



Stream flow Bulletin – July 2023

Introduction

This stream flow bulletin examines the flows within the major rivers in Jamaica's 10 Hydrologic Basins. It assesses the rivers responses to rainfall conditions, and the impact of dry and wet seasons on flow dynamics. The Bulletin uses the monthly Rainfall Summary from the Meteorological Services of Jamaica and the Caribbean Climate Outlook Forum (CariCOF) Drought Outlook and the Caribbean Climate Outlook Newsletter for predicted climatic information.

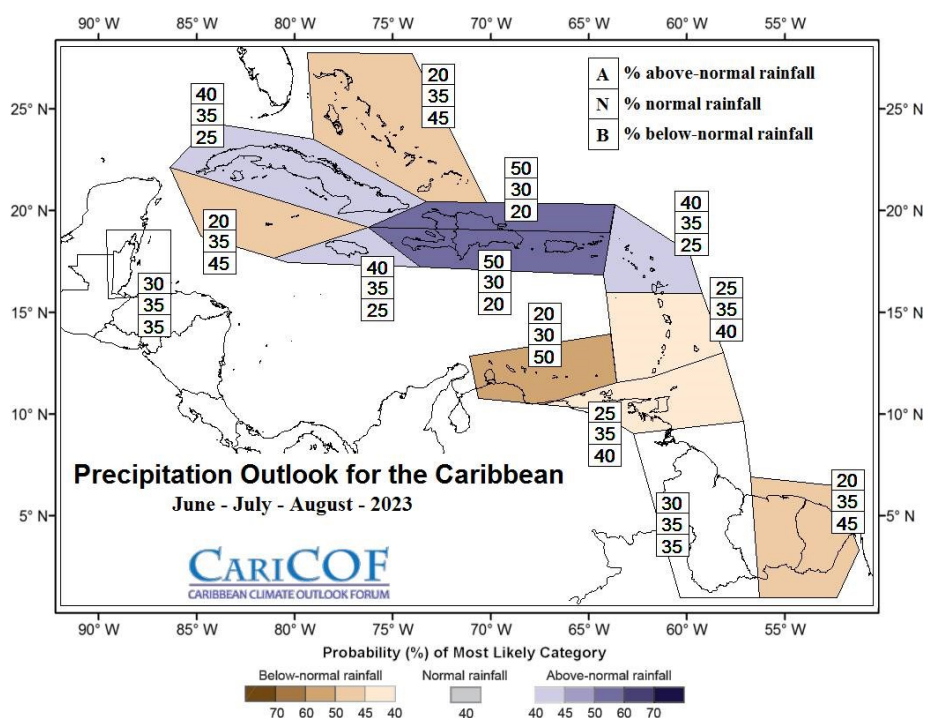
Climatic Outlook

The Meteorological Services of Jamaica (MSJ) reported that 12 parishes recorded below-normal rainfall amounts ranging from 22% to 75% of their respective 30-year monthly means (below-normal) for July 2023. It further reported that 9 parishes recorded negative SPI, and experienced varying level of dryness ranging from near-normal dry to abnormally dry. There was no record meteorological drought conditions in July. The parishes that recorded dry conditions were St. Thomas, Westmoreland, St. Mary, St. Elizabeth, KSA, St. James, Hanover and Trelawny. The forecasts by the MSJ and CariCOF are that the country have a 25 % to 40% probability of receiving below-normal to above- normal rainfall in August.

Rainfall patterns June—August 2023

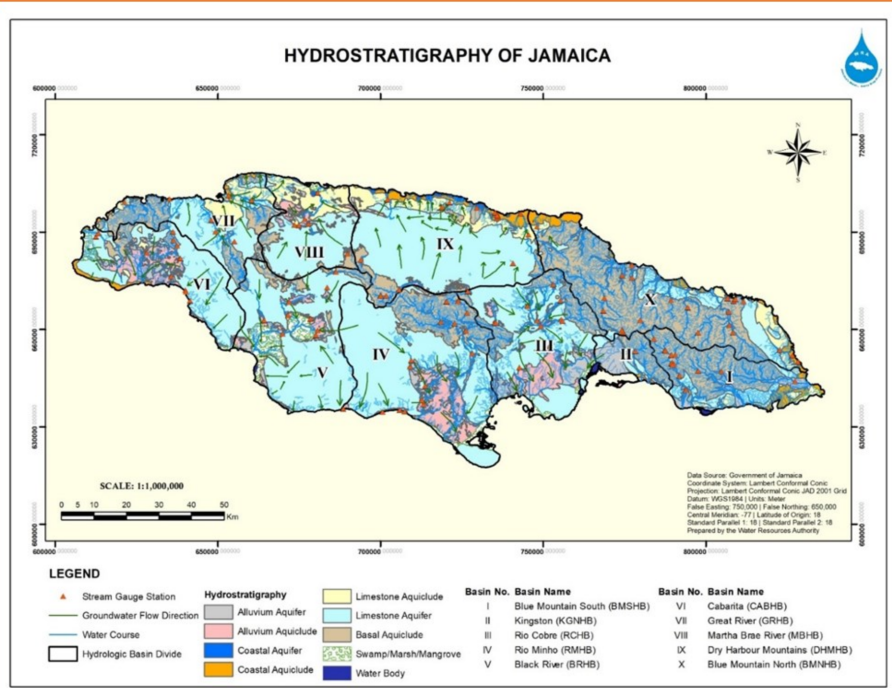
The diagram shows the June to August precipitation outlook for the Caribbean. The forecast is for Jamaica to receive above – normal rainfall amounts for the period.

Source: Caribbean Climate Outlook Forum



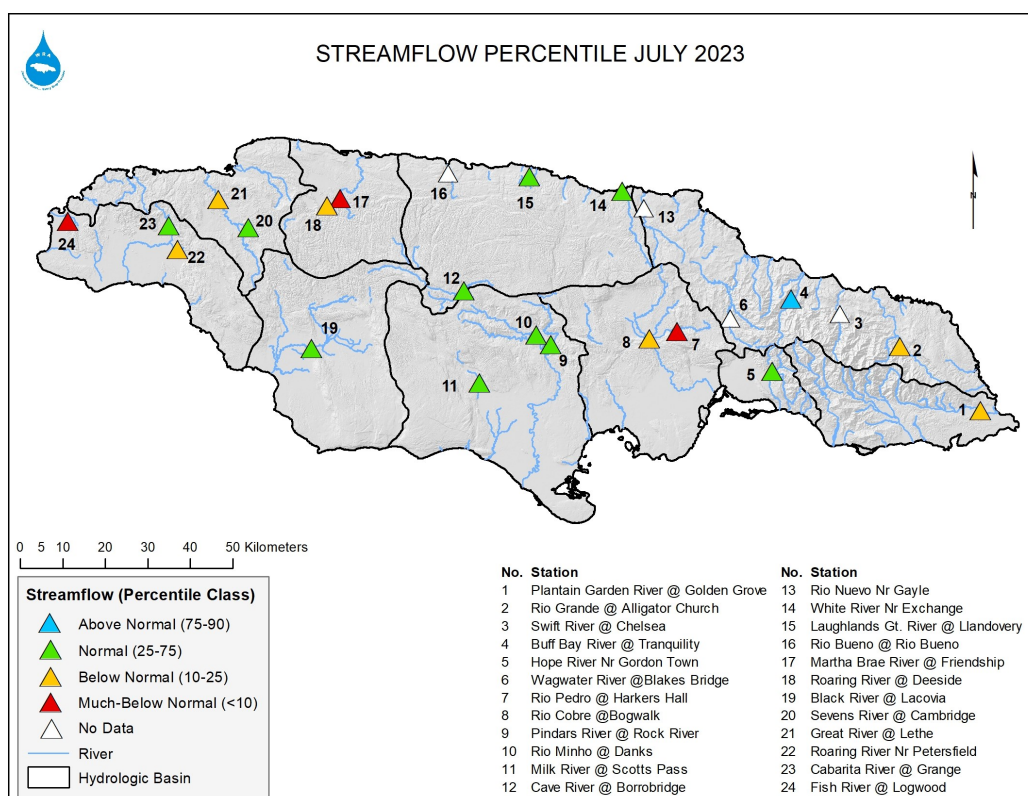
Jamaica Hydrologic Basins and Hydrostratigraphy

The map shows Jamaica Hydrologic Basins and Hydrogeologic Units (Hydrostratigraphy). Basins X, II, I and the Central Inliers which straddle both Basins IX and IV consist of Volcanoclastic rocks which comprise the Basal Aquicludes, while Basins IX, IV, III, VIII, VII and VI are predominantly limestone aquifers.



Situation analysis

For the month of July, mean stream flows for rivers in 6 Hydrologic Basins had percentiles ranging from much-below normal to normal. The remaining 4 Basins recorded flows in the normal percentile. This is a reversal of what transpired in June when mean flows in 8 hydrologic Basins recorded were in the normal percentiles. The Fish River at Logwood and the Rio Pedro at Harkers Hall recorded much-below normal flows for the third and seventh month consecutively. The stream flows reflect the rainfall conditions in different sections of the island with St. Elizabeth, St. James, Hanover, Westmoreland and St. Thomas stream flows indicating responses to reduced rainfall. The flows recorded in the rivers in the Rio Cobre Hydrologic Basins, St. Catherine indicates reduced baseflows flows which is directly linked to lower than normal rainfall. (See figure above)



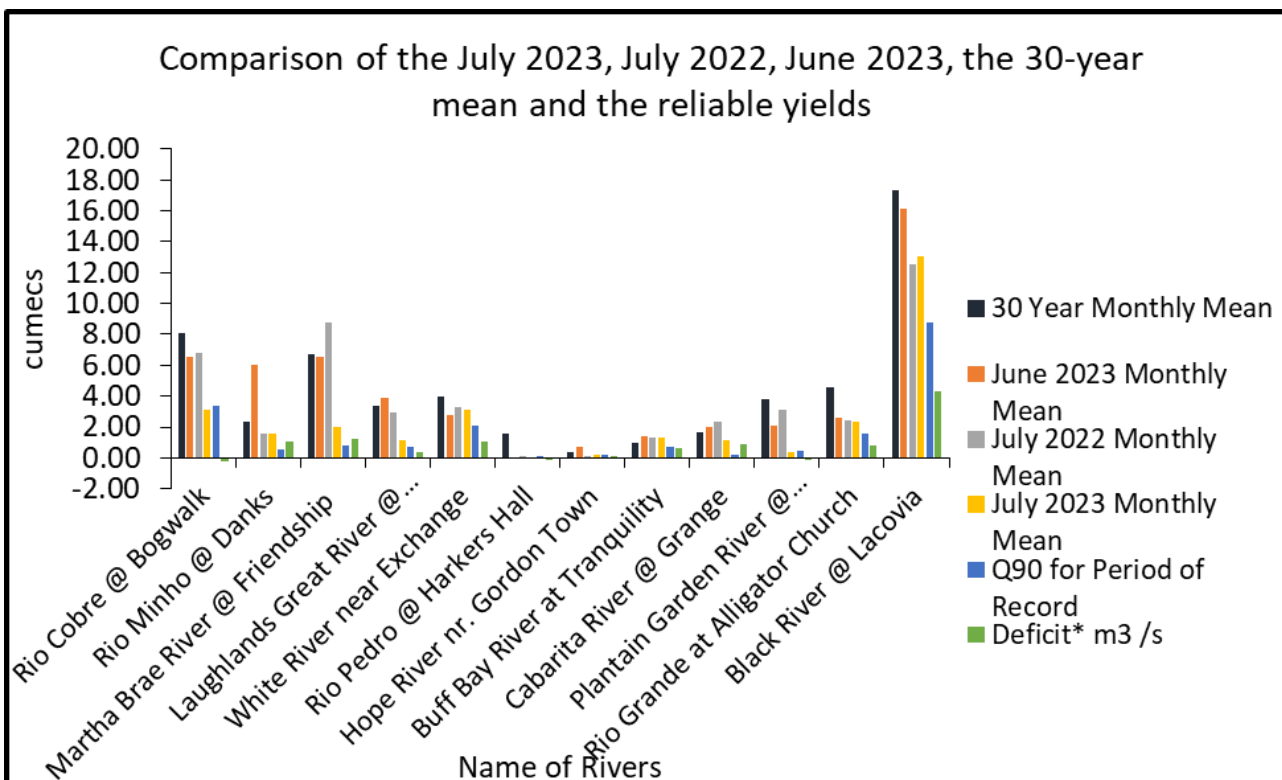
Further Analysis

Eight rivers recorded average flows for July 2023 which ranged from 0% to 96% of the July 2022 average flows. When compared with June 2023 average flows, 10 rivers recorded reduced discharge in July 2023 ranging in volume of 0.09 m³/s to 4.38m³/s (2,054,202 gallons/day to 99, 971,160 gallons/day). When compared, the average flows for 11 of the 12 rivers ranged from 0% to 79% of their respective 30—year means for July. The Buff Bay River at Tranquility in the Blue Mountain North Hydrologic Basin recorded 136% of its 30 year normal. The average flows for July were greater than the Q90s of 9 rivers, the Rio Pedro at Harkers Hall, Plantain Garden River and the Rio Cobre recorded flow deficits. The table below show flows by volume in cubic metres per second

Comparison of monthly mean of July 2023 to the 30 year monthly mean and the Q90

Name of River	Parish	30 Year Monthly Mean	June 2023 Monthly Mean	July 2022 Monthly Mean	July 2023 Monthly Mean	Q90 for Period of Record	Deficit* m ³ /s
Rio Cobre @ Bogwalk	St. Catherine	8.090	6.57	6.76	3.126	3.371	-0.245
Rio Minho @ Danks	Clarendon	2.370	6.00	1.56	1.62	0.518	1.102
Martha Brae River @ Friendship	Trelawny	6.730	6.552	8.8	2.037	0.835	1.202
Laughlands Great River @ Landoverly	St. Ann	3.408	3.92	2.913	1.121	0.732	0.389
White River near Exchange	St. Ann	3.952	2.796	3.315	3.139	2.089	1.05
Rio Pedro @ Harkers Hall	St. Catherine	1.596	0	0.16	0	0.093	-0.093
Hope River nr. Gordon Town	Kingston	0.350	0.733	0.155	0.212	0.171	0.041
Buff Bay River at Tranquility	Portland	0.987	1.44	1.34	1.35	0.703	0.647
Cabarita River @ Grange	Westmoreland	1.660	2.004	2.322	1.119	0.21	0.909
Plantain Garden River @ Golden Grove	St. Thomas	3.817	2.091	3.118	0.368	0.477	-0.109
Rio Grande at Alligator Church	Portland	4.600	2.57	2.43	2.341	1.547	0.794
Black River @ Lacovia	St. Elizabeth	17.349	16.09	12.534	13.04	8.76	4.28

* Deficits are denoted by a negative value (Deficit = Monthly Mean - Q90)



Graphical representation of the comparisons shown in the table.

Discussion

Analysis of the hydrologic data for July 2023 showed greater flows in 33% of rivers which were analysed, when compared with the same period of 2022. Additionally, flows recorded in July 2023 were less in 83% of the rivers when compared with June 2023, this as Jamaica continue to experience below normal precipitation in sections of the island. Regarding the 30—year mean flows, 11 of the 12 rivers recorded were less flows than the respective 30—year means. Three of the twelve rivers, including the Rio Pedro at Harkers Hall recorded flow deficits. The Rio Pedro has been in a flow deficit since January which could be declare as hydrologic drought condition, however, during low flows the river sinks approximately 1.5km upstream of the gauging station and re-emerges approximately 2.5km below. Hence, this may not qualify as drought condition.

The flows trends corresponds with the forecasts from the Meteorological Service of Jamaica and the Caribbean Climate Outlook of below to above-normal rainfall conditions across Jamaica for July 2023. It also demonstrates the dry-mid summer period of July.

According to CariCOF Drought Outlook and the Caribbean Climate Outlook, precipitation forecast for August 2023, Jamaica may experience rainfall conditions ranging from below-normal to normal. The MSJ also predicts 25% to 45% probability of below to above-normal rainfall for August. Thus, the average flows for rivers in the 10 Hydrologic Basins are expected to be greater than the respective reliable yields in most instance, but may be less than the respective 30 years monthly-means in August 2023.

Definition of Terms

Hydrological Drought—This is a hydrological extreme that manifests in abnormally low stream flows, levels in ponds and lakes, reservoirs and groundwater. Hydrological droughts occurs after many months of meteorological drought, that is, extended period of below normal rainfall.

Q90—Q90 or reliable yield, is a statistical low flow index that represents flows that either exceeds or occur 90% of the time. It assists in determining the resource availability during periods of drought.

Percentile—A percentile is a value on a scale of 100 that indicates the percent sample distribution (in this case a particular flow) that is equal to or below it. For example, stream flows in this calendar month at the 90th percentile are equal to or greater than 90 percent of the stream flows which have been recorded in the calendar month for the extent of the station.

Percentiles above 90 are considered Much-Above Normal,

Percentiles between 75 and 90 are considered Above Normal,

Percentiles between 25 and 75 are considered Normal,

Percentiles between 10 and 25 are considered Below Normal, and

Percentiles below 10 are considered Much-Below Normal.

Stream gauging station— Gauging stations are facilities use to automatically monitor streams, or other water bodies.

To convert from m³/s to gal/day: - $\text{m}^3/\text{s} \times 86400 \text{ s/day} \times 264.1721 \text{ gals}$ (where m³ = cubic meters, s = seconds and gal = U.S. gallons).

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October 2023