



NWS Houston, Texas September 2019 Regional Climate Summary

Produced by Jimmy Fowler & Nikki Hathaway

. . . Abnormally warm temperatures continued with extreme rainfall brought on by Tropical Storm Imelda. . .

September continued the abnormally warm temperatures with twenty three daily temperature records broken across the primary climate sites. Initially drought conditions expanded across the entire area for the start of the month, but then extreme rainfall from Tropical Storm Imelda helped to reverse the dry conditions across the eastern and southern portions of the region. Imelda's extreme rainfall brought flash flooding to portions of Chambers, Liberty, Montgomery, Harris, Galveston, Matagorda, and Brazoria counties. After Imelda, the abnormally dry and hot conditions continued for the rest of the month.

Table of Contents

Page Number	Page Title
1	Cover
2	Table of Contents
3	September by the Numbers
4	Precipitation
5	Total Monthly Precipitation
6	Total Monthly Precipitation Departure
	from Normal
7	Temperatures
8 – 9	Monthly Temperature Charts
10	Drought Conditions
11 – 13	September Daily Record Reports
14	October Outlook
15 – 16	ENSO
17 – 19	Tropical Storm Imelda Recap
20	Climate Primary Site History





September 2019 by the Numbers

Location (records started)	Average Temp	Ranking	Total Rainfall	Ranking
City of Houston, TX (1888)	83.9°F	WARMEST ON RECORD (1st)	14.95"	WETTEST ON RECORD (1st)
Houston Hobby, TX (1930)	84.4°F	2 nd Warmest	11.48"	3rd Wettest
City of Galveston, TX (1871)	86.0°F	WARMEST ON RECORD (1 st)	18.06"	5 th Wettest
City of College Station, TX (1882)	84.9°F	2 nd Warmest	2.54"	59 th Driest
Conroe, TX (1997)	81.9°F	2 nd Warmest	17.73"	WETTEST ON RECORD (1 st)
Huntsville, TX (1997)	84.1°F	WARMEST ON RECORD (1st)	1.26"	7 th Driest
Sugar Land, TX (2000)	83.8°F	WARMEST ON RECORD (1st)	9.30"	WETTEST ON RECORD (1 st)
Palacios, TX (1943)	85.9°F	WARMEST ON RECORD (1st)	3.12"	32 nd Driest
Clover Field (Pearland), TX (1997)	83.9°F	2 nd Warmest	10.93"	WETTEST ON RECORD (1 st)
David Wayne Hooks (Tomball), TX (1998)	82.6°F	2 nd Warmest	4.79"	8 th Wettest
Angleton, TX (1998)	82.0°F	5 th Warmest	15.76"	2 nd Wettest
League City, TX (1990)	84.3°F	WARMEST ON RECORD (1st)	14.44"	3 rd Wettest

Precipitation

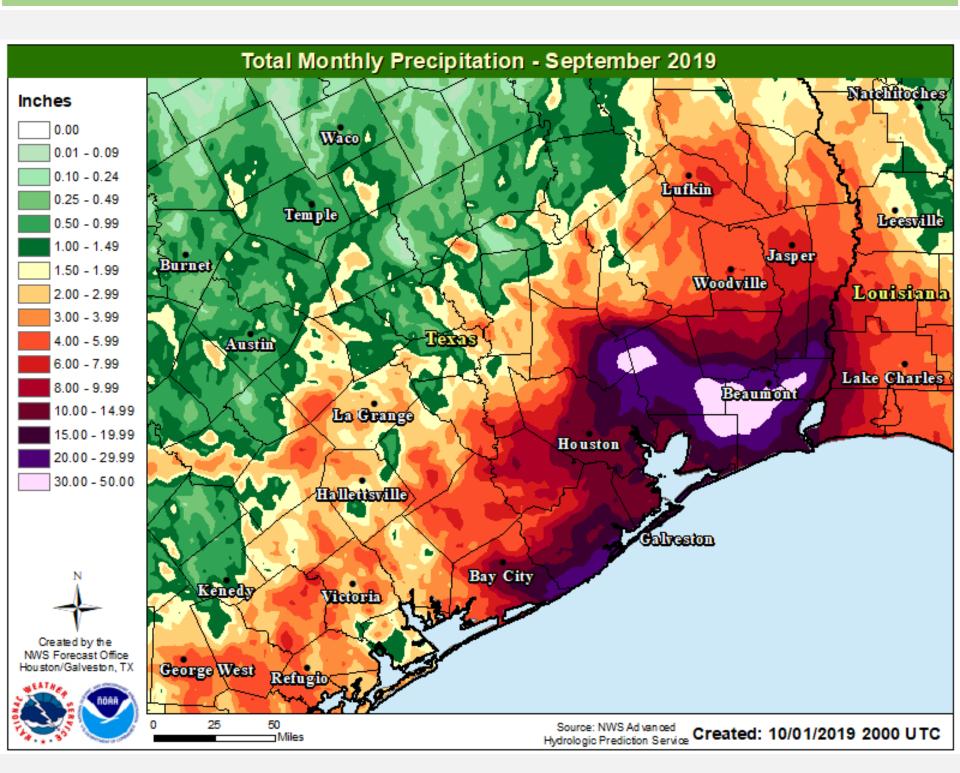
Overall the month of September saw above normal precipitation, but this was mainly due to the extreme rainfall brought on by Tropical Storm Imelda. Galveston, Houston-Hobby, and the city of Houston all saw above normal precipitation totals, while College Station received slightly below normal monthly totals. This was mainly due to Imelda impacting the coastal and eastern portions of the region and not reaching into the Brazos Valley as much. Imelda brought daily record rainfall amounts that occurred on the 17^{th} & 18^{th} at Houston-Hobby, on the 18^{th} and 19^{th} at Galveston, and on the 19^{th} for the city of Houston.

Site	Total Precipitation (in.)	Departure from Normal (in.)	Number of Thunder Days		ım Daily on (in./date)
Galveston (GLS)	18.06	+12.03	11	6.81	September 19th
Houston Hobby (HOU)	11.48	+6.27	7	4.67	September 17th
City of Houston (IAH)	14.95	+10.83	8	9.21	September 19th
College Station (CLL)	2.54	-0.64	6	1.08	September 11th





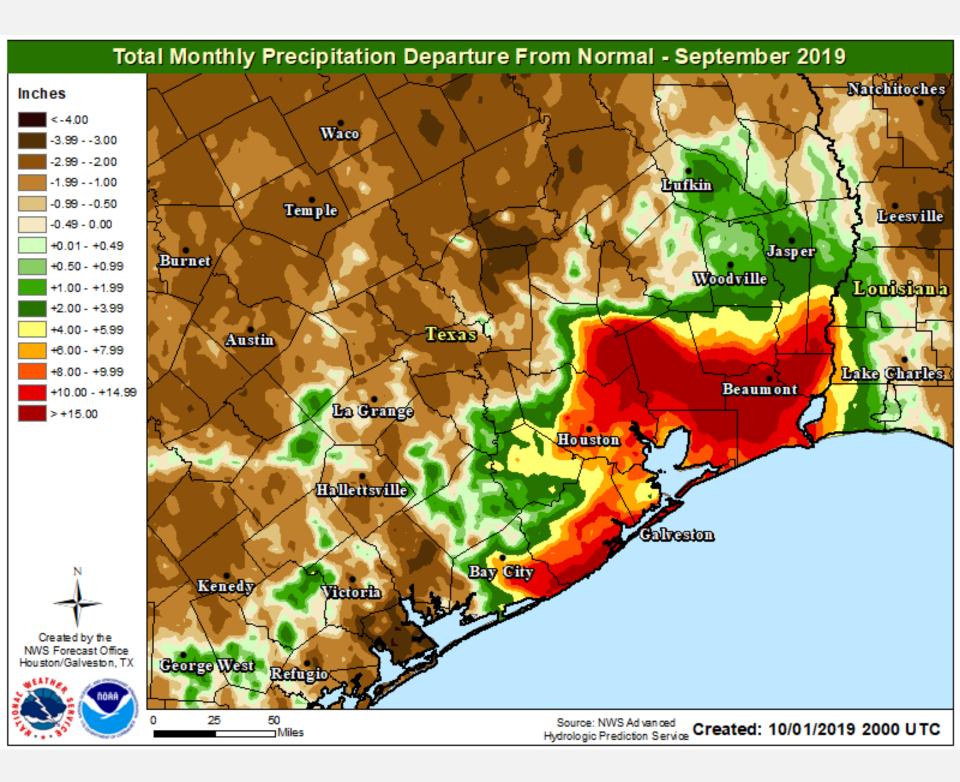
Precipitation (Continued)







Precipitation (Continued)







Temperatures

All of the primary climate sites experienced above normal temperatures during the month of September. The cities of Houston and Galveston experienced their warmest Septembers on record while College Station and Houston-Hobby ranked at number two. This September in Galveston was so warm it would actually rank as the 9th warmest <u>August</u> on record. The city of Houston started out the month with its last 100°F on the year, while College station reached the threshold twice: Sept. 4th and 6th.

Site	Average Temp (F)	Average High Temp (F)	Average Low Temp (F)	Normal Average Temp (F)	Departure From Normal (F)	Maximum Temperature (F)	Minimum Temperature (F)
Galveston (GLS)	86.0	91.2	80.8	81.6	+4.4	96 on Sept. 14 th	73 on Sept. 19 th
Houston Hobby (HOU)	84.4	92.1	76.7	80.1	+4.3	98 on Sept. 14 th	74 on Sept. 25 th & 26 th
City of Houston (IAH)	83.9	93.1	74.6	79.9	+4.0	100 on Sept. 1 st	71 on Sept. 8 th & 26 th
College Station (CLL)	84.9	94.9	74.8	80.0	+4.9	100 on Sept. 4 th & 6 th	72 on Sept. 25 th

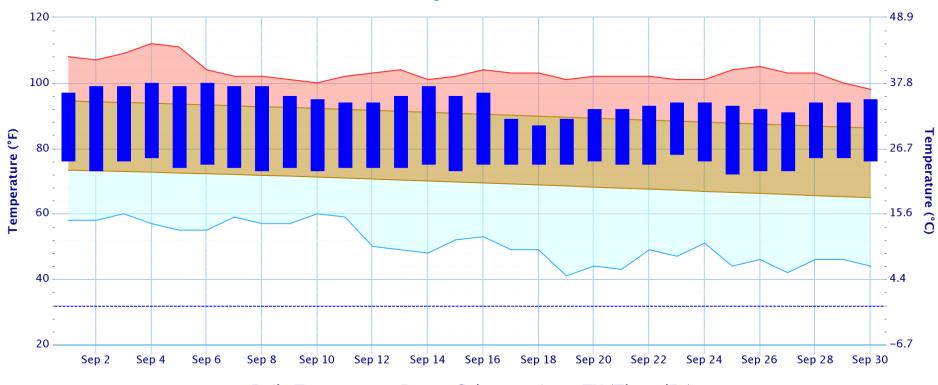




Monthly Temperature Charts

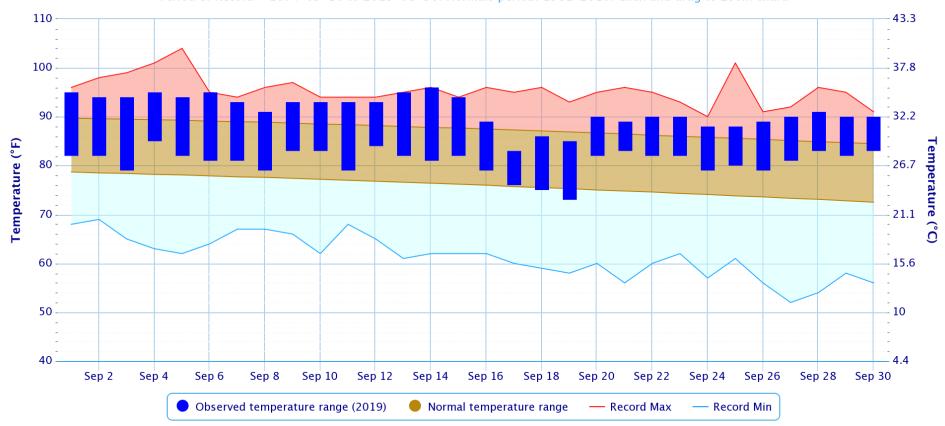
Daily Temperature Data - College Station Area, TX (ThreadEx)

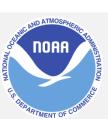
Period of Record - Max temperature: 1888-10-01 to 2019-09-30; Min temperature: 1882-05-15 to 2019-09-30. Normals period: 1981-2010. Click and drag to zoom chart.



Daily Temperature Data - Galveston Area, TX (ThreadEx)

Period of Record - 1874-05-10 to 2019-09-30. Normals period: 1981-2010. Click and drag to zoom chart.



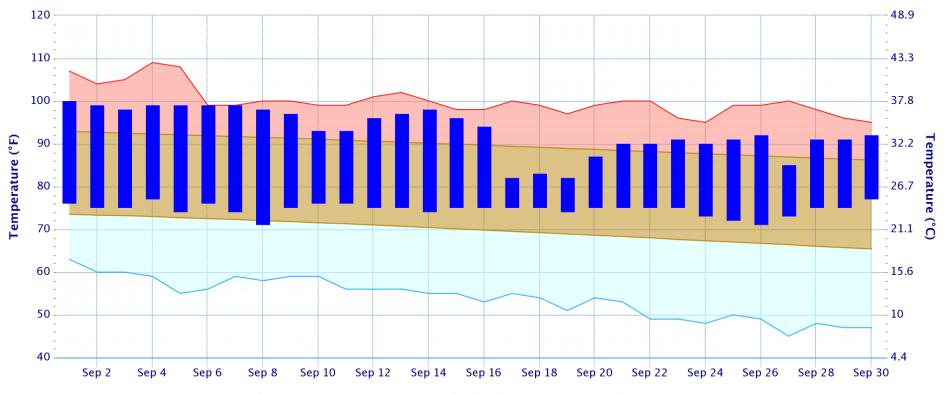




Monthly Temperature Charts (continued)

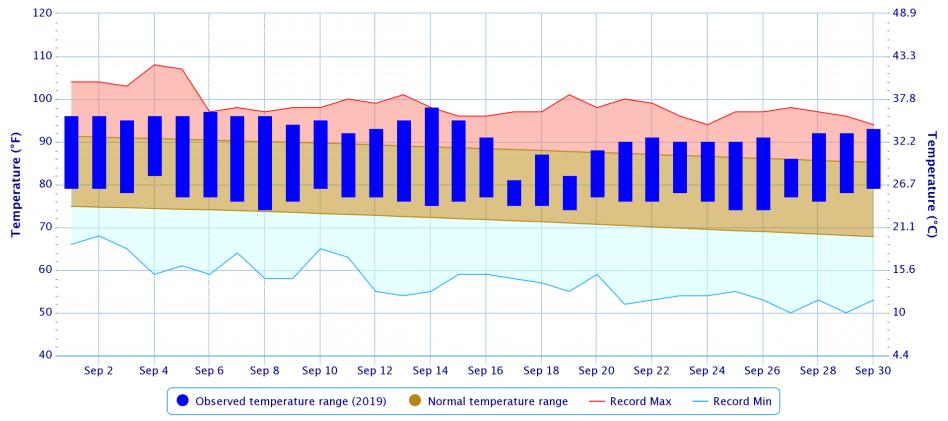
Daily Temperature Data - Houston Area, TX (ThreadEx)

Period of Record - 1889-05-01 to 2019-09-30. Normals period: 1981-2010. Click and drag to zoom chart.



Daily Temperature Data - HOUSTON WILLIAM P HOBBY AP, TX

Period of Record – 1930–08–01 to 2019–09–30. Normals period: 1981–2010. Click and drag to zoom chart.

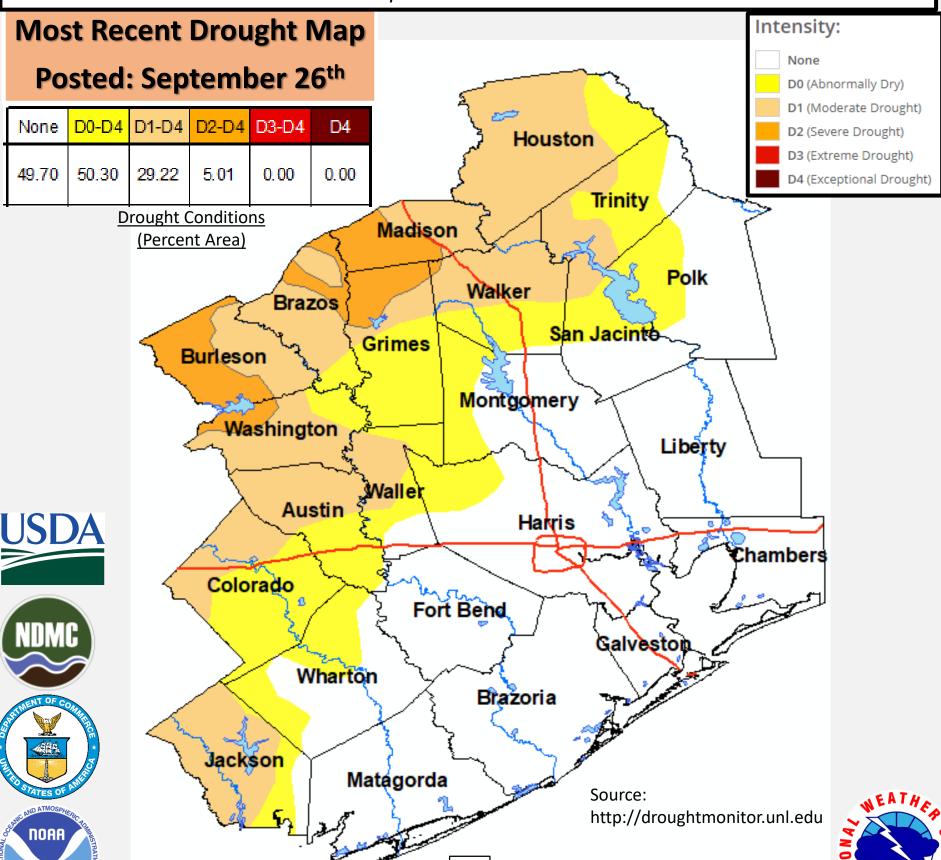






Drought Conditions

By the end of the month, D2 severe drought conditions expanded across portions of Madison, Brazos, Grimes, Burleson, and Washington counties. Additionally, improvements were made across the southeastern zones of the forecast area due to the heavy rainfall associated with Tropical Storm Imelda.



10

September Daily Record Reports

A total of 28 daily records were set across the primary climate sites.

Site	Date	Record Type	New Record	Previous Record
Houston Hobby	September 2 nd	High Min Temperature	79°	79° in 2014
Houston Hobby	September 4 th	High Min Temperature	82°	80° in 1989
City of Galveston	September 4 th	High Min Temperature	85°	84° in 1989
City of Galveston	September 6 th	High Max Temperature	95°	94° in 1912
Houston Hobby	September 6 th	High Max Temperature	97°	97° in 1963
City of Houston	September 6 th	High Max Temperature	99°	99° in 1909
City of Houston	September 7 th	High Max Temperature	99°	98° in 1963
City of Galveston	September 10 th	High Min Temperature	83°	83° in 2014
Houston Hobby	September 10 th	High Min Temperature	79°	79° in 1961
City of Galveston	September 12 th	High Min Temperature	84°	83° in 1909
City of Galveston	September 13 th	High Max Temperature	95°	93° in 2002
City of Galveston	September 14 th	High Max Temperature	96°	93° in 1900





September Daily Record Reports Continued

Site	Date	Record Type	New Record	Previous Record
Houston Hobby	September 14 th	High Max Temperature	98°	98° in 2011
City of Galveston	September 15 th	High Max Temperature	94°	94° in 1900
Houston Hobby	September 17 th	Max Rainfall	4.67"	2.59" in 1958
Houston Hobby	September 18 th	Max Rainfall	2.68"	2.32" in 1979
City of Galveston	September 18 th	Max Rainfall	6.20"	2.47" in 1979
City of Houston	September 19 th	Max Rainfall	9.21"	6.92" in 1979
City of Galveston	September 19 th	Max Rainfall	6.81"	5.11" in 1979
City of Galveston	September 21 st	High Min Temperature	83°	83° in 1992
City of Galveston	September 23 rd	High Min Temperature	82°	82° in 2000
City of College Station	September 24 th	High Min Temperature	76°	76° in 1984
City of Galveston	September 28 th	High Min Temperature	83°	82° in 2005
City of Galveston	September 29 th	High Min Temperature	82°	82° in 1986
Houston Hobby	September 29 th	High Min Temperature	78°	77° in 2013



September Daily Record Reports Continued

Site	Date	Record Type	New Record	Previous Record
City of Galveston	September 30 th	High Min Temperature	83°	82° in 1986
City of College Station	September 30 th	High Min Temperature	76°	75° in 1986
Houston Hobby	September 30 th	High Min Temperature	79°	77° in 1986





October Outlook

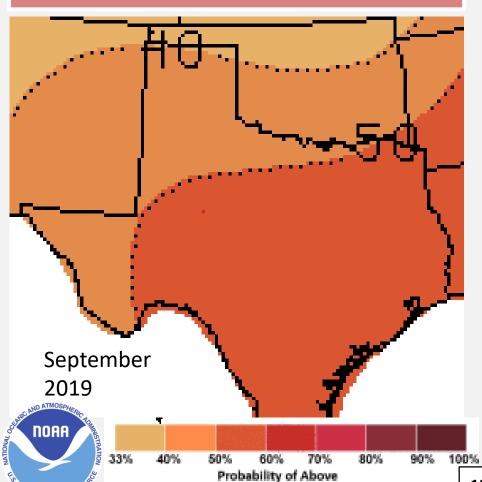
For October, the latest outlook from the Climate Prediction Center (CPC) calls for a 55% chance of above normal temperatures, 33% near normal temperatures, and a 12% chance for below normal temperatures across the area. The precipitation outlook calls for equal chances for above, below, or normal precipitation, across much of Southeast Texas. Across portions of the southeast zones such as Galveston, 31% chance of above normal precipitation, 33% near normal precipitation, and a 36% chance for below normal precipitation.

13

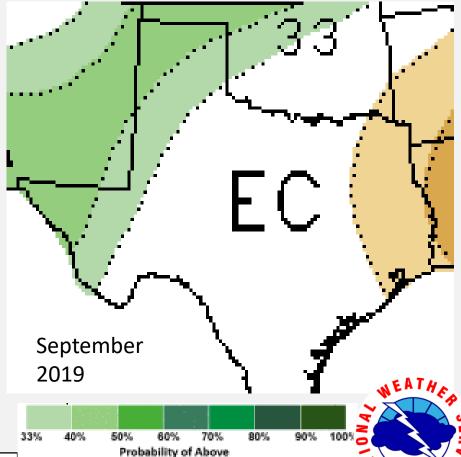
Site	Average Temp(°F)	Normal High (°F)	Normal Low (°F)
Galveston	74.3	80.6	68.1
Houston Hobby	72.1	81.2	63.1
City of Houston	71.5	82.0	60.9
College Station	70.8	81.4	60.3

Site	Normal Monthly Precipitation (in.)
Galveston (GLS)	5.52
Houston Hobby (HOU)	5.99
City of Houston (IAH)	5.70
College Station (CLL)	4.91

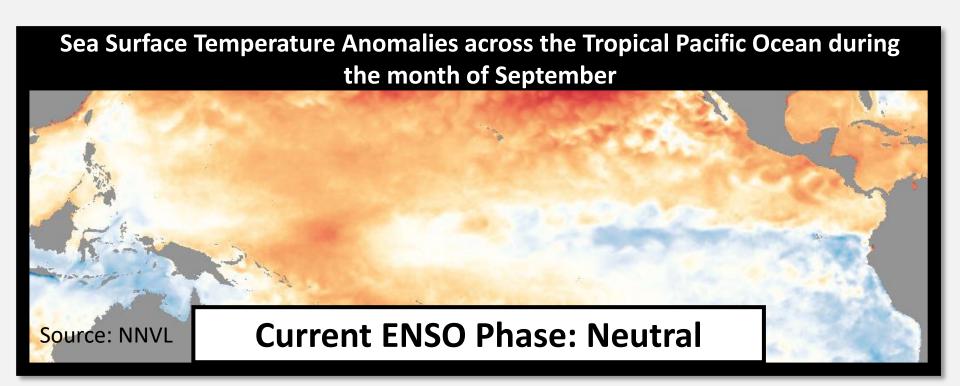
Temperature Outlook

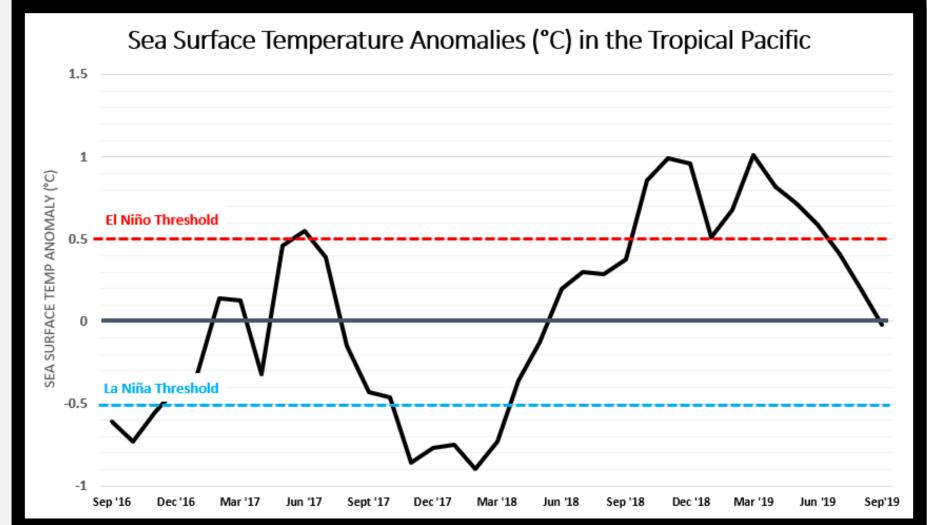


Precipitation Outlook



ENSO Observations





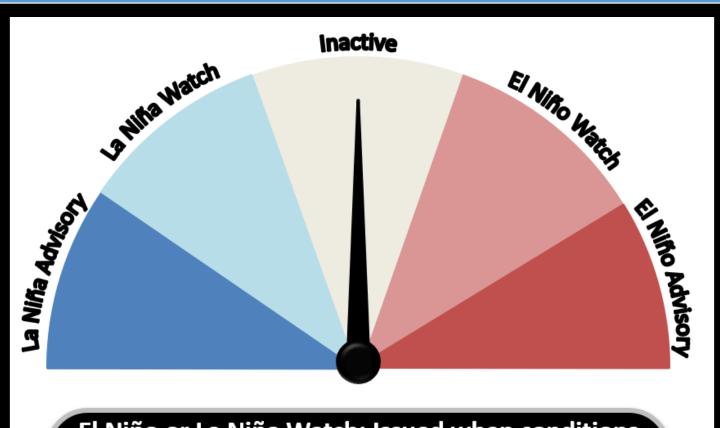




ENSO Forecast

The Climate Prediction Center's ENSO Forecast: ENSO-Neutral Continues

- There is a 85% chance of ENSO-Neutral conditions continuing through the fall
- There is a 55-60% chance of ENSO-Neutral conditions continuing through the spring



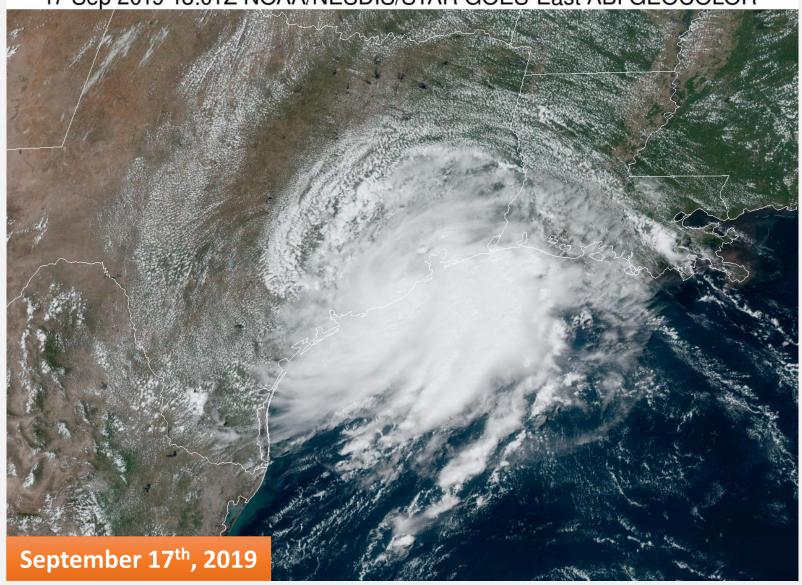
El Niño or La Niña Watch: Issued when conditions are favorable for the development of El Niño or La Niña conditions within the next six months.

El Niño or La Niña Advisory: Issued when El Niño or La Niña conditions are observed and expected to continue.



Tropical Storm Imelda

17 Sep 2019 18:01Z NOAA/NESDIS/STAR GOES-East ABI GEOCOLOR



On September 17th, an area of low pressure over the northwestern Gulf of Mexico organized becoming Tropical Depression Eleven around 12 PM CDT. By 12:45 PM CDT, the National Hurricane Center issued an update to strengthen the system into Tropical Storm Imelda. At approximately 1:30 PM CDT that afternoon, Imelda made landfall near Freeport, Texas with a minimum central pressure of 1005 millibars (29.68 inches of mercury). This system was not long lasting and quickly weakened after landfall, becoming a tropical depression by 7 PM that evening.



Tropical Storm Imelda

Imelda Storm Total Rainfall

Tuesday 7 AM to Thursday 7 PM QPE

Weather Forecast Office Houston/Galveston TX Issued Sep 19, 2019 9:19 PM CDT

This is a 60 hour precipitation estimate (surface observations, radar, satellite) of Imelda's total rainfall which lead to catastrophic flooding across our southeastern forecast area.

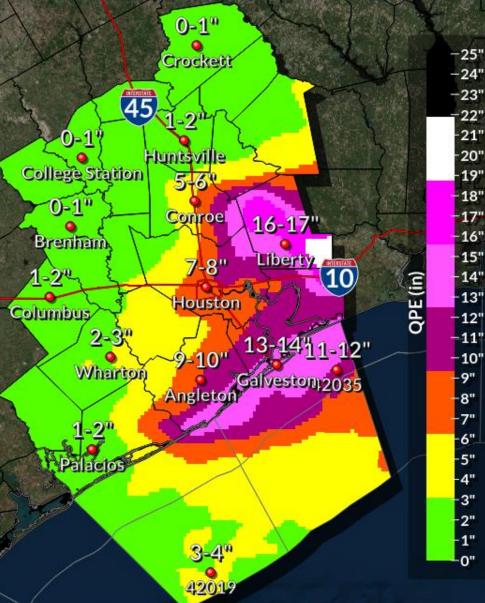
Many Harris County rain gauges reported greater than 15 inch totals (locally 25 inches) from Conroe in Montgomery County southeastward into eastern Harris County (north and east Houston metro), Liberty and Chambers Counties. Most of the highest 24 hour rain totals fell today at between 10 to 15 inches when a near west-to-east storm feeder band very slowly sagged southward through this area. Many common hourly rainfall rates were on the order of 4 to 6 inches.

At 4 PM, Bush-Intercontinental Airport (which was shut down) recorded an all-time September daily rainfall record of 9.20 inches (City of Houston).

Many of the hardest hit areas during Harvey were impacted during this event; generally those communities from eastern Houston east on I-10 into Liberty, Chambers and Jefferson Counties.

An extreme rain amount of 43.15 inches (unofficial) occurred near Fannett, Texas in Jefferson County near the Chambers County line.

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A tornado also occurred associated with a band of thunderstorms within Tropical Storm Imelda. An EF-1 tornado with maximum sustained winds of 90 MPH was on the ground for about 3 miles near Highlands, TX. It brought down large tree branches, snapped tree trunks, and damaged a few structures.





Tropical Storm Imelda

Highest Storm Total Rainfall Amounts

City/Town	County	Rainfall (inches)
NW Winnie	Chambers	40.79
WNW Devers	Liberty	36.26
E Hankamer	Chambers	33.15
SE Roman Forest	Harris	29.72
Splendora	Montgomery	27.04
Sargent	Matagorda	23.06
SE Cut And Shoot	Montgomery	22.84
N Huffman	Harris	22.52

City/Town	County	Rainfall (inches)
SW Porter	Harris	21.35
NE Crosby	Harris	20.76
NNW Dayton	Harris	19.99
N Daisetta	Liberty	18.86
SE Galveston Scholes Field	Galveston	17.72
SSW Kingwood	Harris	17.68
SSE Anahuac	Chambers	17.08
SW Porter Heights	Harris	16.60

Lowest Sea Level Pressure Observations

City		Date/ Time (UTC)	Max Sustained (KT)	Date/ Time (UTC)
High Island	997.97	17/1115	135/028	17/2035
Brazos 451 Oil Platform	1005.08	17/1315	180/020	17/1335
Angleton	1007.11	17/1930	200/018	17/2230

Maximum Observed Water Level

City	County	Water Level (FT)	Datum	Date/Time (UTC)
Manchester	Harris	3.50	MHHW	19/1948
Eagle Point	Galveston	2.22	MHHW	17/0312
Galveston Pier	Galveston	2.08	MHHW	16/2324



Source – NWS Houston/Galveston Post Storm Report Imelda:

https://forecast.weather.gov/product.php?site=NWS&issuedby=HGX&

product=PSH&glossary=1



Climate Primary Site History

Galveston (GLS)

Records for Galveston are from observations at the following locations: 67-69 Strand (April 1, 1871 - Aug 31, 1874); 23rd and the Strand (Sep 1, 1874 - July 29, 1878), 1.75 miles WSW of the previous location; the Custom House at Bath Street and the Strand (July 30, 1878 - May 8, 1882); Colorado and Santa Fe Railroad Building at 25th and the Strand (May 9, 1882 - March 14, 1883); back to the Custom House which later became the Cotton Exchange Building (March 15, 1883 - June 24, 1898), about a 1/3 of a mile E of the previous Custom House location; The Levy Building at 2223 Market Street (June 25, 1898 - Nov 26, 1900); the Trust Building at Tremont and Post Office Streets (Nov 27, 1900 - June 24, 1946), one-quarter mile south of the Levy Building; the U.S. Post Office Building at 601 Rosenberg (June 25, 1946 - 1994); Scholes Field (January 1995 to present).

Houston Hobby (HOU)

Records are based upon observations beginning in August 1931.

City of Houston (IAH)

Records for the City of Houston are from observations at the following locations: Cotton Station from July 1881 through September 1909, Stewart Building at Preston and Fannin from September 1909 through February 1926, Shell Building at Texas and Fannin from March 1926 through August 1938, Federal Building at Franklin and Fannin from August 1938 through May 1969, Intercontinental Airport from June 1969 to the present.

College Station (CLL)