

STREAM FLOW BULLETIN

Vol. 1. August 2019

JANUARY-JUNE 2019



**Water
Resources
Authority**

Introduction

The below normal rainfall observed since 2018 continues to impact the water resources of the island. This has led to reduced surface water flows in rivers and streams, and less recharge of aquifers in most parts of the country. The impact of the below normal rainfall on surface water sources is more obvious in rivers which originate in areas where the dominant hydro-geologic units are basal aquicludes, for example, the Volcanoclastic formations of the Blue Mountain and the Central Inliers. Streams that originate from limestone aquifers are less affected as they maintain a perennial base-flow via groundwater supply. This bulletin will provide an overview of the impact of the below normal rainfall on Jamaica water resources for January to June, 2019.

Definition of Terms

Aquiclude—A low-permeability unit that forms either the upper or lower boundary of a groundwater flow system. A geologic formation, group of formations, or part of a formation through which virtually no water moves.

Aquifers—A subterranean layer of porous water-bearing rock, gravel or sand capable of storing and conveying water to wells and streams. A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield economic quantities of water to wells and springs

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 90 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.

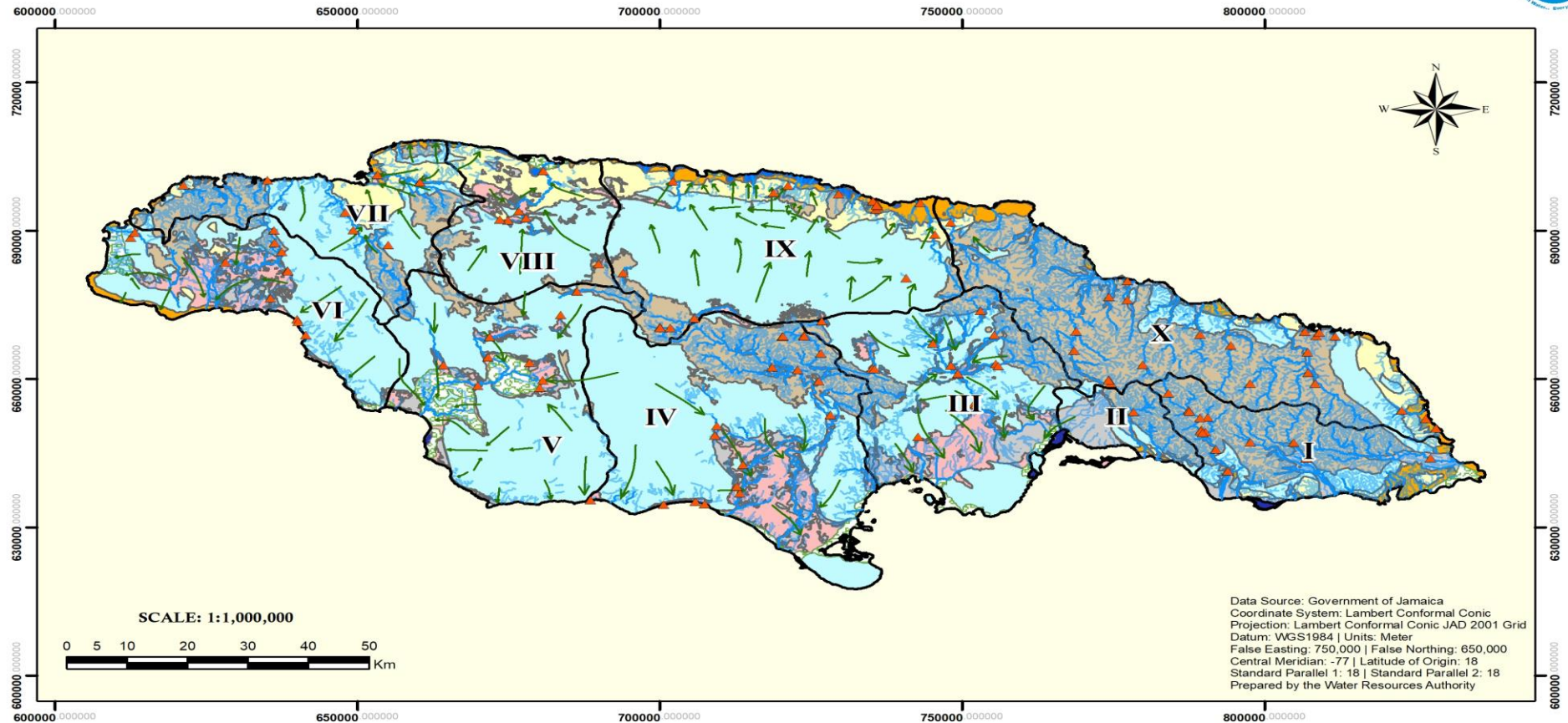
- Percentiles above 90 are considered Much Above Normal,
- percentiles between 75 and 90 are considered Above Normal,
- percentiles between 25 and 75 are considered Normal,
- percentiles between 10 and 25 are considered Below Normal, and
- percentiles below 10 are considered Much Below Normal.

Stream gauging station— Gauging stations are facilities use to automatically monitor streams, or other water bodies. Instruments at these stations collect information such as water height and discharge.

Jamaica Hydrologic Basins and Hydrostratigraphy

The map below shows Jamaica Hydrologic Basins and Hydro-geologic 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.

HYDROSTRATIGRAPHY OF JAMAICA



Data Source: Government of Jamaica
 Coordinate System: Lambert Conformal Conic
 Projection: Lambert Conformal Conic JAD 2001 Grid
 Datum: WGS1984 | Units: Meter
 False Easting: 750,000 | False Northing: 650,000
 Central Meridian: -77 | Latitude of Origin: 18
 Standard Parallel 1: 18 | Standard Parallel 2: 18
 Prepared by the Water Resources Authority

LEGEND

- ▲ Stream Gauge Station
- Groundwater Flow Direction
- Water Course
- Hydrologic Basin Divide

Hydrostratigraphy

- Alluvium Aquifer
- Alluvium Aquiclude
- Coastal Aquifer
- Coastal Aquiclude
- Limestone Aquiclude
- Limestone Aquifer
- Basal Aquiclude
- Swamp/Marsh/Mangrove
- Water Body

Basin No. Basin Name

- I Blue Mountain South (BMSHB)
- II Kingston (KGNHB)
- III Rio Cobre (RCHB)
- IV Rio Minho (RMHB)
- V Black River (BRHB)

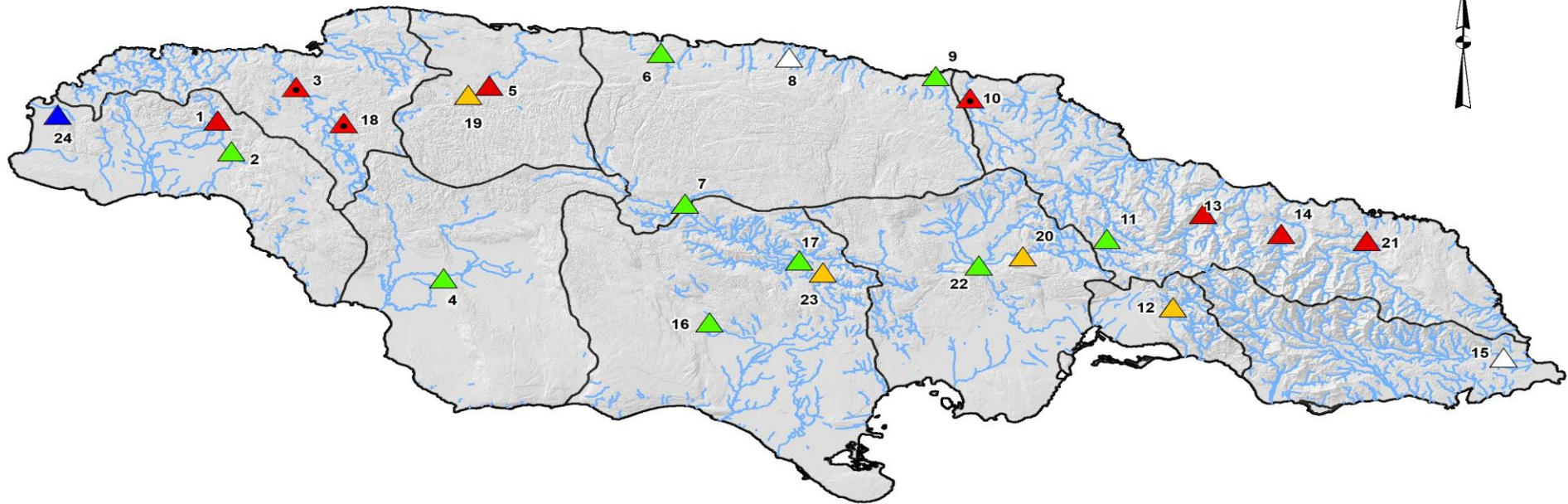
Basin No. Basin Name

- VI Cabarita (CABHB)
- VII Great River (GRHB)
- VIII Martha Brae River (MBHB)
- IX Dry Harbour Mountains (DHMHB)
- X Blue Mountain North (BMNHB)

Stream flow Analysis January 2019

Analysis of the country's mean monthly surface water flows for January 2019 has provided contrasting results for the island's 10 Hydrologic Basins as specified in the figure below. The triangles represent WRA's stream gauging stations and provide indication of the volume of flows. The different colors represent groups of percentiles of the month stream flows compared to the historical stream flows. Triangles numbered 10, 13, 14 and 21 represent Rio Nuevo, Buff Bay River, Swift River and Rio Grande respectively. These rivers are located in the Blue Mountain North Hydrologic Basin (BMNHB). The hydro-geology of BMNHB is Basal aquiclude; therefore, the rivers are mainly rainfall dependent. Flows in January are much below normal for the Buff Bay River, the Swift River and the Rio Grande, with the Rio Nuevo showing the Lowest Flow recorded since the installation of the station. It is important to note that the major rivers in the BMNHB are perennial, as a result of the high levels of rainfall in the Basin. However, small streams will go dry when there are extended periods of reduced or no rainfall.

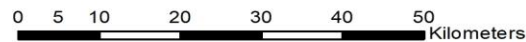
MONTHLY MEAN STREAM FLOWS JANUARY 2019



Legend

Streamflow (Percentile Class)

- ▲ Much-Above Normal (>90)
- ▲ Normal (25-75)
- ▲ Below Normal (10-25)
- ▲ Much-Below Normal (<10)
- ▲ New Low
- △ No Data
- River
- ▭ Hydrologic Basin



No. Station/River

- 1 Cabarita River @ Grange
- 2 Roaring River Nr Petersfield
- 3 Great River @ Lethe
- 4 Black River @ Lacovia
- 5 Martha Brae River @ Friendship
- 6 Rio Bueno @ Rio Bueno
- 7 Cave River @ Borrobridge
- 8 Laughlands Gt. River @ Llandoverly

No. Station/River

- 9 White River Nr Exchange
- 10 Rio Nuevo Nr Gayle
- 11 Wagwater River @Blakes Bridge
- 12 Hope River Nr Gordon Town
- 13 Buff Bay River @ Tranquility
- 14 Swift River @ Chelsea
- 15 Plantain Garden River @ Golden Grove
- 16 Milk River @ Scotts Pass

No. Station/River

- 17 Rio Minho @ Danks
- 18 Sevens River @ Cambridge
- 19 Roaring River @ Deeside
- 20 Rio Pedro @ Harkers Hall
- 21 Rio Grande @ Fellowship
- 22 Rio Cobre @Bogwalk
- 23 Pindars River @ Rock River
- 24 Fish River @ Logwood



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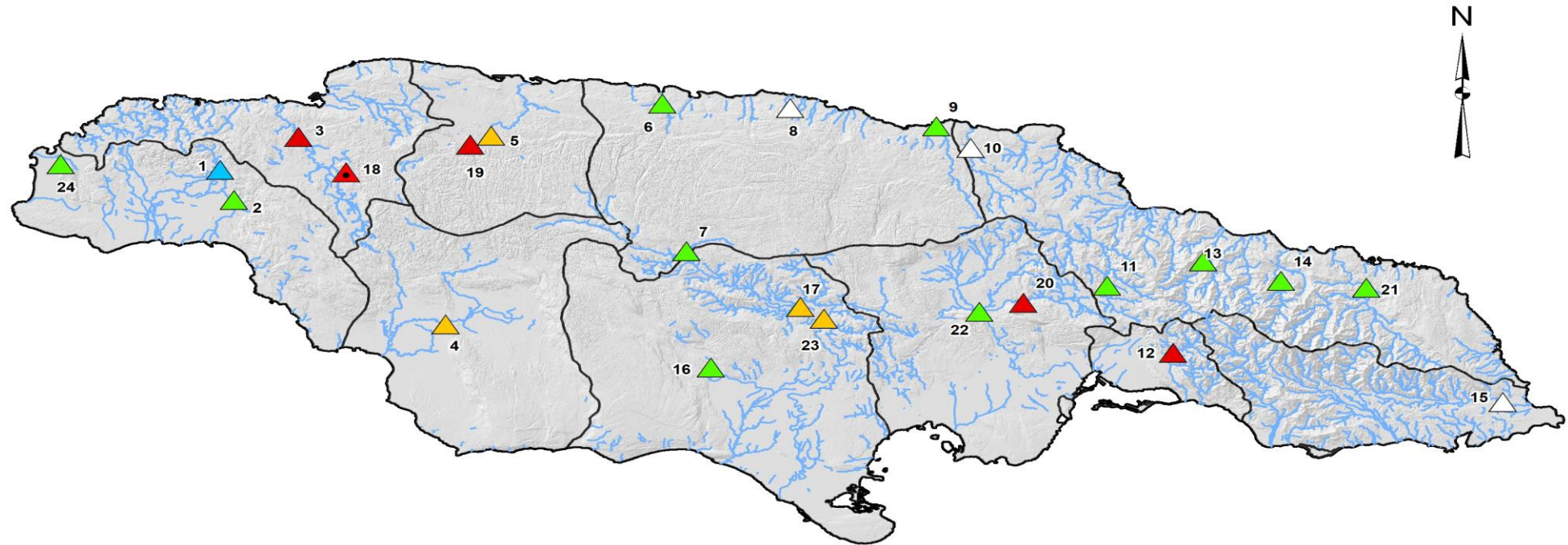
Stream Flow Analysis January

The triangles numbered 6, 17 and 22 represent the Rio Bueno, Rio Minho and the Rio Cobre. These are located in the Dry Harbour Mountains Hydrologic Basin (DHMHB), the Rio Minho Hydrologic Basin (RMHB) and the Rio Cobre Hydrologic Basins (RCHB). The dominant hydro-geologic unit in these basins are the New Port Formation which are classified as limestone aquifers. Thus, the rivers are mainly groundwater supported, which enable them to maintain perennial base-flow. Flows for these rivers are in the 25-75 percentile and are within the Normal range. However, aquifers are also affected by precipitation levels; this is evident at Martha Brae River at Friendship, triangle #5 and Roaring River at Deeside, triangle #19, both of which are groundwater fed but are indicating Much Below Normal and Below Normal flows respectively.

Stream Flow Analysis February—April

The Rivers that are located in the BMNHB had mixed results for February to April. The flows which were measured in February were Normal. This was in response to increased precipitation across the Basin. However, for March and April most the rivers returned to Below Normal and Much Below Normal flows. The Hope River which is in the Kingston Hydrologic Basin (KHB), represented by triangle #12, was Much Below Normal in February and March, responding to the continued below normal rainfall that is impacting the island.

MONTHLY MEAN STREAM FLOWS FEBRUARY 2019



Legend

Streamflow (Percentile Class)

- ▲ Above Normal (75-90)
- ▲ Normal (25-75)
- ▲ Below Normal (10-25)
- ▲ Much-Below Normal (<10)
- ▲ New Low
- △ No Data
- River
- Hydrologic Basin



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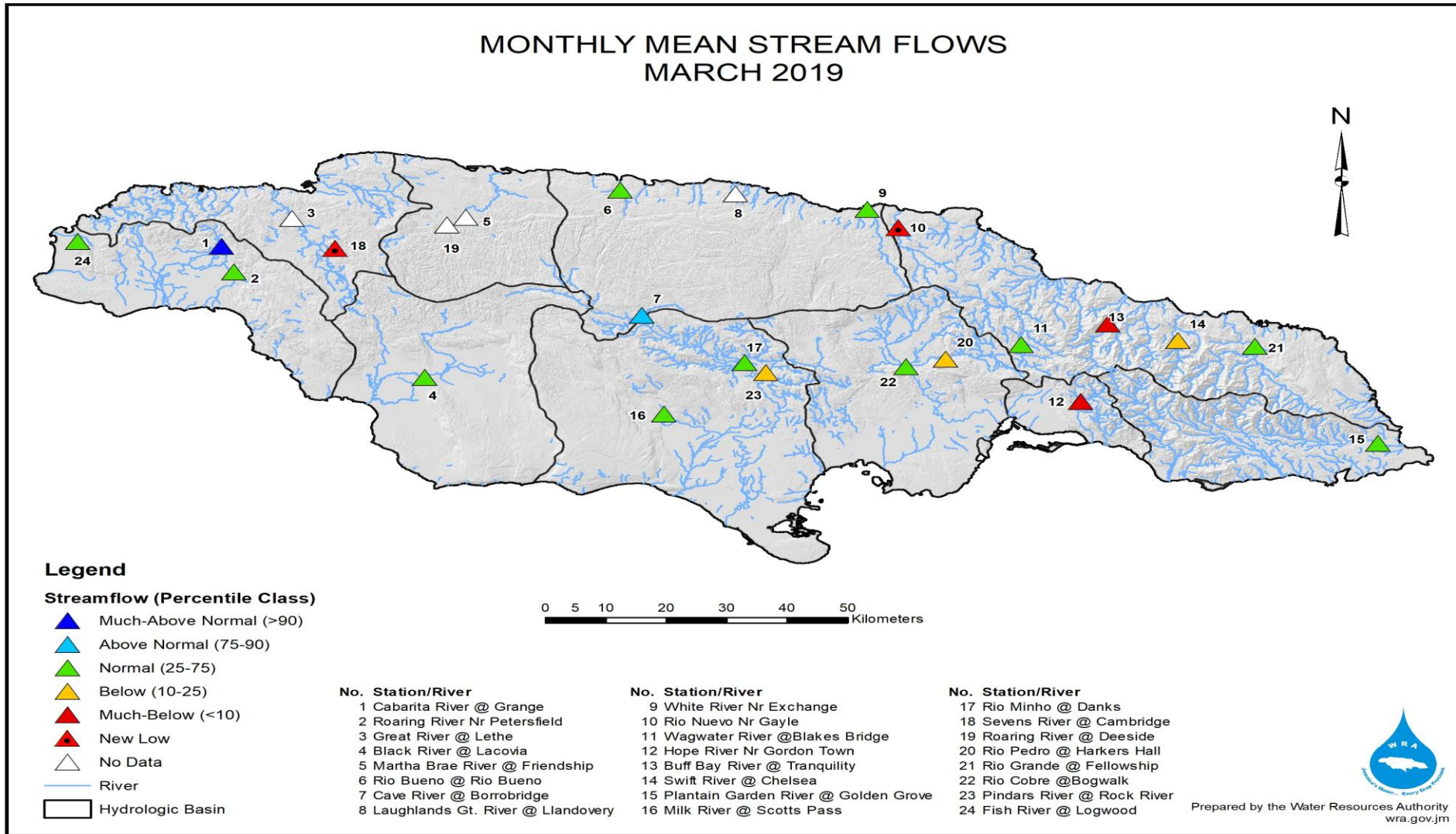
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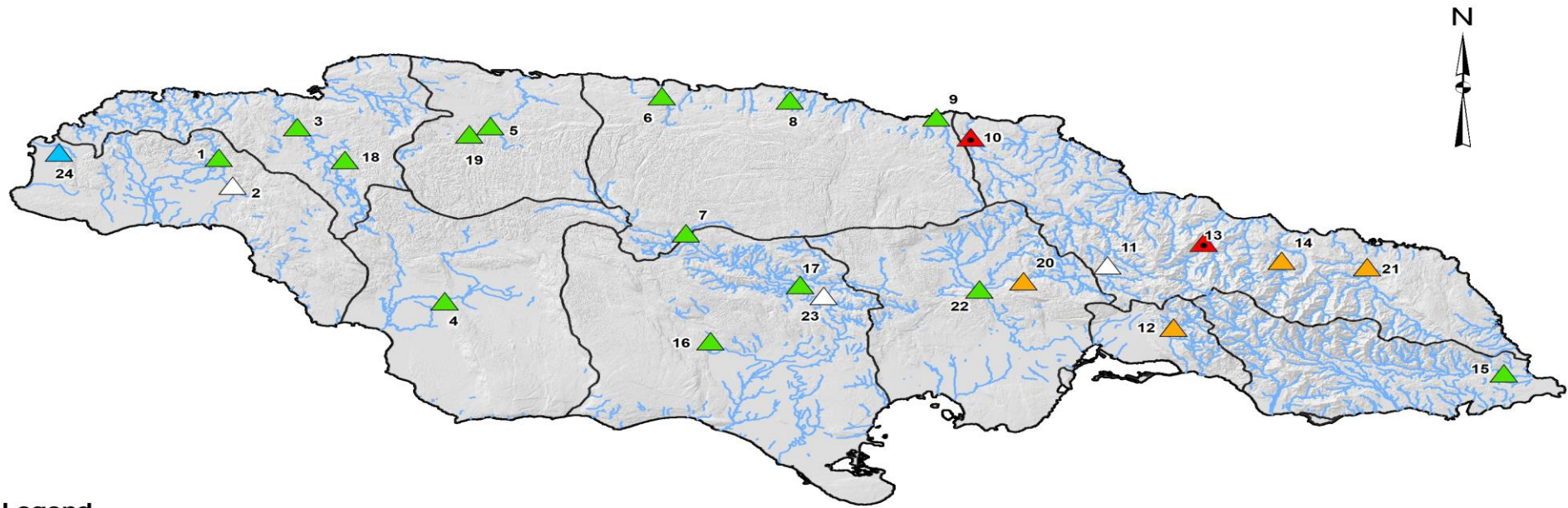
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Stream Flow Bulletin Maps for March



Stream Flow Bulletin Maps for April

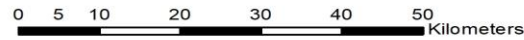
MONTHLY MEAN STREAM FLOWS APRIL 2019



Legend

Streamflow (Percentile Class)

- Much-Above Normal (>90)
- Above Normal (75-90)
- Normal (25-75)
- Below (10-25)
- Much-Below (<10)
- New Low
- No Data
- River
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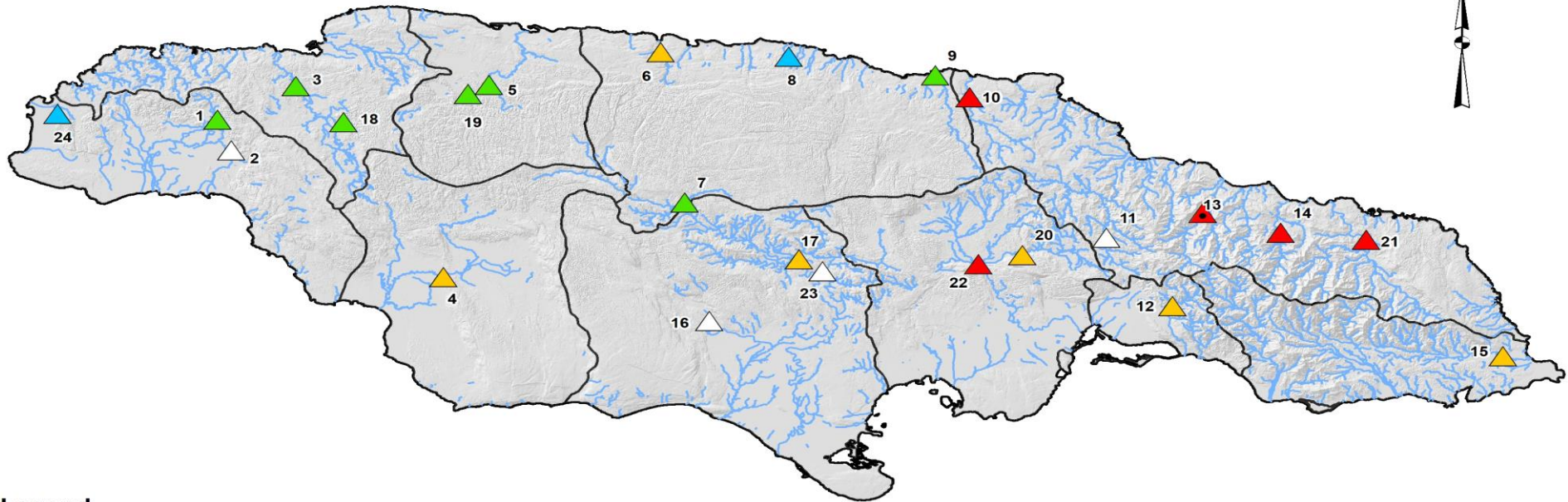
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Stream Flow Analysis May and June

The decline in flows in the BMNHB continued to be observed in the months of May and June. The measured flows continued to be Below Normal for all the rivers with Buff Bay River at Tranquility displaying a New Low for the second time this year. The Hope River in the KHB was Normal as the watershed received some rainfall. For the RCHB, flows in the Rio Cobre, triangle #22, were Much-Below normal in May but recovered slightly in June as flows were impacted by rainfall in the Basin. The Rio Minho, triangle #17, recorded flows Below and Much-Below normal for May and June while the rivers in the west of the island, represented by triangles #s 1,3,18, and 24 were Above and Much-Above normal.

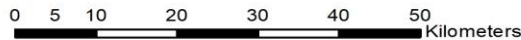
MONTHLY MEAN STREAM FLOWS MAY 2019



Legend

Streamflow (Percentile Class)

- ▲ Much-Above Normal (>90)
- ▲ Above Normal (75-90)
- ▲ Normal (25-75)
- ▲ Below (10-25)
- ▲ Much-Below (<10)
- ▲ New Low
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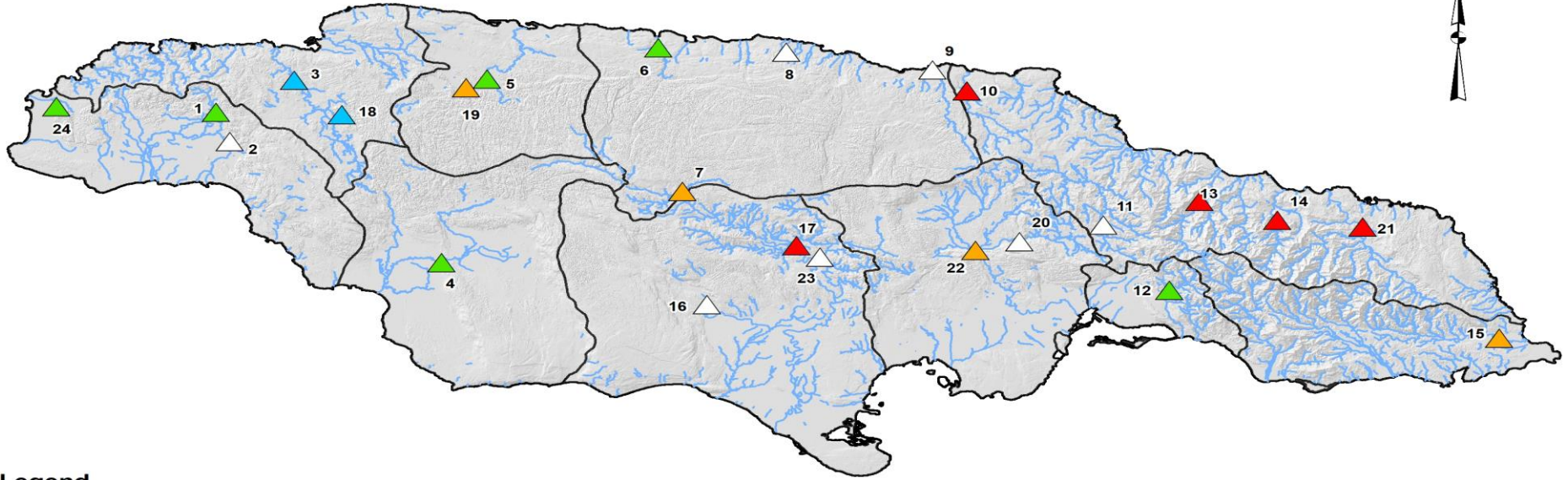
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The Hope River showed signs of recovery in June, as the flows that were measured indicated Normal. In respect of the Roaring River at Deeside, the flows were Below Normal for June, while the Martha Brae at Friendship was however, showing Normal flows.

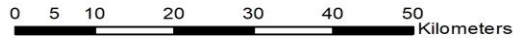
MONTHLY MEAN STREAM FLOWS JUNE 2019



Legend

Streamflow (Percentile Class)

- ▲ Much-Above Normal (>90)
- ▲ Above Normal (75-90)
- ▲ Normal (25-75)
- ▲ Below (10-25)
- ▲ Much-Below (<10)
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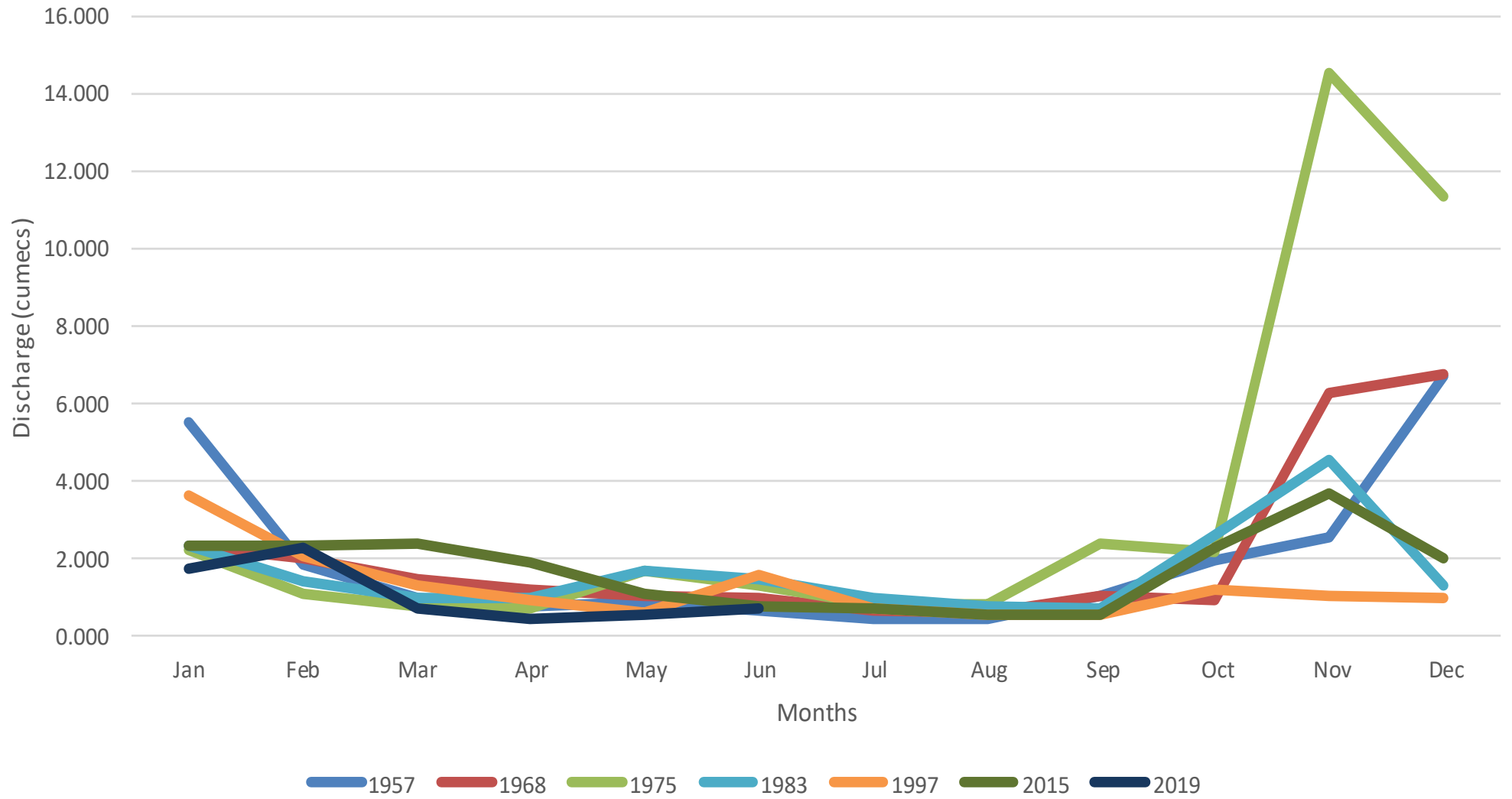


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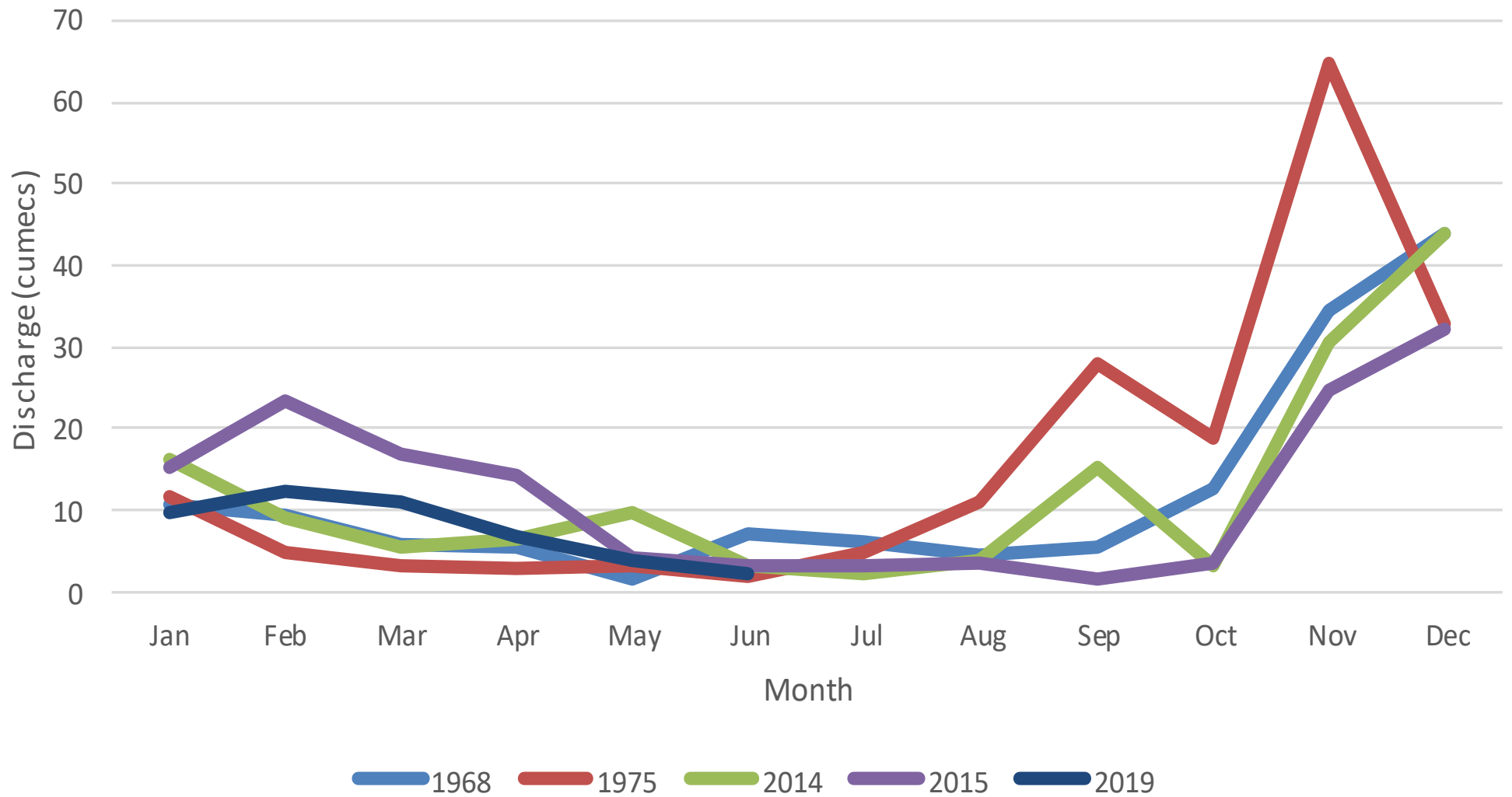
Present and Historical Flow Comparison

A graphical outlay of January to June 2019 stream flow data for the Buff Bay River at Tranquility when compared to other periods of low flows between 1957 to present, provides a visual of the extent of the Below Normal flows being experienced. For low flow analysis, Q90 is used to determine the reliable yield (flow) that a river needs to maintain in order to satisfy particular ecosystem services during periods of drought. The Flows for the present period are the lowest on record, and fall below those of the comparative years, and below the Q90 flows of 16.045×10^6 gal/day in some instances. For the Rio Grande at Fellowship, flows for May and June are similar to those of 1975 which had the lowest flows recorded for the period January to June.

Buff Bay River at Tranquility Flow Comparison (1957-2019)



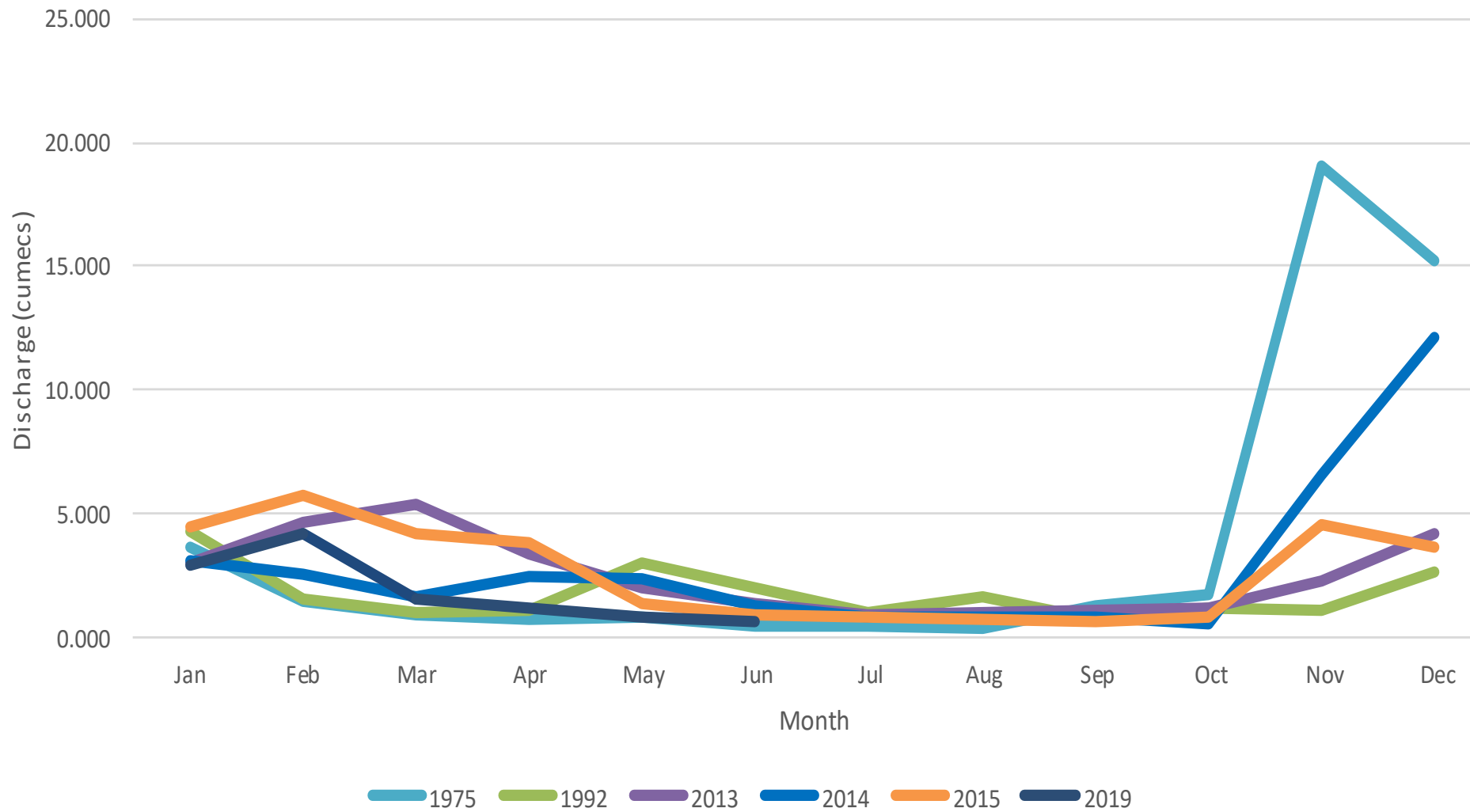
Rio Grande at Fellowship Flow Comparison (1968-2019)



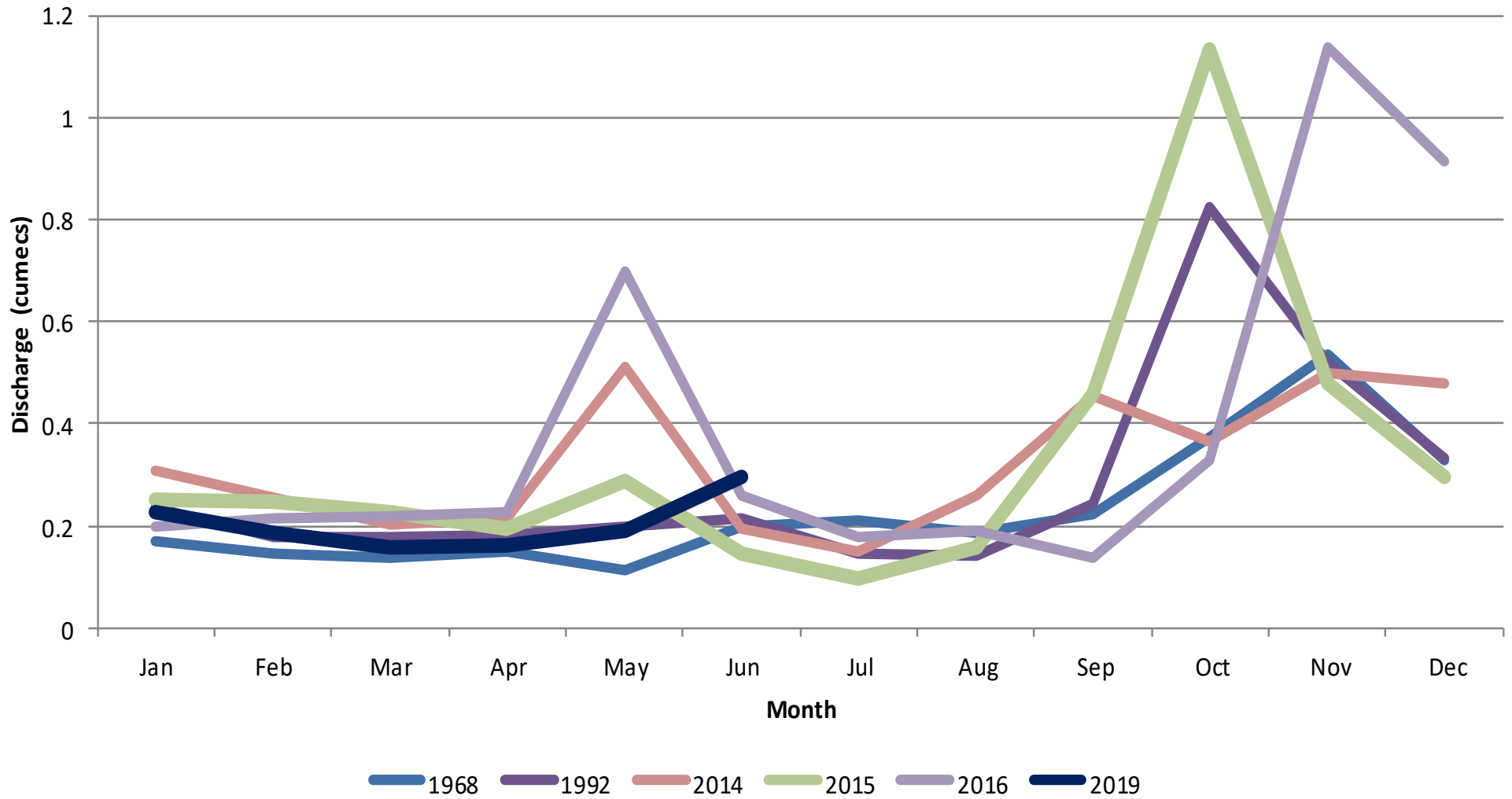
Present and Historical Flow Comparison

Flows in Swift River at Chelsea in the BMNHB, triangle #14, for the months of May and June are comparable to the same period in 1975 which has the lowest flows on record. The Hope River in the KHB continues to show the impact of the below normal rainfall. However, there was a slight recovery towards the end of May into June when the flows indicated Normal.

Swift River at Chelsea Flow Comparison (1975-2019)



Hope River Flow Comparison (1968 - 2019)



The flow data collected over the period January to June has shown that water resources have been negatively impacted islandwide. However, the impact is greater on the eastern side of the country, for example in the KHB and the BMNHB, where flows in rivers and streams are largely rainfall dependent. Some of the smaller streams in these basins have become dry as result of severe lack of precipitation, for example Somerset Falls. In the basins where the rivers are groundwater fed, such as the Rio Cobre and the Dry Harbour Mountains Hydrologic Basins, the observed impact is not as significant as those in the eastern side of the island.

There are rivers that indicate New Low, however, the flows are still sustainable, for example, the Great River near Lethe, triangle #3. While New Low was recorded for this river in January, this did not have significant negative impact on water supply, as the NWC which uses it as a primary source for Montego Bay and environs did not report an adverse challenge to potable water production during the period.