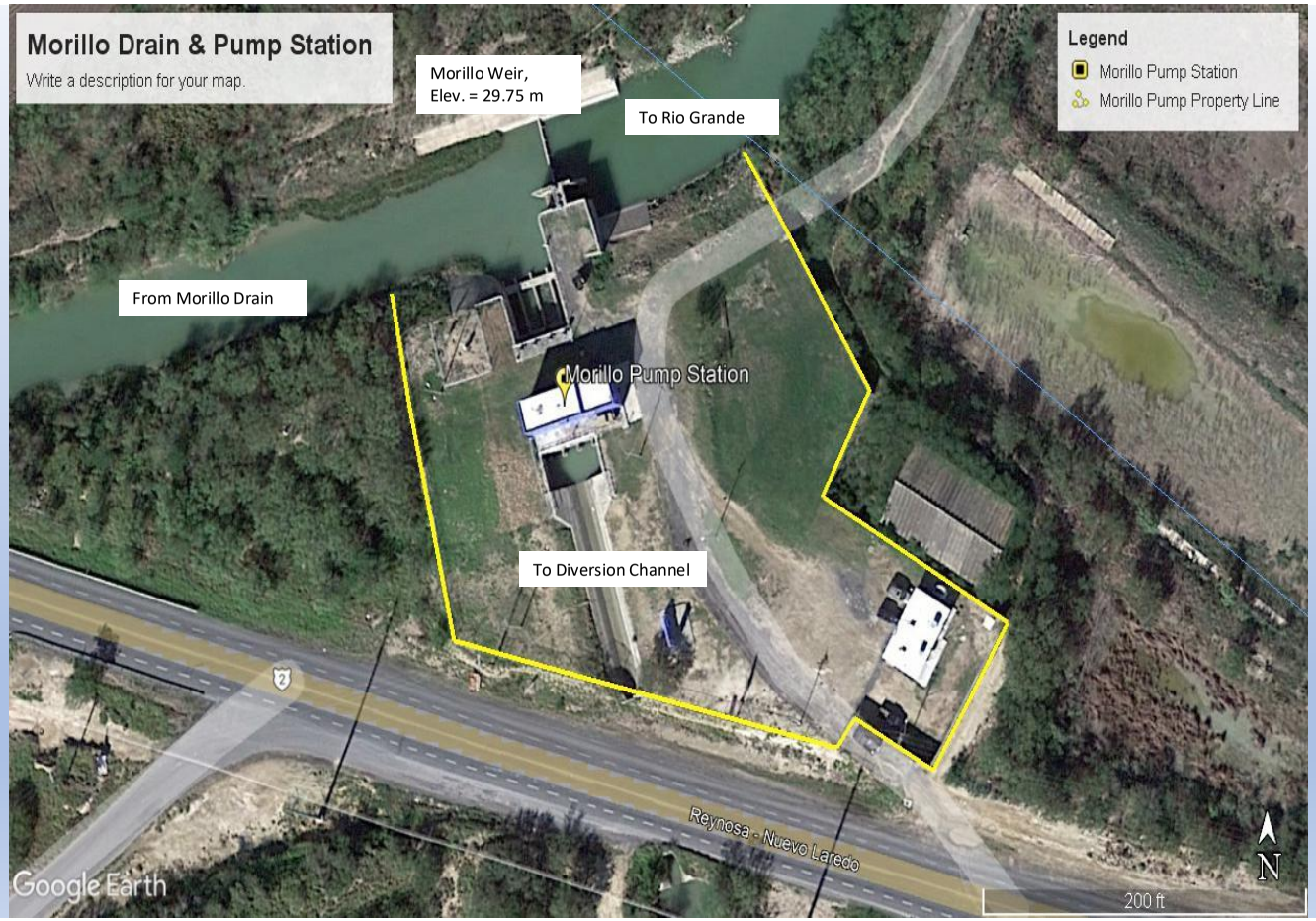
Attachment 2

Executive Study: Morillo Drain and Pump Station by Xochith Aranda, P.E. 2022; Analysis of the Alternatives for Beneficial use of the Agricultural Return Waters from the Morillo Drain, Moro ingenieria S.C. and CONAGUA, April 21, 2016

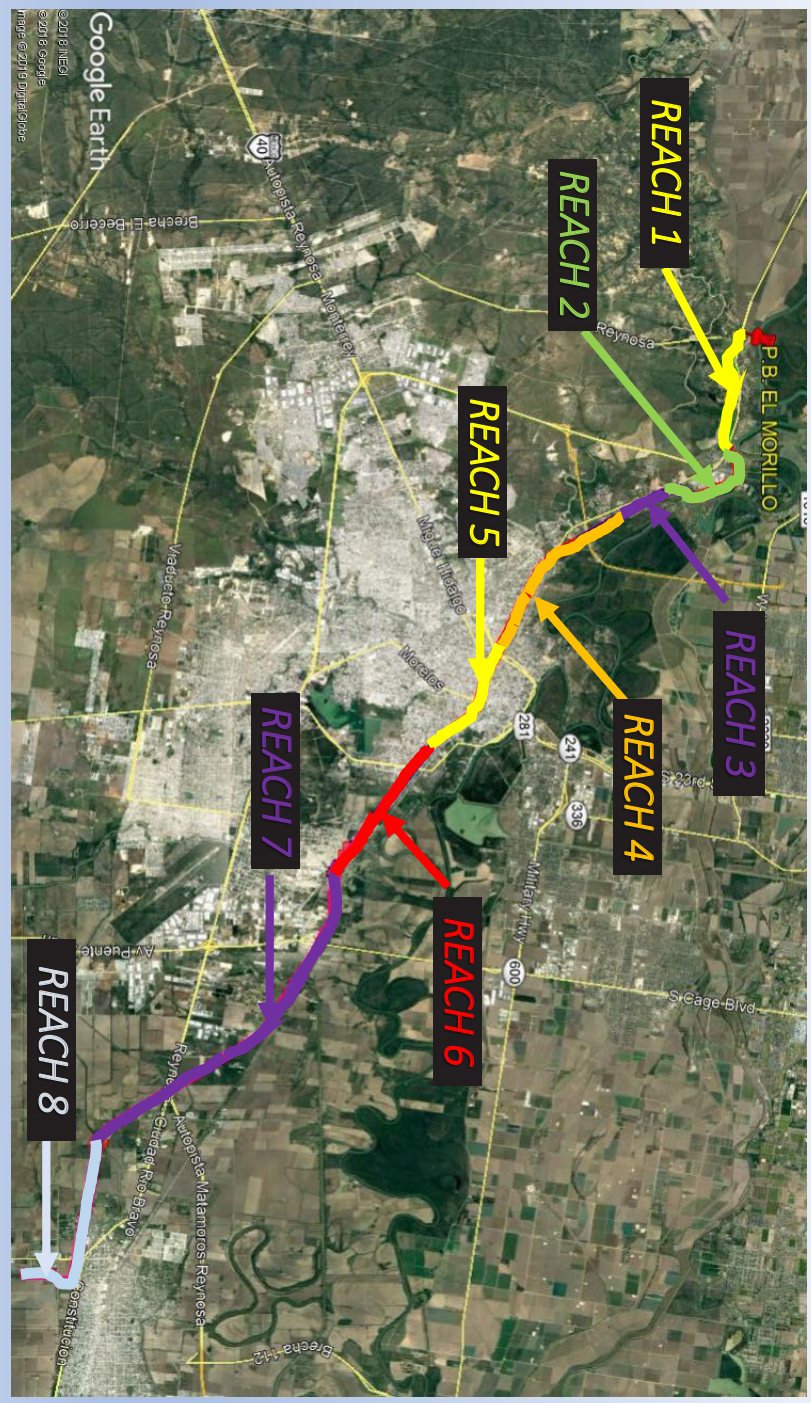
Executive Study: Morillo Drain and Pump Station

Xochitl Aranda, P.E.

Morillo Pump Station



Morillo Drain Study Reaches



Overview

REACH	LENGTH (MI.)	COST FOR 3 CMS	COST FOR 4 CMS
1	2.29	2,838,298.63	3,021,179.03
2	1.70	47,493.50	1,080,615.73
3	0.53	515,386.48	521,471.81
4	3.97	136,434.13	2,480,242.74
5	2.3	69,705.94	3,817,464.10
6	2.74	1,591,174.79	12,728,273.46
7	6.71	1,855,659.86	1,548,422.00
8	4.23	748,600.88	613,818.03
TOTAL=	**24.47**	**$ 7,802,754.22**	**$25,811,486.89**

- Costs include 16% IVA
- Costs from 2019 estimate + 2.4% inflation (2020, 2021) + 18.5% inflation (2022)
- $20.46 MXN/$1USD

Reach 1

Issues: Low velocity, sediment and trash accumulation
Length: 2.29 mi.
Type: Earthen Channel

3 CMS Improvements:
•Narrower channel
•Concrete lining for 3 cms

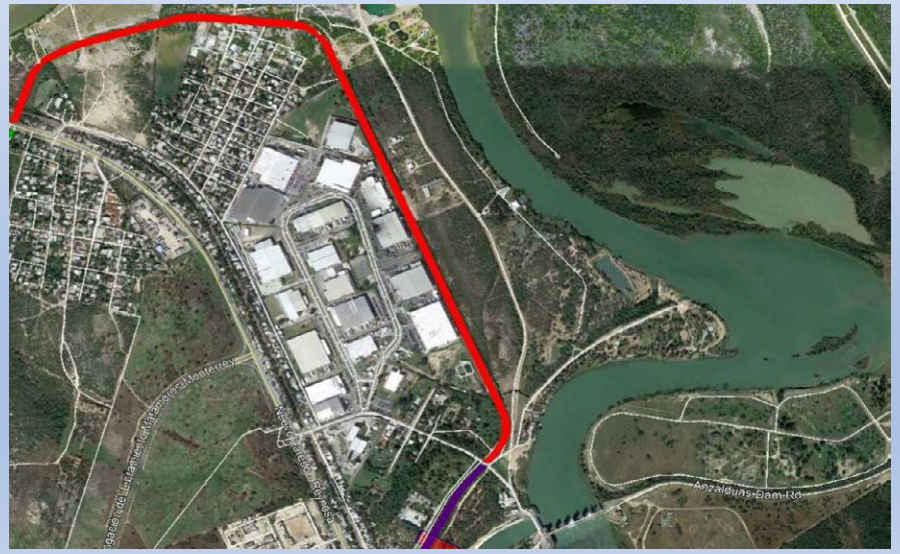
Cost= $2,838,298.63

4 CMS Improvements:
•Narrower channel
•Concrete lining for 4 cms

Cost= $3,021,179.03

Reach 2

Issues: None- this section operates 3cms
Length: 1.70 mi.
Type: Concrete-lined Channel



3 CMS Improvements:
- Repair concrete at transition
- Sediment removal

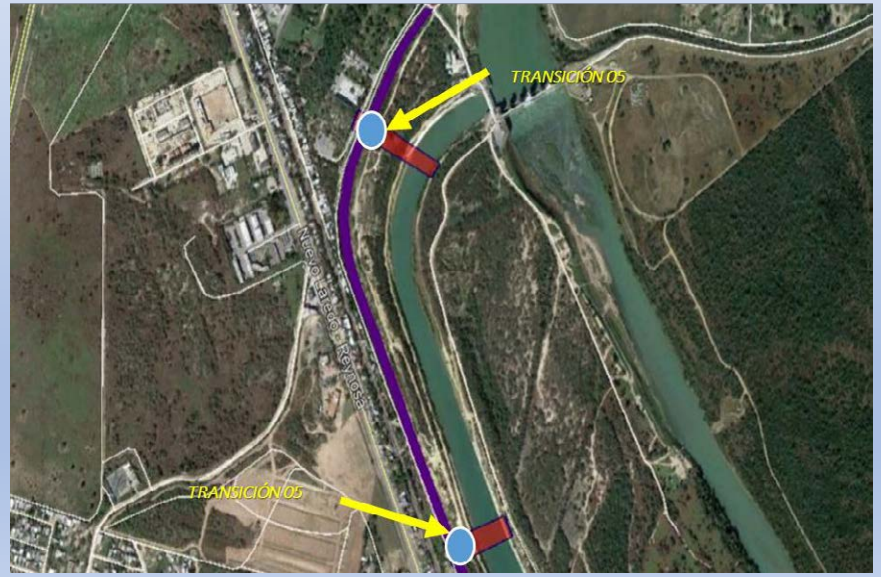
Cost= $47,493.50

4 CMS Improvements:
- Repair concrete at transition
- Sediment removal
- Raise sidewalls

Cost= $1,080,615.73

Reach 3

Issues: 2.3 cms capacity due to shifts in pipe sections
Length: 0.53 mi.
Type: Fiberglass pipe



3 CMS Improvements:
- Replace pipe same gradient
- Repair transitions

Cost= $515,386.48

4 CMS Improvements:
- Replace pipe higher gradient
- Repair transitions
- Add velocity dissipator

Cost= $521,471.81

Reach 4

Issues: None- this section operates 3cms
Length: 3.97 mi.
Type: Concrete-lined Channel

3 CMS Improvements:
- Repair concrete at transition
- Sediment removal

Cost= $136,434.13

4 CMS Improvements:
- Repair concrete at transition
- Sediment removal
- Raise sidewalls

Cost= $2,480,242.74

Reach 5

Issues: None- this section operates 3cms
Length: 2.30 mi.
Type: Concrete Pipe

3 CMS Improvements:

- Lateral diversion at entry to new hydraulic structure

Cost= $69,705.94

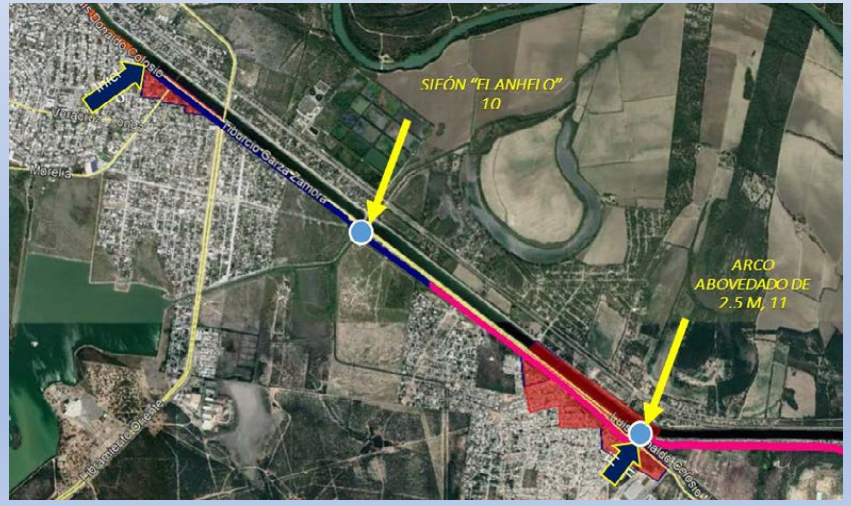
4 CMS Improvements:

- Install parallel pipe

Cost= $3,817,464.10

Reach 6

Issues: Low velocity, sediment and trash accumulation
Length: 2.74 mi.
Type: Earthen Channel



3 CMS Improvements:
•Narrower channel
•Concrete lining for 3 cms

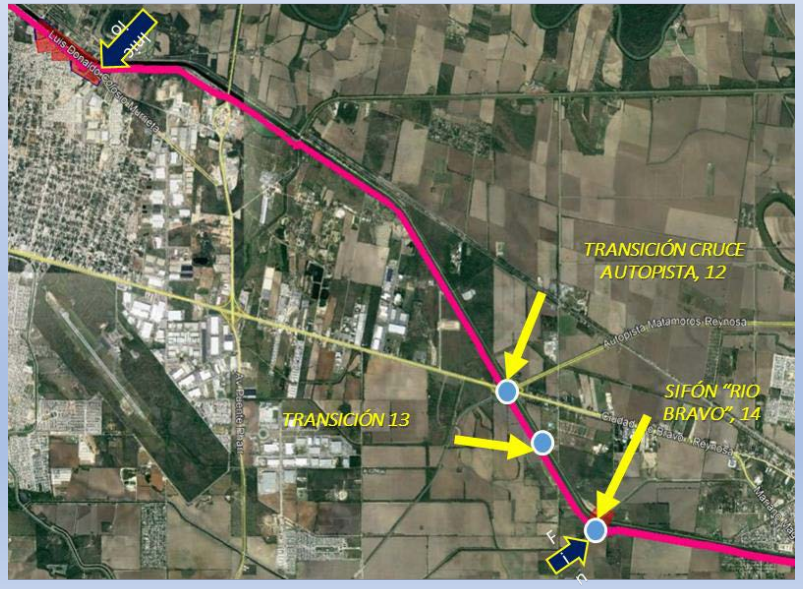
Cost= $1,591,174.79

4 CMS Improvements:
•New fiberglass pipe

Cost= $12,728,273.46

Reach 7

Issues: Low velocity, sediment and trash accumulation
Length: 6.71 mi.
Type: Earthen Channel



3 CMS Improvements:
•Narrower channel
•Partial concrete lining (0.5 mi.)

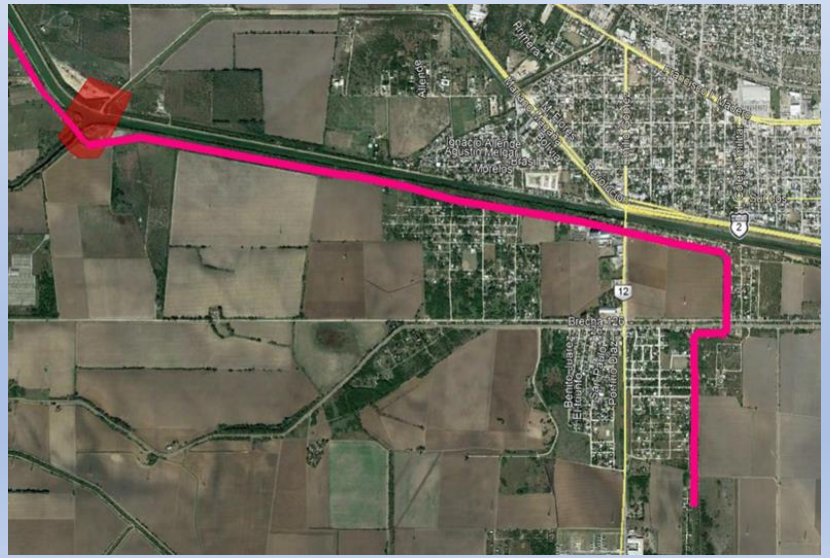
Cost= $1,855,659.86

4 CMS Improvements:
•Narrower channel
•Partial concrete lining (0.5 mi.)

Cost= $1,548,422.00

Reach 8

Issues: Low velocity, sediment and trash accumulation
Length: 4.23 mi.
Type: Earthen Channel



3 CMS Improvements:
•Narrower channel

Cost= $ 748,600.88

4 CMS Improvements:
•Narrower channel

Cost= $ 613,818.03

Attachment 3

Building a Binational Framework for Adaptive Management, Rio Grande/Bravo from Fort Quitman to the Gulf of Mexico– Recommendations to the International Boundary and Water Commission from the Rio Grande Joint Venture, Aug. 19, 2022, revised Oct. 10, 2022

Building a Binational Framework for Adaptive Management
Rio Grande/Bravo from Fort Quitman to the Gulf of Mexico
Recommendations to the International Boundary and Water Commission
From the Rio Grande Joint Venture
August 19, 2022
Revised October 10, 2022

The Rio Grande Joint Venture is a public-private partnership of state and federal agencies and non-governmental organizations from both the U.S. and Mexico (see appendix 2 for more information). The geography we work in encompasses 63 million acres and some 50 partners in collaborative work to support healthy and thriving ecosystems including our shared river. We work with technical teams with representation from these organizations, as well as land and water stewards, corporations, universities, and other conservation partners. Together, we help ensure that the ecosystems across our binational region support diverse communities of plants, wildlife, and people into the future. Our partnership model is built on adaptive ecosystem management for strategic habitat conservation, and our planning processes build upon previous work, including A Vision for the Big Bend Reach of the Rio Grande/Río Bravo and the Conservation Assessment for the Big Bend/Río Bravo Region (Commission for Environmental Cooperation, 2011).

The Rio Grande Joint Venture partners propose a set of planning, implementation, monitoring, research, and communications actions for achieving sustainable management of the Rio Grande/Bravo from Fort Quitman to the Gulf of Mexico. We believe these actions can help achieve goals described in Minute 325 of the Treaty of 1944, specifically "to establish mechanisms for future cooperation to improve the predictability and reliability of Rio Grande water deliveries to users in the United States and Mexico." In addition, sustainable management actions are specifically designed to support ecosystem functions, thereby providing nature-based solutions, for example by ensuring base flows and by mobilizing and evacuating accumulated sediment to improve channel conveyance capacity without the need for new infrastructure, construction, or earth moving. This section of the Rio Grande is the centerpiece of an international area of conservation interest in the northern Chihuahuan Desert and represents one of the most ecologically significant areas in North America. The Rio Grande and its tributaries support aquatic and riparian systems that provide critical ecosystem functions for people and important habitat for birds and other wildlife. Proposed actions are meant to restore some of the lost ecological functioning of the river through managed, functional flows, combined with monitoring and research to inform future management, while meeting Treaty obligations and water user needs.

The recommendations in this paper build on decades of work by many conservation partners, academic researchers, water law experts and even river recreation enthusiasts. This work includes research, coalition-building, habitat restoration, and policy study and development, all bolstered by a belief that it is possible and necessary to include the needs of the river itself – its fish, wildlife, and habitat – in river management planning and operations. Aside from the Rio Grande Joint Venture staff, other contributors to this paper include American Bird Conservancy, Audubon Texas, Comisión Nacional de Areas Naturales Protegidas, the National Park Service and Big Bend National Park, the Nature Conservancy of Texas, Pronatura Noreste, and World Wildlife Fund. These and other Rio Grande Joint Venture partners are ready and willing to assist with further development and implementation of the recommendations in this paper.

Map showing the location of Fort Quitman gaging station (source) and the route of the river along the international border to the Gulf of Mexico.

Background:

The Rio Grande from Fort Quitman to the Gulf of Mexico suffers from a highly altered hydrograph, accumulation of sediment, and increasing salinity. This results in decreased conveyance capacity, declining water quality, and decreasing diversity of riparian and aquatic habitats available for fish and wildlife. Between 1992 and 2008, the channel of the Rio Grande narrowed by approximately 35 to 50% (Dean, 2021; Dean and Schmidt, 2011b; Dean and Schmidt, 2013) due to declining surface flows, abnormally timed flow deliveries, and subsequent decrease in sediment transport. Dean and Schmidt have also documented a feedback loop between the establishment of invasive saltcedar (*Tamarix ramosissima*) and giant cane (*Arundo donax*) and sediment retention. Reduced channel capacity means increased flooding (e.g., the 2008 flood), compromising water management, municipal and transportation infrastructure, as well as security for riverside rural communities. Historic and current water management along with severe drought and climate change have created a dire situation that presents an extraordinary challenge to basin and water resource managers. Water management must change to accommodate a new reality with more sustainable, nature-based practices that will ultimately aid water managers in the long term by lifting stream functions that improve water quality and provide natural water storage and sediment evacuation. Ecosystem and river functions that sustain people and wildlife will likely respond positively to more sustainable management and nature-based solutions.

Within the Big Bend river segment are significant protected areas in both the U.S. and Mexico. In the lower two-thirds of the segment, known as the Lower Canyons, multiple spring complexes provide 150,000 to 200,000 acre-feet of water to the base flow annually (Bennett, 2011). As documented by the Upper Rio Grande Basin and Bay Expert Science Team (2012), this lower portion is an ecological showcase that preserves a relatively intact Chihuahuan Desert fish community; 33 of 40 native fish species and three of five native mussel

species are still present in the Lower Canyons. The native fish that are missing or in steep decline, such as the endangered Rio Grande silvery minnow, are pelagic spawning species that require an attenuated pulse flow in the Spring to complete their reproductive cycles (Upper Rio Grande Basin and Bay Expert Science Team, 2012). This groundwater dependent and relatively ecologically healthy section of the river contributes to the potential for successful restoration and functioning both upstream and downstream and emphasizes the importance of protecting groundwater contributions to surface flows. In the river segment above the Lower Canyons, groundwater does not support base flows and the current condition of the river is an unsound ecological environment that is unfavorable for many native mussel, fish, and wildlife species (Upper Rio Grande Basin and Bay Exert Science Team, 2012). This is primarily driven by occasional cessations in flow with wetted habitat restricted to isolated pools. The recommendations by the Upper Rio Grande Basin and Bay Expert Science Team (2012) include subsistence flows within this segment to ensure long term river functioning.

Proposed Activities:

1. MANAGE TREATY DELIVERIES FOR FUNCTIONAL FLOWS: We recommend implementing a transparent process including stakeholders and First Nations in both the U.S. and Mexico to establish specific goals for managed flows under the 1944 Treaty. Related to ecological functions, specific goals should be developed for base flows, sediment transport, water quality, and when possible, a spring pulse flow.
    - Managing water deliveries is anticipated to occur during the normal course of implementing the Treaty of 1944, but requires coordination of timing, volume, and duration of releases to achieve ecological functions, such as maximum transport and redistribution of gravel and fine sediment contributed from tributaries. For example, a timed release from Luis Leon Dam during the late summer monsoon season would mimic natural processes and maximize sediment transport and maintenance of channel conveyance capacity and flood protection. Triggers for this release could be related to high precipitation in the northeastern Chihuahuan Desert. Improving sediment transport would also improve the diversity of aquatic habitats needed to support fish and wildlife, including declining mussel species.
    - See appendix (page 6-7) and associated spreadsheet for more details on a potential functional flow scenario based on current scientific knowledge – this is a working hypothesis and a starting point for discussions.
2. MANAGE SEDIMENT THROUGH ECOSYSTEM FUNCTION AND RESTORATION: A functioning Rio Grande ecosystem will naturally move sediment through the system, increase channel capacity, reduce flooding, and improve water quality and wildlife habitat. In addition, tributaries with intact ecological functions can reduce sediment transport into the mainstem while also improving water quality and wildlife habitats.
    - Restore native riparian vegetation within the basin along the mainstem and also the tributaries in the U.S. and Mexico.
    - Deploy low-tech, process-based methods (e.g., brush weirs, beaver dam analogues, trincheras, one rock dams, etc.) to slow the movement of water and retain sediment in the tributaries.
    - Reduce non-native riparian vegetation through environmentally friendly techniques, including biocontrol (where permitted and approved by authorities).
3. DEVELOP AND IMPLEMENT AN ADAPTIVE MANAGEMENT PROGRAM: Following an adaptive management framework in the context of a public-private collaboration, evaluate managed, functional flows, vegetation management, and other activities that impact the Rio Grande ecosystem and its ability to improve the predictability and reliability of water deliveries to users in the United States

and Mexico (as described above). This could be done by establishing an interdisciplinary, Adaptive Management Work Group under a new minute to the 1944 Treaty. In 2022-2023, binational, interdisciplinary workshops could be held to prepare for this. The Rio Grande Joint Venture is ready to assist in coordinating such efforts and we have ideas for potential sources of funding to support workshops. Additional activities could be accomplished with support and funding from multiple entities.

- Monitor the impacts of flow management on riverside communities, ecosystem functions, and fish and wildlife. Develop mechanisms for information collected and knowledge gained to be fed back into the decision-making process for managing flows and Treaty deliveries.
- Evaluate the results of managed flows on sediment mobilization. Currently, the U.S. National Park Service supports a sediment monitoring program.
- Evaluate the link between vegetation management and sediment mobility. The understanding on what drives sediment transport is not fully formed and not supportive of sound decision making. This should include monitoring and assessment of the various vegetation management strategies (e.g., chemical, mechanical, prescribed fire, and biocontrol) and potential impacts to ecosystem and river functions. For example:
    i. Establish monitoring programs on the status of Saltcedar (*Tamarix spp.*) to determine the extent of success achieved through biological controls (i.e., tamarisk beetle, *Diorahbda spp.*), and ensure there is continued die-back of Saltcedar.
    ii. In areas dominated by giant cane (*Arundo donax*), monitor the efficacy of biocontrol projects. In 2013, the United States Department of Agriculture, working with the Instituto Mexicano de Tecnologia del Aguas and the IBWC (U.S. and Mexico sections) began implementing two biological control measures for *Arundo donax* (Martinez Jimenez, 2014, Martinez Jimenez, 2016). Releases of Arundo wasp (*Tetramesa romano*) and scale (*Rhizaspidiotus donacis*) were done in both countries in the lower Rio Grande as well as the El Paso area. In 2018, the U.S. Department of Agriculture worked with the National Park Service, Texas Parks and Wildlife, and a private landowner to release both insects at 4 sites in the Big Bend segment.
    iii. Assess the success and ecological implications in the application of other techniques used to manage non-native, invasive riparian vegetation (e.g., chemical, mechanical, prescribed fire).

4. RESEARCH AND EVALUATION: Establish studies to determine the extent of the transboundary aquifer that provides base flow to the Rio Grande to inform water resources management. Determine the ways water quality and quantity can be improved through various methods.

- Groundwater is already accounted for and utilized in Treaty deliveries as it contributes to surface flows through springs. Available data indicate that groundwater accounted for approximately two-thirds of the base flows to the Rio Grande (Bennett, 2007; Brauch, 2009). A significant portion of the base flow of the Rio Grande is derived from the Edwards-Trinity Aquifer, which may prove to be a trans-border aquifer. Understanding aquifer boundaries will help water resource managers better protect recharge zones and target conservation funding and programs in those zones. If groundwater development leads to less water quality or quantity, it would also impact surface water, further reducing the amount and quality of water available for Treaty deliveries and water users, as well as the ecosystem. We recommend working closely with the Texas Council on Environmental Quality and other conservation partners on this.
- Evaluate if there are communities along the river that could benefit from investment in waste water treatment. Evaluate the possibility of returning properly treated wastewater to the river as a contribution to base flows.

- Evaluate opportunities for irrigation efficiencies on the Rio Conchos and Rio Grande that could result in water savings to be used for functional flows.

5. COMMUNICATION: Establish a framework for IBWC/CILA to communicate its coordination of water management operations with stakeholders to include information about dates and times of managed flows from reservoirs within the system. This would have the following benefits (among others):
    - Allow researchers to plan and execute monitoring studies of impacts of releases and inform adaptive management.
    - Allow protected areas managers to plan river restoration actions for the right time and space, avoiding loss of resources, and diminishing risks.
    - Provide technical information for states, municipalities, and protected areas to develop management, restoration, and contingency plans, in order to prevent catastrophic events and adapt to managed, functional flows.
    - Benefit local economies that depend on river recreation tourism (e.g., Boquillas, Coahuila and Terlingua, Texas), and give communities and outfitters the opportunity to organize and optimize their services.

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APPENDIX 1

A WORKING DRAFT FOR A STREAMFLOW SCENARIO FOR PROTECTING ECOSYSTEM FUNCTIONS OF THE BIG BEND REACH OF THE RIO GRANDE/BRAVO

January 30, 2018

Jeff Bennett, Rio Grande Joint Venture / American Bird Conservancy

Problem Statement

The reach of the Rio Grande/Bravo (RGB) downstream of its confluence with the Rio Conchos and above Amistad reservoir is plagued by a diminished hydrograph that fails to transport and redistribute sediment sourced from adjoining tributaries. Sediment accumulation reduces channel conveyance capacity, lifts flood stage elevations, reduces complexity and eliminates a variety of aquatic habitat elements: backwaters, appropriately connected floodplains, multi-threaded channels, and gravel bars. Additionally, the loss of late spring or early summer high flows results in low or no recruitment of pelagic-broadcast spawning fish that rely on increases in flow to initiate reproductive behavior. This type of reproductive behavior relies on a minimum length channel with uninterrupted flow and a spring freshet. Nearly all fish within this guild are in decline, most likely due to stream fragmentation, diminished habitat diversity, channel desiccation, and flow regime changes.

The Big Bend segment, at over 300 miles and containing a mostly intact fish and invertebrate assemblage with the Lower Canyons, represents a unique opportunity to use managed flows to improve habitat and increase species success.

Recommendations

This report summarizes stream-flow recommendations to meet specific eco-hydrologic objectives to support a sound ecological environment for the RGB in the Big Bend segment between the Rio Conchos confluence and Amistad Reservoir. The stream-flow recommendations are based on previous work done by the Basin and Bay Area Expert Science Team working for the Texas Instream Flow Program. Additionally, the information provided here reflects scientific investigations and expertise by Todd Blythe, David Dean, Aimee Roberson, Samuel Sandoval Solis, Jack Schmidt, and others. In this way, this report reflects current scientific understanding of the relationship between stream flow and sediment transport, habitat use and availability for aquatic species, spawning requirements for pelagic-spawning fish, and desirable riparian communities for birds and other wildlife.

Based on the current state of scientific knowledge, three types of flows are recommended: (1) a minimum base or subsistence flow, (2) a late summer or early fall stepped pulse flow to transport and redistribute sediment sourced from tributaries, and (3) a spring variably stepped flow to initiate reproduction and recruitment of pelagic-broadcast fish (e.g., the endangered Rio Grande Silvery Minnow and Rio Grande Shiner). The proposed numbers are relevant to the gage upstream of Johnson Ranch.

During drought, in the segment above the area where groundwater provides significant base flow, flow in the Rio Grande occasionally will cease and wetted habitat is restricted to isolated pools. For this, we recommend that flow at Johnson Ranch not be allowed to go below 1.5 cms. This will also provide benefits to the riparian vegetation community. Dam release would occur whenever the flow at Johnson Ranch drops 1.5 cms.

The stepped pulse flow recommendation should be designed to move gravel from tributary mouths and move and redistribute fine sediment. A step hydrograph is proposed with an initial release of 250 cms for 2 days and then gradually stepping down (see accompanying spreadsheet). This controlled flood would be released from

Luis Leon Dam during the late summer monsoon season. Triggers for this release could be related to high precipitation in the northeastern Chihuahuan Desert.

The spring stepped flow recommendation should be designed so that midstream velocities are sufficient to initiate spawning and inset floodplains are inundated to a shallow depth, creating low velocity habitats for recently hatched fish. Timing should be tied to water temperatures. A 45-day stepped hydrograph with two higher flow pulses is proposed with a beginning flow of at least 8 m^3/s during May and June as measured at the IBWC stream-flow gauge at Johnson Ranch.

APPENDIX 2

BACKGROUND ON THE RIO GRANDE JOINT VENTURE

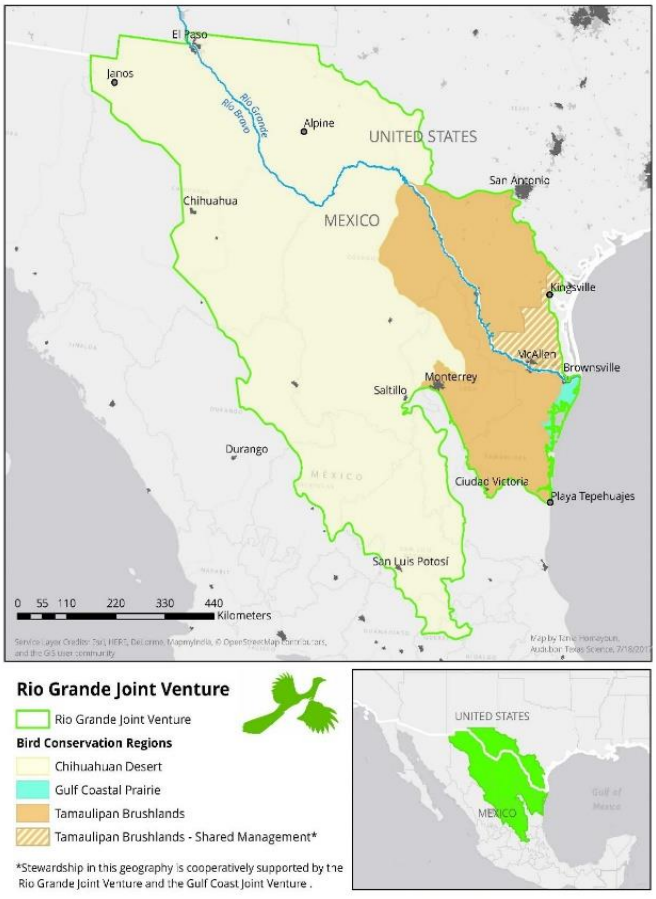
The mission of the Rio Grande Joint Venture is to conserve birds and their habitats across our geography in the U.S. and Mexico.

We achieve our mission by

- Bringing people from the U.S. and Mexico together to collaborate and increase the collective capacity for bird conservation planning, implementation, and evaluation;
- Sharing our resources to assess, communicate, and address the most critical conservation issues related to declining bird populations, habitat loss and degradation, and climate change;
- Using the best-available science and information to guide our decisions and actions; and
- Connecting with the broader conservation community to coordinate conservation of birds throughout their lifecycles, as well as other wildlife that shares their habitats, and the ecosystems that support us all.

Rio Grande Joint Venture Board Organizations

- American Bird Conservancy
- Audubon Texas
- Bird Conservancy of the Rockies
- Comisón Nacional de Áreas Naturales Protegidas
- Comisón Nacional para el Conocimiento y Uso de la Biodiversidad
- Dixon Water Foundation
- Ducks Unlimited México, A.C.
- National Park Service
- Natural Resources Conservation Service
- Pasticultores del Desierto, A.C.
- Pronatura Noreste, A.C.
- Texas Parks and Wildlife Department
- The Nature Conservancy – Texas
- U.S. Fish and Wildlife Service
- World Wildlife Fund



Attachment 4

Fact Sheet and Quantitative Coding Analysis, Primary Research from Chihuahua, Mexico, Phil Gurley, University of Texas at Austin, LBJ School of Public Affairs, June 1, 2022

TEXAS LBJ School
The University of Texas at Austin
Lyndon B. Johnson School of Public Affairs

6/1/2022

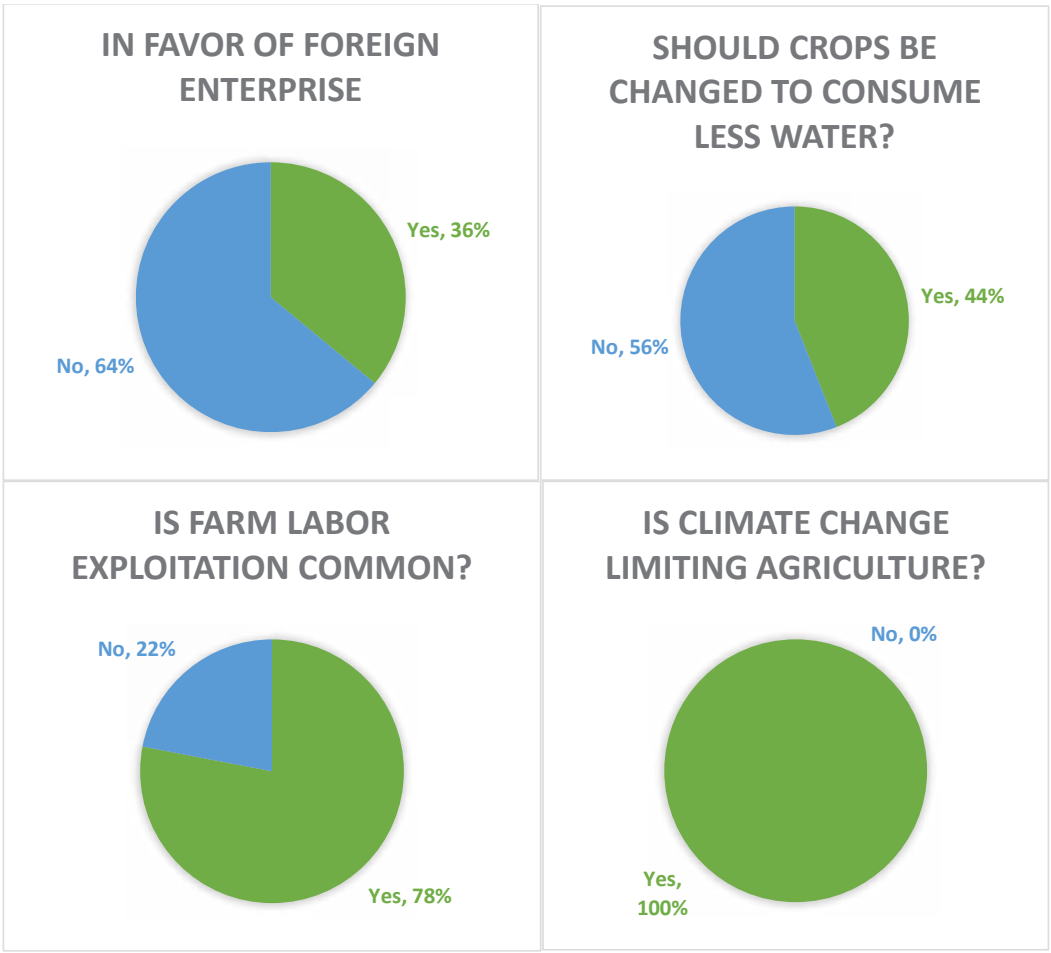
Fact Sheet

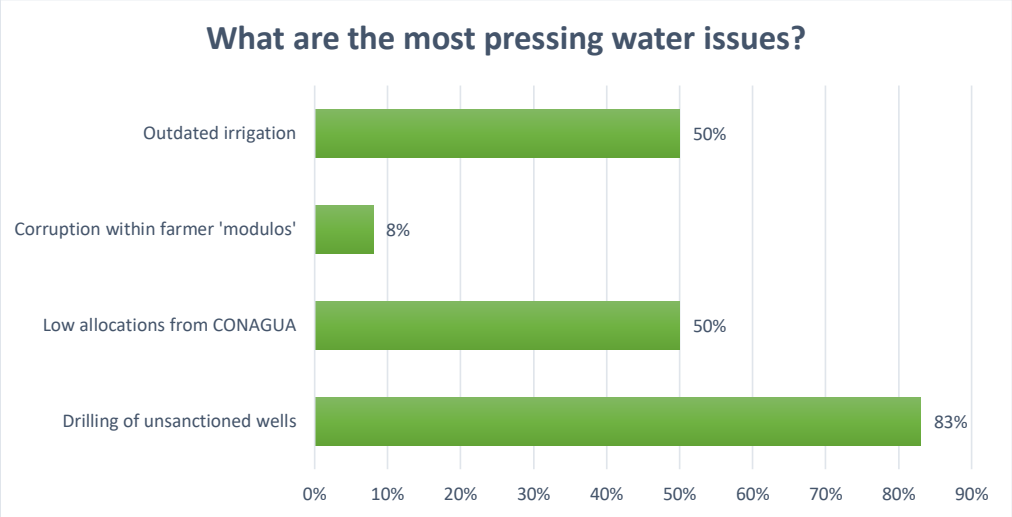
Primary Research from Chihuahua, Mexico

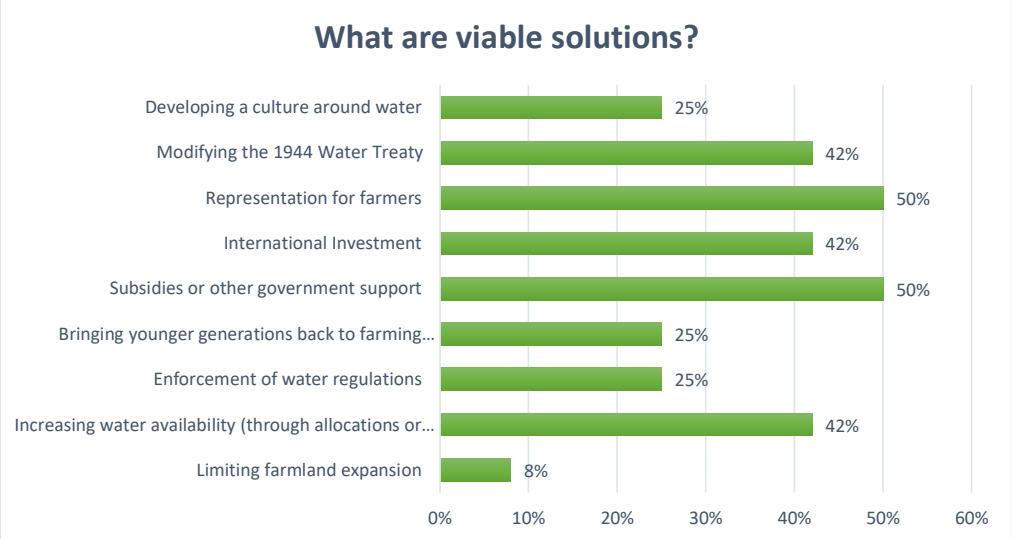
Phil Gurley
THE UNIVERSITY OF TEXAS AT AUSTIN | THE LBJ SCHOOL OF PUBLIC AFFAIRS

Abstract: The economy of Chihuahua is supported by agriculture and manufacturing, with around 80 percent of water used by the agricultural sector. In October of 2020, farmers overtook La Presa Boquilla to voice their frustrations at Mexico's water repayment to the U.S. on behalf of the 1944 Water Treaty. Years of insufficient water allocations from CONAGUA and worsening drought in the Rio Conchos basin is impacting Chihuahuan farming communities. Water-intensive agriculture and manufacturing are expanding in the region, but farmers are receiving reduced surface water allocations. Without sufficient surface water, farmers are turning to groundwater as their primary source of irrigation. Aquifer extraction rates are greatly exceeding recharge rates, partially due to the widespread use of unsanctioned groundwater wells. Chihuahuan officials predict as much as 50% of the groundwater used for irrigation is from unsanctioned wells. Farmers understand the unsustainability of negative groundwater extraction and water-intensive farming. But, their crops are their livelihood, and they are seeking a voice in water allocation and investment decisions to shape the future of their region.

Data:







Key Takeaways:

- Farmers are frustrated by water intensive enterprise in their region, such as the Heineken plant in Meoqui. The factory uses two liters of water for every liter of beer it produces, or around 60 L/s.
- Farmers in the Rio Conchos basin are divided into two groups, alfalfa and vegetable farmers, and nut tree farmers. The latter is much more lucrative, but both types of crops are water intensive.

- Groundwater is being extracted at well above aquifer recharge rates. Some farmers are using wells sanctioned by CONAGUA, but around 50% of groundwater is being pumped by unsanctioned wells. There is a general lack of regulation around groundwater wells because of the minimal CONAGUA presence in the region, and because farmers are hiding their unsanctioned wells.
- Farmers and officials are aware of the effects of climate change, such as less annual rainfall and prolonged drought. Some are pursuing organic production systems or methods of moisture retention for their soil, such as composting.
- Chihuahua is poised to faced severe water shortages without action. There is a dire need to advance irrigation systems and regulate unsanctioned wells. Although farmers are upset with the lack of government support, they view the government as key in solving this crisis.
- Farmers want a say in water allocation and investment decisions. They envision an autonomous committee where they would have authority, or a new water agency that could include the ideas and opinions of farmers from the US, Mexico, and Canada.

Can someone not satisfied with the actions of the Watermaster appeal?

- Yes, the water code and agency rules stipulate that a person dissatisfied with any action of a watermaster may apply to the executive director for relief under the Texas Water Code, §11.326.

Why did Texas agree to accept San Juan water, credit the same as diverted toward Mexico's deficit and not designate the diversions as no-charge water?

- Like in 2005, the utilization of San Juan water was an integral part of a greater discussion and negotiation with Mexico to resolve in a more sustainable manner the issue of frequent deficits and negative impacts to Texas Rio Grande water right holders.
- Resolution of non-compliance with the Treaty is key to providing greater certainty to Mexico water deliveries for the benefit of Texas water users
- Such utilization was made in what those involved in the discussions and decisions believed to be the most equitable manner.

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6/1/2022

Qualitative Coding Analysis

Primary Research from Chihuahua, México

Phil Gurley
THE UNIVERSITY OF TEXAS AT AUSTIN | THE LBJ SCHOOL OF PUBLIC AFFAIRS

Phil Gurley

Qualitative Coding Analysis

Research Design

Purpose: Understand the current situation of drought along the Rio Conchos and how low water allocations are affecting farmers by gathering information on the needs and misconceptions on the agricultural sector, including the economic impacts of less water and farmers' understanding of and response to climate change.

Techniques: Conducted 12 interviews with a diverse range of stakeholders in Chihuahua. Interviews included university researchers, farmers, agricultural leaders, elected officials, and state government officials. All interviews used a list of set questions (different for farmers and officials) but other questions were also asked depending on the direction of conversations.

Methodology: Recorded interviews, written observations, and pictures.

Location: Chihuahua, Delicias, Julimes.

Timeline: March 15th to 19th, 2022.

Measurement: A range of opinions, outlooks, perspectives, and data from stakeholder interviews.

Analysis: Qualitative coding analysis dividing research into themes. The five themes are: economic development, farm operations, irrigation and water distribution, climate change, and solutions and outlook.

Interview Subjects

Salvador Alcantar: Director, Secretary of Rural Development, Department of Agriculture

Mario Mata: Federal Congressman representing Chihuahua

Mario Trevizo: General Attorney UACH

Flor Sigala: Julimes Municipal Union

Roque Martinez: Engineer for JCAS

Dr. Carlos Manjarrez: UACH Researcher

Andrés Valles: Agricultural Leader, Delicias

Miguel Maciel: Farmer, Module 7

Don Pablo: Alfalfa Farmer, Julimes

Elizabeth Roacho: Farmer

Nicolas Koturakis: Nut Farmer, Chihuahua

Sachel Sánchez: Nut Farmer, Delicias

Ernesto Muñoz: Nut Farmer, Delicias

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Themes

Economic Development

The economy of Chihuahua is supported by agriculture, manufacturing, and tourism. Around 80% of water used in Chihuahua is for agriculture and more innovation is needed to ensure the responsible development of the Chihuahuan farming sector. Although agriculture has historically lagged in development, the expanded presence of agribusiness has forced some innovation.

One example is the Heineken Factory in Meoqui. The factory is a point of contention among farmers in the Rio Conchos basin and officials in Chihuahua, and farmers felt excluded from the approval of the factory. Farmers point to the factory's excessive water use and even believe the presence of the factory has pushed farmers to start building unsanctioned wells on their land to guarantee irrigation water. Separately, officials view the Heineken Factory as the future of industry in the Conchos Basin. Officials point to the important economic and labor benefits of the factory and the sustainable water use practices put in place by Heineken. The factory uses two liters of water for every liter of beer produced and has a wastewater plant on-site.

Interviewees also discussed outdated infrastructure, particularly the age of the Chihuahua's dams and the lack of investment by the government in rural areas.

Key Quotes:

- industry
    - Dr. Carlos Manjarrez: "The state of Chihuahua has two very important natural development pillars: One is tourism, the other is agriculture."
    - Roque Martinez: "Agribusiness forces technological innovation and market innovation you will not continue to produce what the market no longer demands of you, and you will not continue to reproduce techniques that make you lose money."
    - Roque Martinez: "There is a mining operation that takes care of its environment and manages its emissions correctly, both atmospheric and water, it does not have to be in any trouble. They are the ones who offer employment and with good management we set the example the brewery that requires water, they need it in their processes for training for treatment systems of the generation of jobs. "
    - Roque Martinez: "I think there is going to be a situation that is going to accelerate the process of technification and industry that has a lot to do with intergenerational change."
    - Flor Sigala: "Here if someone to say agriculture comes a company here in Julimes to link, a company to produce something such as the nut, I mean an investment that would be very good to activate the economy in places and investment and more, because yes the foreigner is much better because of this too."
    - Nicolas Koturakis: "80% of the water available or little more in this desert state is used to produce food. Another 10% for industry, 85 + 10% and only 5% for human consumption."
    - Dr. Carlos Manjarrez: "I stopped using the term sustainability because politicians, academics, researchers, and reporters used them interchangeably and now I tell them better than talking about responsible development without exploiting nature. "

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- New industry
    - Heineken Factory
        - Sachel Sanchez: "I don't understand who opened doors for the brewery. They put themselves in a state of being. They consume a lot of water and have to make wastewater for wastewater treatment. But it does consume one hundred percent and twenty percent. It is what recycling is doing for the wastewater, but everything else it is consuming then also has a lot to do and will be fine opening another new plant that I do not know does not consume at zero that I know if they say that I do not understand and continues, and it is a very big problem. "
        - Don Pablo: "Very, very bleak. Because precisely now, when we have a bad problem with water, governments somehow authorized the Heineken brewery. And that brewery absorbs the water that we had. That voice, that beer. This Meoqui is consuming too much water then and the soils are and treating us so sucking it up and it is not directing at all. The Government authorized it. It's them, and now everyone is going to be a positor."
        - Salvador Alcantar: "The future is more in the industry or it is to change more things as well. Well, we cannot go fighting with the industry but we can however demonize them a lot. But if we do a measurement of the water [Heineken Plant], the water they use to make about 70 or 100 hectares but it gives life to many farmers so that they go get a lot of workers and this creates jobs directly and indirectly because they are buying barley and other things. "
        - Salvador Alcantar: "I think that all the farms must go hand in hand with both agricultural holdings and in this case the industry has to arm itself and find a way to control it."
        - Roque Martinez: "You are using four for a production of high added value to a primary activity ... for an industry that generates formal jobs that develops a value-added network from primary production to its commercialization in your final product, that is, those are the chains that you must develop throughout the state and not only exclusive beer, but for all products we will talk about the production of cotton for example. How many millions of pesos, how much social welfare are we producing when we are putting four wells at 120 liters per second compared to how much [cotton] they produce and cultivate and how many hectares of alfalfa can be compared for how much reaches 44 groundwater wells that generate tons economically…never towards agribusiness. We are in the century of industrialization. "
        - Roque Martinez: "Heineken must be considered an agribusiness not to categorize it as a polluting industry because the 60 liters per second that absorbs which atom today are effectively sent to the atmosphere. In truth 30% evaporates what evaporation is if not incorporated into the hydrological cycle is what is represented and 50% of 30 liters per second is reused with a treatment system so the cycle can be used for agricultural production, but it is badly stigmatized, or we can say it because neither industry nor governments have been able to raise awareness so that society understands."
- Outdated Infrastructure

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- Miguel Maciel: "The Boquilla Dam is already more than one hundred and ten years old like one hundred and ten years old, right? And up to a hundred years that is the only good dam and Las Virgenes Dam, must have 60 years or more. And [AMLO] hasn't done any agricultural infrastructure work here in Chihuahua."
- Ernesto Muñoz: "The current government has no commitment to the countryside."

Farm Operations

Farmers in the Rio Conchos basin are mostly divided into two groups: alfalfa and vegetable farmers, and nut farmers. Both nut and alfalfa farming are water intensive, and one nut can use around 4 gallons of water to produce. Farmers are also pursuing alternative crops, such as asparagus, since it consumes less water and has a higher export price than other produce.

The nut farmers generate significant income since nuts maintain a high export price. These farmers do not want to grow less water-intensive crops, like wheat, because profitability will decline. Some farmers noted that their nut trees are experiencing water stress from less irrigation water and therefore harvests have been less. Several farmers spoke to the role of Indigenous labor on nut farms and how many farmers exploit them as cheap labor. Furthermore, nut farmers promoted the perennial nature of their trees, which helps to build soil structure and reduce erosion and runoff.

Alfalfa farmers generate less income since alfalfa is sold cheaply as cattle feed. As farmers struggle with low water allocations, they may only water their fields once monthly, even though alfalfa should be watered several times a month. Also, alfalfa farmers use little to no additional labor, instead relying on tractors for planting and harvesting.

The town of Julimes has an Indigenous representative who is trying to reduce the exploitation of the Indigenous labor force.

<u>Key Quotes:</u>

- Farming
  - Andrés Valles: "What crops can I sow that earn more with the water that goes to me? Nothing."
  - Don Pablo: "With the Ukrainian war. Forty percent of the fertilizers come from Ukraine and Russia…here right now, and they increased one hundred and twenty percent. So, what are we going to throw into the fertilizer for alfalfa? Forty percent of the corn also comes here. All this comes to increase the cost of feeding the cattle here."
  - Roque Martinez: "I'll comment without knowing the experience you had yesterday with Don Pablo, but I think don Pablo use pea fertilizer and I don't think his production is organic. I wish they made it organic even I am not a tractor I do not use fuel I do not use chemical fertilizers I do not use and tell me and organic productions is used by a culture that no longer exists today."
- Types of farmers
  - Walnut/Walnut
    - Miguel Maciel: "The state of Chihuahua is number one in nut production and the world level in quality. Now because to crops with high water consumption because it is the most profitable. It is the most profitable. If we go back to

wheat, I absorb. If less water is used, but economically it is not profitable for the farmer."

- Ernesto Muñoz: "Hopefully this year another crop does not die because already last year I lost crop because in all the plots there are nut tree rise and it is because of water stress. I know if we continue with this same level, probably in five years there will be no more. "
- Salvador Alcantar: "We are for the water that is produced in the upper basin and that water is being used there because many demonize it, but this one is like Satan and it demonizes the cultivation of walnut. Many tell me hey why walnut trees, but if we see the phenomena of the water cycle, the walnut trees also send the water they take into the atmosphere in the form of a vote and also capture carbon."
- Dr. Manjarrez: "Right now we did a mathematics that a nut takes 4 gallons of water to produce, then that nut that is worth about 50 cents and it used $20 in water. Do not forget 20 liters is 5 cents and part of the New Vision of the issue of food products where the planning gives you value. How important right now is the socio-environmental part where you are going to mark at the tip of the spear for the next generations."
- Nikolas Koturakis: "Where a series of drillings have already been authorized and they are already disgracing the culture. Yes, in the walnut zone if there are surface water pollution problems they are not solved."
- Nicolas Koturakis: "It may be a crop that consumes a lot of water, but to say walnuts in Chihuahua yes, because Chihuahua has the agro-climatological conditions to produce the best best nuts in the world. You see, and you have to produce nuts. Here the issue, this Water Institute and the Planning Directorates of the federal and state agricultural areas should be planning to how far to promote the production of nuts. It's a perennial crop."
- Nicolas Koturakis: "Four, four gallons for a nut and how much is a nut worth? Right now, to walk in the arms of when they hold, it is not per kilo, they are MXN $ 3.55 are like 180, it is not per kilo 50 cents, a nut."
- Nikolas Koturakis: "Yes then, for example, an orchard, I have 3,000 trees and yes, but I have 6 people permanently working there, plus all the people I have at harvest times."

- Alfalfa/onion/others
  - Flor Sigala: "I at least see on my land that we are watering once a month since we are not allowed to two or three times a month, it depends."
- Alternative Crops
  - Sachel Sanchez: Right now, we are looking for alternatives that consume less water. One of them is asparagus. See they have been coming from other states to bring us information and there are some good ones from the PRI party—this is the party that I belong to—and we have been trying to get farmers who want to join, so that they can come and settle here because it is a crop that has to be exported quickly."

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        - Sachel Sanchez: "Alfalfa, for example, has an irrigation sheet of like a nine and asparagus has about two and a half or three. So, we're talking about a lot less water."
        - Roque Martinez: "The idea would be that you take the vocation of the soil of our climate to produce those goods and products in the field that demand less water and that gives you a greater added value in the food chain and in the production chain ... in truth, a clear example is the develop the theme of viticulture and the culture of wine which can lead you to a low demand for water for each hectare much lower than that of nut trees, and much less than that of alfalfa."
        - Roque Martinez: "But you can still have the issue of asparagus. if asparagus has a high value in the Sonora market, then it is the one that dominates it. There are arid lands, see here, we also have sandy soils with similar high temperature conditions. Truth is, it would demand less water than what is alone being used for walnuts or for alfalfa or for cotton."
        - Roque Martinez: "Asparagus is an excellent alternative for desert areas and we don't really produce it in Chihuahua."
        - Flor Sigala: "We grow asparagus here in Chihuahua but I have barely had it for a year. But it is not yet being produced on a large scale, so if we are if we get out of that water issue, then yes it would be good if many wanted to participate in growing it. Nothing more than how it is a species of planting and the first year it does not produce anything and the second year it produces little. Many do not want the risk or long-term investment."
    - Mennonites
        - Dr. Carlos Manjarrez: "A little bit the history of Chihuahua, that in nineteen twenty-two or twenty-nine Mennonite colonies arrive, Mennonites arrive, inhabiting the northwest of their favorite state and they are all over the country. Mennonites have the culture of starting a ranch, exploiting the challenges. Of course, soil and water are no longer productive [on their lands]. It has little strength on the ground. The water table comes down and they go somewhere else. Right now, they are already colonizing some parts of the South of the country, including Central America."
        - Ernest Muñoz: "Well, being there, yes, themselves. They are running it two hours from now, up to two hours, but it helps us a lot to have it close because they are suppliers of all kinds of consumption for example for me and the machinery, the inputs, the engine, my pump. They have companies that are already here in the region."
- Work
    - Indigenous work
        - Ernesto Muñoz: "Pure labor, yes. Pure manpower. They are *hardworking* but they are exploited a lot."
        - Don Pablo: "Obviously you have many indigenous people from all over the country. A lot come from Veracruz, from Michoacán, and to tell the truth, the

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indigenous people here in Chihuahua do not enter to work some of them come from here."

- Roque Martinez: "The treatment given to day laborers in any of their ethnic conditions is inhumane, it does not have to be only to the indigenous person, but also to the local resident himself, it is his condition of precariousness of life, which threatens his dignity as well."
- Roque Martinez: "Greater social responsibility, greater dignity to people, is a good source because where they are, they have no source of employment, but not because of that need you would have to exploit it."
- Flor Sigala, on Indigenous representation: "within the Public Administration we have an indigenous representative, she is the one who represents the indigenous culture, and it is through her that we organize ourselves for the different activities they mostly are the ones who work alone. The day laborers are the ones who work in agriculture."

- Manual labor vs. Industrialized farming
  - Roque Martinez: "When someone talks about human resources, they are wrong, humans are not resources, we are people, yes, and dignified treatment is an area of opportunity that is lacking throughout our state and throughout our country, not only in agriculture, but in agriculture it is accentuated. "
  - Roque Martinez: "Should you start considering the high value of an organic agricultural product, also in its character of the treatment and management that is given to the living conditions of those who produce it? No, not more in the chemical or non-chemical component, which brings a product, but in the human or non-human treatment that its production brings. It's a very large area of opportunity. "
  - Elizabeth Roacho: "I hire about 30 people who come from the Sierra every year and last year they talked to me around May-June To ask me for money to send them money to survive in the rest of the year they pay me when where they come and work here because more or less they earn well for the average can be the two of what is earned, but already last year they had to ask me for money to subsist the rest."

Irrigation and Water Distribution/Allocation

Water scarcity is not a new problem in Chihuahua, but the increased exploitation of groundwater is draining aquifers. Farmers in the Rio Conchos basin organize themselves into 'modulos' which distribute CONAGUA's water distributions to farming regions in an irrigation district. But, since more farms are being authorized to operate, and drought is reducing CONAGUA's annual allocations, farmers have less water to irrigate.

Current irrigation systems are outdated, and new technologies are needed, such as precision agriculture. The federal government has provided little recent support to advance irrigation systems. From 1994 to 1995 there was a severe drought and the government provided technical support to upgrade some farmers to pressurized irrigation systems and credits to protect farmers yields. Additionally, international support needs to be improved. NADB has provided investments in the past by supplying

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equipment and infrastructure, but these investments did lead to substantial advancements in water-saving technologies or increased field research.

With less water but more agriculture, some farmers are turning to unsanctioned wells to extract groundwater. Unsanctioned wells are common because them, especially near the Boquilla Dam where cartels apparently control the illicit pumping. Groundwater in the Rio Conchos Basin is being extracted at a non-rechargeable rate and if aquifers begin to run dry it can take months or years for them to recharge.

Andrés Valles and others discussed the 2020 La Boquilla Dam protests and the reasons farmers fought for water. Farmers wanted to maintain the value of their land and felt they should have been consulted in water repayments as required by the Treaty. Farmers also mentioned corruption in CONAGUA, since the agency is using deep that should not be operating, is not enforcing illegal water extractions, is approving more irrigation water for Tamaulipas than Chihuahua, and does not have adequate staff to surveil groundwater extraction.

Key Quotes

- History
    - Salvador Alcantar: "It is worth mentioning that the problem of water in the state of Chihuahua is very much an old problem we can see because it is the only desert that exports water. We are subject to treaties since 1848."
    - Roque Martinez: "Two years ago we were in 2020 all year in drought and we had the dams with enough capacity to see them used rationally however we continue to live with the problem of groundwater for all uses, the use of industry, the use of agriculture, the use of services of any nature restaurants hotels ..."
    - Flor Sigala: "The problem of water in our area is suffering the consequences that we are with very little water; the modules of the irrigation units have to be organized to save the resource and be able to distribute it in a way in which we can take part of the year right now without these rainy moments. It has not rained no rain has fallen we do not have enough water for anything in our municipality."
    - Nicolas Koturakis: "Among the problems I see in the irrigation systems, many more perennial plantations were authorized or built without authorization than there must be an irrigation system that can vary its delivery capacity a lot."
- Investment in irrigation
    - Dr. Carlos Manjarrez: "What about precision agriculture? It is a permanent communication between the plant, the soil and the farmer. What measure the plant when it has, I know how much water I need to give it through remote sensing technology."
    - Andrés Valles: "Well, thirty-one years ago the federal government what we farmers do now was done by the federal government through the Secretariat at the time the Ministry of Culture of hydraulic resources. when they gave us the hydraulic infrastructure, which was the canals, we just had fifteen percent of the canals lined, fifteen percent. Today the farmers the work we have done we have in the irrigation district 005 we have ninety percent of the canals lined."

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  - Andrés Valles: "Many farmers are using contiguous risks, sprinkler irrigation, that is, they make the use of water more efficient. And why this observation? Because chihuahua only rains in three hundred and twenty millimeters of rain in the year on average on average."
  - Ernesto Muñoz: "If you like my intervention, it would be to tell you that we had a severe drought from ninety-four to ninety-five. That year the dam was closed and some support at that time was to implement pressurized irrigation systems. I was one of the people who could count on support from the Government and credits, and I managed to transition to pressurized irrigation system, and many did, but it is still needed. Much more."
  - Salvador Alcantar: "I want to give you an example like him there we have 50 km of cannals of main channels which are in which they are completely lined are this with control gates sockets for the different farms we have 1600 km of secondary channels of which we have this of which we have 1200 lined about a little more than 220 tubed we have little left to be able to comply with these standards. But I think that what we now have to look for in modern irrigation is the pressurization drip or another type of River that forces us to save more volume. Unfortunately, the last years that we have been in agriculture, the irrigation districts have been restricted. For example, last year we had a 70% restriction on volumes in District 005."
  - Roque Martinez: "When we talk about these NADB investments, they historically go to equipment and infrastructure, we have to go more to technological and scientific and social issues, it is welcome and we are very close to the first world. In other words, the greatest technology that can exist is being applied in the United States."
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- Protest
  - Andrés Valles: "Now, what consequences did they have? Well, the dams emptied us... What happens? Yes? Would all the people have taken the water? The farmers of Conchos would not have to irrigate. and our plots or our lands would be worth zero pesos. Because? Because there is no water, for the land is worth nothing."
  - Ernesto Muñoz, on Governor Campos freeing farmers from jail: "Everyone saw it. I did with good eyes. We are waiting because of the promise of her too."
  - Salvador Alcantar: "So all these sets of numbers of offers and these things, well it was coupled with the insensitivity of the governments that we of the Federal Government that we wanted to interview to make a deep analysis of what the treaty is because they never consulted us until they began to send the security of the national guard to protect water in our reservoirs. That was the Las Virgenes Dam and the Presa Boquilla and the diversion dams that I had never known because we are aware that this. It is what gives life to the region ... we have to take care of it because we live there."
- Illegal water extraction
  - Miguel Maciel: "The strongest observation is the federal government. It is that there is a problem for the payment of water. Apart from the fact that it rains little less is the river. From the Boquilla dam to Rio Bravo you are talking about three hundred kilometers away. We are about three hundred and fifty kilometers to the dam. There are many illegal people who do not have the right. Grab water and put pumps in the river and

they are extracting the water which has been the most serious. Because the river does not let the river go naturally. Every kilometer every kilometer downstream, every kilometer increases ten liters of water."

- Miguel Maciel: "Then the river would only bring five to seven cubic meters per second and does not provide them because there are many pumps to the riverbank illegally that do not have permission. The collaboration they have from the federal government is one thing, because the federal government wants the water. They want to come and take the prey out of here…all those who so with a little sucking the water, and that is what generated the conflict between and have not done anything yet to see how it was paid right now. The Treaty is going to see problems again. Maybe in the first five years there are no problems but in the second five, everything."
- Sachel Sanchez: "Right now the excavations are being dug deeper because there are not so many resources, because the water from the dam is not enough and because as we know about the problem of water, because we do not have great resources, this is the limitation right now."
- Don Pablo: "Here as there is no water, because we all made wells. In the unit we made four wells, two with permission from CONAGUA and two to the brave. And there are two, three people who have things in excavations to put their place, a seduction, a little bit."
- Don Pablo: "There have been people who drill a well and make a little house. They have all the pumps and everything in that room. And piping the water from there, this is just one of the many tricks I know of, but it is stealing from ourselves the best."
- Salvador Alcantar: "I think that out of every ten wells that are drilling right now there are 5 irregulars."
- Roque Martinez: "Groundwater should be the source through which it comes without cases of drought. It should not be our ordinary source of supply if you have dams with enough water to supply the population and enough water for food production you should reserve subsurface water for drought cases. However, I also told them that the state of Chihuahua is the only side of the whole country that depends more on groundwater than surface water not only its proportion is 60% subsoil water in all uses and 40% only. The surface for all uses is a very serious issue and the situation of the cities, Ciudad Juárez and Ciudad Chihuahua, concentrate 80% of the population and are supplied 99.9% of groundwater. Then those aquifers of which the water is used I insist should be reserved for cases of drought, but the problem is that they are being depleted by their overexploitation."
- Flor Sigala: "The wells they have Ojinaga are used by the Mennonites. They are the ones who are using the wells and that also some of the localities of them are part of our municipality, but they are authorized by CONAGUA."

- Corruption
  - Ernesto Muñoz: "I would add that there is a lot of corruption, especially in CONAGUA. There are countless deep wells that should not be operating. Many do not have titles and there are many pumps also in the rivers, pumping water from the dammed rivers into the dams everywhere. So, there is no order. It's already gotten out of control. All of that."

- Ernesto Muñoz: "That's right, there are producer organizations, but they are limited right now, and the purpose of the government seems to be to weaken the northern states. In fact, we have come to think that the water conflict was a political conflict, because the president himself on some occasions made statements about the crops, here in the region they had said Tabasco, which is the land."
- Salvador Alcantar: "It is true that the offices of CONAGUA previously serve many people right now who are completely dismantled and do not have enough staff to do the functions of surveillance of operability of many of the work they should be doing and this has given that I say that freedom calls debauchery to see that no one tells you anything what you have to do Because everyone is looking for this one is looking for how extract water to produce."
- Salvador Alcantar: "in the district 025 of Tamaulipas I think there is a mistake. I do not know if it is on purpose or purpose that they should have been considered for urban public use first before agriculture use. Between putting agriculture, urban public use however authorized more water for agricultural use than they had available and then authorizing urban public use put about another 400 million cubic meters."

Climate Change

Farmers are working to counter the effects of climate change with organic production systems and note the absence of government support. Climate factors are out of farmers control, but changing farming methods and adapting to less water can increase production and extend planting seasons. Farmers need to form their own vision of the future since the government is not focused on climate change. For example, President Lopez Obrador's administration is focusing more on drilling new oil wells than harnessing the vast sun and wind resources in Mexico.

Officials pointed to the visible effects of climate change and need for swift action. Annually, farmers have less rain and no frosts, but they are continuing to plant more seeds. There needs to be a push to help farmers adapt to planting with less water and make use of the increasingly scarce resource. In addition to farmers, community members need to learn to take care of the environment. Without this sense of environmental consciousness, change will be slow and drawn out, regardless of government support or not.

<u>Key Quotes:</u>

- Limits
  - Dr. Carlos Manjarrez: "In Chihuahua there is the limitation that we have many opportunities, but this is also a climatic limitation. The alteration of agriculture and ecosystems, undoubtedly yesterday with climate change, and the bad practices that we have carried out in several corners of the world have generated impact on territories such as this state. Fact is, climate change from bad practices does not distinguish a border between countries."
  - Sachel Sánchez: "We need more water through irrigation systems and we are also aware that climate change is generating problems. Our crop yields are falling. We don't know the effect of the specific change, but every year it is manifesting itself in one way or another. and we're trying to counter that with more organic management."

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- Ernesto Muñoz: "What we are doing is changing methods that help with the impact of climate change. But the government is doing nothing."
- Salvador Alcantar: "Well, as I have always said, farmers sow hope because we do not know how it is presented. We are exposed to many factors that we cannot control how are the climatological factors? Well, we are never able to control those, however we are responsible for providing food. Not just the people of Mexico but many of the times as exports to other parts of the world."
- Flor Sigala, on the lack of commitment from the government: "Well, there is much to be done about this lack of commitment from the people to the authorities I believe above all because sometimes our authorities at the top do not want to support the ways to take advantage of the energy of the sun the air and if you still want to handle fuels, then that is not a good or technological thing or you do not want to advance or want the future of agriculture in the Conchos Basin. That its vision for the future."
- Elizabeth Roacho: "We don't have to build a wall on the border like that because climate change doesn't distinguish between a line or a wall."

- Effects
  - Don Pablo: "Now ten times more seed is sown and there are no frosts anymore. It does not help that the last rain will be in September. December is money, frost and snow. And now it is aerial from the diversity of and the climatic changes that have occurred."
  - Salvador Alcantar: "Right now the problem of water is very serious. I think I am already sure that climate change has reached us, and I think that there climate change is playing a very important role in the decreased volumes during the rainy seasons. This is bringing rains droughts that lead to longer droughts. And well, here in this region we have to play with what we have and try to make a better and greater use of the waters we have, that is, we have to make good use of good distribution and save the little [water] we have."
  - Flor Sigala: "It was being seen by me and I least know that problem and I know how for 8 years we lacked a lot of awareness [of climate change]. There is still much to do on this issue. People really do not know what is affecting us and they are not taking care of our environment and ecology because there is a lot left and because we have already seen the changes. When it has to be cold it is not, and when it has to be hot it is not cold."
  - Sachel Sánchez: "Most farmers are not doing or acting. We are giving alternatives such as changing the soil, this is my focus. In changing the structure of the soil so that it has a greater retention of moisture. Because of climate change, apart from that it has been very hot, while in other years it has not."
  - Ernesto Muñoz: "We depend on the rain and nobody knows if there will be one, but what is certain is that there is a climate change. So, it's a very uncertain and dark time."

Solutions & Outlook

A key takeaway from the outlook of farming in the Rio Conchos Basin are the contradicting views of Dr. Carlos Manjarrez and Andrés Valles. Dr. Manjarrez believes there should be a limit on agricultural production because technological advances to improve water-use on farms are not enough to counter strained water resources. Andrés Valles believes the maximum amount of irrigable area should be

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planted with the water that is available through technological enhancement of irrigation and water distribution systems.

Looking to the future, farmers and officials have a bleak vision for Chihuahua. Without strong enough motivation to combat drought and climate change, and little enforcement from the federal government on agricultural and water regulations, Chihuahua will face severe water shortages. Furthermore, younger generations are leaving the countryside to seek opportunities in urban areas.

Yet, some officials view the flock of younger generations from rural to urban areas as an opportunity, since the younger generation has a stronger connection to climate change and can bring technical skills back to their rural hometowns. Furthermore, officials note the pressing need for federal and international investment to make water-use more efficient.

Subsidies, or the lack thereof, are another point of contention. Some interviewees believe that government subsidy programs should be expanded to larger farms to account for wasted harvests resulting from low irrigation and drought. Others believe the subsidy system should be scrapped altogether since it stimulates the production of specific products, changing the market value for that product and encouraging farmers to produce low-end food products without a real profit margin.

Furthermore, farmers recognize tensions with the government but understand it is a necessary partner for solving the water crisis. Chihuahua wants to work with the Mexican federal government to launch a water institute to pursue future water solutions with American and Canadian officials. Also, farmers want CONAGUA to establish a representative body where state representatives, including producers, can have a say in water distribution and change the mentality of farmers to promote more efficient production practices. Yet, these proposed changes will require significant federal and international investment.

Additionally, interviewees shared different opinions of the 1944 Water Treaty. Many pointed to the changes that have occurred since the Treaty, such as the effects of climate change and the explosion of agriculture in Northern Mexico after NAFTA. While some believe there needs to be a new Treaty that better fits the times, others feel the Treaty can be enhanced by improving collaboration between CILA, IBWC, and the Mexican government, Farmers can also be involved in a separate commission, and consulted on water allocation decisions. Overall, most interviewees agree there is no tension between Mexico and the US regarding water, but that the struggle is Mexico's to fix.

<u>Key Quotes</u>

- Farming and Outlook
    - Dr. Carlos Manjarrez: "But it is not enough to be technical. A lot of water is still used here to plant the crops. We must, of course, first delimit the agricultural frontier, not grow further. Don't grow anymore because we don't have water."
    - Andrés Valles: "The future would be to support and dignify the maximum the irrigable area for the water that we have, to use less water. More watering on more lands, but with less water."
    - Andrés Valles: "Well, it's going down to those who if they could shift the support of the United States directly to the farmers to be more efficient."

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- Miguel Maciel: "Right now the vegetables, mostly, I think. Ninety percent go to technified irrigation and the vegetable with technified irrigation spends about thirty percent less water with an increase of thirty or forty percent more in harvest. That is, they use less water and produce more."
- Don Pablo: "But yes to our children, because we are going to finish the mantles, okay? We are not going to finish. That is what I see for the future. I see a very bleak future because, well, every day we go backwards, backwards."
- Salvador Alcantar: "Here all the people of the countryside have no income and they go to the big cities, swelling the circles of poverty in the big cities. The completely strong social problem of the countryside is staying with older people, women, and children because this shortage of water is a scarcity of vital liquid."
- Salvador Alcantar: "Also, many parts of the United States that have riverbeds have become latrines where the black waters drain, where the sewage of the big cities arrives. So that is going to be very serious problem we will have, we have to take action now if we are not going to have these problems."
- Salvador Alcantar: "Unfortunately Chihuahua is one of the driest states in the republic. And they are the state that contributes the most to give life to other entities."
- Salvador Alcantar: "I believe in young people but we have to lower as much as possible our experience towards them so that they begin to generate or take the opportunity that we did not make them see, so that they analyze the mistakes we made, and so that they do not fall into the same thing, and begin to look for a better future for the region."
- Roque Martinez: "I would say that in less than 10 years the leaders of agricultural production in the Conchos region are going to be young people of 40 years or less. With this generational change they will have a greater mentality if they are given the necessary conditions for opening business and entrepreneurship. These improvements will be a part of the intergenerational change."
- Roque Martinez: "We can't think that conditions are going to improve in hydrological terms, they will become more expensive. You have to start making more efficient decisions right now since the water has a high cost for the producer. There is going to be a time when it is going to be so high, that they will have to start thinking and implementing what others before thought was crazy. Not giving it the added value is going to be an obligation so that [producers] can cover their total costs of production. But I see it as hopeful. I see it as positive in terms of facing a negative hydrological challenge."
- Flor Sigala: "It's good to change agricultural policies, and changing agricultural policies can improve the ways, not so much in which agriculture is supported, but rather to help me if I am unsure where to go, where are they going to buy me. But, if you do not help me or give me support, then I will be able to with the expenses of the three inputs I have. All fertilizer is very expensive, and the seed too. Right now, I think I need more investments from the United States, Soriana, or an international group."
- Mario Trevizo: "Yes for Chihuahua if it does not rain in the months of April and May then we have a serious supply problem. And if there is no production in the countryside, there is going to be a lot of unemployment, there is going to be hunger."

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- Mario Trevizo: "Now this situation can help us. Instead of people turning to organized crime and trafficking, we can pay them so that food is produced and giving them a salary."
- Mario Trevizo: "Here at the table we carry a proposal from the current state government. They are going to launch a state water institute with the United States, Mexico, and Canada through the federal system. In the federal system because we say this is the responsibility of the national government and all states on issues such as water, health, and safety. We have to transcend. We have to go further."
- Nicolas Koturakis: "The producer feels that there are laws and that they are not applied."
- Nicolas Koturakis: "A territory defines its vocation for the natural resources it has: soil, water, climate, and the skills of people."
- Elizabeth Roacho: "If we don't work together with the government, we won't take care of all areas, including development."
- Dr. Carlos Manjarrez: "Why cling to food sovereignty when I do not have the environmental, social, and economic conditions to be able to produce what fills this dish that I am going to consume."

- 1944 Water Treaty
  - Dr. Carlos Manjarrez: "Seventy years ago when an international water treaty was drawn up between Mexico and the United States, there was no talk of climate change. There was no talk after the population explosion, there was no talk of consumerism, there was no talk of lifestyle. "
  - Dr. Carlos Manjarrez: "That is why I insist to not to enter into conflict with the brothers in the southern United States and those of northern Mexico. Because we have been confronted a lot, like we have to do it. We don't have to fight. We have to agree in order to make a modern treaty in two thousand and thirty—that is in force in the two thousand and thirty."
  - Dr. Carlos Manjarrez: "So this is in my proposal, for through the diplomatic mechanisms that exist between the two nations, the project of a modern treaty can be integrated. There are many actors here in Chihuahua thet you are going to see that say no, no, no. Let the Treaty not be touched because it is good for me. It benefits us. I don't know why. Do not touch, let it stay as it is. He said it, that it be reviewed and that it be modernized with the sense that we all do well. "
  - Andrés Valles on the future of the treaty: "I believe that there should be a good collaboration between the United States, American CILA, Mexican CILA, and the federal government."
  - Ernesto Muñoz: "What has to be reviewed in the treaty? I cannot say if it is flattering for us or for them, but I know that it has to be reviewed. What I can tell you is that the problems that were generated by the treaty were the problems that we made ourselves. It wasn't a problem with the United States. It was decided as political issues and they took us away. The water in the region is our water, [the Treaty] should have been paid for differently. "
  - Sachel Sanchez: "Eighty percent depend on agriculture in this region. We have to review, update and then update more, so now negotiating or reaching an agreement is

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not about not paying. If there is no need to reach an agreement, I do not, we do not give in since we are so harmed by the situation we are experiencing. "

- Salvador Alcantar: "The problem of wanting this is the water of the dams that was detected is from the beginning of the 19th century. You want water to comply with the commitments that Mexico has with the United States. However, it was not like that since it had been fulfilled for five years. And if we see we make accounts of how Chihuahua has behaved, mainly that contributed to the Treaty right now, we should go in the five-year. However, we are 31 for the 36, meaning that we have contributed 15 times more water than is required. However, at that time they argued that it was for that purpose and we saw that it was not for that."
- Salvador Alcantar: "That's why I believe that farmers are the same and our purpose is to get the land fruit to be able to maintain or feed the population. However, there are farmers in Tamaulipas who do not depend on the waters of the treaty because they have other concessions."
- Roque Martinez: "It is a very valid and important agreement that generates natural interaction between the two countries permanently for that there is the IBWC to be able to regulate, but not only goes to the scheme of regulating that compliance but there are also instances such as NADB that helps and finances projects on the border—up to 200 miles from the border—there are projects that are financed with these international resources more effectively than with the pure national or state or private resources."
- Flor Sigala: "Water. We do not have problems. We commission a lot of truth we have tried to manage to raise awareness among the farmers of the chemicals and the fertilizers they use, and all that do not fall to the main ditches because they do pollute."
- Flor Sigala: "Well I say that with the intention of truth, the treaty was made with good intentions and above all that it comes out on one side and recovers. On the other hand, nothing more than if we lack maybe a national commission that involves farmers from the states. I do not know which part is represented so that they can know how it is handled because I think there is a lot of ignorance of that treaty alone."
- Mario Trevizo: "More than half of the territory is desert and yet we have to deliver water for that treaty. When I was a deputy, I put the senate of the republic to join with it because the United States will not be the only mechanism to make a revision of the water treaty because the circumstances of this 21st century are totally different from those of 80 years ago."
- Mario Trevizo: "I would recommend to the dog of the country that the United States government approach be very clear with transparent conditions and specialized scientists and technicians to look for the best way to review treaty waters. Mexico and the United States could get better results for both countries, but above all is advancing the culture of saving water and developing a culture around liquid."
- Nikolas Koturakis: "To say we can't pay, we must have a longer term or we will no longer be able to pay, etc., and not make all the mess that became a political mess when it could have been a technical resolution between the two countries."

- Government assistance

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- Miguel Maciel: "But the question of whether you mean fertilizers or technology equipment to save water? Nothing. Not by the federal government. There is nothing."
- Andrés Valles, thoughts on Governor Maru Campos: "Good, in the question of what those of the farmers and that has helped us, for example, in this agricultural cycle we are going to be given less water and [Campos] was the one who negotiated with the federal government, so we were given a little more water than if they could not give more, than if the relationship or if they couldn't. But there were efforts and the political will to solve this problem. That is, in this year and last year, I do not know, I already say I am with my farmers and I am not taking the water and I am not going to defend it. So, if it is already existing, fulfilling what this moment has promised to be. "
- Andrés Valles: "For example, the subsidies are very few and they are very low, for example, a week ago, they were giving news from Tamaulipas. In Tamaulipas, there is no water. They irrigate much of it from storms. That is, rainwater. Then they said they cannot, there is water but there has not been enough rain, they are given one thousand four hundred and fifty pesos per hectare, less than fifty hectares."
- Andrés Valles: "In 2004, the World Bank and NADB were going to put in about a hundred million dollars for technification. But that was so that less water would be spent. The water from dams was followed, to me, so that there was water so that Mexico could easily pay to comply with the Treaty in relation to the Rio Bravo."
- Ernesto Muñoz: "To begin, it should be an entity formed by the National Water Commission, a representative of the State Government, and a representative of the producers."
- Ernesto Muñoz: "In fact, since the MORENA government came in, there is no agricultural support, all of it went blank. They have taken the few supports that Chihuahua had. None, no machinery, no water, nothing. Although it is true there was not much, there was still agricultural support."
- Ernesto Muñoz: "The government could help by changing the mentality of the people, so that they see the future that in five years we are not going to be efficient, but it does depend a lot, personally, on each farmer. "
- Don Pablo: "Today we will try to solve this problem. We have to change the federal government for us."
- Salvador Alcantar: "But unfortunately we have to seek financing and support from the governments of the states of the federation and I think we have to go to what you say right now about the World Bank and NADB. Why do we have to do that way? Because right now the economic crisis that farmers are going through is a very strong crisis. That the two restricted cycles and the cost of inputs that hits us right now. For example, there are some that have increased up to 200% of 100, to 200% mainly in fertilizers. This nitrogen that practically brought them is imported from Russia and Ukraine and the situation between those countries is directly impacting us here. Then this is a rather delicate situation that is going through the Mexican countryside and particularly in rural agriculture."
- Salvador Alcantar: "Us and farmers already have three years of making a small effort to start working up to reforestation with payment and with gabions, all to avoid erosion.

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And right now, because this year we are going to invest a little more resources to the farmer from the government—the Federal Government and State Government."

- Salvador Alcantar: "We need to update and see the availability of water on both sides of the border... we have to bet on dialogue and not confrontation."
- Roque Martinez: "Here the problem is that you stimulate some products with subsidies that do not have this value in the market. So, you distort that situation and people continue to produce low food and products that do not have a real profit margin."
- Roque Martinez on subsidizing asparagus production: "If it can be stimulated by the subsidies and support then you should carry it out, so that people without the need for a future subsidy can change their production habits both for their types of crops and for their production systems."
- Flor Sigala: "I think there was, with the water last year, the way it was unorganized at the federal level, and I say Federal organization brings your idea if it is true, that sometimes it is abused, that those who have sometimes buy more water do not allow those who have less water. If it is true, then the policies have to change from the federal level to change from the bottom and up."
- Flor Sigala, on minimum prices: "How do you sow without a guaranteed price. And here we do not have [a guaranteed price] to sow if they do well one year, or if I am sending alfalfa, all want to sow because next year is a very hard production year and this does not lower the total price."
- Mario Trevizo: "Governor Maru Campos brings the best of intentions, but memories are scarce and time is running out and the demand of the people will be intense."
- Nicolas Koturakis: "We had talked to some people about the need to make a Water Institute, that is, something with whom you must do the numbering of all opinions and entities, this so that it really becomes a policy, on the one hand, that has a social function."
- Nicolas Koturakis: "There is no support right now for more reasonable, smarter irrigation systems, that is, they stopped giving support for the risks of sprinkling in orchards."
- Nicolas Koturakis: 'I question my leaders a lot because they simply do not do their work, they do not do their job. I tell them that they have to take advantage of, but not exploit, the natural resources that they have, to generate employment and good pay."
- Elizabeth Roacho: "For example, right now we see the issue of security in the part of the mountains and there are tremendously deforested areas. We can think that all the work has to do with me and the other, not because it has to be so far, but because while we are thinking about water in agriculture, we continue to provide reasons I do not even know. They are dying to know how many things are covered by illegal logging and it is tremendous to see what is happening on the land. There is no security and we see it at the national level right now as a country that does not have a government, but that takes care of the security issue that is affecting us a lot."
- Elizabeth Roacho: "I wouldn't want to call it resistance on the part of farmers because many times I have to want to access this technology because it is possible. So, there is no real support from the government."

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The University of Texas at Austin
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6/1/2022

Qualitative Coding Analysis

Primary Research from Chihuahua, México

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Research Design

Purpose: Understand the current situation of drought along the Rio Conchos and how low water allocations are affecting farmers by gathering information on the needs and misconceptions on the agricultural sector, including the economic impacts of less water and farmers' understanding of and response to climate change.

Techniques: Conducted 12 interviews with a diverse range of stakeholders in Chihuahua. Interviews included university researchers, farmers, agricultural leaders, elected officials, and state government officials. All interviews used a list of set questions (different for farmers and officials) but other questions were also asked depending on the direction of conversations.

Methodology: Recorded interviews, written observations, and pictures.

Location: Chihuahua, Delicias, Julimes.

Timeline: March 15th to 19th, 2022.

Measurement: A range of opinions, outlooks, perspectives, and data from stakeholder interviews.

Analysis: Qualitative coding analysis dividing research into themes. The five themes are: economic development, farm operations, irrigation and water distribution, climate change, and solutions and outlook.

Interview Subjects

Salvador Alcantar: Director, Secretary of Rural Development, Department of Agriculture

Mario Mata: Federal Congressman representing Chihuahua

Mario Trevizo: General Attorney UACH

Flor Sigala: Julimes Municipal Union

Roque Martinez: Engineer for JCAS

Dr. Carlos Manjarrez: UACH Researcher

Andrés Valles: Agricultural Leader, Delicias

Miguel Maciel: Farmer, Modulo 7

Don Pablo: Alfalfa Farmer, Julimes

Elizabeth Roacho: Farmer

Nicolás Koturakis: Nut Farmer, Chihuahua

Sachel Sánchez: Nut Farmer, Delicias

Ernesto Muñoz: Nut Farmer, Delicias

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Themes

Economic Development

The economy of Chihuahua is supported by agriculture, manufacturing, and tourism. Around 80% of water used in Chihuahua is for agriculture and more innovation is needed to ensure the responsible development of the Chihuahuan farming sector. Although agriculture has historically lagged in development, the expanded presence of agribusiness has forced some innovation.

One example is the Heineken Factory in Meoqui. The factory is a point of contention among farmers in the Rio Conchos basin and officials in Chihuahua, and farmers felt excluded from the approval of the factory. Farmers point to the factory's excessive water use and even believe the presence of the factory has pushed farmers to start building unsanctioned wells on their land to guarantee irrigation water. Separately, officials view the Heineken Factory as the future of industry in the Conchos Basin. Officials point to the important economic and labor benefits of the factory and the sustainable water use practices put in place by Heineken. The factory uses two liters of water for every liter of beer produced and has a wastewater plant on-site.

Interviewees also discussed outdated infrastructure, particularly the age of the Chihuahua's dams and the lack of investment by the government in rural areas.

Key Quotes:

- industry
    - Dr. Carlos Manjarrez: "El estado de Chihuahua tiene dos pilares de desarrollo naturales muy importantes Uno es el turismo, el otro es la agricultura."
    - Roque Martínez: "Agroindustria obliga a la innovación tecnológica y a la innovación del mercado no vas a seguir produciendo lo que ya no te demandan mercado y no vas a seguir reproduciendo técnicas que te hacen perder dinero."
    - Roque Martínez: "Está una operación minera y que cuida su entorno y maneja sus emisiones de manera correcta tanto las atmosféricas como las de carácter hídrico no tiene porqué ser en ningún problema. Son los que detonan el empleo y con un buen manejo ponemos el ejemplo la cervecería ponemos él siempre la minería industria de la metalmecánica verdad que quieres en el Ford Motors en la era espacial requieren agua lo necesitan en sus procesos para entrenamientos para sistemas de tratamiento de la generación de los empleos."
    - Roque Martínez: "Creo que va a haber una situación que va a acelerar el proceso de la tecnificación y de la industria que tiene mucho que ver con el cambio intergeneracional."
    - Flor Sígala: "Aquí si alguien por decir de agricultura llega una empresa aquí en Julimes para enlazados, una empresa para producir algo en la nuez no sé Dale o el procesamiento O sea quiero una inversión eso sería muy bueno para activar la economía en sitios y la inversión y más, pues sí el extranjero mucho mejor porque así también."
    - Nicolas Koturakis: "80% del agua disponible o poco más en este Estado desértico se utiliza para producir alimentos. Otro 10% para la industria, 85 + 10% y solamente un 5% para consumo humano."

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- Dr. Carlos Manjarrez: “Yo deje de utilizar el término sustentabilidad y sostenibilidad porque los políticos, los académicos, los investigadores, y los reporteros, los utilizaban de forma indistinta y ahora yo para hablar de un desarrollo sustentable les digo mejor que hablar de un desarrollo responsable aprovecha sin explotar la naturaleza.”

- New industry
  - Heineken Factory
    - Sachel Sánchez: "Yo no entiendo quien abrió puertas para que me ha cervecería. Se pusieran en un estado de serlo. Consumen muchísima agua y tienen para hacer aguas residuales para tratado de aguas residuales. Pero es de consumen un del cien por ciento están un veinte por ciento. Es lo que están haciendo para el de las aguas residuales los reciclados, pero todo lo demás están consumiendo los entonces a también tiene muchísimo que ver y estará bien abriendo otra planta nueva que yo no sé no entiende en cero que se si dicen que no entiendo y sigue y es un problema muy grande."
    - Don Pablo: “Muy, muy desolador. Porque precisamente ahora, cuando mal problema tenemos con el agua Los gobiernos de alguna forma autorizaron la cervecería Heineken. Y esa cervecería absorba el agua que teníamos nosotros. Esa voz, esa cerveza. Este Meoqui está consumiendo demasiada agua entonces y los suelos nos están y tratando tan chupándole arriba y no es este detectando para nada. El Gobierno autorizó. Es el, y ahora todos a ser pósitos.”
    - Salvador Alcantar: ”El futuro es más en la industria o es para cambiar más cosas como así bueno no podemos ir peleados con la industria, pero podemos ir sin embargo satanizan mucho. Alazán planta Heineken, pero si hacemos una medición del agua es el agua que usan para hacer unos 70 o 100 hectáreas, pero les da vida a muchos agricultores de forma de ir a mucha trabajadora crea empleos de forma directa y la indirecta porque están comprando la cebada y otras cosas.”
    - Salvador Alcantar: “Creo que deben de ir de la mano la todas las explotaciones tanto agrícolas este pecuarias y en este caso la industria tiene que armarse y buscar la manera de que haya un control.”
    - Roque Martínez: “Estás usando cuatro para una producción de alto valor agregado a una actividad primaria… por una industria que genera empleos formales que desarrolla una red de valor agregado desde la producción primaria hasta su comercialización en tu producto final verdad, o sea esos son las cadenas que debes desarrollar en todo el estado y no nomás exclusivo el cerveza es para todos los productos llegaron al final vamos a hablar de la producción del algodón si realmente estamos vendiendo en fresco por ejemplo Cuántos millones de pesos Cuántos bienestar social está produciendo están poniendo cuatro pozos 120 litros por segundo en comparación a cuánto producen cultivas alabanzas con cuántas hectáreas de alfalfa se puede comparar para cuantas alcanza en 44 pozos y que generan en toneladas económicamente nunca hacia la agroindustria estamos en el siglo de la industrialización. ”

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        - Roque Martínez: “Heineken debe considerarse una agroindustria no categorizar la como una industria contaminante incluso de los 60 litros por segundo que absorbe qué átomo hoy en día efectivamente se mandan a la atmósfera verdad el 30% se evapora qué es la evaporación si no incorporar al ciclo hidrológico es de lo que se representa y el 50% 30 litros por segundo lo regresa con un sistema de tratamiento al ciclo que puede ser aprovechado para la producción agrícola pues está mal estigmatizada, o podamos decirlo porque no han sido capaces ni la industria ni los gobiernos de sensibilizar para que la sociedad entienda.”
- Outdated Infrastructure
    - Miguel Maciel: "Inclusivo en la presa boquilla ya tiene más de ciento diez años como ciento diez años, ¿verdad? Y arriba a cien años que es la única presa bueno y las vírgenes que debe tener que 60 años otro llámanos e intentaré. Y no ha hecho ninguna obra de infraestructura del agrícola aquí en Chihuahua."
    - Ernesto Muñoz: "El Gobierno actual no tiene ningún compromiso con el campo."

Farm Operations

Farmers in the Rio Conchos basin are mostly divided into two groups: alfalfa and vegetable farmers, and nut farmers. Both nut and alfalfa farming are water intensive, and one nut can use around 4 gallons of water to produce. Farmers are also pursuing alternative crops, like asparagus since it consumes less water and has a higher export price than other produce.

The nut farmers generate significant income since nuts maintain a high export price. These farmers do not want to grow less water-intensive crops, like wheat, because profitability will decline. Some farmers noted that their nut trees are experiencing water stress from less irrigation water and therefore harvests have been less. Several farmers spoke to the role of Indigenous labor on nut farms and how many farmers exploit them as cheap labor. Furthermore, nut farmers promoted the perennial nature of their trees, which helps to build soil structure and reduce erosion and runoff.

Alfalfa farmers generate less income since alfalfa is sold cheaply as cattle feed. As farmers struggle with low water allocations, they may only water their fields once monthly, even though alfalfa should be watered several times a month. Also, alfalfa farmers use little to no additional labor, instead relying on tractors for planting and harvesting.

The town of Julimes has an Indigenous representative who is trying to reduce the exploitation of the Indigenous labor force.

<u>Key Quotes:</u>

- Farming
    - Andrés Valles: "Que cultivos siembro que puedan ganar más con el agua que me? Va nada."
    - Don Pablo: "Con la guerra Ucranio. El cuarenta por ciento de los fertilizantes vienen de Ucrania y Rusia, y aquí ahorita y a los aumentaron el ciento veinte por ciento. Entonces Qué le vamos a echar a la alfalfa de fertilizante Un cuarenta por ciento del maíz viene también para acá. Todo eso viene a incrementar el costo de la alimentación del ganado Lógico y para acá."

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- Roque Martínez: “Actúas comentario creo sin conocer la experiencia que tuvieron ayer con Don Pablo, pero yo creo que Don Pablo usarte guisante sé no creo que su producción sea orgánica. Ojalá lo hicieron orgánico siquiera yo no soy tractor yo no uso combustible yo no uso fertilizantes químicos yo no uso y decirme Y producciones orgánicas y está hecha con una cultura que ya no existe hoy en día.”

- Types of farmers
  - Nuéz/Nogal
    - Miguel Maciel: “"El estado de Chihuahua es el número uno en producción de nogal y el nivel mundial en calidad. Ahora porque a cultivos de alto consumo de agua porque es lo más rentable. Es lo más redituable. Si volvemos al trigo, absorbo. Si se utiliza menos agua, pero económicamente no es rentable para el agricultor.”
    - Ernesto Muñoz: "Esperemos este año no muera otra parte porque si ya el año pasado un pues en todas las parcelas hay nogales alzarnos y es por estrés de agua entonces se si seguimos con este mismo nivel, probablemente en cinco años no haya ver."
    - Salvador Alcantar: “Nosotros para el agua que se produce en la Cuenca alta y la que están usándose ahí pues no es un muchos la satanizan, pero éste está como satanás y satanizar en el cultivo en nogal muchos me dicen oye porque nogales, pero si vemos los amemos fenómenos del ciclo del agua. Los nogales la agua que toman también la mandan a la atmósfera en forma de votación y también capturan carbono.”
    - Dr. Manjarrez: “Ahorita hacíamos una matemática de que una nuez se lleva 4 galones de agua entonces una nuez que vale 50centavos se lleva a cantidad de agua en $20 no perdón 20 litros en 5 centavos parte del de la Nueva Visión del tema de productos alimentos donde la planeación y darle valorar lo importante que ahorita es la parte socioambiental vayas a ir marcando a punta de lanza en las próximas generaciones.”
    - Nikolas Koturakis: “En donde ya se han autorizado una serie de perforaciones que ya están desgraciando la cultura. Sí, en la zona de la nuez si hay problemas de contaminación de aguas superficiales que no se resuelven.”
    - Nicolas Koturakis: “Puede ser que sea un cultivo que consuma mucha agua, pero por decir nueces en Chihuahua sí, porque Chihuahua cuenta con las condiciones agro-climatológicas para producir las mejores almendras para mejores nueces del mundo. Ves y hay que producir nueces, aquí el tema es que ese Instituto del Agua con las direcciones de Planeación de las áreas de agricultura federal y estatal, debieran estar planeando hasta donde fomentar la producción de nueces. Es un cultivo perenne.”
    - Nicolas Koturakis: “¿Cuatro, cuatro galones por una nuez y cuánto vale una nuez, una nuez, una nuez? Ahorita de andar en los brazos de cuando se aguantan, no es por kilo, son MXN$ 3.55 son como 180, no es por kilo 50 centavos, una nuez.”

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- Nikolas Koturakis: “Sí entonces, por ejemplo, una huerta, yo tengo 3000 árboles y sí, pero tengo permanentemente 6 gentes trabajando ahí, más toda la gente que tengo en las épocas de cosecha.”

- Alfalfa/onion/others
  - Flor Sígala: “Yo a lo menos lo que en mi tierra estamos regando una vez al mes lo que nos están permitidas regando dos o tres veces al mes depende.”
- Alternative Crops
  - Sachel Sánchez: Ahorita se está buscando alternativas que consuman menos agua. Una de ellas es el espárrago. Ver han estado viniendo de otros estados para traernos información y hay algunos este buenas por parte del partido del PRI es que yo pertenezco el también el partido y hemos estado intentando conseguir agricultores que quieran unirse. para que puedan venir a establecerse aquí porque es un cultivo que se tiene que exportar rápido.”
  - Sachel Sánchez: "La alfalfa algún ejemplo, tiene una lámina de riego de como un nueve y el espárrago tiene como en dos y medio tres. Entonces hablamos de muchísimo menos agua."
  - Roque Martínez: “La idea sería que tomes la vocación del suelo de nuestro clima para producir aquellos bienes y productos del campo que demandan menos cantidad de agua y que te dan un mayor valor agregado en la cadena alimenticia y en la cadena de producción… verdad un ejemplo claro es la bici para desarrollar el tema de la vitivinicultura la cultura del vino te lleva a una baja demanda de agua por cada hectárea, mucho menor que la del nogal mucho menor que la de la alfalfa.”
  - Roque Martínez: “Pero igual puedes tener el tema del espárrago si el espárrago tiene un alto valor en el mercado Sonora es el que lo domina son terrenos áridos ver aquí tenemos suelos también arenosos con condiciones de temperatura alta similares verdades y que te demandarían menos agua que lo que está solita empleando edad para el nogal o para la alfalfa para el algodón.”
  - Roque Martínez: “El espárrago es una excelente alternativa para zonas desérticas y no producimos realmente en Chihuahua.”
  - Flor Sígala: “Nosotros el espárrago aquí en Chihuahua Apenas llevo un año que lo tengan, Pero todavía no se está produciendo sí estamos si salimos de ese tema y sí estaría bien que muchos quisieran participar nada más que cómo es una especie de lo siembras y el primer año no da nada y el segundo año dar poquito muchos no quieren arriesgarse y por la inversión.”
- Mennonites
  - Dr. Carlos Manjarrez: “Un poco la historia de Chihuahua, que en mil novecientos veintidós o veintinueve llegan las colonias menonitas, llegan los menonitas, habitarse el noroeste del estado favorito es y hay por todo el país menonitas y ellos y tienen la cultura de llegar a ser un rancho, explotar el reto. curso. Suelo y agua terminan ya no es productivo. Está poco fuerte en el suelo. El manto freático bajó y se van a otro lugar. Ahorita ya están colonizando algunas partes del sur del país, incluso de Centroamérica."

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        - Ernest Muñoz: "Bueno, estando allá sí, sí mismos. Están ejecutarla dos horas de aquí hasta dos horas. Pero nos ayuda muchísimo tenerlo cerca porque son proveedores de todo tipo de consumos por ejemplo a mí y maquinaria, insumos El motor de mi bomba. días la, en la bomba en su verías todo les compró a ellos. Tienen ellas empresas que ya están aquí en la Región."
- Labor
    - Indigenous labor
        - Ernesto Muñoz: “Pura mano de obra Si. Pura mano de obra. Son trabajadores Son *hardworking,* pero los sobre explotan mucho.”
        - Don Pablo: "Obviamente tiene muchos indígenas de todo el país. Viene mucho de Veracruz, de Michoacán, y, a decir verdad, los indígenas de aquí de Chihuahua no entran a trabajar algunas vienen las gentes de por allá."
        - Roque Martínez: “Es inhumano el trato que se le da a los jornaleros en cualquiera de sus condiciones étnicas, no tiene que ser únicamente a la persona indígena, también a la, al propio residente local, es su condición de precariedad de vida, lo que atenta contra su dignidad también.”
        - Roque Martínez: “De mayor responsabilidad social, de mayor dignidad a las personas, es una buena fuente porque en dónde están, no tienen fuente de empleo, pero no por esa necesidad tendrías que explotarlo.”
        - Flor Sígala, on Indigenous representation: “dentro de la Administración pública tenemos una representante indígena ella es la que representa la cultura indígena y es a través de ella que nos organizamos para las diferentes actividades ellos en su mayoría si son los que trabajan solos los jornaleros son los que trabajan tanto la agricultura.”
    - Manual labor vs. Industrialized farming
        - Roque Martinez: “Cuando alguien habla de los recursos humanos está equivocado, los humanos no somos recursos, somos personas, sí, y el trato digno es un área de oportunidad que en todo nuestro estado y en todo nuestro país se carece, no nomás en la agricultura, sí, pero en la agricultura se acentúa.”
        - Roque Martinez: “¿Deberías de empezar a considerar el alto valor de un producto agrícola orgánico, también en su carácter del trato y del manejo que se le da a las condiciones de vida de quienes producen en él? No, no más en el componente químico o no químico, que trae un producto, sino en el trato humano o no humano que trae su producción. Es un área de oportunidad muy grande.”
        - Elizabeth Roacho: “Yo contrato alrededor de 30 gentes que vienen de la Sierra cada año ya el año pasado me hablaron por ahí te mayo-junio Para pedirme dinero que les mandara dinero para subsistir en el resto del año me lo pagan cuando dónde vienen y trabajan acá porque más o menos ganan bien para el promedio puede ser los dos de lo que se gana, pero ya el año pasado me tuvieron que pedir dinero para subsistir el resto.”

Irrigation and Water Distribution/Allocation

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Water scarcity is not a new problem in Chihuahua, but the increased exploitation of groundwater is draining aquifers. Farmers in the Rio Conchos basin organize themselves into 'modulos' which distribute CONAGUA's water distributions to farming regions in an irrigation district. But, since more farms are being authorized to operate, and drought is reducing CONAGUA's annual allocations, farmers have less water to irrigate.

Current irrigation systems are outdated, and new technologies are needed, such as precision agriculture. The federal government has provided little recent support to advance irrigation systems. From 1994 to 1995 there was a severe drought and the government provided technical support to upgrade some farmers to pressurized irrigation systems and credits to protect farmers yields. Additionally, international support needs to be improved. NADB has provided investments in the past by supplying equipment and infrastructure, but these investments did lead to substantial advancements in water-saving technologies or increased field research.

With less water but more agriculture, some farmers are turning to unsanctioned wells to extract groundwater. Unsanctioned wells are common because them, especially near the Boquilla Dam where cartels apparently control the illicit pumping. Groundwater in the Rio Conchos Basin is being extracted at a non-rechargeable rate and if aquifers begin to run dry it can take months or years for them to recharge.

Andrés Valles and others discussed the 2020 La Boquilla Dam protests and the reasons farmers fought for water. Farmers wanted to maintain the value of their land and felt they should have been consulted in water repayments as required by the Treaty. Farmers also mentioned corruption in CONAGUA, since the agency is using deep that should not be operating, is not enforcing illegal water extractions, is approving more irrigation water for Tamaulipas than Chihuahua, and does not have adequate staff to surveil groundwater extraction.

<u>Key Quotes</u>

- History
    - Salvador Alcantar: "Cabe mencionar que el problema del agua en el estado de Chihuahua es un problema mucho muy antiguo podemos ver porque eso es lo único desierto que exporta agua estamos sujetos a tratados desde el 1848."
    - Roque Martínez: "Hace dos años estuvimos en el 2020 todo el año en sequía y teníamos las presas con suficiente capacidad para verlas aprovechado de manera racional sin embargo seguimos viviendo con el agua subterránea este problema para todos los usos, el uso de la industria el uso de la agricultura el uso de los servicios de cualquier naturaleza restaurantes hoteles…"
    - Flor Sígala: "El problema del agua en nuestra zona está sufriendo las consecuencias de que estamos con muy poca agua se tuvieron que organizarse los módulos sociedades unidades de riego para ahorrar el recurso y poderlo distribuir una forma en que podamos sacar parte del año ahorita estos momentos llovidos. No ha llovido no ha caído ninguna lluvia no tenemos suficiente agua si acaso nuestro municipio."
    - Nicolas Koturakis: "Entre los problemas que veo yo esté en los sistemas de riego, autorizaron o se pusieron sin autorización muchas más plantaciones perennes de las

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que debe haber en un sistema de riego que puede variar mucho su capacidad de entrega."

- Investment in irrigation
    - Dr. Carlos Manjarrez: "Qué pasa con la agricultura de precisión? Es una comunicación permanente entre la planta, el suelo y el granjero. Para qué medida la planta cuando tiene sé cuánta agua Necesito darle a través de tecnología de sensores remotos."
    - Andrés Valles: "Bueno, hace treinta y un años el Gobierno federal lo que nosotros hacemos ahora los agricultores lo hacía el Gobierno federal por medio de la Secretaría en su momento la Secretaría de Cultura de recursos hidráulicos. cuando nos entregan la infraestructura hidráulica, que eran los canales, nada más teníamos el quince por ciento de los canales revestidos, el quince por ciento. Hoy los agricultores el trabajo que hemos hecho tenemos en el distrito de riego 005 tenemos el noventa por ciento de los canales revestidos."
    - Andrés Valles: "Muchos agricultores están utilizando riesgos por contigua, riegos de aspersión o sea eficientizan el uso del agua. ¿Y por qué a esta observación? Porque a Chihuahua nada más de llueve en tres cientos veinte milímetros de lluvia en el año en promedio en promedio."
    - Ernesto Muñoz: "Si gustan mi intervención sería al respecto decirle que tuvimos una sequía severa en el noventa y cuatro. Noventa y cinco Ese año se cerró la presa. y algunos apoyos en aquel entonces para implementar sistemas de riego presurizado. Yo fui una de las personas que puede contar con apoyo por parte del Gobierno y créditos y logré dar en la transición a sistema riego presurizado y muchos lo hicieron, pero hace falta. generalizar más."
    - Salvador Alcantar: "Le quiero poner un ejemplo como él ahí tenemos siento 50 km de camión de canales principales los están en los cuales están completamente revestidos están este con compuertas de control tomas para las diferentes explotaciones agrícolas tenemos 1600 km de canales secundarios de los cuales tenemos este de los cuales tenemos 1200 revestidos alrededor de poquito más de 220 entubados nos queda poquito para poder cumplir con estas normas. Pero yo pienso que lo que ahora tenemos que buscar a los riegos modernos la presurización goteo puesto otro tipo de Río que nos obliga o nos lleve ahorrar más estos volúmenes desgraciadamente los últimos años que se te que en la agricultura y principalmente los distritos de riego Hazme han sido ciclos restringidos. Por ejemplo, el año pasado este tuvimos una restricción de un 70% los volúmenes en Distrito 005."
    - Roque Martínez: "Cuando hablamos de esas inversiones del NADB se van tradicionalmente históricamente a equipamientos e infraestructuras, tenemos que irnos más a temas tecnológicos y científicos y sociales es bienvenido es necesario y lo estamos muy pegadito al primer mundo. O sea, la mayor tecnología que puede existir está aplicándose en Estados Unidos."
    -
- Protest
    - Andrés Valles: "¿Ahora, qué consecuencias tenían? Pues que nos vaciaron las presas… ¿Qué sucede? ¿Sí? ¿Se hubieran llevado el agua toda la gente? Los agricultores del

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Conchos no tendríamos que regar. y nuestras parcelas o nuestras tierras valdrían cero pesos. ¿Por qué? Porque no haber agua, pues una tierra no vale al nada."

- Ernesto Muñoz, on Governor Campos freeing farmers from jail: "Todo el mundo lo vio. Quiero con buenos ojos. Estos. Estamos esperando porque con la promesa también de ella."
- Salvador Alcantar: “Entonces todos estos juegos de números de ofertas y estas cosas Pues fue y aunado a la insensibilidad de los gobiernos que nosotros del Gobierno Federal que nosotros queríamos entrevistarnos para ver exactamente hacer un análisis profundo de lo que es el tratado pues nunca nos nunca nos atendieron hasta que empezaron a mandar la seguridad la guardia nacional a resguardar lo que en los embalses nuestro que era las vírgenes y la boquilla y las presas derivadoras eso nunca había sabido porque nosotros somos conscientes que eso es lo que le da vida a la región… nosotros tenemos que cuidarlo porque ahí vivimos.”

- Illegal water extraction
  - Miguel Maciel: “La observación más fuerte es el Gobierno federal. Es que hay un problema para el pago del agua Aparte de que llueve poco menos es que el río. de la presa Boquilla a rio bravo estás hablando de trescientos infracción de kilómetros. Los que hay trescientos. Nosotros unos tres cientos, cincuenta kilómetros en ese inter a la presa hay mucha gente ilegal que no tiene derecho. Agarra agua y pone bombas en el río y está extrayendo en el agua ha sido los más graves. Porque el río no deja que vaya el rio de forma natural. Cada kilómetro cada kilómetro de por decirlo de esa Saucillo hacia aguas abajo, cada kilómetro aumenta diez litros de agua.”
  - Miguel Maciel: "Entonces el río sólo aportaría descubrimientos cinco siete metros cúbicos por segundo han llegar a Granero y no los aporta porque hay muchos bombeos a la orilla del río de forma ilegal que no tienen permiso. Donde es una cosa la colaboración que tienen desde el Gobierno federal. porque el Gobierno federal cuando quiere el agua. Quiere venir sacarle la presa de acá está hecha abuela. Todos esos que tan con un poco de chupando el agua, y eso es lo que generó el conflicto entre y no han hecho nada todavía para que ver cómo ahorita se pagó. El Tratado va a volver a ver problemas. A lo mejor en el primer quinquenio no hay problemas del segundo todo."
  - Sachel Sánchez: "Ahorita de las excavaciones están teniendo que servirse más profundas porque ya no hay tantos recursos más aparte, pues el agua de la presa no estando a basto y pues como sabemos de la problemática del agua, pues no tenemos ahorita grandes recursos en está limitan."
  - Don Pablo: "Aquí como no hay agua, pues todos hicimos pozos. En la unidad nosotros hicimos cuatro pozos, dos con permiso de CONAGUA y dos a la brava. Y hay dos, tres gentes que tienen cosas en excavaciones poner su pósito, una seducirle, un poquito.”
  - Don Pablo: “Ha habido gentes que sean un poso y hacer una casita. Sigo para para las instalaciones. Ayer como a cien doscientos metros al, un chorro de agua o sea que pozos está aquí. Tienen todas las bombas y todo en el cuartito. Y por pipas el agua por allá hay muchos trucos sé, pero es robarnos a nosotros mismos la mejor.”
  - Salvador Alcantar: “Este creo que de cada diez pozos que ahorita están perforando Están en 5 son irregulares.”

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- Roque Martínez: “Subsuelo debería ser la fuente por la que atiende sin casos de sequía. No debería ser nuestra fuente ordinaria de abastecimiento si tienes presas con agua suficiente para suministrar a la población y agua suficiente para la producción de alimentos deberías de reservar el agua del subsuelo para los casos de la sequía sin embargo también les platicaba que el estado de Chihuahua es el único lado de todo el país que depende más del agua de subterránea que el agua superficial no solo su proporción es de un 60% agua del subsuelo en todos los usos y 40% únicamente Lo superficial para todos los usos siendo una cuestión muy grave la situación de las ciudades la Ciudad Juárez en Ciudad Chihuahua que concentra el 80% de la población se abastecen al 99.9% de agua subterránea entonces esos acuíferos de los que se aprovecha el agua insisto deberían ser reservados para casos de sequía y el problema es que se están agotando por su sobreexplotación.”
- Flor Sígala: “Los pozos también contamos con Ojinaga qué son los menonitas. Ellos son los que están usando los pozos y que también algunas de las localidades de ellos forman parte de nuestro municipio, pero son cosas autorizados por CONAGUA.”

- Corruption
  - Ernesto Muñoz: "Agregaría que hay mucha corrupción, sobre todo en CONAGUA. Hay infinidad de pozos profundos que no deberían es el de estar operando. Muchos no tienen títulos y hay muchísimas bombas también en los ríos, bombeando agua de los ríos de la presa en las presas por todos lados. Entonces no hay un orden. Ya se salió de control. Todo eso."
  - Ernesto Muñoz: "Así es. Sí hay organizaciones de productores, pero están limitados ahorita el propósito del Gobierno tan pareciera que es debilitar en los estados del norte. De hecho, hemos llegado a pensar que el conflicto del agua fue un conflicto político, porque el mismo presidente en algunas ocasiones hizo declaraciones de los cultivos, aquí en la región se habían dirá Tabasco, que es la tierra.
  - Salvador Alcantar: “Es cierto las oficinas de CONAGUA anteriormente dan servicio a mucha gente ahorita están completamente desmantelada no tienen suficiente personal para hacer las funciones de vigilancia de operatividad de muchas del trabajo que deberían estar haciendo y esto ha dado a que yo digo que la libertad llama libertinaje al ver que no nadie le dice nada qué es lo que tiene que hacer Pues todo mundo va buscando este va buscando cómo sacar agua para producir.”
  - Salvador Alcantar: “en el distrito 0 25 de Tamaulipas entonces creo que hay un fue un error no sé si a propósito o apropósito que deberían haber considerado para el uso público urbano primero antes que la agricultura entre ponerle agricultura, el uso público urbano sin embargo autorizó más agua de para uso agrícola que la que tenían disponible y después autorizan la de uso público urbano alrededor de otros 400 millones de metros cúbicos.”

Climate Change

Farmers are working to counter the effects of climate change with organic production systems and note the absence of government support. Climate factors are out of farmers control, but changing farming methods and adapting to less water can increase production and extend planting seasons. Farmers need to form their own vision of the future since the government is not focused on climate change. For

example, President Lopez Obrador's administration is focusing more on drilling new oil wells than harnessing the vast sun and wind resources in Mexico.

Officials pointed to the visible effects of climate change and need for swift action. Annually, farmers have less rain and no frosts, but they are continuing to plant more seeds. There needs to be a push to help farmers adapt to planting with less water and make use of the increasingly scarce resource. In addition to farmers, community members need to learn to take care of the environment. Without this sense of environmental consciousness, change will be slow and drawn out, regardless of government support or not.

Key Quotes:

- Limits
    - Dr. Carlos Manjarrez: "Ahí esto Chihuahua y es en la limitante que tenemos muchas oportunidades, pero esto es una limitante climática. La alteración de los agros, ecosistemas, sin duda ayer a con el cambio climático, las malas prácticas que hemos realizado en varios rincones del mundo han generado impacto en territorios como el estado. Hecho va también que quiere decir que el clima que en las malas prácticas no distinguen una frontera entre los países para poder ir."
    - Sachel Sánchez: "Necesitamos suficiente más el agua por medio sistemas de riego y también estamos conscientes que el cambio climático está generando problemas. Nos están bajando los rendimientos de nuestras cosechas. No sabemos el efecto del cambio en específico, pero cada año se está manifestando de una o de otra manera. y estamos tratando de contrarrestar eso con un manejo más orgánico."
    - Ernesto Muñoz: "Lo que estamos haciendo cambiar métodos que te ayudan a el impacto del cambio climático. Pero el Gobierno no está siendo nada."
    - Salvador Alcantar: "Bueno pues como yo siempre he dicho los agricultores sembramos esperanzas porque no sabemos cómo se presenta estamos expuestos a muchos factores que no los podemos controlar cómo son los factores climatológicos que eso Bueno pues esos vamos nunca se pueden controlar sin embargo somos los responsables de estar proveyendo de la alimentación. No nada más de pueblo de México sino muchas de las veces en las exportaciones para otros lugares del mundo."
    - Flor Sígala, on the lack of commitment from the government: "Pues si falta mucho por hacer sobre esto falta de compromiso de la gente de las autoridades yo creo sobre todo porque por allí a veces nuestros autoridades de arriba no quieren apoyar las formas de aprovechar la energía del sol el aire y si todavía quiere manejar combustibles y pues no eso no es algo bueno ni tecnológico ni a querer avanzar y superior quiere su futuro de agricultura en la Cuenca del Conchos y que su visión para el futuro."
    - Elizabeth Roacho: "No tenemos que construir un muro en la frontera así porque el cambio climático no distingue una línea figurada o un muro."
- Effects
    - Don Pablo: "Ahora se siembran diez veces más de semilla y hay no heladas ya no, No ayuda del culminantes antes será en septiembre La última lluvia. Diciembre dinero, heladas y nieve. Y ahora es una pasa ya y aérea desde el precisamente de la diversidad de y los cambios climáticos que ha habido. Porque antes y llora no."

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- Salvador Alcantar: “Ahorita el problema del agua es un problema mucho muy serio creo que ya estoy seguro de que el cambio climático nos alcanzó creo que ahí el cambio climático está jugando un papel muy importante sean desfasado las épocas de lluvia disminuido los volúmenes que esté aportaban lluvias las sequías se han sido sequías más prolongadas. Y bueno, pues aquí en esta región pues tenemos que jugar con lo que tenemos y tratar de ir haciendo un mus un mejor y mayor uso de las aguas con las que contamos o sea tenemos que hacer un buen uso de una buena distribución y guardar lo poquito que tenemos.”
- Flor Sígala: “Se venía viendo yo y yo lo menos conozco ese problema ya sé cómo 8 años me tocó nos falta mucha concientización aún hay mucho por hacer sobre este tema este sobre las personas desconocen realmente lo que nos está afectando no cuidar nuestro medio ambiente en la ecología si falta mucho porque sí hemos visto ya los cambios cuando tiene que hacer frío no hace y cuando tiene que ser calor hace frío.”
- Sachel Sánchez: "La mayoría de los agricultores no están haciendo, actuando de hecho... Estamos dando alternativas como cambiar el suelo este yo me estoy enfocando. En cambiar la estructura del suelo para que tengan una mayor reflexión de humedad. Porque por el cambio climático aparte que ha estado haciendo muchísimo calor, cosa que en otros años no."
- Ernesto Muñoz: "Dependemos de la lluvia y esa Nadie sabe si habrá uno, pero es lo que sí es seguro es que hay un cambio climático. Entonces es muy incierto y oscuro panorama."

Solutions & Outlook

A key takeaway from the outlook of farming in the Rio Conchos Basin are the contradicting views of Dr. Carlos Manjarrez and Andrés Valles. Dr. Manjarrez believes there should be a limit on agricultural production because technological advances to improve water-use on farms are not enough to counter strained water resources. Andrés Valles believes the maximum amount of irrigable area should be planted with the water that is available through technological enhancement of irrigation and water distribution systems.

Looking to the future, farmers and officials have a bleak vision for Chihuahua. Without strong enough motivation to combat drought and climate change, and little enforcement from the federal government on agricultural and water laws, Chihuahua will face severe water shortages. Furthermore, younger generations are leaving the countryside to seek opportunities in urban areas.

Yet, some officials view the flock of younger generations from rural to urban areas as an opportunity, since the younger generation has a stronger connection to climate change and can bring technical skills back to their rural hometowns. Furthermore, officials note the pressing need for federal and international investment to make water-use more efficient.

Subsidies, or the lack thereof, are another point of contention. Some interviewees believe that government subsidy programs should be expanded to larger farms to account for wasted harvests resulting from low irrigation and drought. Others believe the subsidy system should be scrapped altogether since it stimulates the production of specific products, changing the market value for that product and encouraging farmers to produce low-end food products without a real profit margin.

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Furthermore, farmers recognize tensions with the government but understand it is a necessary partner for solving the water crisis. Chihuahua wants to work with the Mexican federal government to launch a water institute to pursue future water solutions with American and Canadian officials. Also, farmers want CONAGUA to establish a representative body where state representatives, including producers, can have a say in water distribution and change the mentality of farmers to promote more efficient production practices. Yet, these proposed changes will require significant federal and international investment.

Additionally, interviewees shared different opinions of the 1944 Water Treaty. Many pointed to the changes that have occurred since the Treaty, such as the effects of climate change and the explosion of agriculture in Northern Mexico after NAFTA. While some believe there needs to be a new Treaty that better fits the times, others feel the Treaty can be enhanced by improving collaboration between CILA, IBWC, and the Mexican government, Farmers can also be involved in a separate commission, and consulted on water allocation decisions. Overall, most interviewees agree there is no tension between Mexico and the US regarding water, but that the struggle is Mexico's to fix.

<u>Key Quotes</u>

- Farming and Outlook
    - Dr. Carlos Manjarrez: "Pero no basta con tecnificadas. Aquí se utiliza todavía mucha agua rodada para sembrar los cultivos. Tenemos que, sin duda, primero delimitar la frontera agrícola, no crecer más. No crecer más porque no tenemos agua."
    - Andrés Valles: "El futuro sería apoyar para dignificar al máximo el área regable para con el agua que se tiene para usar menos agua, más regar la misma superficie, pero con menos agua."
    - Andrés Valles: "Bueno, pues que es bajar a los que si pudieran nos bajaran los apoyos de los Estados Unidos directamente a los agricultores para el ser más eficientes."
    - Miguel Maciel: "Ahorita las hortalizas, en su mayoría yo creo. Un noventa por ciento van en riego tecnificado y la hortaliza con rival del tecnificados de gasta como un treinta por ciento menos de agua con un incremento de un treinta o cuarenta por ciento más en cosecha. O sea, gastan menos agua. Produce más con tecnificada."
    - Don Pablo: "Pero si a nuestros hijos, porque vamos a acabar nosotros los mantos, ¿de acuerdo? No nos vamos a acabar. Es eso que mí que entra es el futuro. Lo veo muy desolador porque bien con diario vamos pa'trás, pa'trás."
    - Salvador Alcantar: "Aquí toda la gente del campo al no tener ingresos se vienen las grandes ciudades engrosar los círculos de pobreza en las grandes ciudades y se va quedando el campo únicamente es un problema social completamente fuerte del campo se está quedando con gente mayor mujeres y niños porque esta escasez de agua está escasez de líquido."
    - Salvador Alcantar: "También muchas partes de Estados Unidos que los lechos de los ríos se han convertido en las letrinas de océano donde se desagua las aguas negras. Dónde llegan las aguas negras de las grandes ciudades. Entonces eso va a ser gravísimo tenemos que no hay para atrás tenemos que tomar acciones ya si no vamos a tener problemas."
    - Salvador Alcantar: "Desgraciadamente Chihuahua es de los estados más secos de la república. Y son el que más aporta para darle vida a otras entidades."

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- Salvador Alcantar: “Creo en los jóvenes, pero tenemos que bajar todo lo posible experiencia nuestra hacia ellos para que empiecen a generar o a tomar la oportunidad que nosotros no hicimos que vean que analizan los errores que nosotros cometimos para que ellos no caigan en lo mismo y empiezan a buscar un mejor futuro para la región.”
- Roque Martínez: “Yo diría que en menos de 10 años los líderes de la producción agrícola de la región del Conchos van a hacer jóvenes de 40 años o menos en ese cambio generacional y van a tener una mentalidad con mayor este si se les dan las condiciones necesarias apertura y emprendimiento de estas mejoras otro que viene hacer aparte el cambio intergeneracional.”
- Roque Martínez: “No podemos pensar en que las condiciones van a ir mejorando en términos hidrológicos van a ir encareciendo. Entonces tienes que empezar a hacer más eficiente ahorita el agua tiene un alto costo para el productor agrícola va a haber un momento en que va a tener un alto costo va a tener que empezar a pensar y a implementar lo que para otros antes era una locura no sea del darle el valor agregado va a ser una obligación para que puedas cubrir el costo total de tu producción, pero lo veo esperanzador lo veo positivo en cuanto a que ante un reto hidrológico negativo.”
- Flor Sígala: “Eso es bueno para cambiar las políticas agropecuarias y se cambian las políticas agropecuarias pueden mejorar este para las formas en que se la agricultura no tanto los apoyos, es más bien ayúdame a tener uno como ordenarme ayúdame a que yo si tenga donde seguro dónde voy, a dónde me van a comprar. Pero si no me ayudas ni me das voy a poder con los gastos de los insumos tres han de saber que está bien caro todo fertilizante, la semilla y ahorita me piensa quiero que sería necesita más inversiones de los Estados Unidos, Soriana, o de un grupo internacional.”
- Mario Trevizo: “Sí para Chihuahua si no llueve en meses de abril y mayo y tener un serio problema de abasto. Y si no hay producción en el campo pues va a haber mucho desempleo va a haber hambre.”
- Mario Trevizo: “Ahora esta situación nos puede permitir que en lugar de que las personas se vayan al crimen organizado tráfico podamos pagar es para que se van a producir alimentos darles un salario.”
- Mario Trevizo: “Aquí en la mesa que llevamos una propuesta del gobierno actual del estado y lo van a lanzar declaró un instituto estatal del agua nosotros Estados Unidos, México, y Canadá tenemos el sistema federal. En el sistema federal pues decimos esto le competen lugar nacional 10 todos los estados en temas como el agua como la salud como la seguridad tenemos que trascender tenemos que ir más allá.”
- Nicolas Koturakis: “El productor siente que existen leyes y que no se aplican.”
- Nicolas Koturakis: “Un territorio definir su vocación por los recursos naturales con los que cuenta, suelo, agua, clima, pero también por las habilidades de las personas.”
- Elizabeth Roacho: “Si no trabajamos en conjunto con gobierno no cuidamos todas las áreas incluyendo el desarrollo.”
- Dr. Carlos Manjarrez: “Por qué aferrarnos a una soberanía alimentaria cuando no tengo las condiciones ambientales, sociales, y económicas para poder producir lo que llene este plato que voy a consumir.”

- 1944 Water Treaty

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- Dr. Carlos Manjarrez: "Hace setenta años cuando se elaboró un tratado internacional de aguas entre México y Estados Unidos, pues no se hablaba del cambio climático. No se hablaba después de explosión demográfica, no se hablaba de consumismo, no se hablaba tampoco de estilo de vida."
- Dr. Carlos Manjarrez: "Por eso que yo insistentemente y no para entrar en conflicto con los hermanos en el sur de Estados Unidos; son los del norte de México entre todos. Porque mucho nos han confrontado, como que nos tenemos que hacer. No nos tenemos que pelear. Los tenemos que poner de acuerdo para poder hacer un tratado moderno dos mil treinta que sea vigente en el dos mil treinta."
- Dr. Carlos Manjarrez: "Entonces este es en mi propuesta, para a través de los mecanismos diplomáticos que existen entre las dos naciones, se puede integrar un proyecto de un tratado moderna. Hay muchos actores aquí en Chihuahua y lo van a ver ustedes que dice no, no, no. Que no se toque el Tratado porque es bueno para mí. Nos beneficia que no sé por qué. No se toque, que se quede como está. Lo dijo, que se revise y que se moderniza con el sentido de que nos vaya bien a todos."
- Andrés Valles on the future of the treaty: "Yo creo que si debe haber una buena colaboración entre los Estados Unidos, CILA americanos y CILA mexicano y el gobierno federal."
- Ernesto Muñoz: "Que había que habría que revisarlo tratado. Yo no puedo opinar si es favorecedor para nosotros. Sé para ellos, pero sí, sí, sí, sé que se tiene que revisar. Lo que si te puedo decir es que los problemas que se generaron por el tratado fue en problemas que los hicimos nosotros mismos. No fue problema con Estados Unidos se decidió nosotros fue cuestiones políticas y nos quitaron. El agua en la región es agua, se debió haber pagado de otra forma."
- Sachel Sánchez: "Como el ochenta por ciento depende de la agricultura en esta área. Tenemos que revisar, actualizar y después de actualizar, entonces ahora si negociar o ver la manera de llegar a un acuerdo no se trata de no pagar donde no. Si no hay que llegar a un acuerdo, no me, no se le damos tan perjudicados por la situación que estamos viviendo."
- Salvador Alcantar: “El problema del de querer este está el agua de las presas eso se detectó es desde principios del 1900 1000 1990 lo quiera agua para cumplir con los compromisos que tiene México con Estados Unidos sin embargo no era así puesto que se había cumplido con un sí que son por quinquenios. Y si vemos nosotros hacemos cuentas de lo que se ha portado Chihuahua principalmente que aportado al tratado ahorita deberíamos ir en el quinquenio 16 sin embargo estamos en el 31 para el 36 quiere decir que hemos aportado 15 veces más agua que la que requería sin embargo en ese momento ellos argumentaban que era con esa finalidad y nosotros vimos que no era para eso.”
- Salvador Alcantar: “Por eso yo creo que los agricultores somos los mismos y lo nuestro propósito Es sacarle la tierra fruto para poder este mantener o darle alimentación a la población. Sin embargo, Ahí agricultores en Tamaulipas que no dependen de las aguas del tratado porque ellos tienen otras concesiones.”
- Roque Martínez: “Es un acuerdo muy válido importante eso genera interacción natural entre los dos países permanentemente para eso existe la comisión internacional de

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límites y aguas para poder regular pero no nomás se va al esquema de regular ese cumplimiento sino también existen instancias como el banco de desarrollo de América del Norte El patán qué ayuda y financia proyectos en la frontera hasta 200 millas de la frontera tus hay proyectos que se han financiado con esos recursos internacionales verdad con mayor eficacia que con el puro recurso nacional o Estatal o privado…"

- Flor Sígala: "Agua no tenemos problemas encargamos mucha verdad hemos tratado de manejar y ser concientizar a los agricultores de los botes los botes químicos los fertilizantes que usan y todo eso que no caigan a la dos las acequias principales porque pues sí contaminan."
- Flor Sígala: "Bueno yo digo que la intención verdad el tratado se hizo con buenas intenciones y sobre todo de que sale por un lado y se recupera. Por otra parte, nada más que si nos falta a lo mejor una comisión este nacional que involucre a los agricultores a los estados no sé qué parte está representada para que ellos puedan saber cómo se maneja porque yo pienso que existe mucho desconocimiento de ese tratado solas."
- Mario Trevizo: "Más de la mitad del territorio somos desierto y sin embargo nosotros tenemos que entregar agua va hacia ese tratado y yo cuando fui diputado por puse al senado de la república que se juntara con él porque no lo Estados Unidos que serán los mecanismos para hacer una revisión del tratado de aguas porque las circunstancias de este Siglo 21 son totalmente diferentes a las de hace 80 años."
- Mario Trevizo: "Yo sí recomendaría al perro del país que se acercara el gobierno de Estados Unidos y con unas condiciones muy claras transparentes con científicos y técnicos especializados buscarán la mejor manera para que el con una revisión ha tratado de aguas. México y los Estados Unidos pudiéramos obtener mejores resultados para ambos países, pero sobre todo avanzando en la cultura del ahorro del agua está pasando en la cultura del líquido."
- Nikolas Koturakis: "Decir no podemos pagar, debemos tener un plazo mayor o ya no se va a poder pagar, etcétera, y no hacer todo el lío que se convirtió en un lío político cuando pudo haber sido una resolución técnica entre los dos países."

- Government assistance
  - Miguel Maciel: ""Pero en cuestión de si te refieres a fertilizantes o equipos de tecnología para ahorrar Es de agua? Nada. No por parte del Gobierno federal. No hay nada."
  - Andrés Valles, thoughts on Governor Maru Campos: "Bueno en la cuestión de lo esas de los agricultores y nos ha ayudado, por ejemplo, en este ciclo agrícola se nos iba a dar menos agua y ella fue la que gestionó en el con el gobierno federal, al que se nos diera un poquito más de agua que si no podían dar más, que si la relación o si no podían. Pero, si hubo las gestiones, igual la voluntad política. Para solucionar este problema, o sea, en este año y el año pasado, no sé, ya digo yo estoy con lo mis agricultores y yo estoy que no se lleven el agua y no la voy a defender. Entonces, si está ya lo exista. Cumpliendo lo que su momento se comprometió a ser."
  - Andrés Valles: "Por ejemplo, los subsidios son muy pocos y son muy bajos, por ejemplo. Hace una semana. Estaban dando una noticia y Tamaulipas en Tamaulipas, no hay agua. Ellos riegan gran parte por temporal. O sea, del agua de lluvia. Entonces dijeron pues

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como no pueden No, hay agua no ha habido suficiente lluvia. Les están dando mil cuatrocientos cincuenta pesos por hectárea, menos de cincuenta hectáreas."

- Andrés Valles: "Es que, en 2004, El Banco Mundial y el Banco de desarrollo norteamericano iban a meter por lo desear alrededor de cien millones de dólares para tecnificación. Pero eso era para que se gastará menos agua. Las presas de amaran a mí me ha seguido que hubiera agua para que México pagará más fácil el tratado fácil para cumplir el con el tratado de agua de con relación al Rio Bravo."
- Ernesto Muñoz: "Para empezar, debería de ser una entidad formada por Comisión Nacional de Agua, alguien y un representante del Gobierno del Estado, un representante de los productores."
- Ernesto Muñoz: "De hecho desde que entró el Gobierno de MORENA, no, no hay y todos apoyos agrícolas y se fue en blanco. Les ha estado de chihuahua te los pocos apoyos que teníamos en los quitaron Para. Ninguna, ni maquinaria, ni agua, nada. porque se había no mucho, es verdad, pero había apoyos agrícolas."
- Ernesto Muñoz: "El Gobierno podría ayudar en eso, en cambiar la mentalidad de la gente, para que vea al futuro que en cinco años no vamos a ser eficientes, pero sí depende mucho, personalmente, cada agricultor."
- Don Pablo: "Ahorita intentará solucionar este problema. Tenemos que cambiar el Gobierno federal de nosotros."
- Salvador Alcantar: "Pero desgraciadamente tenemos que buscar financiamientos y apoyos de los gobiernos de los estados de la federación y creo que tenemos que acudir a lo que comentan ahorita usted de lomas del Banco Mundial banco interamericano de desarrollo Por qué razón tenemos que hacer de esa manera porque ahorita la crisis económica que están atravesando los agricultores cosas una crisis mucho muy fuerte que el primero lo que es les decía los dos ciclos restringidos para ahorita lo el costo de los insumos que nos lleva ahorita. Por ejemplo Hay unos que han se han incrementado hasta un 200% de un 100 un 200% principalmente los principalmente los fertilizantes Este nitrogenados que prácticamente los traían los importaban de Rusia y Ucrania entonces la situación que están viviendo esos países de alguna manera u otra nos están impactando directamente a nosotros aquí a los agricultores Entonces este pues es una situación bastante delicada la que está atravesando el campo mexicano y particularmente en el campo la agricultura."
- Salvador Alcantar: "Nosotros ya los agricultores ya tenemos tres años pues haciendo un pequeño esfuerzo para empezar a trabajar arriba con reforestaciones con pago con gaviones y todo esto para evitar este la erosión y ahorita pues este año se va a invertir un recurso poquito más fuerte al agricultor el gobierno de Gobierno Federal y Gobierno del Estado."
- Salvador Alcantar: "Tenemos que actualizar y ver la disponibilidad de agua en ambas partes de la frontera… tenemos que apostarle al diálogo y no la confrontación."
- Roque Martínez: "Aquí el problema es que estimulas algunos productos con subsidios que no tienen su valor en el mercado entonces haces una distorsión de esa situación y la gente sigue produciendo bajos alimentos y productos que no te son de un margen de utilidad real."

Phil Gurley

Qualitative Coding Analysis

- Roque Martínez on subsidizing asparagus production: “Pero si puede ser estimulado por los subsidios y respaldos que deberías de llevar a cabo para que la gente sin necesidad de subsidio futuro pueda llegar a cambiar su hábito de producción tanto por su tipo de cultivo como por su sistema de producción.”
- Flor Sígala: “Yo creo que hubo con lo del agua el año pasado fue la forma en que no está organizada a nivel federal y yo digo si se ciempiés organizarse Federal trae bien su idea si es cierto, que a veces se abusa no de que los que más tienen a veces compran el agua y no permiten que los que menos tienen agua si es verdad Salí más bien las políticas tienen que cambiar desde nivel Federal venir cambiando hasta abajo y arriba.”
- Flor Sígala, on minimum prices: “Cómo se siembra que no se esté el precio se garantiza y aquí no tenemos ese a ese ordenamiento para sembrar si les va bien un año, por si estoy enviando alfalfa, todos quieren sembrar pues siguiente año y eso está muy dura la producción y no baja el precio total.”
- Mario Trevizo: “Gobernadora Campos Maru Campos trae en la mejor de las intenciones, pero los recuerdos son escasos y el tiempo se agota y la demanda de la gente va a ser intensa.”
- Nicolas Koturakis: “Habíamos platicado algunas gentes de la necesidad de hacer el Instituto del Agua, o sea, alguien que deberás con hágala con numeración de todas las opiniones entidades, esto para que se haga de veras una política, por un lado, que tengan la función social.”
- Nicolas Koturakis: “No hay apoyos ahorita para sistemas de riego más razonables, más inteligentes, o sea, dejaron de dar apoyos para los riesgos de aspersión en huertos.”
- Nicolas Koturakis: ‘Yo cuestiono mucho a mis gobernantes porque simplemente no hacen su chamba, no hacen su trabajo porque les digo que tienen que aprovechar, pero no explotar los recursos naturales que tienen que generar empleo y pagarlo bien.”
- Elizabeth Roacho: “Por ejemplo ahorita vemos el tema de la seguridad en la parte de la sierra y hay zonas deforestadas tremendamente. Entonces no podemos pensar que todo el trabajo hacerme unos y de otros no porque tiene que ser tan lejos porque mientras estemos pensando nosotros enfriar en agua Acapulco en la agricultura pero sigamos aportando razones no sé ni siquiera sabemos vayan comprando para saber cuántas cosas de portadas ahí con tala ilegal y es tremendo lo que está pasando en la tierra no hay seguridad y lo vemos en el nivel nacional ahorita es un país que no tiene un gobierno como tal que cuide el tema de seguridad y eso nos está afectando mucho.”
- Elizabeth Roacho: “Yo no le quisiera llamar resistencia por parte de los agricultores porque muchas veces tengo que ellos quieran acceder a esta tecnología pues es posible. Entonces no hay por parte de gobierno apoyo reales.”

Attachment 5

Texas Utilization of San Juan Water and the Equitable Distribution of These Inflows, Carlos Rubenstein, August, 2015

Texas Utilization of San Juan Water

And the Equitable Distribution of these Inflows

August 2015

The purpose of this document is to clarify the basis for authority to utilize San Juan water to meet Texas water demands and how the same is accounted for both against the Treaty and by the Watermaster (TCEQ)

Treaty Authority & Clarifications

Is the San Juan a tributary of the Rio Grande that is noted in the 1944 Treaty? Put another way, is the San Juan a Treaty tributary?

- The San Juan is a named tributary noted in Article 4 of the Treaty. It is designated as a 100% inflow river for Mexico (see below text from the Treaty):
    - 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.

Can Mexico give up rights via the IBWC for water entering the Rio Grande from the San Juan under the Treaty?

- Yes, Mexico can give up rights to water from the San Juan under Article 9 of the Treaty (see below text from Article 9 of the Treaty):
    - (e) The Commission shall have the power to authorize temporary diversion and use by one country of water belonging to the other, when the latter does not need it or is unable to use it, provided that such authorization or the use of such water shall not establish any right to continue to divert it.
- Additionally, during a cycle that began with a debt, IBWC can also rely on Minute 234 provisions.

Do diversions of any water from the Rio Grande, including those from San Juan inflows, have to be accounted for by the IBWC?

- Yes, all diversions have to be accounted for and charged to the respective country (see below text from Article 9 of the Treaty)
    - (c) Consumptive uses from the main stream and from the unmeasured tributaries below Fort Quitman shall be charged against the share of the country making them.
    - (d) The Commission shall have the power to authorize either country to divert and use water not belonging entirely to such country, when the water belonging to the other country can be diverted and used without injury to the latter and can be replaced at some other point on the river.
    - (j) The Commission shall keep a record of the waters belonging to each country and of those that may be available at a given moment, taking into account the measurement of the allotments, the regulation of the waters in storage, the consumptive uses, the

withdrawals, the diversions, and the losses. For this purpose the Commission shall construct, operate and maintain on the main channel of the Rio Grande (Rio Bravo), and each Section shall construct, operate and maintain on the measured tributaries in its own country, all the gaging stations and mechanical apparatus necessary for the purpose of making computations and of obtaining the necessary data for such record. The information with respect to the diversions and consumptive uses on the unmeasured tributaries shall be furnished to the Commission by the appropriate Section. The cost of construction of any new gaging stations located on the main channel of the Rio Grande (Rio Bravo) shall be borne equally by the two Governments. The operation and maintenance of all gaging stations or the cost of such operation and maintenance shall be apportioned between the two Sections in accordance with determinations to be made by the Commission.

Is there a penalty for one country using water belonging to the other without replacing that volume?

- Yes, if for example in one segment of the Rio Grande Texas diverts more water than it owns then it would have diverted water belonging to Mexico.
- If this overuse in one segment is not corrected in any downstream segment then a condition often referred to as “negative to the Gulf” is created.
- As IBWC moves from preliminary accounting to final accounting, months after diversions take place, it will correct any “negative to the Gulf” condition by transferring from storage water from the country that over diverted to the other country. Losing wet water in this manner affects all Texas water right holders in a negative way and thus should always be prevented.

Are discharges from the San Juan during 2015, on which Texas relied upon for offsetting some of its demands, considered flood discharge spills under the Treaty?

- While Mexico did in fact release water from Marte Gomez and El Cuchillo on the San Juan during 2015 while these reservoirs were at a time over conservation capacity, the discharges were coordinated in large part to meet treaty obligations and make water available to Texas. Thus, these dedicated and controlled releases, which were conducted for Article 9 utilization by Texas (other purposes), do not meet the Treaty definition of spills as per Article 1 of the Treaty (see Treaty text below):
    - (g) "Flood discharges spills" means the voluntary or involuntary discharge of water for flood control as distinguished from releases for other purposes.
    - (i) "Release" means the deliberate discharge of stored water for conveyance elsewhere or for direct utilization.

Has the IBWC taken a position that utilization of San Juan inflows by Texas, and crediting the same towards an established deficit is permitted under the Treaty?

- Yes. The IBWC has adopted an operating policy (01/2015) for how these flows can be used and that credit against the deficit is consistent with the Treaty is reflected in the July 2015 letter from Commissioner Drusina to Jim Darling as well as previous actions, namely the 2005 agreement where credit against a debt was also allowed.

State authority

Who is responsible for the allocation, distribution and authorization of diversions from the Rio Grande below Fort Quitman?

- The responsibility rests with the TCEQ Rio Grande Watermaster as per Section 11.3271 of the Texas Water Code and 30 TAC, Chapter 303 rules.

  TWC Sec. 11.3271. POWERS AND DUTIES OF RIO GRANDE WATERMASTER; DELIVERY OF WATER DOWN BANKS AND BED OF RIO GRANDE.

  - (a) This section applies only to the watermaster with jurisdiction over the Rio Grande and the water division for which that watermaster is appointed.
  - (b) The watermaster shall divide the water of the streams or other sources of supply of the division in accordance with the adjudicated water rights.

  30 TAC **Section 303.12**

  (a) The watermaster shall maintain an accurate inventory of water in Falcon and Amistad Reservoirs and shall maintain records and institute necessary procedures with the International Boundary and Water Commission as may be appropriate to perform this function.

How is a Watermaster appointed and who is he ultimately responsible to?

- Per TWC Section 11.326, the Rio Grande Watermaster is appointed by and ultimately responsible to the executive director of the TCEQ.

Does the Watermaster have to satisfy all diversion requests with releases from the International Reservoirs?

- No. The Watermaster is authorized to waive travel time restrictions and authorize diversions if in his/her opinion sufficient water, available for U.S. use, exists in the segment to satisfy that demand without having to make dedicated releases (see 30TAC Section 303.12 (b) noted below **emphasis added**)

  (b) A diverter shall request written certification in advance to allow travel time for the released water to reach the river diversion point as scheduled. Each reach of the river shall constitute one day of travel time from Amistad Dam downstream. Whenever there is a flow of water in the Rio Grande in excess of downstream requirements, ***the watermaster may waive travel time requirements to allow immediate diversions***, provided that the diverter shall post the certification at or near his diversion facility.

Was the Watermaster's determination to rely on available water from the San Juan to meet demands below Falcon consistent with agency rules?

- Among the many duties of the Watermaster is to promote the efficient use and optimum yield of U.S. share of water in the international reservoirs (see 30TAC 303.16)
    - 303.16 - The watermaster will request releases from Amistad and Falcon Reservoirs for authorized domestic, municipal, industrial, irrigation, and other uses ***in such a manner which promotes the efficient use and optimum yield of the United States' share of water in the Amistad/Falcon System, consistent with the 1944 Treaty between the United States and Mexico***.
    - By relying on San Juan water made available to Texas by Mexico under Article 9 of the Treaty, as needed, the Watermaster conserved a corresponding amount of Texas water at Amistad and Falcon thus optimizing overall system yield.

Could the Watermaster have granted available San Juan water as "no-charge" water and if so who would have benefitted and who would have been negatively impacted?

- Yes, under TCEQ rules, permit and order, the Watermaster could but is not required to have authorized the diversion of San Juan water inflows as no-charge.
- Among the findings of fact in the 1981 order are the recognition that "The Watermaster in the Rio Grande can best determine when adequate water is available to justify allowing temporary use of Rio Grande water pursuant to 11.0871, Texas Water Code".
- The Watermaster determined not to make these flows available as no-charge authorizations.
- The 1981 order speaks primarily to spills from Amistad and Falcon. The order does also reference intervening inflows.
- The order defines spills as the flow of water when the water level is above conservation level or released by the IBWC in anticipation of storm or flood inflows.
- The 1981 order is permissive in nature as it relies repeatedly on the term "may".
- A significant point that is not discussed in the order is how its improper application, or the assumption that Texas has the right under the order to grant the use of water belonging to Mexico ignores the negative effect such interpretation and use of water would have on all Texas water right holders by the establishment of a previously discussed condition of "negative to the Gulf".
- Clearly, water authorized to be diverted as no-charge cannot then be deducted from the respective diverter's account. In this instance (2015), water was not authorized to be diverted as no-charge, thus a deduction for use from the diverter's account is proper.
- Granting no-charge authorization would have only benefitted the users below the confluence of the San Juan and the Rio Grande who actually diverted these flows. All other users, from Amistad to the confluence of the San Juan and Rio Grande who would not be able to divert these flows primarily because of diversion point location would not have benefitted.
- Mexico's offer of San Juan water was predicated on receiving credit for such diversions against the deficit Mexico had established during the current cycle. The deficit is one to Texas, not just certain water right holders that could divert San Juan water. Thus, the deficit impacts the entire

system. Among the considerations of not designating these inflows as no-charge were the equity consideration for all users.

Was the Watermaster's use of San Juan water during 2015 equitable?

- By relying on the controlled and dedicated releases of San Juan flows to meet Texas demands and not designating these as no-charge water the watermaster ensured a more equitable distribution and benefit to all of Texas' authorized water right holders from Del Rio to the Gulf of Mexico by:
    - Meeting the demand for water from those Texas lower Rio Grande users below the confluence of the San Juan and the Rio Grande with San Juan inflows rather than dedicated releases from Falcon, thus conserving Texas water at the reservoir (optimizing yield)
    - By conserving Texas water at the reservoir in a corresponding amount of that authorized to be diverted downstream, the Watermaster's action in essence "created" additional water belonging to Texas at the reservoir.
    - This action benefitted the entire system in that "created" or water conserved at the reservoir was then, as per agency rules, made available and in fact allocated to all users in the middle and lower Rio Grande as per commission rules.
    - Irrigation water rights in the Rio Grande can only increase their reserves via allocation, thus the conserved water being made available for allocation assisted, in an equitable manner, all users.

Was 2015 the first time San Juan water inflow diversion by Texas water right holders the first time it was credited against a deficit?

- No. The 2005 agreement that settled a more substantive debt at that time relied in large part on a very similar utilization of San Juan water.

Has the use of San Juan water been a point of contention in the past?

- Yes. In fact a year or so ago such use and concerns resulted in the TCEQ developing an agency protocol for the better management of these inflows. That protocol was shared by the TCEQ with water right holders for review, comment and concurrence prior to implementation. The protocol mirrors the actions taken by the Watermaster in 2015.

Have San Juan inflows in the past been designated as no-charge water available for diversion?

- Yes, many times and likely to be made available for no-charge diversion in the future.
- Among issues to consider is whether Mexico has granted use of these inflows to the U.S and whether the use will be credited against a deficit existing at that time.
- If the U.S. receives authority to divert San Juan water in the future, no deficit exists and thus credit against a Treaty delivery requirement is not contemplated, then no-charge diversion authorization can and should be strongly considered

Can someone not satisfied with the actions of the Watermaster appeal?

- Yes, the water code and agency rules stipulate that a person dissatisfied with any action of a watermaster may apply to the executive director for relief under the Texas Water Code, §11.326.

Why did Texas agree to accept San Juan water, credit the same as diverted toward Mexico's deficit and not designate the diversions as no-charge water?

- Like in 2005, the utilization of San Juan water was an integral part of a greater discussion and negotiation with Mexico to resolve in a more sustainable manner the issue of frequent deficits and negative impacts to Texas Rio Grande water right holders.
- Resolution of non-compliance with the Treaty is key to providing greater certainty to Mexico water deliveries for the benefit of Texas water users
- Such utilization was made in what those involved in the discussions and decisions believed to be the most equitable manner.