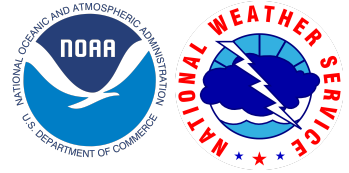


Climate and Hydro Review for PR and USVI

July 2023



Synopsis: *The most significant event of the month was a very rare [EF-1 Tornado](#) registered in Aguada. Otherwise, a typical summer weather pattern prevailed for July across the islands. Weather conditions were characterized from being significantly drier, with episodes of Saharan dust across the area and very unstable and wet days due to the arrival of several tropical waves across the islands. Compared to the last month, heat conditions continued; however, only for the northern sections and urban areas. Several tropical waves moved through the area, leaving a reasonable amount of rainfall across the western and the diagonal sectors between Loiza and Caguas.*

Observed Conditions:

Several variables contributed to a typical summer weather pattern prevailing across the islands during the month. At the beginning of the month, a surface high pressure over the Atlantic basin primarily resulted in a southeasterly wind flow across the area. This wind pattern and a Saharan Air Layer over the area induced warm temperatures and injected humidity across the region. During the episode of heat, several records were tied or broken. On July 2nd, the maximum temperature record was tied at the Luis Munoz Marin International Airport with 93 degrees. On July 5th, Cyril R. King International Airport, tied the record for the warmest minimum temperature of 82 degrees. Lastly, on July 22nd, a new maximum temperature record was set SJU with 94 Fahrenheit, breaking the old record of 93 degrees set in 2015. Another pulse of Saharan dust reached the islands by mid-month, maintaining the islands under a deep layer of Saharan dust. This was the most prolonged period of the year with hazy skies.

Several rainy events were observed during the month, mainly due to the arrival of tropical waves. The most significant event was a vigorous wave on July 7th to 9th. The rain was heavy across the vicinity of Caguas, southeastern and southwestern sections of Puerto Rico. Rio Naguabo went off the banks. Although the heaviest activity was not over the San Juan Metro area, a new record was set at SJU with 1.58” collected, beating the old record of 1.56” from 1996. Another tropical wave moved over the area around mid-month, and a couple of severe thunderstorms developed over northwestern Puerto Rico, merging over Aguada and spawning an EF-1 (Enhanced Fujita Scale, EF) Tornado with an estimated peak wind of 110 mph, determined after the storm survey.

Non-Routine Hydrologic Products Issued	Products issued for the month
Hydrologic Outlooks (SJUESFSJU)	0
Flood Watches (SJUFFASJU)	0
Flood Warnings (SJUFLWSJU)	0
Flash Flood Warnings (SJUFFWSJU)	4
Flash Flood Statements (SJUFFSSJU)	0
Urban/Small Stream Flood Advisories (SJUFLSSJU)	32
Local Storm Reports (Debris Flow and Flood)	2
Local Storm Reports (Severe Weather)	3

Table 1. Hydrologic products and Local Storm Reports issued during the month of July.

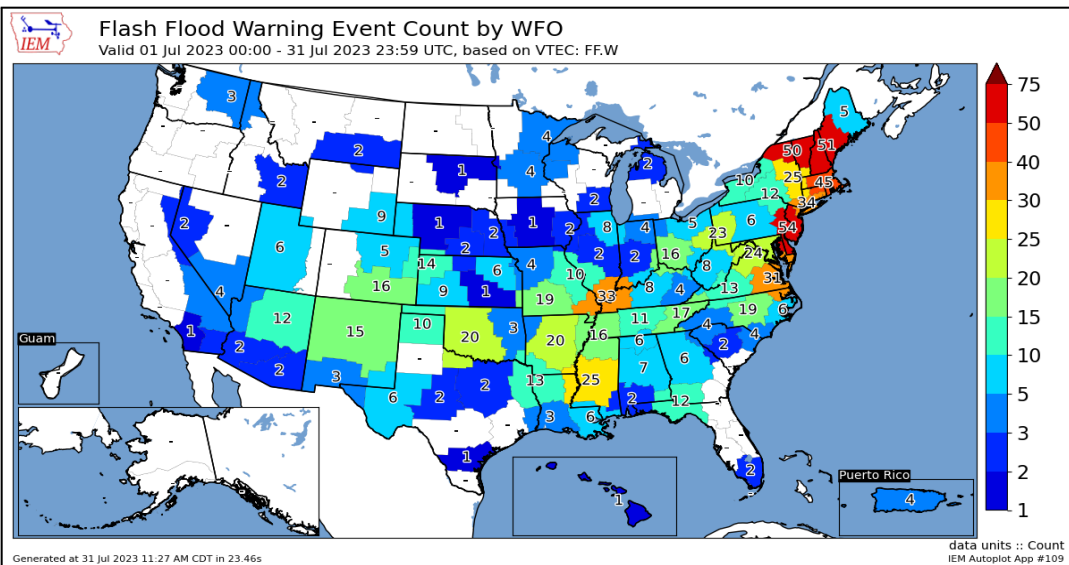
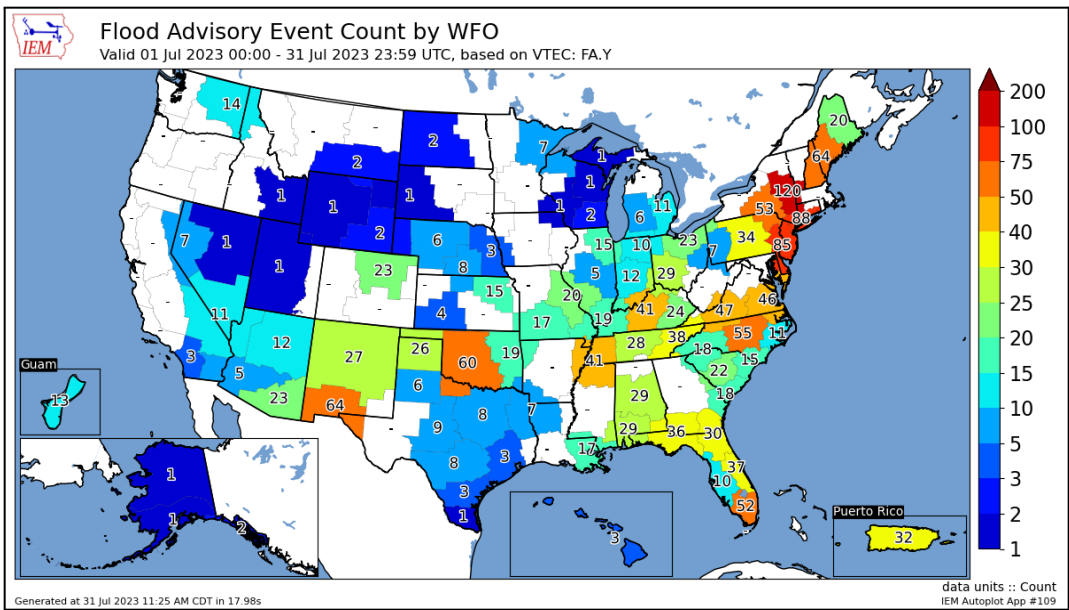


Figure 1. Flood Advisories and Warnings issued for July 2023.

Estimates from the Doppler radar and rain gauges indicated good amounts of rainfall accumulation across Puerto Rico during the month. According to the data, rainfall accumulations were as low as one inch to as high as 15 inches. The eastern half of Puerto Rico, including the San Juan Metro area and the western interior received 8 to 10 inches. The most significant rainfall accumulation of 10 to 15 inches were reported for the vicinity of Mayagüez, the southwestern boundary of Arecibo with Utuado, San Lorenzo and around El Yunque. The rest of the area only received from 1 to 4 inches of rain. St. Croix and St. Thomas received 2 to 4 inches of rain, while St. John only collected 1 to 2 inches (Figure 2).

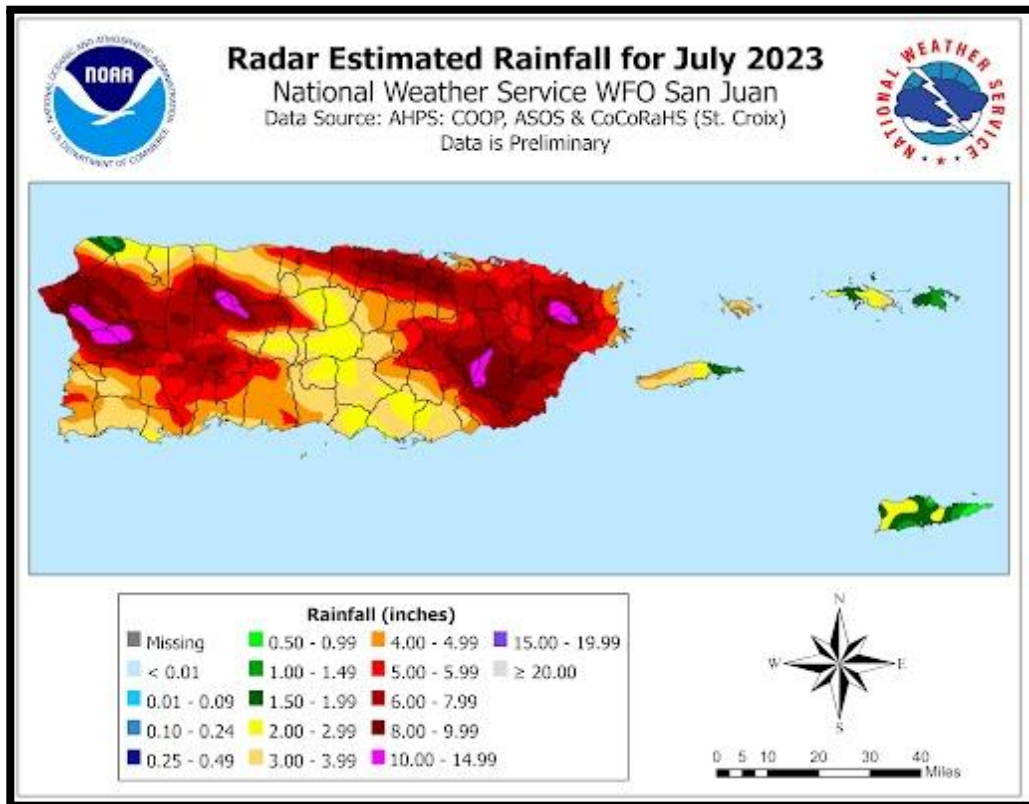


Figure 2. Radar rainfall estimates for July 2023.

Some areas ended drier than normal. The greatest deficit is clearly represented around eastern (El Yunque area), and northwestern Puerto Rico, and some sections south of the Cordillera Central with 3 to 5 inches below normal. In contrast, some sections across the north-central coast, south-central to southwest, and the vicinity of Caguas ended with a 1 to 4 inches above normal (Figure 3).

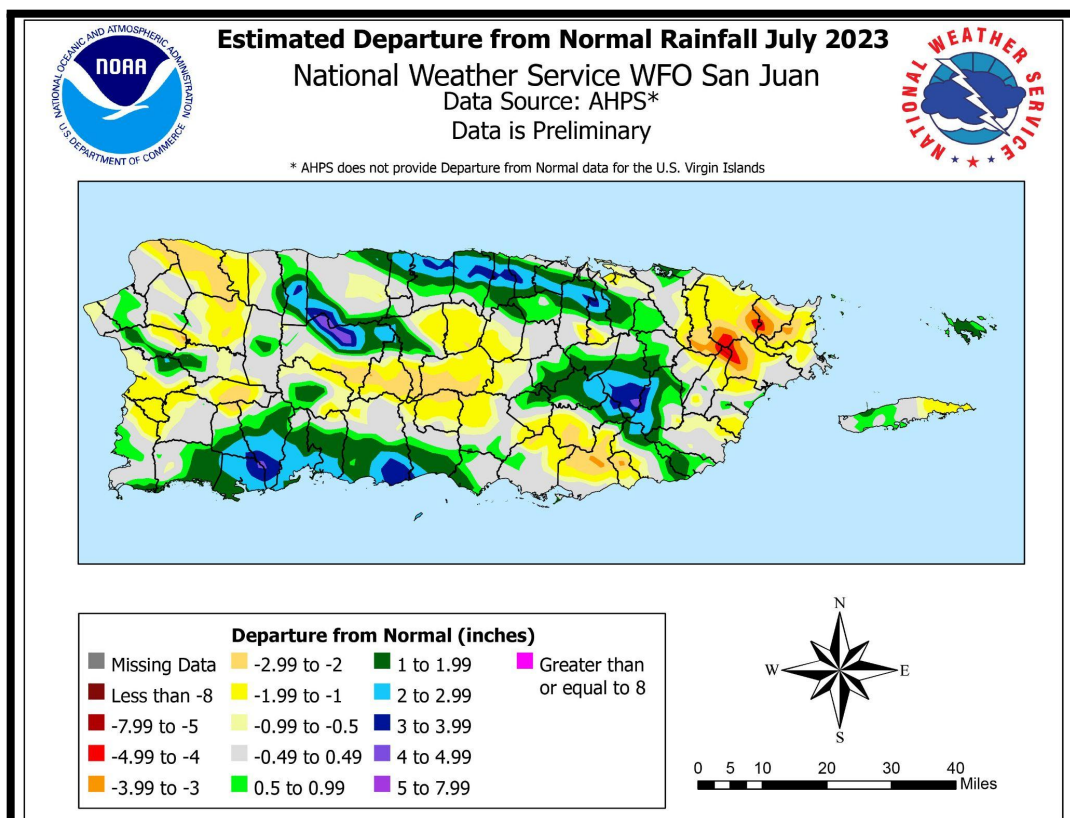


Figure 3. Estimated Departure from normal rainfall for July 2023 from AHPs.

All of the climatological sites ended with a rainfall deficit of at least one inch. For San Juan and St. Thomas, it was two inches below normal. Although the San Juan area received 4.01” of rainfall from several tropical waves, rainfall activity remained mainly south of the rain gauge (Table 2).

	Total Monthly Rainfall	Monthly departure from normal rainfall	Year-To-Date departure from normal rainfall
<u>JSJ</u>	4.01”	-2.01”	-3.34”
<u>IST</u>	0.81”	-2.10”	-7.83”*
<u>ISX</u>	1.26”	-1.38”	-5.06”

Table 2. Rainfall highlights for the local international airports. *This data does not consider missing values reported in February.

For SJU, the month ended with a daily maximum of 94° Fahrenheit (F) on the 22nd with 15 days observing 90° + and 16 days in the upper 80s. The minimum temperature was 75° F on the 25th, with 19 days of minimum temperatures above 80° . A similar pattern was observed over the Virgin Islands, with a monthly mean temperature of 86° F for St. Thomas and 84.5° F for St. Croix. (Table 3). Two daily maximum temperature records were tied or broken in San Juan. A daily rainfall record was also set in San Juan on the 8th. (Table 4).

	Highest Daily Max Temp (°F)	Lowest Daily Min Temp (°F)	Monthly Mean Temp (°F)	Monthly departure from normal Mean Temp (°F)
<u>JSJ</u>	94 – Jul 22 nd	75 – Jul 25 th	84.6	1.5
<u>IST</u>	94 – Jul 11 th	78 – Jul 28 th *	86.0	1.5
<u>ISX</u>	92 – Jul 30 th *	76 – Jul 21 st	84.5	1.3

Table 3. Temperature (°F) highlights for the local international airports.

*Date of last occurrence. This temperature was observed in more than one day.

	Records Set or Tied This Month	Previous Record and Year
JSJ	93° – July 2 nd	93° – 1995
	94° – July 22 nd	93° – 2015
	1.58” – July 8 th	1.56” – 1996
IST	NONE	NONE
ISX	NONE	NONE

Table 4. Daily Records set or tied this month.

Across the COOP stations, the warmest high was reported at Lajas Substation and Ponce 4E with 96^oF. Meanwhile the coolest low was observed at Adjuntas Substation with 61^oF. The wettest month was for Arecibo Observatory with 10.27” collected (Fig 4). In the Virgin Islands, it was wettest for the northern islands with Cruz Bay reporting 1.47” and in Saint Croix, and drier in St. Croix with the maximum amount collected of 1.30”.

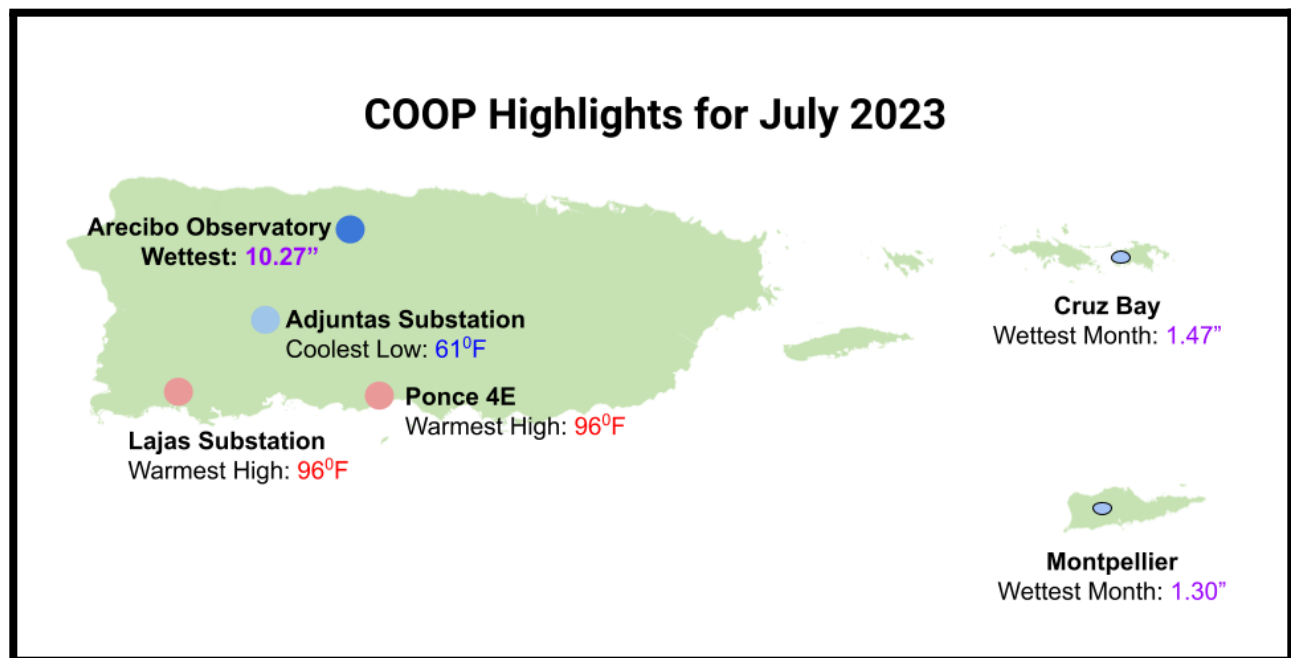


Figure 4. COOP Highlights for the Month of July 2023

State	Name	Station Type	Value	Ending Date	Missing Days	Valid Date Range
PR	ADJUNTAS SUBSTATION	COOP	75.7	2023-07-31	0	1970-01-01 to 2023-08-11
PR	MAGUEYES ISLAND	COOP	84.4	2023-07-31	0	1959-01-03 to 2023-07-31
PR	COLOSO	COOP	82.8	2023-07-31	0	1899-10-15 to 2023-08-14
PR	TORO NEGRO FOREST	COOP	73.5	2023-07-31	0	2002-02-03 to 2023-07-31
PR	CIALES 2S	COOP	81.6	2023-07-31	0	2017-05-05 to 2023-07-31
PR	PALMA SOLA	COOP	78.9	2023-07-31	1	2010-11-26 to 2023-08-11
PR	WFO SAN JUAN	COOP	84.6	2023-07-31	0	2006-11-01 to 2023-08-13
PR	AIBONITO 1 S	COOP	76.4	2023-07-31	0	1906-01-01 to 2023-08-14
PR	TRUJILLO ALTO 2 SSW	COOP	83.6	2023-07-31	1	1957-02-15 to 2023-08-14

Table 5. COOP Stations that ended with the warmest July on record. (only allowing for 1 missing day in the dataset).

Drought conditions deteriorated even further for areas along northwestern Puerto Rico from Isabela to Arecibo. Some improvements were noted from the vicinity of San Juan diagonal south to Guayama (Figure 5). In summary, nearly 39% of Puerto Rico is under Abnormally Dry (D0) conditions, while almost 8% is under a Severe Drought (D2) (Figure 6).

During the past month, the U.S. Virgin Islands experienced some rainfall, but it was not enough to prevent further deterioration for Saint Thomas, now under an Extreme Drought (D3), just like Saint Croix. St. John is now under a Moderate Drought (D1). Additional details regarding the drought situation across the U.S. Virgin Islands will be available next month as the Drought Outlooks will include the U.S. Virgin Islands (USVI) in the updates.

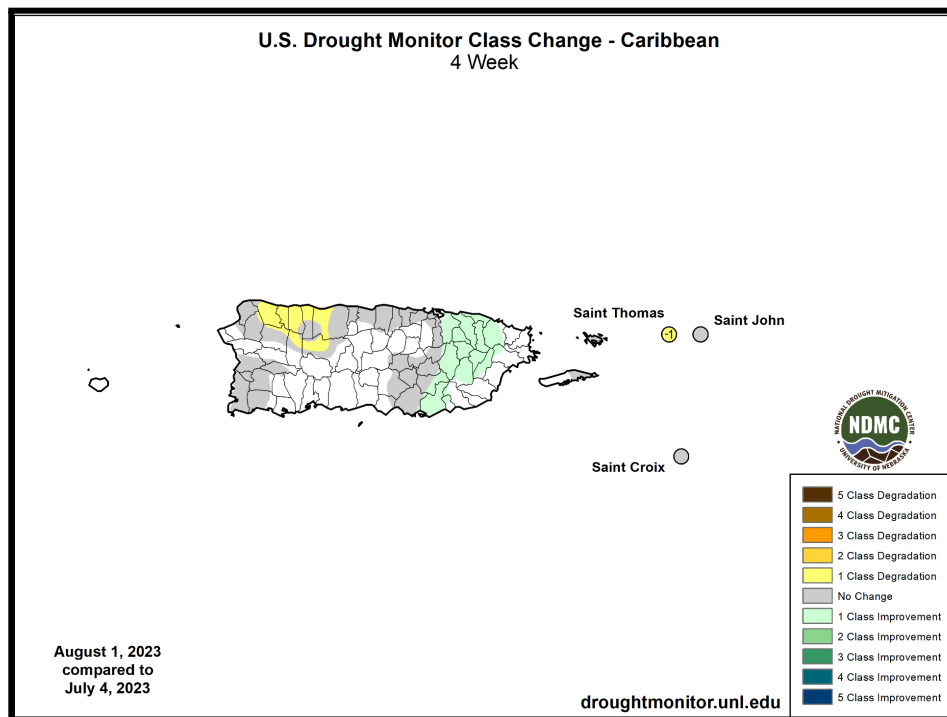


Figure 5. U.S. Drought Monitor Class Change from July 6th to August 1st

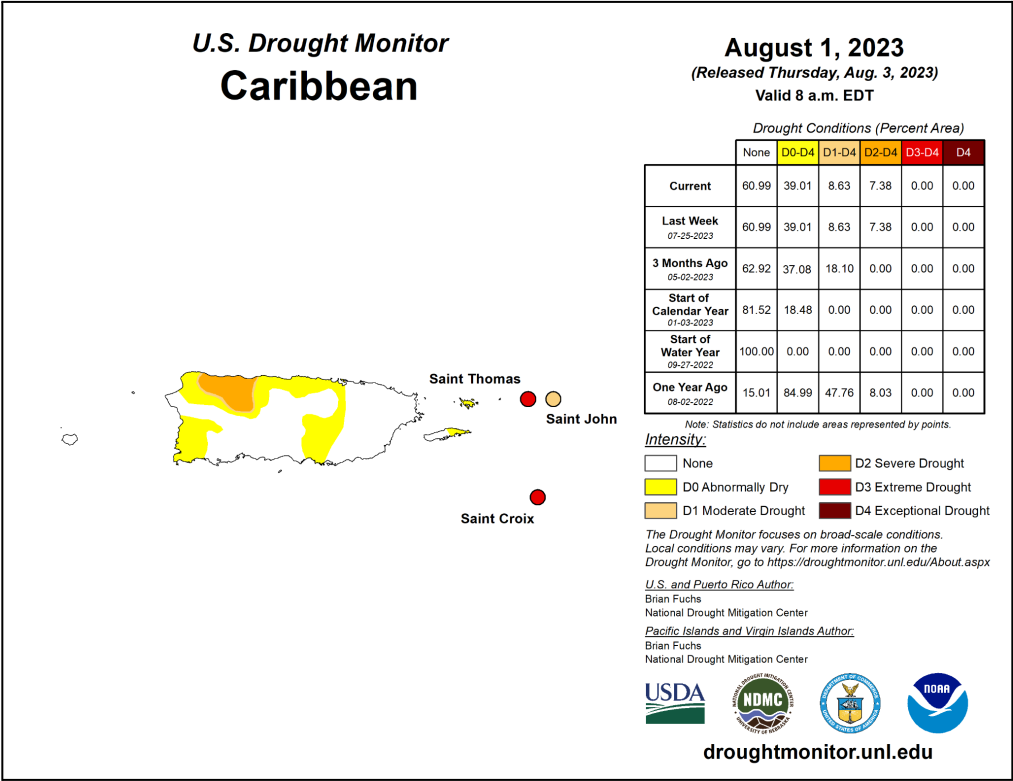


Figure 6. U.S. Drought Monitor for Puerto Rico and the U.S. Virgin Islands. Released August 1th, 2023.

The soil saturation map from PRAGWATER shows some dry soils along the western half of Puerto Rico and some of the northeastern areas as well. Below to much below normal streamflows were observed along a few streams along the east and southeast, and western and western interior. (Fig 7) All of the reservoirs are at optimal levels, except for Guajataca and Matrullas, which are at observational levels.

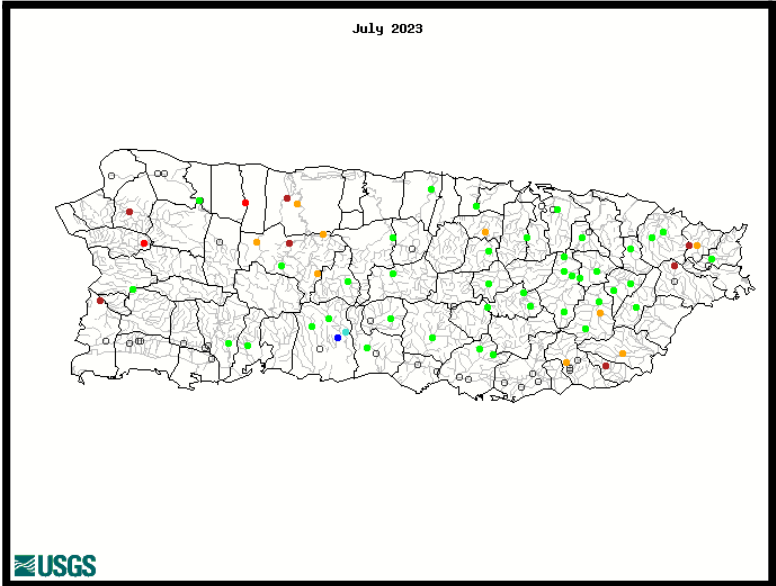


Figure 7. Streamflow levels from the USGS river sensor network across Puerto Rico for the month of July. Percentile Reference

Looking Ahead:

The latest seasonal outlook from the ensemble models for the 3-month period of August-September-October (ASO) favors slightly above normal precipitation for Puerto Rico and the U.S. Virgin Islands (Figure 8). El Niño conditions are expected to prevail through the winter months. Click for [more info](#).

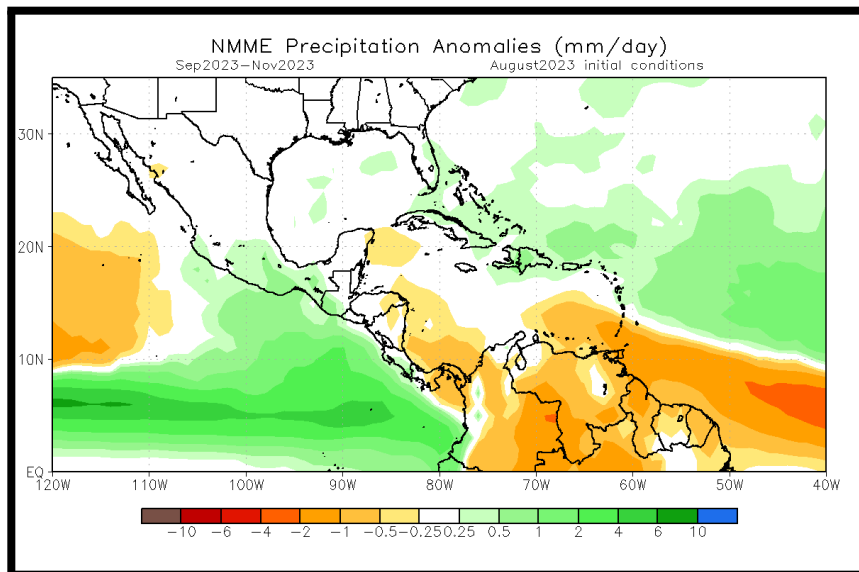


Fig 8. Precipitation Anomalies from the ensemble of models indicating below normal rainfall for the three month period of August, September & October.