University of California, Davis
Water Management Lab

Monthly Report – Cycle 35

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Background and Objectives

Water availability and water supply in the Rio Grande basin depend on numerous factors related to climate conditions, storage in reservoirs and aquifers, stochastic characteristics of rainfall, water allocation policies, and other climatic variables.

As a result, it is essential to determine the current conditions and estimate the most probable future conditions of water availability to define strategies to meet water demands in the basin in order to mitigate the risk of not complying with the commitments of the international agreement (See Appendix A, Article 4 of the 1944 Water Treaty).

The main objective this study is to present the current conditions of the allocation of water to the United States (US) for the fulfilling the agreements established in the 1944 Treaty, including probable future scenarios if no management actions are taken and also if some management actions are taken in order to fulfill international commitments.

This document presents three scenarios for allocating water to the US:

- Current Situation - The allocation of water to the US on the date of this monthly report.
- Probable Future:
    - Without any management action: This scenario depends exclusively on weather conditions with predictions based on the current conditions of the basin and the historical behavior of the streamflow from 1953 to 2019.

    - With management action(s): This scenario considers transfers from some Mexican rivers, reservoirs, and international dams [in progress].

In both scenarios, the probable allocation of water to the US in the short-term (May 31, 2020) and in the medium-term (October 25, 2020 as well as the probable date of the end of the Cycle 35) is estimated. Finally, given the possible occurrence of an extraordinary phenomenon during hurricane seasons, statistical analyses of hurricanes and their influence on the Río Grande/Bravo basin are presented along with their as well as their impact on meeting demand **[in progress]**.

Water allocation scenarios in the Rio Bravo designated to the United States

First scenario - Current situation: Allocation of water to the US up to the date of this report

Figure 1 shows the current conditions of the accumulated volume of the Rio Grande/Bravo water in thousands of acre-feet (TAF) designated to the US from one-third of the total volume of the six Mexican tributary rivers (Conchos, San Diego, San Rodrigo, Escondido, Salado, and Arroyo Las Vacas) until **May 31, 2020**, as stipulated in the 1944 Treaty.

As of the date of this report, **1,211.2 TAF has been delivered** of **1,610.51 TAF that is committed to this date**, which represents a **deficit of 399.3 TAF**.

Comparing the cumulative volume delivered up to the date of this report with the commitment established for the possible end of the cycle on October 25, 2020 (1,750 TAF), the current deliveries have a difference below the amount of **538.8 TAF.**

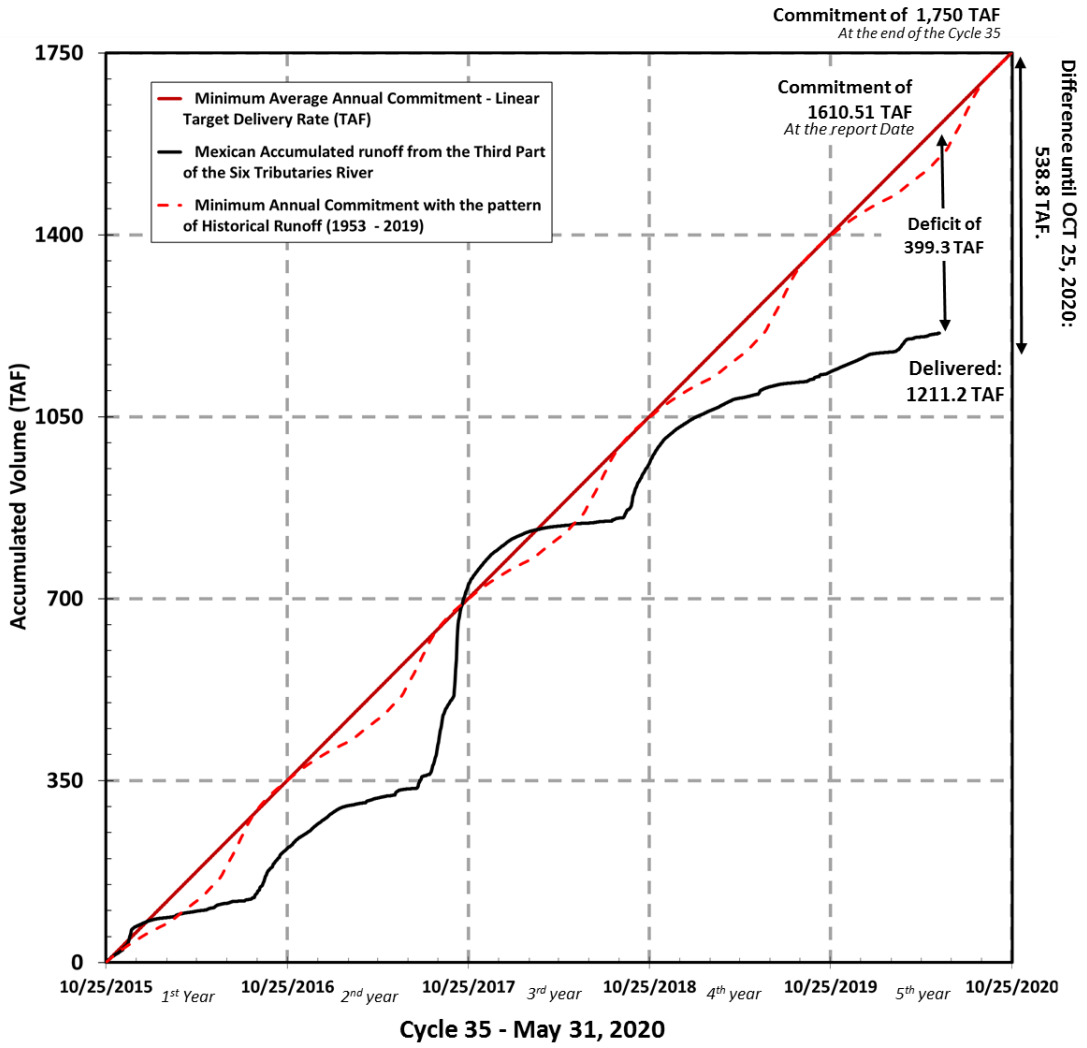

Figure 1. Accumulated volume assigned to the United States for Cycle 35 (from Oct. -25, 2015 to March 31, 2020) from the six Mexican tributary rivers in accordance with the Treaty of 1944.

Second scenario – Probable future: Without any management action

a) Short term - Until May 31, 2020

For this analysis, two interannual seasons are defined: a rainy season from June 1 to October 31 and a drought season from November 1 to May 31. The process of estimating the runoff without any management action is as follows:

- The accumulated runoff was calculated for the last rainy season (June 1, 2019 to October 31, 2019), resulting in 138 TAF.
- Using the historical values of all the rainy seasons from the period of 1953 to 2019, values of precipitation were filtered to find the years with less or equal to162 TAF (close to 139 TAF) allowing the identification of five years with similar rainy seasons : 1956, 1994, 1995, 1997, and 2001.
- Using the data from the rainy seasons of these years allows us to determinate the probable accumulated volume in the current dry season (November 1, 2019, to May 31, 2020).

Figure 2 shows the result of the analysis described above with the different probabilities (P (x)) associated with the delivered volumes. As of this report's date, the deliveries were just 15.8 TAF below the less expected delivery. This action represents a commitment between both countries to fulfill the commitment of the Treaty of 1944.

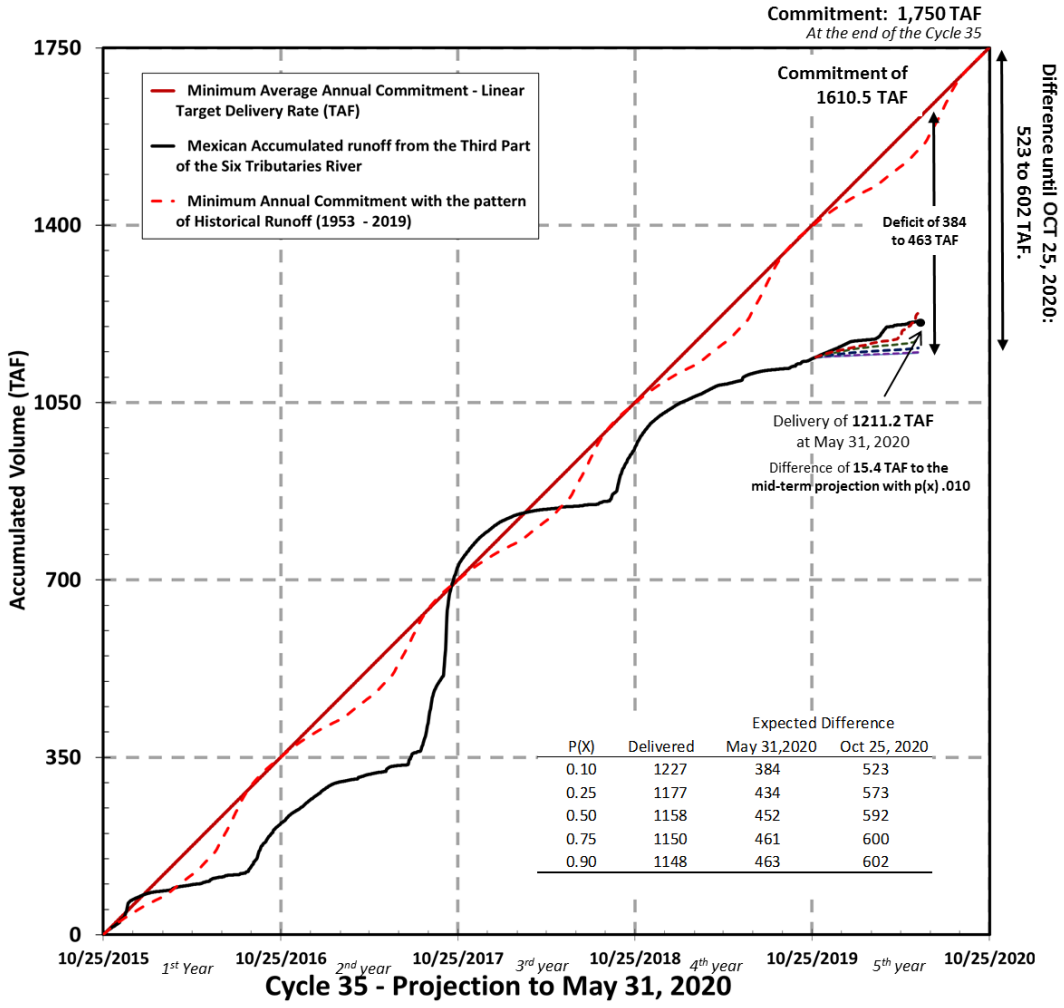

Figure 2. Estimation of probable cumulative volume during the dry season to predict different possible scenarios of treaty commitments until May 31, 2020.

b) Medium term - Until October 25, 2020 (probable end of the cycle 35)

The procedure used to estimate runoff at the possible end date of cycle 35 (October 25, 2020) without any management action is as follows:

- The accumulated runoff for the previous year was calculated from October 26, 2018 to October 25, 2019, with a total volume of 497 TAF.
- The values of all the previous years from 1953 to 2019 were obtained to determine the years with equal to or less than 503 TAF (similar to 497 TAF) leading to 11 years with similar cumulative runoff: 1956, 1983, 1984, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002 and 2012.
- Using the immediate next years of the series from the previous step (for example, for the year 1956 we use the upcoming year, 1957), we were able to determine the probable volume accumulated for the following year (from October 26, 2019, to October 25, 2020).

Figure 3 shows the result of the described analysis. The table in the figure shows the different probabilities (P (x)) associated with the volume delivered, showing that the higher the volume, the lower the probability that the water (or the required amount) will be delivered.

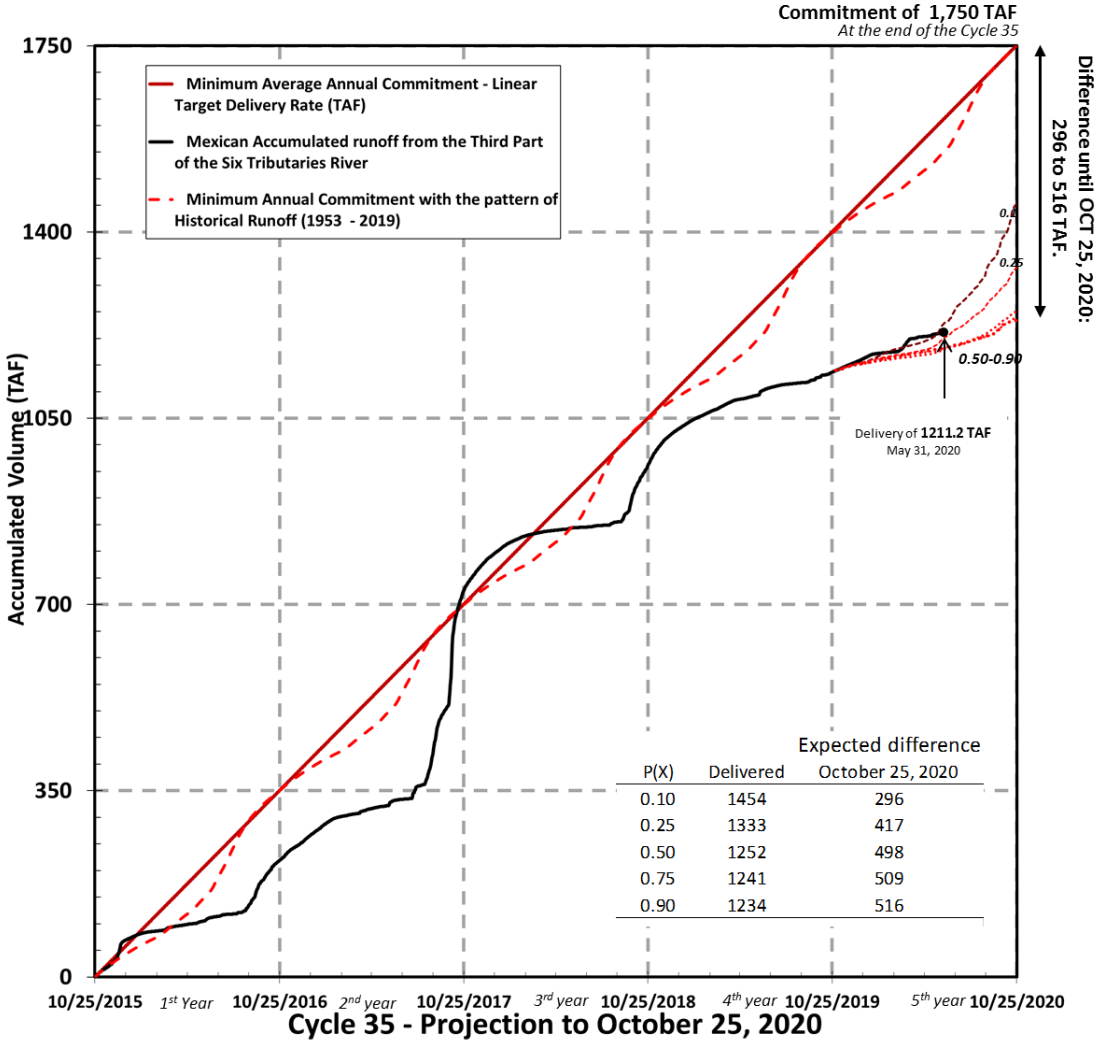

Figure 3. Estimated accumulated volume likely until October 25, 2020, to predict possible difference with treaty commitments at the end of cycle 35.

Third Scenario – Probable Future: Considering management action(s)

[In progress]

Appendix A - Water distribution between Mexico and the United States in the Rio Grande

Article 4 of the 1944 Water Treaty (Treaty) establishes the distribution of Rio Bravo water between Mexico and the United States (EU) as follows:

For Mexico (MX):

- 100% from San Juan and Álamo rivers
- **Two-thirds of the six Mexican rivers: Conchos, San Diego, San Rodrigo, Escondido, Salado, and Arroyo Las Vacas**
- Half of any other runoff including ungraded rivers (not specified in the treaty)

For the United States (US):

- 100% Pecos, Devils rivers and Alamito, Terlingua, San Felipe, and Pinto streams.
- **One-third of the six Mexican rivers. This third must not be less than 350 Thousand Acre-Feet on an annual average, during cycles of 5 consecutive years.**
- Half of any other runoff and ungraded rivers

Treaty Cycles:

The cycles last **five years.** However, the cycles will be considered completed **(it may last less than five years)** if the useful capacity assigned to the US of both international dams (Amistad and Falcón) is filled with water assigned to the US.

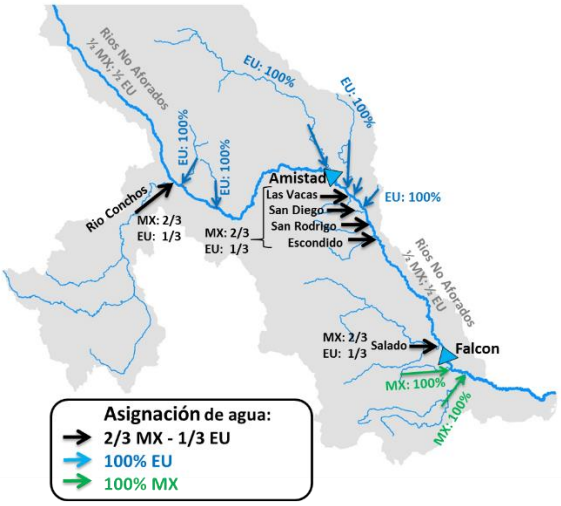

Figure 1.A – Global description of water distribution within the US and Mexico according to the 1944 Treaty.

The accumulated volume of the one-third of water assigned to the US from the six Mexican rivers is accounted for in cycles of the treaty. The treaty cycles last five years. However, the cycle will be considered concluded (it may last less than five years) if the useful capacity of water assigned to the US of both of the international dams (Amistad and Falcón) is filled with water assigned to the US from México. When this occurs, all debts will be considered entirely paid, beginning from this moment a new cycle.