2018 Climate Review for Puerto Rico and the U.S. Virgin Islands.

Synopsis: *Overall below normal rainfall was observed across Puerto Rico and the U.S. Virgin Islands during 2018. The early months of the year had above normal rainfall but it became drier than normal starting early in the summer and through the rest of the year. A few tropical waves in the months of July and August caused episodes of heavy rain and flooding. Near normal mean temperatures were observed.*

Summary: The typical and seasonable weather patterns were dominant this year. With the exception of the impact from the remnants of Hurricane Beryl in July and a strong tropical wave that affected the islands in November, there were no other features or events that were out of the ordinary. However, the main story of 2018 was the rainfall deficit that gradually became more pronounced as the year progressed, especially across the eastern to central interior of Puerto Rico as well as the South Coastal Plains of Puerto Rico. Portions of the U.S. Virgin Islands also had rainfall deficits, especially across south and western Saint Croix. In fact, 2018 was on the drier end of the yearly total rainfall record at the international airports in San Juan, Saint Croix, and Saint Thomas.

During January and February, the weather pattern was fairly typical, but slightly higher than average moisture allowed for above normal rainfall across the local area except the South Coastal Plains of Puerto Rico and the island of Saint Croix. The months of March and April were also fairly typical as we gradually transition from the dry months to wetter months ahead. Some areas did observe above normal rainfall such as northern and western Puerto Rico, while the rest of Puerto Rico and the U.S. Virgin Islands observed below normal rainfall; that said, eastern Puerto Rico did observe above average rainfall in April. In May, the upper troughs were starting to become more present over the local area, causing showers and thunderstorms, particularly across western and portions of eastern and northern Puerto Rico. Generally speaking, central and southern Puerto Rico as well as Saint Croix observed below normal rainfall, while elsewhere in Puerto Rico and the U.S. Virgin Islands observed near or above normal rainfall. A small exception is the San Juan Luis Muñoz Marín International Airport, where it rained about one inch less than normal. June and July observed many episodes of Saharan dust, limiting not only the tropical cyclone activity across the Atlantic, but also limiting the shower and thunderstorm activity across the local islands. By early June, the drought monitor had started highlighting some areas in Puerto Rico as Abnormally Dry (D0) by the drought monitor (Fig 1).

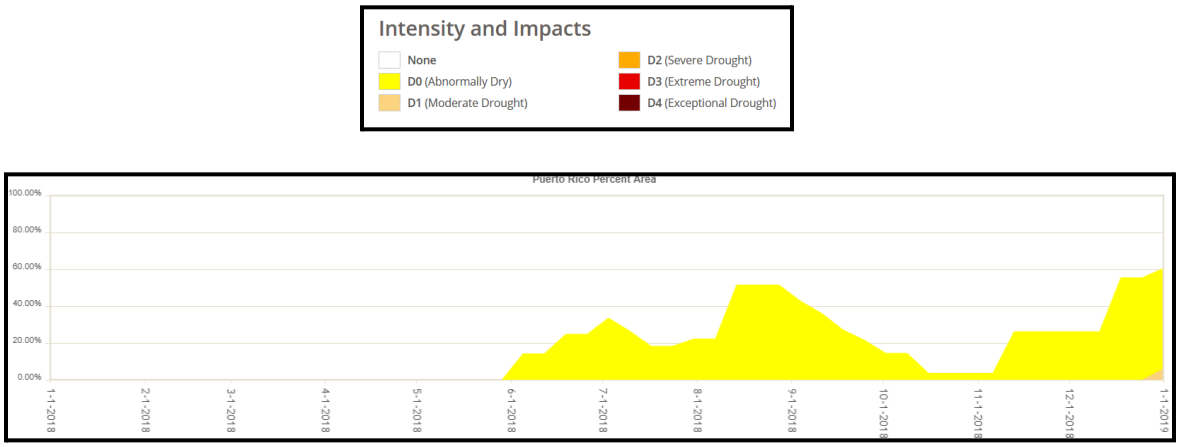


Figure 1. Percent Area of PR under U.S. Drought Monitor - Drought Categories 2018.

July started with the remnants of Hurricane Beryl affecting the U.S. Virgin Islands and Puerto Rico with heavy rain and strong gusty winds. It was the most significant rainfall event thus far in the year with some areas

observing up to about 6 inches of rain across eastern Puerto Rico. However, even though the remnants of Beryl and other tropical waves that affected the area into August did improve the rainfall deficit slightly, they were not enough to completely remove the "Abnormally Dry" category from portions of Puerto Rico, especially since most of the rain was observed across the easternmost sections of Puerto Rico.

During the early fall months, normally fairly rainy, we observed the typical increase in available moisture, tropical waves and upper troughs, all of which enhanced rainfall and thunderstorm development over the local islands. Through the early fall months, drought monitor steadily shrunk the area classified as Abnormally Dry (D0), and by November less than 4% of Puerto Rico had the classification of D0. However, the month of November, which is typically a very rainy month, was relatively dry this year. There was only one rainfall event, which was a strong tropical wave that affected the area and caused significant rainfall accumulations across the central interior into eastern Puerto Rico, the rest of the rainfall activity observed was generally brief affecting the U.S. Virgin Islands, Vieques and Culebra islands as well as the eastern coastal municipalities of Puerto Rico as well as locally induced showers across western Puerto Rico. That said, the amounts of rain were below normal and the rainfall deficit continued to worsen, so much that the Drought Monitor gradually increased the coverage of Abnormally Dry conditions across Puerto Rico, which only got worse in December. The unusually month of December caused the Drought Monitor to increase the coverage of Abnormally Dry conditions to about 55% of Puerto Rico, but by January 1, 2019 about 55% was under D0 and 6% was upgraded to D1. Preliminarily, the average rainfall total from the local COOP stations in Puerto Rico was of 62.08 inches, which is 0.42 inches below normal (Table 1).

For rainfall accumulation and percent of normal per climate division visit: https://www.weather.gov/media/sju/climo/stats/2018.pdf

For the driest and wettest years on record visit: http://www.weather.gov/media/sju/climo/stats/TopYears.pdf

Temperatures across Puerto Rico ranged from 98ºF at the Aguirre station on the 14th of September, to 50ºF at the Adjuntas AES on the 2nd of March. The mean annual temperature for the local COOP stations in Puerto Rico was 77.4ºF, which is approximately 0.6ºF warmer than the 30-year average from the National Centers for Environmental Information (NCEI). This pattern of above normal temperatures was observed across most of the Caribbean region (Fig 2).

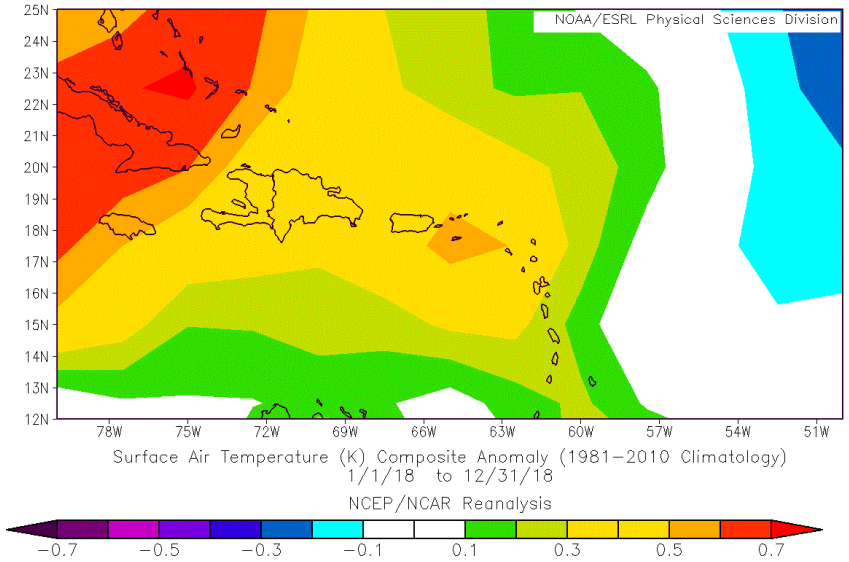


Figure 2. Surface Air Temperature Anomaly for the Caribbean from Jan 1st 2018 through Dec 31st 2018.

Monthly Rainfall Accumulations

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Observed	4.36	4.24	3.78	5.34	6.64	4.15	3.69	8.20	6.12	7.57	5.69	2.30
Normal	3.33	2.60	2.86	4.68	6.98	4.53	5.01	6.01	7.81	7.94	6.69	4.06
% PON per month	**131**	**163**	**132**	**114**	**95**	**92**	**74**	**136**	**78**	**95**	**85**	**57**
Accumulated	4.36	8.60	12.38	17.72	24.36	28.51	32.20	40.40	46.52	54.09	59.78	62.08
Normal accumulation	3.33	5.93	8.79	13.47	20.45	24.98	29.99	36.00	43.81	51.75	58.44	62.50
% PON accumulated	**131**	**145**	**141**	**132**	**119**	**114**	**107**	**112**	**106**	**105**	**102**	**99**

Table 1. 2018 Rainfall Totals and Percent of Normal (PON) across Puerto Rico based on COOP.

At the primary climatological data sites, 91, 90, 64 percent of the normal rainfall was observed at Luis Muñoz Marin Airport **(JSJ)** in San Juan, Cyril E. King Airport **(IST)** in Saint Thomas, and Henry E Rohlsen Airport **(ISX)** in Saint Croix, respectively. A preliminary rainfall total of 51.38 inches was measured at TJSJ, which is 4.97 inches below normal. In terms of temperature, the mean annual temperature at TJSJ was 80.7ºF, which is approximately 0.3ºF cooler than the 30-year average from the National Centers for Environmental Information (NCEI).

Looking Ahead

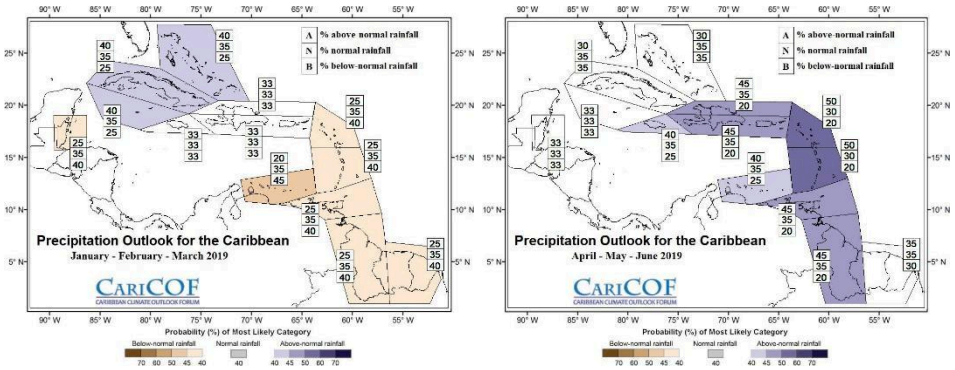


Image 1. CariCOF forecast for Jan-Feb-Mar and Apr-May-Jun

Above average Sea Surface Temperatures (SSTs) were recently observed across the El Niño region of the Pacific, exhibiting weak El Niño conditions. Most models suggest temperature anomalies to remain around a weak El Niño through the spring of 2019, then weakening to neutral conditions thereafter. Weak El Niño conditions and average SSTs across the Caribbean is what is driving the "Equal Chances" for precipitation across the local islands. A change from El Niño to Neutral conditions after the spring months, while SSTs in the Caribbean continues to warm to slightly above average will cause increasing chances for wetter conditions across the Caribbean from April to June 2019. This is because warm SSTs in the Caribbean typically leads to above-average humidity, as well as enhanced atmospheric instability. With SSTs remaining slightly above average throughout much of the region, air temperatures are also expected to be warmer than average.

More Info: http://rcc.cimh.edu.bb/long-range-forecasts/caricof-climate-outlooks/

Highlights for Primary Climatological Data Sites

1. There were a total of 7 days (nights) with a minimum temperature of 80ºF or above at the **Luis Muñoz Marin Airport** in 2018. This ranks as the 30th highest number of "80ºF or above" minimum temperature days on record, but the 5th lowest since the year 2000**.**

Rank	Year	Number of days
1st	2009	59
2nd	2017	54
3rd	2012	43

2. February 2018 ended as the 4th **wettest February** for any given year at **Luis Muñoz Marin Airport.**

Rank	Month/Year	Inches
1st	February 1982	6.69
2nd	February 1956	6.44
3rd	February 1989	6.05
4th	February 2018	5.18
5th	February 1997	4.58
6th	February 1969	3.97

3. 9th longest streak of consecutive days without rain at the **Henry E Rohlsen Airport in Saint Croix.**

Rank	Year	Number of Consecutive Days Without Rain

1st	April 1st 1988 - May 1st 1988	31
2nd	February 24th 1958 - March 21st 1958	26
3rd	May 24th 2012 – June 15th 2012	23
4th	May 9th 2008 – May 31st 2008	23
5th	June 3rd 2001 – June 23rd 2001	21
6th	March 21st 1980 – April 10th 1980	21
7th	March 28th 1973 – April 17th 1973	21
8th	January 14th1980 – February 2nd 1980	20
9th	March 2nd 2018 – March 20th 2018	19

2018 Monthly & Seasonal Highlights for Primary Climatological Data Sites

	Dec (2017)	Jan	Feb	Season
JSJ	6th warmest 80.0ºF	3rd warmest 78.9ºF	---	---
IST	8th warmest 80.7ºF 5th driest 1.18”	8th wettest 3.37”	9th wettest 2.64”	---
ISX	---	---	---	---

Table 2. Winter 2017-18

	Mar	Apr	May	Season
JSJ	---	---	---	---
IST	Coolest 74.5ºF	9th driest 1.06”	---	5th coolest 78.7ºF
ISX	---	8th driest 0.62”	---	4th driest 3.11”

Table 3. Spring 2018

	Jun	Jul	Aug	Season
JSJ	---	---	---	---
IST	---	8th warmest 84.5ºF	---	---
ISX	---	9th driest 1.26”	---	10th driest 5.82”

Table 4. Summer 2018

	Sep	Oct	Nov	Season
JSJ	---	---	---	---
IST	4th driest 1.59”	---	---	---
ISX	8th warmest 83.6ºF	8th warmest 83.1ºF 8th driest 1.95”	10th warmest 81.4ºF	7th warmest 82.7ºF

Table 5. Fall 2018

	Dec	2018
JSJ	---	---
IST	8th driest 1.47” 10th warmest 80.3ºF	---
ISX	7th warmest 80.1ºF	4th driest 24.75”

Table 6. December and 2018 Highlights

Additional Highlights Based on COOP Data

Wettest Days

Station	Rainfall	Date
EAST END	6.10”	8/29/2018
MARICAO FISH HATCHERY	6.00”	6/28/2018
JUNCOS 1 SE	4.34”	7/10/2018
RIO BLANCO LOWER	4.26”	6/23/2018
MOROVIS 1 N	4.15”	3/28/2018

Hottest Days

Station	Temperature (°F)	Date
AGUIRRE	98	9/06/2018 and 9/14/2018
LAJAS SUBSTATION	97	7/03/2018
AGUIRRE	97	8/17/2018
PONCE 4 E	96	Observed 12 days in August 2018.
PONCE 4E	95	Observed 9 days in August 2018.

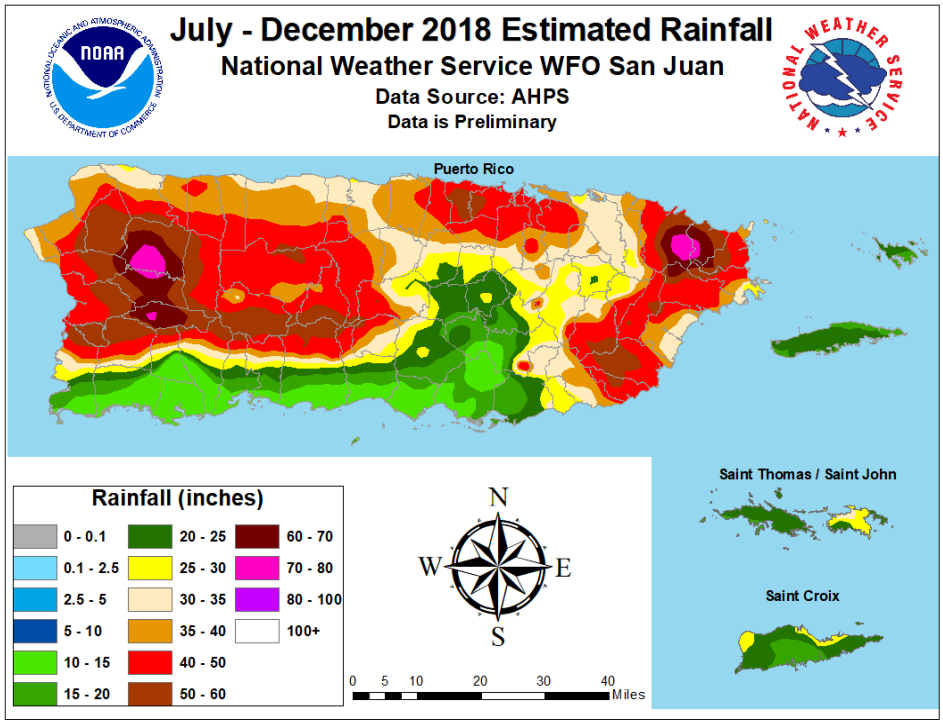
Coolest Nights

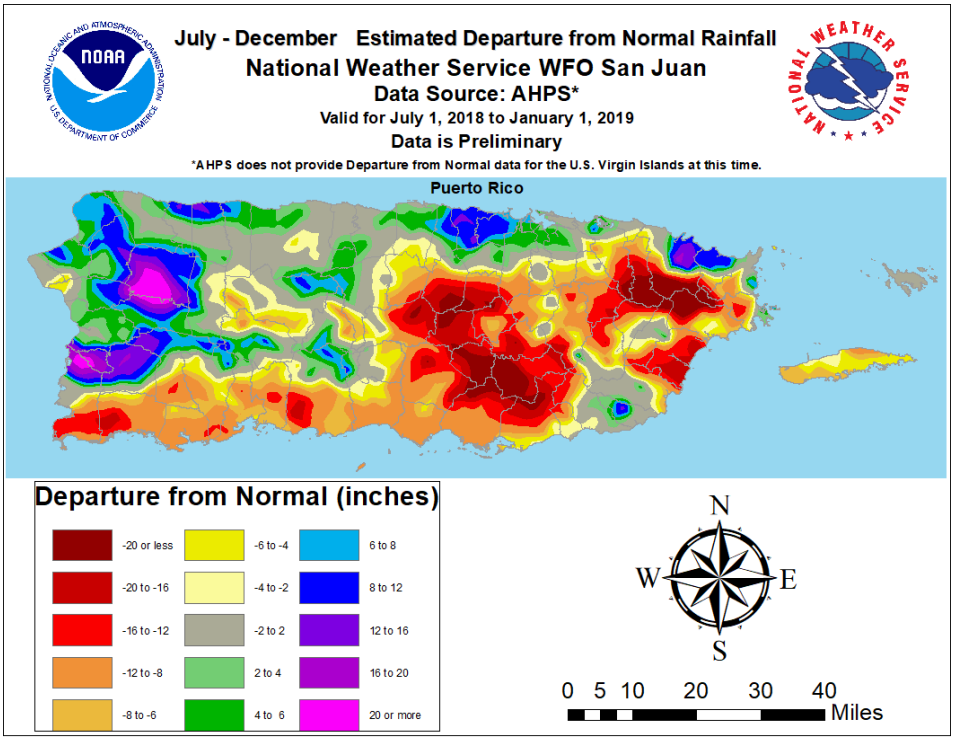
Station	Temperature (°F)	Date
ADJUNTAS SUBSTATION	50	3/02/2018
ADJUNTAS SUBSTATION	51	3/16/2018
ADJUNTAS SUBSTATION	52	3/06/2018 and 3/07/2018
ADJUNTAS SUBSTATION	53	1/03/2018, 1/09/2018 and 1/22/2018
MARICAO 2 SSW	53	3/03/2018 and 3/04/2018

Data are preliminary and have not undergone final quality control by the National Centers for Environmental Information / NCEI/. Therefore, these data are subject to revision.

Maps with radar estimated rainfall and rainfall deficits.

*After Hurricane María in September 2017, the Doppler Radar was not operational until July 2018. Therefore, the following maps are radar estimates with data from July through December 2018.


July - December 2018 Estimated Rainfall
National Weather Service WFO San Juan
Data Source: AHPS
Data is Preliminary
Puerto Rico
Saint Thomas / Saint John
Saint Croix
Rainfall (inches)
0 - 0.1
0.1 - 2.5
2.5 - 5
5 - 10
10 - 15
15 - 20
20 - 25
25 - 30
30 - 35
35 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 100
100+
N
W
E
S
0 5 10 20 30 40
Miles


July - December Estimated Departure from Normal Rainfall
National Weather Service WFO San Juan
Data Source: AHPS*
Valid for July 1, 2018 to January 1, 2019
Data is Preliminary
*AHPS does not provide Departure from Normal data for the U.S. Virgin Islands at this time.
Puerto Rico
Departure from Normal (inches)
-20 or less
-20 to -16
-16 to -12
-12 to -8
-8 to -6
-6 to -4
-4 to -2
-2 to 2
2 to 4
4 to 6
6 to 8
8 to 12
12 to 16
16 to 20
20 or more
N
W
E
S
0 5 10 20 30 40
Miles