

U.S.-Mexico Water Sharing: Background and Recent Developments

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November 10, 2015

Congressional Research Service

7-....

www.crs.gov

R43312

Summary

The United States and Mexico share the Colorado River and Rio Grande pursuant to binational agreements. Increasing water demands and reduced supplies deriving from drought and high heat increase the challenges and significance of treaty compliance. The International Boundary and Water Commission (IBWC), a binational entity with a U.S. Section that operates under the foreign policy guidance from the U.S. Department of State, is charged with addressing issues that arise during application of these treaties.

Colorado River. The Colorado River flows through seven U.S. states before reaching Mexico; 97% of the basin is in the United States. A 1944 Water Treaty requires that the United States annually provide Mexico with 1.5 million acre-feet (AF) of Colorado River water, which represents about 10% of the river's average flow. Binational disputes have arisen over water quantity, quality, and conservation. Under the Treaty, disputes can be resolved through amendments, called "minutes." Minute 242 from 1973 requires that salinity of Colorado River water deliveries not exceed a specified limit. Minute 319 from 2012 provides for a bilateral basin water management, storage, and environmental enhancement effort; the minute is to be enforced through 2017 with the possibility of an extension.

Rio Grande. The Rio Grande is governed by two separate agreements. Deliveries to Mexico in the northwestern portion of the shared basin (near El Paso/Ciudad Juárez) occur under a 1906 Convention, while deliveries for the southeastern portion (which is below Fort Quitman, Texas) are laid out in the 1944 Water Treaty. The 1906 Convention requires an annual delivery to Mexico of 60,000 AF, which can be proportionally reduced based on drought conditions. The United States is not required to make up for reductions. From 1939 to 2013, deliveries to Mexico were reduced in roughly 30% of the years, including significant reductions in each year since 2012.

Under the 1944 Water Treaty, Mexico has rights to two-thirds of the flows of six Mexican Rio Grande tributaries. The one-third delivered to the United States must average at least 350,000 AF per year, measured in five-year cycles. A five-year cycle ended in October 2015, with Mexico likely ending behind on deliveries. Mexico's deliveries fell behind early in that cycle. It is anticipated that the final accounting (which may be available in early 2016) may indicate that Mexico met its deliveries in the cycle's fourth year and was close to meeting the delivery target in the fifth year. Roughly 100,000 AF of the water delivered in the fifth year came from sources not formally covered by the 1944 Water Treaty.

Legislative and Diplomatic Responses. Some Members of Congress have expressed concerns about the adequacy of Mexico's 1944 Water Treaty compliance, U.S. efforts to hold Mexico to its treaty obligations, and the resulting economic impacts, especially in Texas border counties. On December 16, 2014, P.L. 113-235, the Consolidated and Further Continuing Appropriations Act, 2015, became law, and a provision in this omnibus legislation required the U.S. Section of the IBWC to report to the Committees on Appropriations on various water delivery and accounting issues within 45 days of enactment. In 2014 and 2015, the U.S. Department of State submitted reports to Congress on the status of Mexico's deliveries, including a status update in September 2015. Also in 2015, the U.S. Department of State raised water issues in meetings with Mexican officials and the IBWC organized a July 2015 meeting in Texas with representatives from the state of Texas and Mexico's national water agency. The Texas meeting's discussion covered basin water modeling efforts and various means to improve the predictability and compliance of Mexico's water deliveries.

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U.S.-Mexico Water Sharing

How to share water has long been a complex issue for the U.S.-Mexico border region and in the broader U.S.-Mexico relationship.¹ The two countries share a nearly 2,000-mile border. Multiple rivers cross the border or form the border at various points. The principal shared river basins are:

- the Colorado River, which is predominantly in the United States, and crosses the Mexican border on its way to the Gulf of California (**Figure 1**), and
- the Rio Grande, with major tributaries in the United States and Mexico and whose riverbed is the U.S.-Mexico border in Texas (**Figure 2**).

In the 19th century, numerous questions arose regarding the boundaries between the two countries and water sharing of international rivers. Early agreements, starting in 1848, sought to clarify the location of the border.² Later in the century, the two countries entered into the Convention of March 1, 1889, establishing the International Boundary Commission (IBC) to apply border agreements.³ Starting in 1906, agreements to distribute water binationally began to emerge; a 1906 convention on the sharing of Rio Grande for irrigation purposes distributed water in the vicinity of El Paso, Texas.⁴ In 1944, the two countries entered into a treaty on “Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande” (hereinafter Treaty or 1944 Water Treaty).⁵ The Treaty reconfigured the IBC into the International Boundary and Water Commission (IBWC), which provides binational support and facilitates resolution of issues arising during application of U.S.-Mexico treaties on water quantity, sanitation, water quality, flood control, and boundary demarcation.⁶

This report is a primer on U.S. and Mexican water sharing. It focuses on surface-water quantity sharing. Due to Mexico’s below-target deliveries of Rio Grande water to the United States during the early years of the 2010-2015 cycle, particular attention is given to the status, underlying causes, and responses to the Rio Grande water delivery shortfalls. This report describes the following:

- legal obligations and processes under the 1944 Water Treaty;
- drought conditions from 2010 to 2013;
- developments in the Colorado River basin;
- developments in the Rio Grande; and
- stakeholder, diplomatic, and legislative responses.

¹ For background on the broader U.S.-Mexican relationship, see CRS Report R42917, *Mexico: Background and U.S. Relations*, by (name redacted).

² Treaty of Guadalupe Hidalgo, U.S.-Mex., February 2, 1848, available at http://www.ibwc.state.gov/Files/Treaty_of_1848.pdf (ending the Mexican-American War).

³ Convention Between the United States and Mexico regarding the Water Boundary, U.S.-Mex., December 2, 1898, at http://www.ibwc.state.gov/Files/TREATY_OF_1898.pdf.

⁴ Convention of May 21, 1906, on the Equitable Distribution of the Waters of the Rio Grande, at <http://www.ibwc.gov/Files/1906Conv.pdf>.

⁵ 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., Feb. 3, 1944, 59 Stat. 1219 (hereinafter referred to as the 1944 Water Treaty or the Treaty).

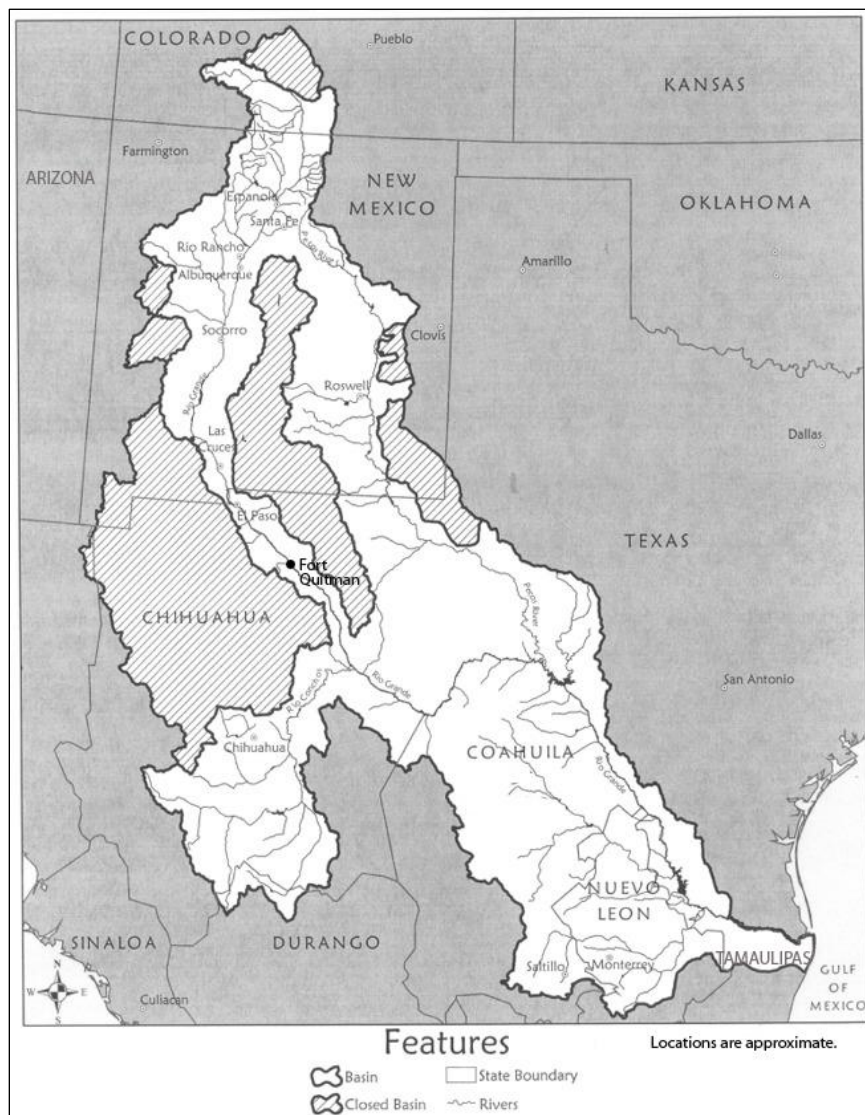
⁶ The U.S. Section of the International Boundary and Water Commission (IBWC) operates under the foreign policy guidance of the U.S. Department of State; its funding typically is provided through the annual Department of State, Foreign Operations, and Related Programs appropriations process.

Figure I. Colorado River Basin



Source: The Earth Institute at Columbia University (with minor modification by CRS), at <http://blogs.ei.columbia.edu/wp-content/uploads/2012/12/CO-River-Basin-REVISED.jpg>, and modified by CRS.

Figure 2. Rio Grande Basin



Source: New Mexico Museum of Natural History and Science, at http://www.nmnaturalhistory.org/BEG/BEG%20Images/MAP_RGB_pg48.jpg, and modified by CRS.

1944 Water Treaty

Responsibilities, Execution, and Treaty Minutes

The 1944 Water Treaty establishes water allocations for the United States and Mexico and creates the current governance framework for the IBWC to resolve disputes arising from its execution.⁷ The IBWC is an international body consisting of U.S. and Mexican Sections, which are overseen by the U.S. Department of State and Mexico's Ministry of Foreign Relations, respectively.⁸

⁷ Ibid.

⁸ Ibid. The members of the IBWC are granted diplomatic status and enjoy "the privileges and immunities appertaining (continued...)"

Disputes that arise under the 1944 Water Treaty are settled through the Treaty's "minute" process. The IBWC is authorized to develop rules and to issue decisions regarding the execution of the Treaty in the form of minutes,⁹ which become legally enforceable and essentially amend the Treaty. A proposed minute is forwarded within three days to the government of each country for approval.¹⁰ If the government of either country fails to announce its approval or disapproval within 30 days, the minute is considered approved.¹¹ If either government disapproves, the matter is removed from IBWC control and the two governments negotiate the issue.¹² If an agreement is reached between the governments, the IBWC must then take any further actions "as may be necessary to carry out such agreement."¹³ For the United States, the executive branch has the authority to approve or disapprove of the proposed minutes arising from the 1944 Water Treaty;¹⁴ the President only has the ability to make such agreements pursuant to a treaty if the agreement is in the purview of the treaty.¹⁵

Water Distribution Requirements

The basic water distribution arrangements in the 1944 Water Treaty are as follows.

- For the Colorado River basin, the United States is to provide Mexico annually with 1.5 million acre-feet (AF)¹⁶ of water.¹⁷
- For the Rio Grande basin below Fort Quitman, Texas,
 - Mexico has the rights to two-thirds of the flows that feed into the Rio Grande from the six major tributaries that enter from Mexico: the Conchos, San Diego, San Rodrigo, Escondido, and Salado Rivers and the Las Vacas Arroyo (stream).¹⁸
 - the United States receives all flows from Rio Grande tributaries in the United States and one-third of flows from the six Mexican tributaries.¹⁹ Mexico's water delivery

(...continued)

to diplomatic officers" and may "freely carry out their observations, studies and field work in the territory of either country" (ibid.). However, all works and structures that are wholly located within one country—despite the potential international character of such works—remain under the exclusive jurisdiction of the country in which they are located. Each country is responsible for the expenses incurred by their respective section; however, joint expenses are "borne equally by the two Governments."

⁹Treaty, art. 25.

¹⁰ Ibid.

¹¹ Ibid.

¹² Ibid.

¹³ Ibid.

¹⁴ The Administration has authority to agree to the minutes because they are agreements made pursuant to the 1944 Water Treaty, a treaty that the Senate has ratified. Because a properly enacted treaty is the "Supreme Law of the Land," the power to enter into an agreement required or contemplated by the treaty lies fairly clearly within the President's executive function. U.S. Const. art. VI, § 2 ("the laws of the United States ... [and] all treaties made, or which shall be made, under the authority of the United States, shall be the supreme Law of the Land."); Congressional Research Service, *Treaties and Other International Agreements: The Role of the United States Senate*, A Study Prepared for the Senate Comm. on Foreign Relations 5 (Comm. Print 2001). For further discussion on the treaty process and executive agreements, see CRS Report RL32528, *International Law and Agreements: Their Effect upon U.S. Law*, by (name redacted)

¹⁵ Treaty, art. 26.

¹⁶ An acre-foot (AF) is about 326,000 gallons of water, enough to cover an acre of land with one foot of water.

¹⁷ Treaty, art. 10.

¹⁸ Ibid., art. 4(A)(c).

from these six tributaries must average at least 350,000 AF per year, measured in five-year cycles.²⁰

If Mexico fails to meet its minimum flow obligations for a five-year cycle because of “extraordinary drought”—a term not defined in the 1944 Water Treaty—it must make up the deficiency during the next five-year cycle with water from the Mexican tributaries.²¹ Minute 234 established that Mexico may repay a water debt using three sources of water: (1) excess water from its tributaries; (2) a portion of its allotment from its tributaries; or (3) a transfer of its stored water in the international reservoirs.²²

If Mexico fails to meet its minimum flow obligations for a five-year cycle and there is no agreement that an extraordinary drought existed, Article 24(d) of the 1944 Water Treaty provides certain mechanisms for dispute settlement. First, the IBWC has the authority “to settle all differences that may arise between the two Governments with respect to ... application of the Treaty.”²³ However, if the commissioners are unable to reach agreement on a dispute, the dispute shall be settled through diplomatic channels between the United States and Mexico.²⁴ Article 24 also provides that the countries may seek recourse in any “general or special agreements which the two Governments have concluded for the settlement of controversies.”²⁵ However, it does not appear that these mechanisms have been necessary in the past. As discussed throughout this report, the United States and Mexico previously have used the minute process and diplomatic efforts to reconcile disputes regarding the 1944 Water Treaty.

Article 9 of the 1944 Water Treaty provides the IBWC with some flexibility regarding the diversion of water from the Rio Grande. For example, in cases of extraordinary drought occurring in one of the countries, the IBWC may permit water to be withdrawn from the other country in order to help alleviate drought conditions.²⁶ Further, the IBWC may allow one country to use water allocated to the other country if it can be done “without injury to the latter and can be replaced at some other point on the river.”²⁷ However, if the IBWC authorizes temporary diversions of water from one country to another, the use of such water does not establish a permanent right to divert.²⁸ Under article 9, the IBWC also is responsible for keeping records concerning the water belonging to both Mexico and the United States.

The 1944 Water Treaty establishes a hierarchy of uses for the water: (1) domestic and municipal uses; (2) agriculture and stock-raising; (3) electric power; (4) other industrial uses; (5) navigation; (6) fishing and hunting; and (7) any other beneficial uses which may be determined by the Commission.²⁹ A frequent critique of this hierarchy is that it does not include an obligation to

(...continued)

¹⁹ Ibid., art. 4(B).

²⁰ Ibid., art. 4(B)(c).

²¹ Ibid., art. 4. For more on compliance, see Allie Alexis Umoff, “An Analysis of the 1944 U.S.-Mexico Water Treaty: Its Past, Present, and Future,” *Environs: U.C. Davis School of Law Environmental Law and Policy Journal*, vol. 32, no. 1 (2008), hereinafter Umoff 2008.

²² IBWC Minute 234, December 2, 1969.

²³ Treaty, art. 24(d).

²⁴ Ibid.

²⁵ Ibid.

²⁶ Ibid., art. 9(f).

²⁷ Ibid., art. 9(d).

²⁸ Ibid., art. 9(e).

²⁹ Ibid., art. 3.

maintain water for ecological purposes.³⁰ In addition, the original 1944 Water Treaty does not have any provisions that establish requirements for water quality, but only establishes the quantity requirements outlined above.³¹ This led to tensions regarding salinity levels in the United States deliveries to Mexico after the Treaty was ratified.³² As discussed in the “Salinity” section below, the two countries agreed to Minute 242 in 1973 to resolve the dispute.³³

Regarding management of reservoirs in the basin that are wholly in one country, the Protocol accompanying the original 1944 Water Treaty establishes that constructed works, such as dams and conveyance structures, in one country that are used only partly for Treaty compliance shall be constructed and operated by the federal agencies of that country, in conformance with the Treaty and in cooperation with the IBWC.³⁴ Subsequent minutes, such as Minute 319 (which is discussed below under “Minute 319: Water Conservation and Environmental Protection”), have integrated operational activities in specific circumstances for specific works. To what extent Mexico operates its reservoirs to support Treaty compliance is discussed in the “Stakeholder Perspectives” section below, which focuses on Mexico’s Rio Grande water delivery shortfalls.

Other Treaty Provisions

The 1944 Water Treaty established other requirements beyond water distribution obligations. The Treaty, among other things, (1) provided for the construction of certain dams and channels along the rivers;³⁵ (2) required the IBWC to establish studies and prepare plans for flood control;³⁶ (3) provided that the IBWC should study and plan for the generation of hydroelectric energy along the rivers;³⁷ and (4) required the IBWC to establish regulations for the maintenance and operation of reservoirs.³⁸ Discussion of these treaty requirements is beyond the scope of this report.

Drought Conditions

Water sharing becomes more complicated during droughts, and both the Colorado River and the Rio Grande basins are prone to multiyear droughts. For the Rio Grande, as shown in **Figure 3**, both 2011 and 2012 were marked by dry conditions, resulting from high heat, low precipitation,

³⁰ See, for example, Umoff 2008.

³¹ See Treaty.

³² See Umoff 2008, p. 78.

³³ IBWC Minute 242, Aug 30, 1973.

³⁴ The Protocol states that for “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.” Treaty, Protocol.

³⁵ Treaty, art. 5.

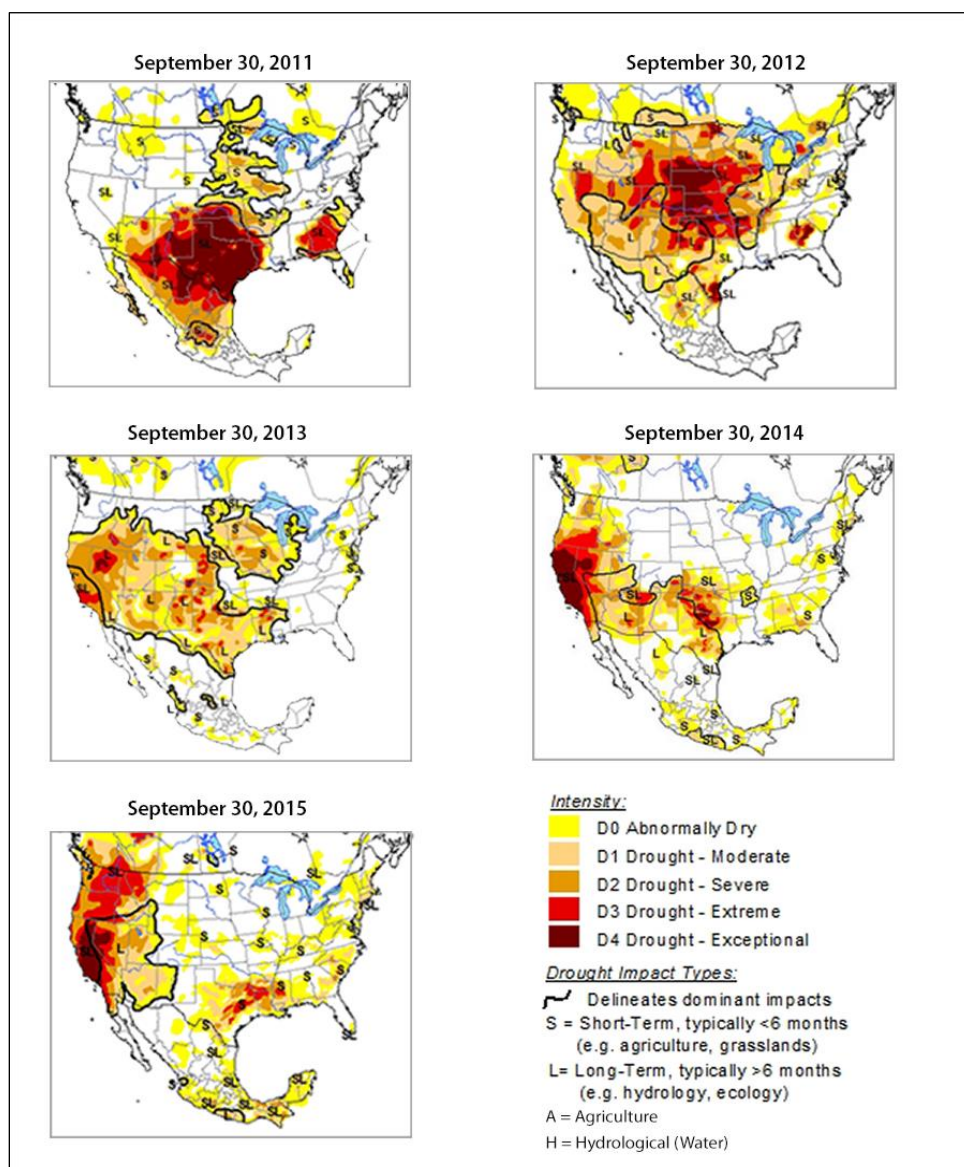
³⁶ Ibid., art. 6.

³⁷ Ibid., art. 7.

³⁸ Ibid., art. 8.

and low runoff throughout most of the basin. For the Colorado River, dry conditions developed more noticeably in 2012 and persisted in varying degrees through September 2015.³⁹

Figure 3. Evolution of North American Drought from 2011 to 2015



Source: North American Drought Monitor maps (minor modifications by CRS), available at <http://www.ncdc.noaa.gov/temp-and-precip/drought/nadm/index.php>. These maps are created by U.S., Mexican, and Canadian experts who synthesize various drought indices and impacts.

³⁹ For more on the causes and consequences of drought, see CRS Report RL32528, *International Law and Agreements: Their Effect upon U.S. Law*, by (name redacted).

Colorado River Basin

As depicted in **Figure 1**, the Colorado River flows through seven U.S. states (Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming) and forms the border between the Mexican states of Baja California Norte and Sonora, before emptying into the Gulf of California; 97% of the basin is in the United States. Disputes have erupted over the use of the Colorado River water supplies for most of the past century. Although many of these disputes have related to state allocations on the U.S. side of the border, issues have also arisen over water quality, availability, and conservation between the United States and Mexico.

When the 1944 Water Treaty was signed, Colorado River flows were estimated at some 16.8 million AF per year. Recent flows have averaged volumes closer to 14.4 million AF annually.⁴⁰ That is, the 1944 Water Treaty requirement that the United States provide Mexico with 1.5 million AF annually means that the United States retains roughly 90% of the average flow, but less than originally estimated. In December 2012, the Department of the Interior's Bureau of Reclamation published a study documenting that the demand for the basin's water in the United States in some years exceeds supply, and that the demand-supply imbalance is anticipated to worsen in coming decades.⁴¹ While discussion of Colorado River water issues within the United States is beyond the scope of this report, concern about meeting future demands in the United States is significant to the context of discussions about the basin's water sharing with Mexico.

The following treaty implementation issues in the Colorado River basin are discussed in more detail below: salinity, environmental protection, and Minute 319.

Salinity

While the United States has consistently delivered Mexico's minimum allotment of Colorado River water, disputes did arise about the quality of the water. In the 1960s, salinity in the Colorado River rose dramatically.⁴² Mexico was receiving water that was too salty for human, livestock, or agricultural uses. The IBWC helped both countries agree to Minute 218, which took effect in 1965 for a period of five years, requiring the United States to extend a drainage channel to reduce salinity. Five years later, Mexican farmers remained angry about the salinity issue. After the Mexican government threatened to take the water dispute to the International Court of Justice, the United States agreed to Minute 242 in 1973. Per Minute 242, the United States agreed to construct additional channels to control salinity, fund clean-up of the Mexicali Valley lands damaged by the accumulation of salts, and keep salinity levels of delivered water below a certain level. Minute 242 remains in force, and the United States continues to comply with its provisions.

⁴⁰ "U.S., Mexico: The Decline of the Colorado River," *Stratfor Global Intelligence*, May 13, 2013.

⁴¹ U.S. Department of the Interior, Bureau of Reclamation, *Colorado River Basin Water Supply and Demand Study*, December 2012.

⁴² Part of the U.S. effort to manage the salinity of its water included the construction of the Yuma Desalting Plant by the Department of the Interior's Bureau of Reclamation. This facility has rarely operated since its construction, however, due in part to the cost of its operations (desalination can require considerable electricity to operate). Instead, the high-saline irrigation water has been disposed (through a canal that enters Mexico and discharges into wetlands called the Ciénega de Santa Clara near the Gulf of California) separately from the United States' required deliveries to Mexico. Whether and how the Yuma Desalting facility should be operated, and how the impacts on the Ciénega de Santa Clara from the reduced discharge of the untreated irrigation runoff should be managed, remain topics of some debate in the basin.

While the IBWC-backed resolution to this crisis proved to be successful, the agreement took a long time and required external pressure to be reached.⁴³

Instream Flows for Environmental Protection

The Colorado River Delta at the terminus of the Colorado River, prior to significant expansion of the basin's water consumption, covered 9,650 square miles in the United States and Mexico. The Mexican side of the delta contains wetlands, woodlands, and desert areas that are home to many endangered species; part of Mexico's delta is a designated United Nations Biosphere Reserve. According to environmental interests, insufficient water flowing into the delta has contributed to the degradation of 90% of the delta's wetlands;⁴⁴ these interests recommend that annual flows accompanied by larger pulses of water every four years would restore the wetlands.⁴⁵ These stakeholders have argued that "environmental protection" should be added to the 1944 Water Treaty as a factor in determining water deliveries to Mexico. Other stakeholders are less supportive of these restoration efforts; some are concerned that they may reduce the allocations available for U.S. users and others do not want to support these efforts while the question of Mexico's compliance with water deliveries in the Rio Grande basin is raising tensions (discussed in "Responses to Mexico's Rio Grande Water Delivery Shortfalls").

The issue of instream flows for environmental protection entered bilateral discussions in the IBWC in the late 1990s. In recent years, bilateral discussions in the basin coalesced around improved management of and conservation of both the Colorado River and its delta. Both governments, along with state officials and conservation groups, worked with the IBWC to develop an agreement that would allocate water to Mexico based on whether there was a surplus or drought and allow for joint investments to create greater environmental protection, as well as greater water conservation (i.e., ability to store water) for Mexico. These discussions led to Minute 319.

Minute 319: Water Conservation and Environmental Protection

Minute 319 was signed on November 20, 2012, and is to be enforced for five years (with the possibility of an extension through 2026 if not supplanted or replaced by another minute). Some viewed Minute 319 as a step forward in bilateral water management and environmental protection efforts.⁴⁶ Others did not support Minute 319 for a variety of reasons, including that the minute signaled increasing cooperation at the same time that water tensions in the Rio Grande basin were particularly acute.

Key elements of the agreement include 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 Mexico repairs earthquake-damaged infrastructure;

⁴³ Umoff 2008.

⁴⁴ CRS phone interview with Carlos de la Parra, Professor in the Department of Urban Studies and the Environment at El Colegio de la Frontera Norte, Mexico, July 8, 2013.

⁴⁵ Sierra Club, *Regional Conservation Committee: Colorado River Report*, February 2001.

⁴⁶ CRS phone interview with Carlos de la Parra, Professor at El Colegio de la Frontera Norte, Mexico, July 8, 2013.

- delivering additional water (i.e., above the 1.5 million AF annual delivery required by the Treaty) to Mexico when water levels are high in Lake Mead;
- reducing deliveries during low Lake Mead reservoir conditions (i.e., Mexico's annual water deliveries would be reduced by up to 0.5 million AF, similar to the reduction by the U.S. lower basin states);⁴⁷
- implementing jointly funded water efficiency and conservation projects to free up water for the Colorado River Delta;
- creating a mechanism by which U.S. water deliveries to Mexico can be held in United States reservoirs for subsequent delivery; and
- continuing to work together to address salinity concerns per Minute 242.

Rio Grande Basin

On most maps, the Rio Grande appears as a continuous line from Colorado to the Gulf of Mexico; in reality, the river dries up at various points. Consequently, what looks like a continuous basin in **Figure 2** actually operates as two separate binational basins divided into:

- the northwestern El Paso-Juárez Rio Grande basin from south of Elephant Butte Dam in New Mexico past the water withdrawals and return flows of El Paso, Texas, and Ciudad Juárez, Chihuahua; and
- the southeastern Lower Rio Grande basin, including its tributaries (e.g., Rio Conchos) from Fort Quitman, Texas, to the Gulf of Mexico.

Binational water-sharing agreements differ in the two binational Rio Grande basins. In the northwestern El Paso-Juárez basin, the United States is required to deliver water to Mexico. In the southeastern Lower Rio Grande basin, it is largely Mexico that is obligated to deliver water to the United States. A common characteristic of both basins is that the water demands regularly exceed supply; this imbalance becomes particularly apparent during droughts. While the northwestern El Paso-Juárez water issues have raised significant local concerns recently, the delivery of water from Mexico in the southeastern Rio Grande basin has received the majority of national media and political attention.

Water stored in aquifers is generally not addressed by the U.S.-Mexico binational water-sharing agreements. Groundwater may play a significant role in water supply in some parts of the U.S.-Mexico border, especially during dry conditions. For more on shared groundwater resources in the border region, see the box “Border Aquifers Are Largely Not Addressed by Binational Agreements.”

⁴⁷ Minute 319 stipulates: “the Government of the United States will provide the most current information to Mexico on basin conditions as often as required, including precipitation, stream flow, and water storage conditions in the basin and their historical behavior; the consumptive water uses for the different basin states, and the historical trend; and the status of the determination of shortage conditions in the Colorado River Basin within the United States....” This level of data sharing is higher than required in the Rio Grande basin.

Border Aquifers Are Largely Not Addressed by Binational Agreements

Binational aquifers also are shared water resources that can be particularly important for meeting needs during dry times; roughly 20 binational aquifers are significant sources of domestic water supply for overlying populations. For example, the Hueco Bolson aquifer provides water for Ciudad Juárez's 1.5 million residents and 40% of El Paso's 730,000 residents.

Many border aquifers have experienced significant declines in volume and/or quality. No broad bilateral agreement exists on U.S.-Mexico border groundwater management and use. Declining water levels, deteriorating water quality, and increasing use of groundwater resources have raised concerns about the long-term availability of the border's aquifers. Knowledge about the extent, depletion rates, and quality of transboundary aquifers is limited and in some areas completely absent. A binational aquifer quantity and quality assessment has been initiated, pursuant to the U.S.-Mexico Transboundary Aquifer Assessment Act (P.L. 109-448). The act authorized the Secretary of the Interior, through the U.S. Geological Survey (USGS), to collaborate with the states of Arizona, New Mexico, and Texas through their Water Resources Research Institutes (WRRIs) and with the International Boundary and Water Commission, stakeholders, and Mexican counterparts to provide information and a scientific foundation for state and local officials to address pressing challenges along the U.S.-Mexico border. According to the act's accompanying Senate report (S.Rept. 109-17),

Ground-water pumping has lowered the water table, depleted aquifers, and reduced the base flow of many streams thus decreasing the quantity of water available to support critical riparian habitats. Excessive ground-water pumping in some major urban centers, such as in the El Paso/Juárez metropolitan region, has caused land subsidence that has damaged homes and essential urban infrastructure. In addition to the effects of ground- and surface-water depletion, degradation of water quality has reduced habitat suitability for the region's diverse biota.

The assessment was authorized in 2006 for \$50 million. The USGS used and distributed a total of \$2 million through FY2010 for the assessment. It has received no subsequent funding as of November 2015. Mexico also contributed funding, but estimated funding levels are not available. Additional USGS-supported work is contingent on funding.

Sources: G. E. Eckstein, "Buried Treasure or Buried Hope? The Status of Mexico-U.S. Transboundary Aquifers under International Law," *International Community Law Review*, vol. 13 (2011), pp. 273-290; W. A. Alley, *Five-Year Interim Report of the United States-Mexico Transboundary Aquifer Assessment Program: 2007 -2012*, U.S. Geological Survey, Open File Report 2013-1059, Reston, VA, 2013; Christopher E. Wilson, Erik Lee, et al., *The State of the Border Report: A Comprehensive Analysis of the U.S.-Mexico Border*, Woodrow Wilson Center, El Colegio de la Frontera Norte, Arizona State University, May 2013.

Northwestern Rio Grande Basin (El Paso-Ciudad Juárez)

Under the 1906 Convention that guides U.S. deliveries to Mexico at Ciudad Juárez, the United States is to deliver to Mexico 60,000 AF (enough water to irrigate about 25,000 acres) for use in the Juárez Valley of Chihuahua. However, during conditions of extraordinary drought, these deliveries to Mexico are reduced proportionally to reductions in available supplies in the broader basin. From 1939 to 2015, deliveries to Mexico were reduced in roughly 30% of the years; the United States is not required to repay any reduced deliveries. U.S. deliveries to Mexico have been reduced in recent years as follows: 23,200 AF (39% of full allotment) in 2012; 3,700 AF (6%) in 2013; 18,300 AF (30%) in 2014; and 33,800 AF (56% of full allotment) in 2015.

In recent years, U.S. water deliveries to Mexico in the northwestern binational Rio Grande basin have drawn regional attention because the Middle Rio Grande (the portion of the river that traverses New Mexico) has experienced particularly low flow conditions and low storage at reservoirs due to drought. Junior water rights holders (whose water allocations are reduced prior to those with more senior rights) in New Mexico and Texas have received deeply curtailed deliveries (as low as 4% of a full allotment) in recent years.

Specifically, U.S. stakeholders associated with the U.S. Bureau of Reclamation's Rio Grande Project are interested in how water is being delivered to Mexico when the basin is affected by

drought.⁴⁸ The Rio Grande Project furnishes irrigation water for approximately 178,000 acres in New Mexico and Texas, as well as electric power. Water deliveries from this project have been significantly curtailed as multiple years of dry conditions have depleted reservoir storage.

Southeastern Rio Grande Basin (below Fort Quitman, Texas)

In the southeastern Lower Rio Grande basin, Mexico is required to deliver water to the United States under the 1944 Water Treaty. As previously noted, the southeastern Lower Rio Grande water delivery account is managed largely on five-year cycles. Mexico's compliance with Treaty delivery requirements often has been accomplished through wet-weather flows (i.e., excess flows) rather than through purposeful releases from Mexican reservoirs to provide for reliable delivery to the United States.

Mexico met its deliveries within the five-year cycles until the 1994-2003 drought.⁴⁹ Significant irrigated agricultural production developed in the Rio Conchos basin during the 1980s and early 1990s. It is the change in water deliveries from the Rio Conchos that garnered most of the critical attention during the 1994-2003 drought. During that drought period, Mexico accrued a water debt through two five-year water cycles.⁵⁰ Diffusion of tensions over the debt was accomplished through presidential intervention, negotiation of new minutes under the 1944 Water Treaty, and investments in improved water efficiency. Hurricane-induced wet conditions cleared the remaining water debt in 2005.⁵¹ The most significant tributary in the southeastern Rio Grande basin is Mexico's Rio Conchos, which historically contributed 70% of the flow in the Rio Grande but as of the 1990s was contributing only 40% of the flow.

⁴⁸ In particular, the timing of the water releases in 2012 for delivery to Mexico and their potential impacts on U.S. regional interests (e.g., potential conveyance losses because releases for Mexico would not be timed with deliveries to U.S. water districts) raised concerns among some U.S. stakeholders (Letter from Patrick R. Gordon, Texas Commissioner, Rio Grande Compact Commission, to Edward Drusina, Commissioner, U.S. Section, International Boundary and Water Commission, April 9, 2012; Texas Agrilife Research Center, *Drought Watch*, February 2013). Mexican growers had sought the surface-water deliveries because pumping problems had impaired their ability to start the agricultural season using groundwater.

⁴⁹ During the two five-year cycles between 1992 and 2002, Mexico incurred water debt, failing to deliver the 1,750,000 AF (average annual 350,000 AF) required under the Treaty. See Umoff, 2008. In Minute 293 from October 1995, the United States agreed to loan Mexico water to alleviate the drought. However, in subsequent years Mexico's water debt continued to increase. Minute 308, from June 2002, required Mexico to immediately transfer 90,000 AF of water from international reservoirs to the United States, as partial repayment of the water debt, and required Mexico to conduct studies to improve drought management. After extended negotiations, the two countries reached a solution to eliminate Mexico's water debt for the aforementioned shortages in 2005.

⁵⁰ As previously noted, Minute 234, established in 1969, includes a procedure whereby Mexico may pay a water debt using three different sources of water. Minute 234 requires that the deficit payments from these three sources be made concurrently with required deliveries in the following five-year cycle. The United States and Mexico differ in their interpretation and implementation of Minute 234. For example, Mexico claimed that in the event of extraordinary drought, only the deficit incurred during the 1992-1997 five-year water cycle needed to be repaid in the following five-year cycle (i.e., by 2002), and any deficit incurred during the 1997-2002 cycle could be deferred until the next five-year cycle. The United States argued that Minute 234 required that the water debt incurred during the 1997-2002 cycle be made up concurrently with the 1992-1997 water debt. The matter was left unresolved.

⁵¹ C. Reed, "The Texas-Mexico Water Dispute and Its Resolution (?): Agricultural Liquid & Land Practice and Discourse along the Rio Conchos, Chihuahua, 1990-2005," (Ph.D. dissertation, The University of Texas at Austin, 2007); hereinafter Reed 2007. For additional information, see footnote 49 of this report.

Mexico's Rio Grande Deliveries

A delivery cycle started October 25, 2010, and ended October 24, 2015. It is anticipated that the final accounting for the 2010-2015 cycle may indicate a shortfall in Mexico's water deliveries, largely resulting from low deliveries early in the cycle. The final water accounting may be available by early 2016. 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-October 2012 period. Although it is anticipated that the final accounting may indicate that Mexico was close to or exceeded the 350,000 AF annual delivery target in the last three years of the cycle, Mexico is not anticipated to meet its cumulative requirement of 1,750,000 AF for the five-year cycle. Notably, in the fifth year of the cycle, Mexico delivered approximately 100,000 AF of water from supplemental water sources that are not formally part of the water treaty as part of its reported efforts to reach the 350,000 AF annual target.

The predictability and consistency of the Mexican deliveries within the five-year cycle is a point of tension among some basin interests. This tension was particularly acute during 2012, when Texas water-rights holders faced persistent dry conditions and Mexican water deliveries were significantly below the annual delivery target. Two binational reservoirs on the Rio Grande store much of the water that Mexico delivers to the United States; these reservoir releases help regulate when the water is delivered to U.S. interests, thereby increasing the value of the delivered water in meeting U.S. water demands. Some U.S. stakeholders have argued that the uncertainty regarding the timing of Mexico's deliveries reduces the effective utilization and management of the delivered water, its storage, and its release. Mexico, on the other hand, has argued that its deliveries are in compliance with the cycle provided for in the 1944 Water Treaty.

According to a U.S. Department of State status report delivered to Congress in September 2015, the U.S. Department of State and the U.S. Section of the IBWC were working with Mexico to ensure that the remaining delivery deficiencies from the 2010-2015 cycle “are made up in the next cycle, as required by the Treaty.”⁵² Regarding future deliveries, the report also stated that the Department and the IBWC were working with Mexico to

establish the modalities for predictable and complaint water deliveries. A key area of focus has been for Mexico to adopt procedures that would reliably deliver adequate water without the accumulation of future deficits and expressly incorporate Mexico's Treaty obligations to the United States in the country's annual apportionment of internal water resources. These efforts, undertaken in concert with Texas authorities, have achieved substantial positive momentum in the course of 2015. In our view, Mexico is in a position to meet its delivery obligation in 2015 and clear any prior-year deficiencies in the next five-year cycle.⁵³

An Over-Allocated Basin

Demands for water in the southeastern Rio Grande basin exceed average supply; it is an over-allocated basin. This imbalance became acute during the 1994-2003 drought. During that drought, the water supply for U.S. agriculture in the Lower Rio Grande basin averaged 78% of the full

⁵²Department of State, *Status Update to Report to the Congress on Water Deliveries from Mexico to the Rio Grande under Existing Treaty Obligations*, September 4, 2015. Hereinafter referred to as September 2015 Status Update to Congress.

⁵³ Ibid.

allocation from 1994 to 1996, and 53% from 1997 to 2004.⁵⁴ Currently, Texas water users, other than priority water users that generally receive their full water allocations (i.e., municipal, domestic, and industrial users), can expect to receive on average 70% of their water allocation in average water years.⁵⁵

Over-allocation in Mexico's Rio Grande basin also exists.⁵⁶ Much of Mexico's over-allocation is attributed to the expansion of Mexican irrigated agriculture from 1965 to 1994, first in Tamaulipas and later in Chihuahua. Significantly, Texas agricultural water withdrawals did not increase at a similar rate during this period in part because agriculture was already well established on the U.S. side of the border. Growth in industrial activity near the border associated largely with the maquiladora (export assembly plant) industry in Mexico and population growth in the basin's urban areas on both sides of the border also increased demands for urban water supplies.

After the 1994-2003 drought, efforts were made to better align water demand and supply in the southeastern Rio Grande basin; these efforts included buyback of water rights and infrastructure improvements (e.g., reducing water losses from agricultural and municipal water distribution systems). Much of the focus has been on reducing agricultural water use since it accounts for 84% of water withdrawals in the southeastern Rio Grande basin. Some of these efforts were undertaken binationally.⁵⁷ Support for some of these investments was provided by Minute 309.⁵⁸ Although progress has been made, demand still exceeds supply.⁵⁹ Some stakeholders have also questioned how much water savings has been accomplished through these investments and whether the investments in Mexico resulted in improved water deliveries by Mexico under the 1944 Water Treaty.⁶⁰

Responses to Mexico's Rio Grande Water Delivery Shortfalls

Stakeholder Perspectives

Some U.S. interests have contended that Mexico's water-delivery process treats U.S. deliveries as a secondary priority to meeting Mexico's own water uses; unpredictable deliveries from Mexico have angered some U.S. stakeholders because of the more prescriptive nature of the U.S. water-delivery requirement to Mexico (i.e., specified quantities are required to be delivered annually).

⁵⁴S. Sandoval-Solis, "Water Planning and Management for Large Scale River Basin Case of Study: the Rio Grande/Rio Bravo Transboundary Basin," (Ph.D. dissertation, The University of Texas at Austin, 2011). Hereinafter Sandoval-Solis 2011.

⁵⁵ Sandoval-Solis 2011.

⁵⁶ Sandoval-Solis 2011.

⁵⁷ For example, efforts to improve irrigation efficiency in the largest irrigation district in the Rio Conchos basin were undertaken using assistance from the North American Development Bank (NADBank). NADBank also invested in irrigation efficiency conveyance improvements in U.S. border counties. NADBank provided \$40 million in grants for these activities in Mexico, and \$40 million for activities in the United States (Reed 2007).

⁵⁸ 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, available at <http://www.ibwc.gov/Files/Minutes/Min309.pdf>.

⁵⁹ Sandoval-Solis 2011.

⁶⁰ Reed 2007.

They have pointed to high storage levels in some Mexican reservoirs as evidence to support their position. They have sought the release of waters from these reservoirs to help with the agricultural water needs in the most eastern portion of the Rio Grande basin. These interests view Mexico's high reservoir levels as its hoarding of a shared resource.

Other basin stakeholders have argued that Mexico's delivery flexibility was explicitly provided for in the 1944 Water Treaty to deal with the annual variability of water conditions in the basin. While the flexibility in delivery schedule can be viewed as generous to Mexico, some Mexican interests view the water delivery requirements in the Treaty as generous to the United States. They argue that although 30% of the water in the southeastern Rio Grande basin historically originated in the United States, 50% of the basin's water has been allotted to the United States.⁶¹ This occurs in part because U.S. tributaries are allotted 100% to the United States.

For Mexico, conserving water in its reservoirs can be viewed as part of a long-term drought risk management strategy. The strategy in some Mexican sub-basins to conserve water in some reservoirs during drought also may be influenced by the less developed levels of agricultural insurance and government assistance programs in Mexico. These types of programs in the United States reduce the agriculture sector's economic exposure to droughts and other natural disasters.

Some U.S. stakeholders support reevaluating the current binational water-sharing framework for multiple reasons, including Mexico's Rio Grande water deliveries, its reservoir management and plans, and other disputes and concerns (e.g., environmental restoration and protected and invasive species management issues) in both the Rio Grande and Colorado River basins. Others support continuing to work within the existing IBWC framework, including some U.S. interests that are encouraged by the resolution and cooperation on binational Colorado River issues and concerned that opening up the 1944 Water Treaty may be risky for U.S. interests.

Diplomatic Responses

The IBWC has resolved most border water disputes since 1944, although its processes may be slow to reach resolution. The IBWC employs a combination of technical expertise and diplomacy (backed by the U.S. Department of State and Mexico's Foreign Ministry) to find solutions that are acceptable to stakeholders on both sides of the border. As with past binational water issues, the IBWC has been the primary entity engaged in resolving the current Rio Grande water dispute over how to address dry conditions and water deliveries in that region.

The U.S. and Mexican Sections of the IBWC have been meeting regularly since late 2012 to discuss Mexico's water deliveries. In April 2013, the U.S. Section of the IBWC reported that the Mexican government had initiated some releases from a reservoir on the San Rodrigo River per the U.S. Section's (and the Mexican state of Tamaulipas's)⁶² repeated requests.⁶³ Since April 2013, U.S. and Mexican political officials have stepped in to support IBWC efforts to resolve the current water dispute. According to U.S. and Mexican officials, the water dispute was a topic of conversation between high-level government officials in 2013.⁶⁴ Mexican president Enrique Peña Nieto reportedly had instructed his Foreign Ministry to prioritize working with the IBWC, the

⁶¹ Spener 2013.

⁶² Spener, 2013.

⁶³ Letter from Edward Drusina, U.S. IBWC Commissioner, to the Honorable U.S. Representatives Cuellar, Gallego, Hinojosa, and Vela, April 5, 2013.

⁶⁴ CRS phone interview with State Department official, July 11, 2013; CRS phone interview with Mexican official, July 5, 2013; September 2014 Status Update to Congress.

U.S. Department of State, Mexico's Water Commission, and authorities from Texas to reach a mediated settlement to the dispute as soon as possible.⁶⁵

Among the outcomes of diplomatic efforts has been an exchange of technical data to assist in developing options for future water management in the basin. In 2015, the U.S. Department of State raised water issues in meetings with Mexican officials and the IBWC organized a July 2015 meeting in Texas with representatives from the state of Texas and Mexico's national water agency. The Texas meeting's discussion covered basin water modeling efforts and various means to improve the predictability and compliance of Mexico's water deliveries.

Congressional Responses

Several Members of Congress have noted the complaints of farmers, local officials, and state officials about the rate of Mexico's water deliveries.⁶⁶ Some Members of Congress expressed concerns about the adequacy of the efforts by the U.S. Section of the IBWC and the U.S. Department of State to press Mexico to comply more consistently with its 1944 Water Treaty obligations. On December 16, 2014, P.L. 113-235, the Consolidated and Further Continuing Appropriations Act of 2015, became law; Section 7045(g)(3) of Division J of the law required the U.S. Section of the IBWC to report to the Committees on Appropriations on various water delivery and accounting issues:

Not later than 45 days after the enactment of this Act, the Secretary of State, in consultation with the Commissioner for the United States Section of the International Boundary and Water Commission (IBWC), shall report to the Committees on Appropriations on the efforts to work with the Mexico Section of the IBWC and the Government of Mexico to establish mechanisms to improve the transparency of data on, and predictability of, the water deliveries from Mexico to the United States to meet annual water apportionments to the Rio Grande, in accordance with the 1944 Treaty between the United States and Mexico Respecting Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, and on actions taken to minimize or eliminate the water deficits owed to the United States in the current 5-year cycle by the end of such cycle: Provided, That such report shall include a projection of the balance of the water delivery deficit at the end of the current 5-year cycle, as well as the estimated impact to the United States of a negative delivery balance.

The U.S. Department of State delivered to Congress three reports in response to this language, including a report in February 2015, a report in March 2015, and a status report in September 2015. As previously noted, the September 2015 status report indicated that the U.S. Department of State and the U.S. Section of the IBWC were working with Mexico to ensure that the remaining delivery deficiencies from the 2010-2015 cycle "are made up in the next cycle, as required by the Treaty."⁶⁷

⁶⁵ CRS phone interview with State Department official, July 11, 2013; CRS phone interview with Mexican official, July 5, 2013.

⁶⁶ See, for example, "Water Fights Flare," *Frontera Norte-Sur*, May 7, 2013.

⁶⁷ September 2015 Status Update to Congress.

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