HYDROLOGIC DATA BRIEF FOR THE EDWARDS AQUIFER THROUGH MAY 2017

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Edwards Aquifer Authority

Wednesday, June 7, 2017

UVALDE COUNTY RAINFALL (in inches) for 2017

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2017)	0.80	1.58	1.92	2.67	3.70							
1981-2010 Climate Normals	1.18	1.25	1.76	1.71	3.03	2.97	2.79	1.81	2.59	2.88	1.54	1.09
Difference	**-0.38**	**0.33**	**0.16**	**0.96**	**0.67**							

30-year Normal Average	**24.60**
Total for January - May 2017	**10.67**
30-year Normal Average January - May 2017	**8.93**
Total Difference for Year to Date	**1.74**
Percent of 30-year Normal Average Year to Date	**119%**

Rainfall Data provided by National Weather Service (NWS) rainfall station located at Garner Field Airport.

MEDINA COUNTY RAINFALL (in inches) for 2017

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2017)	0.41	1.31	1.78	2.71	2.81							
1981-2010 Climate Normals	1.38	1.49	2.13	1.98	3.38	3.49	2.09	1.67	2.60	3.31	1.58	1.14
Difference	**-0.97**	**-0.18**	**-0.35**	**0.73**	**-0.57**							

30-year Normal Average	**26.24**
Total for January - May 2017	**9.02**
30-year Normal Average January - May 2017	**10.36**
Total Difference for Year to Date	**-1.34**
Percent of 30-year Normal Average Year to Date	**87%**

Rainfall Data provided by NWS rainfall station located at Hondo Municipal Airport.

1981-2010 Climate Normals are NCDC's latest three-decade averages of climatological variables, including temperature and precipitation. This new product replaces the 1971-2000 Climate Normals product, which remains available as historical data.
SOURCE: https://www.ncdc.noaa.gov/cdo-web/datatools/normals

BEXAR COUNTY RAINFALL (in inches) for 2017

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2017)	2.72	3.61	2.09	2.89	1.76							
1981-2010 Climate Normals	1.76	1.79	2.31	2.10	4.01	4.14	2.74	2.09	3.03	4.11	2.28	1.91
Difference	**0.96**	**1.82**	**-0.22**	**0.79**	**-2.25**							

30-year Normal Average	**32.27**
Total for January - May 2017	**13.07**
30-year Normal Average January - May 2017	**11.97**
Total Difference for Year to Date	**1.10**
Percent of 30-year Normal Average Year to Date	**109%**

Rainfall Data provided by NWS rainfall station located at San Antonio International Airport.

COMAL COUNTY RAINFALL (in inches) for 2017

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2017)	2.78	2.33	3.30	4.40	2.50							
1981-2010 Climate Normals	1.86	2.02	2.66	2.28	3.97	4.78	2.62	1.95	3.09	4.25	2.87	2.27
Difference	**0.92**	**0.31**	**0.64**	**2.12**	**-1.47**							

30-year Normal Average	**34.62**
Total for January - May 2017	**15.31**
30-year Normal Average January - May 2017	**12.79**
Total Difference for Year to Date	**2.52**
Percent of 30-year Normal Average Year to Date	**120%**

Rainfall Data provided by NWS rainfall station located at New Braunfels Municipal Airport.

1981-2010 Climate Normals are NCDC's latest three-decade averages of climatological variables, including temperature and precipitation. This new product replaces the 1971-2000 Climate Normals product, which remains available as historical data.
SOURCE: https://www.ncdc.noaa.gov/cdo-web/datatools/normals

HAYS COUNTY RAINFALL (in inches) for 2017

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2017)	2.46	2.66	3.04	6.54	2.20							
1981-2010 Climate Normals	2.06	1.92	2.48	2.72	4.13	4.64	2.5	2.19	3.42	4.33	3.05	2.29
Difference	**0.40**	**0.74**	**0.56**	**3.82**	**-1.93**							

30-year Normal Average	**35.73**
Total for January - May 2017	**16.90**
30-year Normal Average January - May 2017	**13.31**
Total Difference for Year to Date	**3.59**
Percent of 30-year Normal Average Year to Date	**127%**

Rainfall Data provided by NWS rainfall station located in San Marcos.

Rainfall Data provided by EAA Gauge HA158 located about 0.25 miles west of Bobcat Stadium.
NWS Rainfall Station at San Marcos Airport-out of service

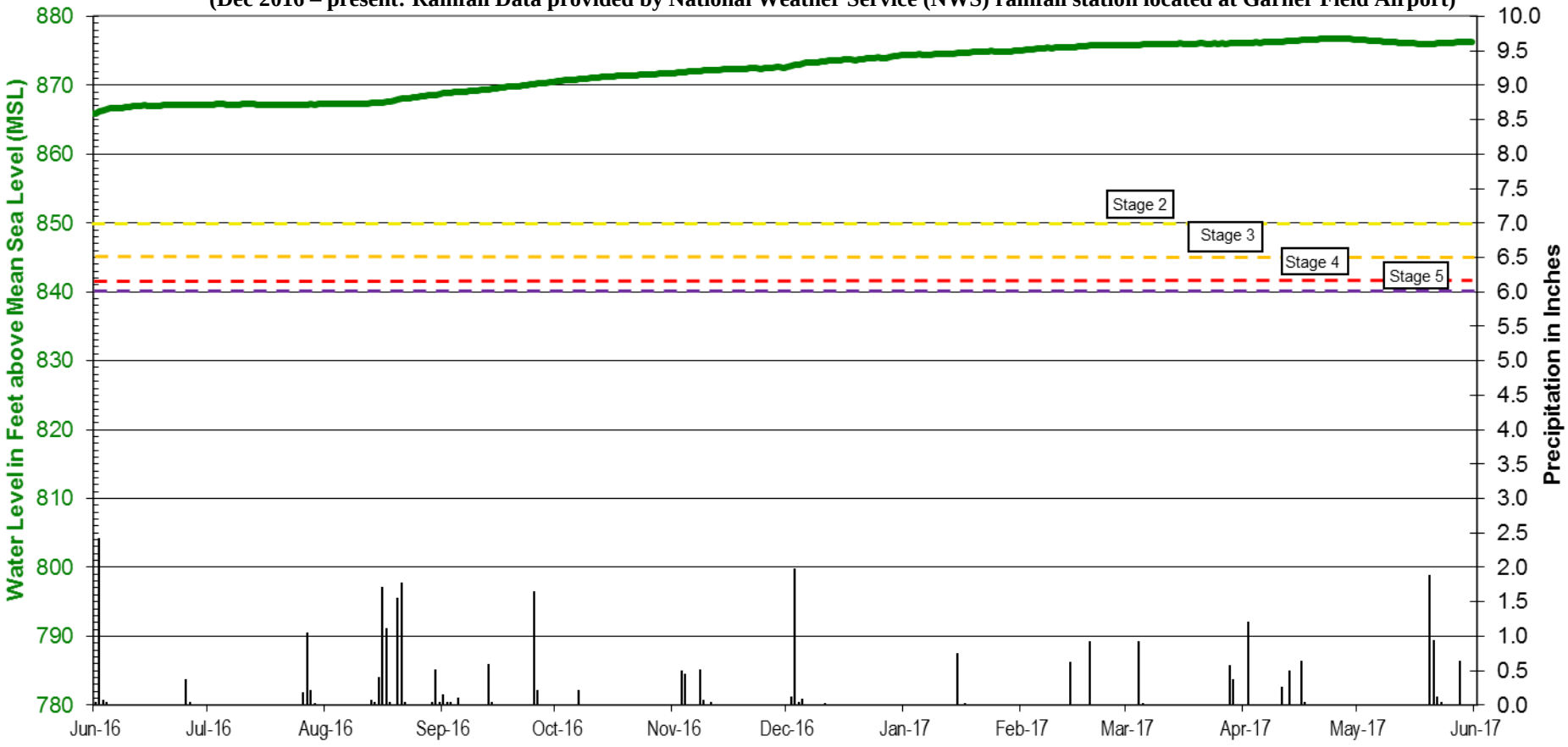
May 20-22, 2017: HA157 data substituted for HA158 due to technical issues at HA158

1981-2010 Climate Normals are NCDC's latest three-decade averages of climatological variables, including temperature and precipitation. This new product replaces the 1971-2000 Climate Normals product, which remains available as historical data.
SOURCE: https://www.ncdc.noaa.gov/cdo-web/datatools/normals

Hydrograph of the Uvalde County Index Well (J-27) and Precipitation at Uvalde

(Feb – Nov 2016: Rainfall Data provided by EAA Rain Gauge UV033 located 4.4 miles south of the City of Uvalde)

(Dec 2016 – present: Rainfall Data provided by National Weather Service (NWS) rainfall station located at Garner Field Airport)



Stage 1 - None
Stage 2 - Critical Period - 10-day avg. < 850' MSL
Stage 3 - Critical Period - 10-day avg. < 845' MSL
Stage 4 - Critical Period - 10-day avg. < 842' MSL
Stage 5 - Critical Period - 10-day avg. < 840' MSL

Date

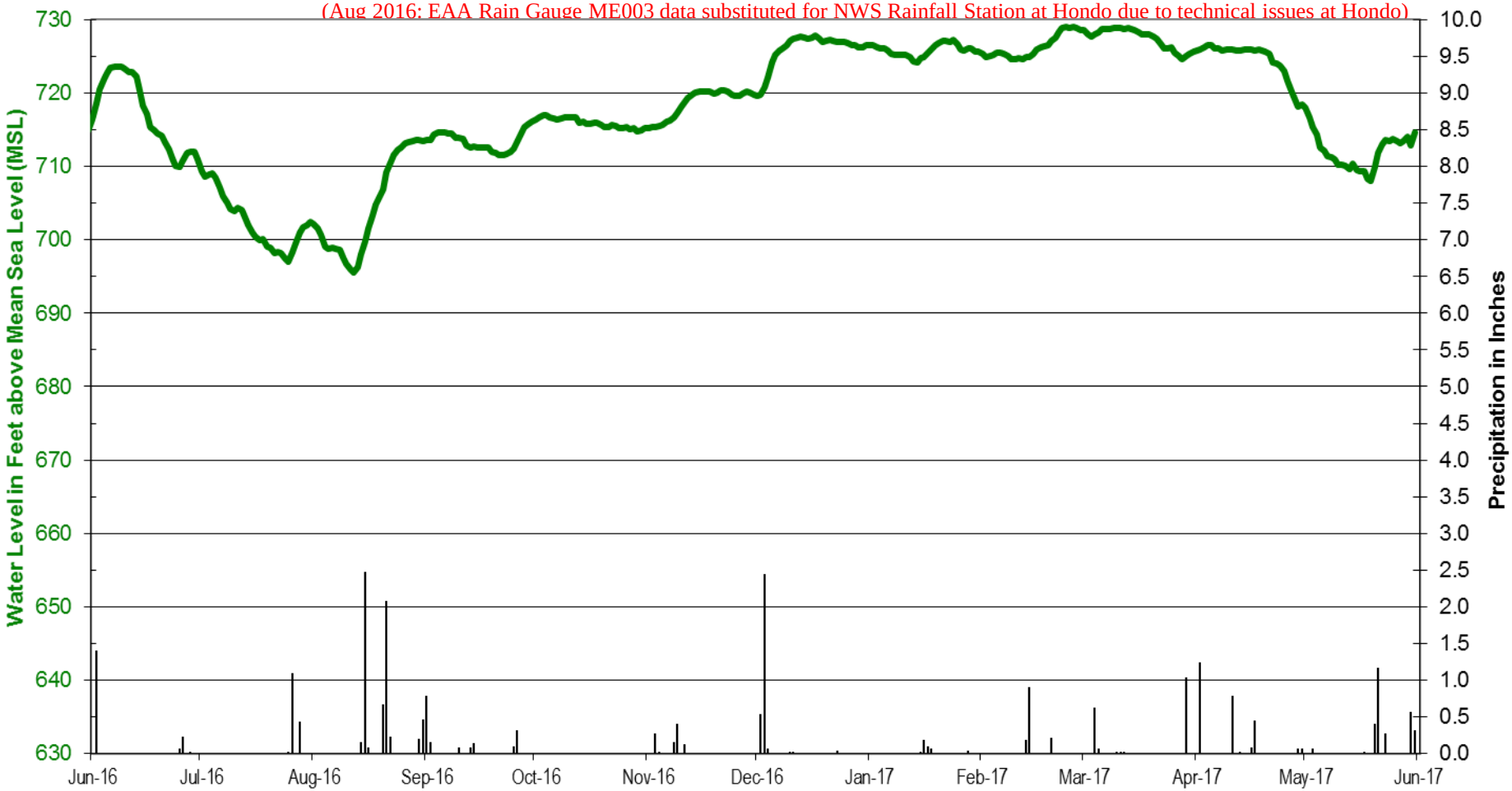
Historical High - 889' MSL (6/15/87)
Historical Low - 811' MSL (4/13/57)

J-27 Water Level Precipitation at Uvalde

Hydrograph of the Medina County Hondo City Well and Precipitation at Hondo

(NWS Rainfall Station: Hondo Municipal Airport)

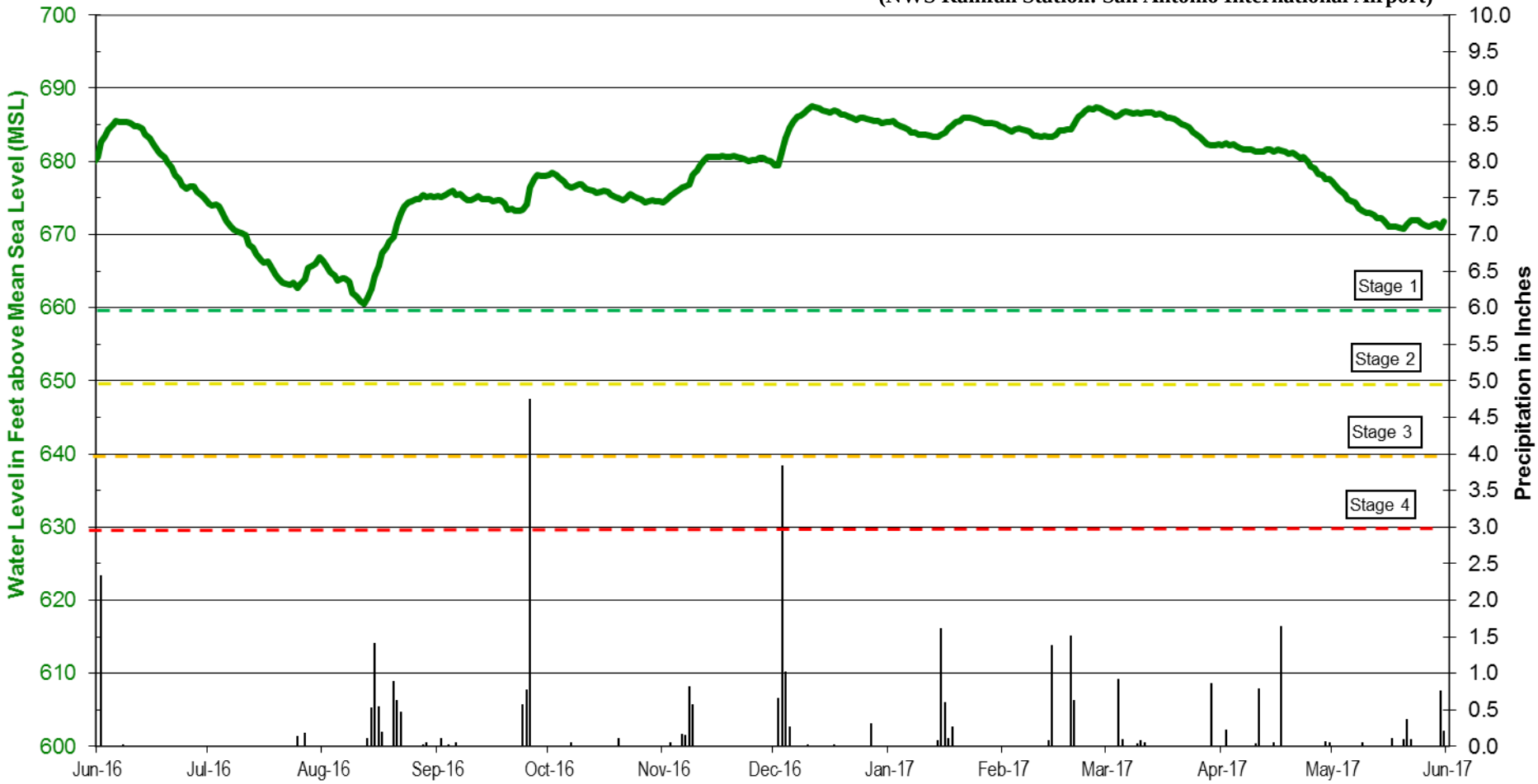
(Aug 2016: EAA Rain Gauge ME003 data substituted for NWS Rainfall Station at Hondo due to technical issues at Hondo)



CPM in Medina County is triggered by:
the10-day average water level at J-17 or
the10-day average springflow at Comal Springs or at San Marcos Springs

Hydrograph of the Bexar County Index Well (J-17) and Precipitation at San Antonio

(NWS Rainfall Station: San Antonio International Airport)

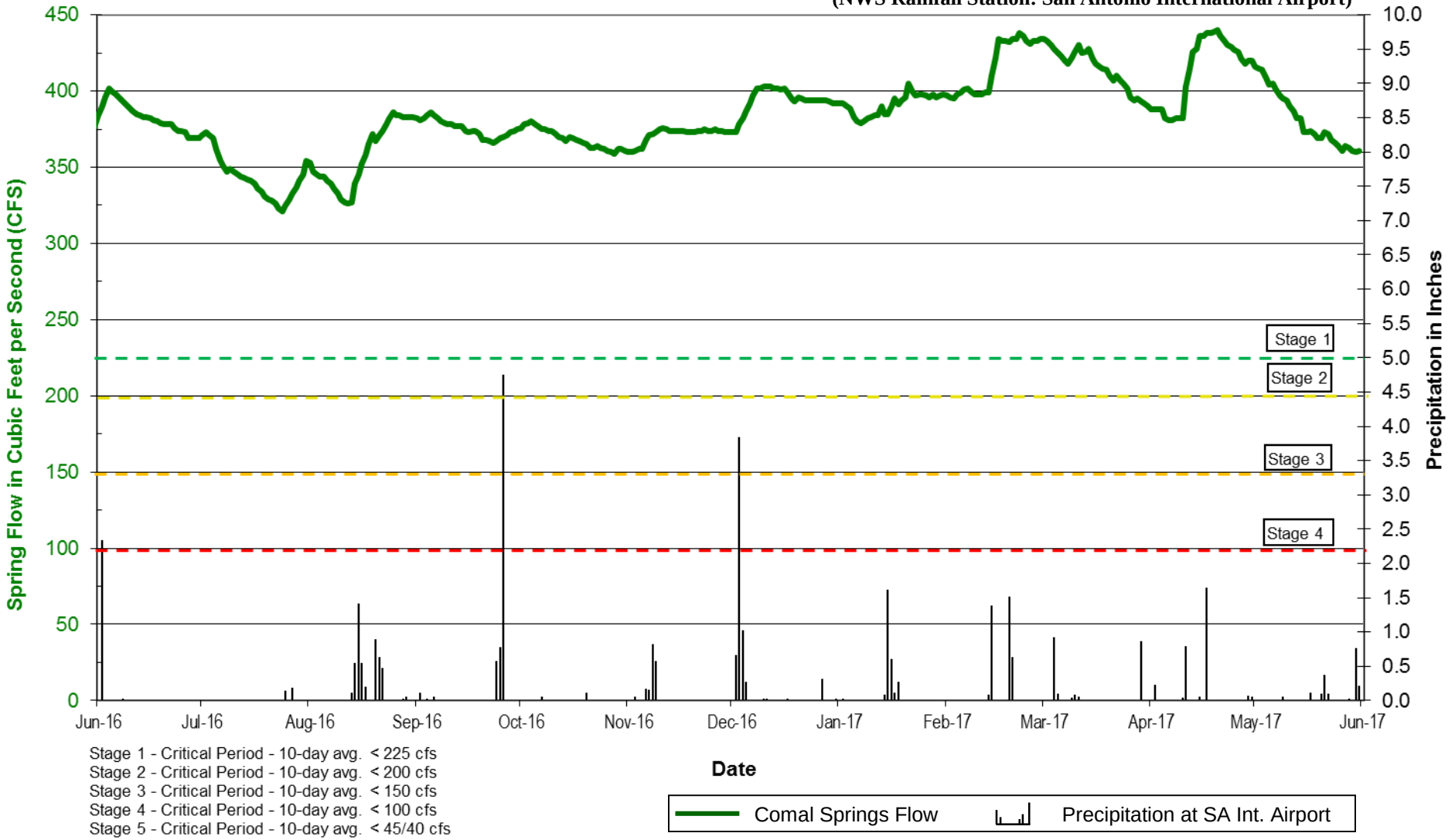


Stage 1 - Critical Period - 10-day avg. < 660' MSL
Stage 2 - Critical Period - 10-day avg. < 650' MSL
Stage 3 - Critical Period - 10-day avg. < 640' MSL
Stage 4 - Critical Period - 10-day avg. < 630' MSL
Stage 5 - Critical Period - 10-day avg. < 625' MSL

Historical High - 703.3' MSL (6/14/92)
Historical Low - 612.5' MSL (8/17/56)

Hydrograph of the Comal Springs Discharge and Precipitation at San Antonio

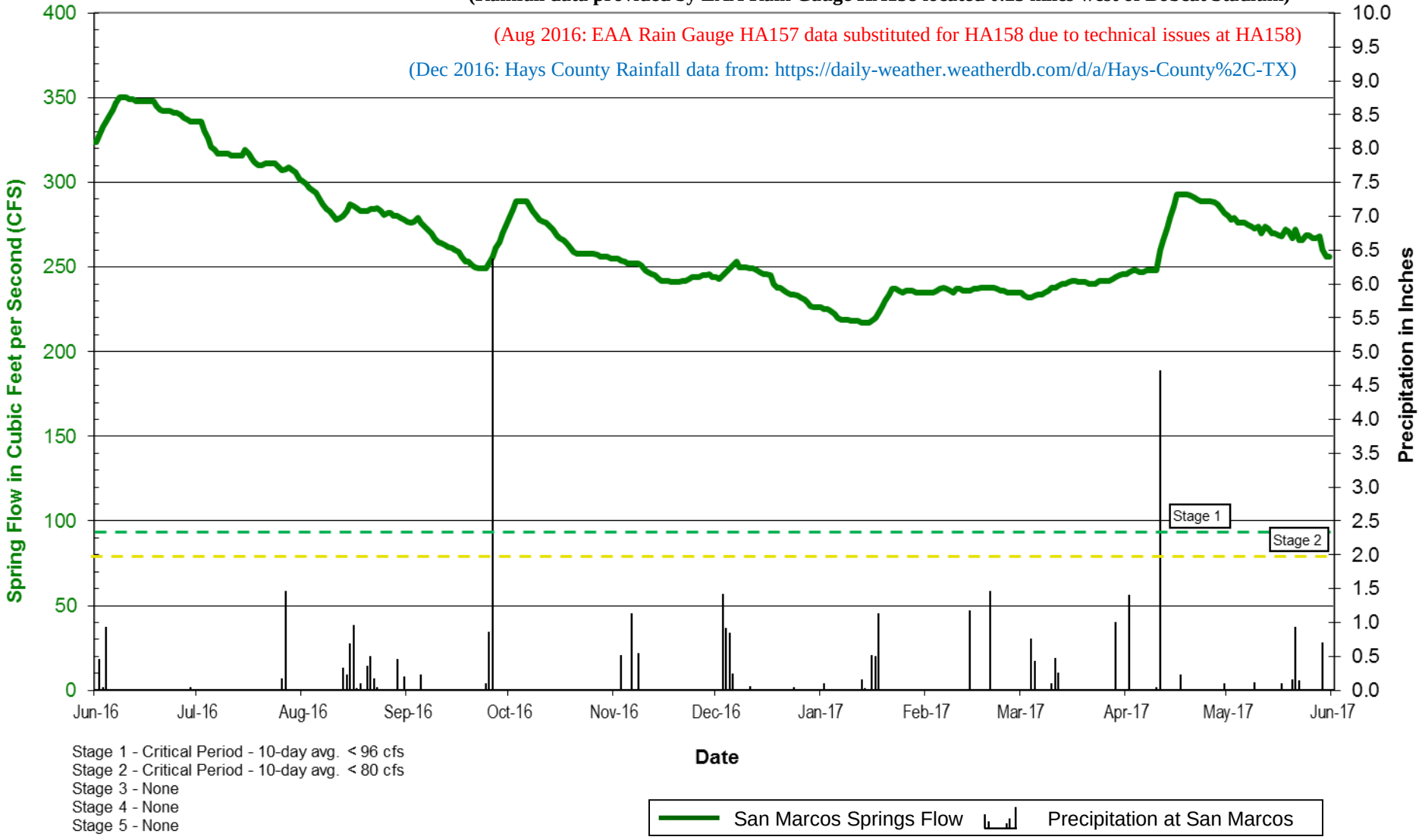
(NWS Rainfall Station: San Antonio International Airport)



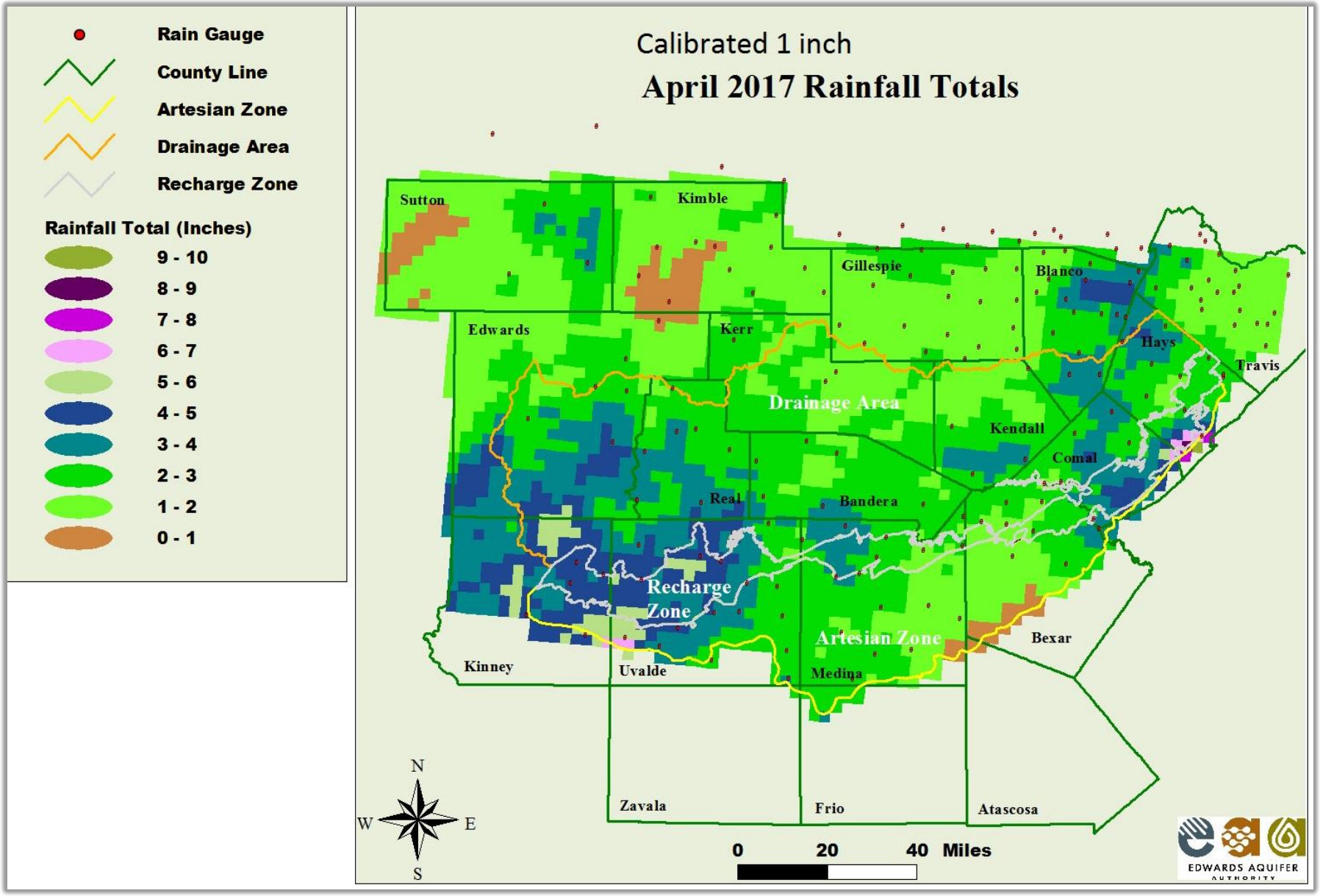
Stage 1 - Critical Period - 10-day avg. < 225 cfs
Stage 2 - Critical Period - 10-day avg. < 200 cfs
Stage 3 - Critical Period - 10-day avg. < 150 cfs
Stage 4 - Critical Period - 10-day avg. < 100 cfs
Stage 5 - Critical Period - 10-day avg. < 45/40 cfs

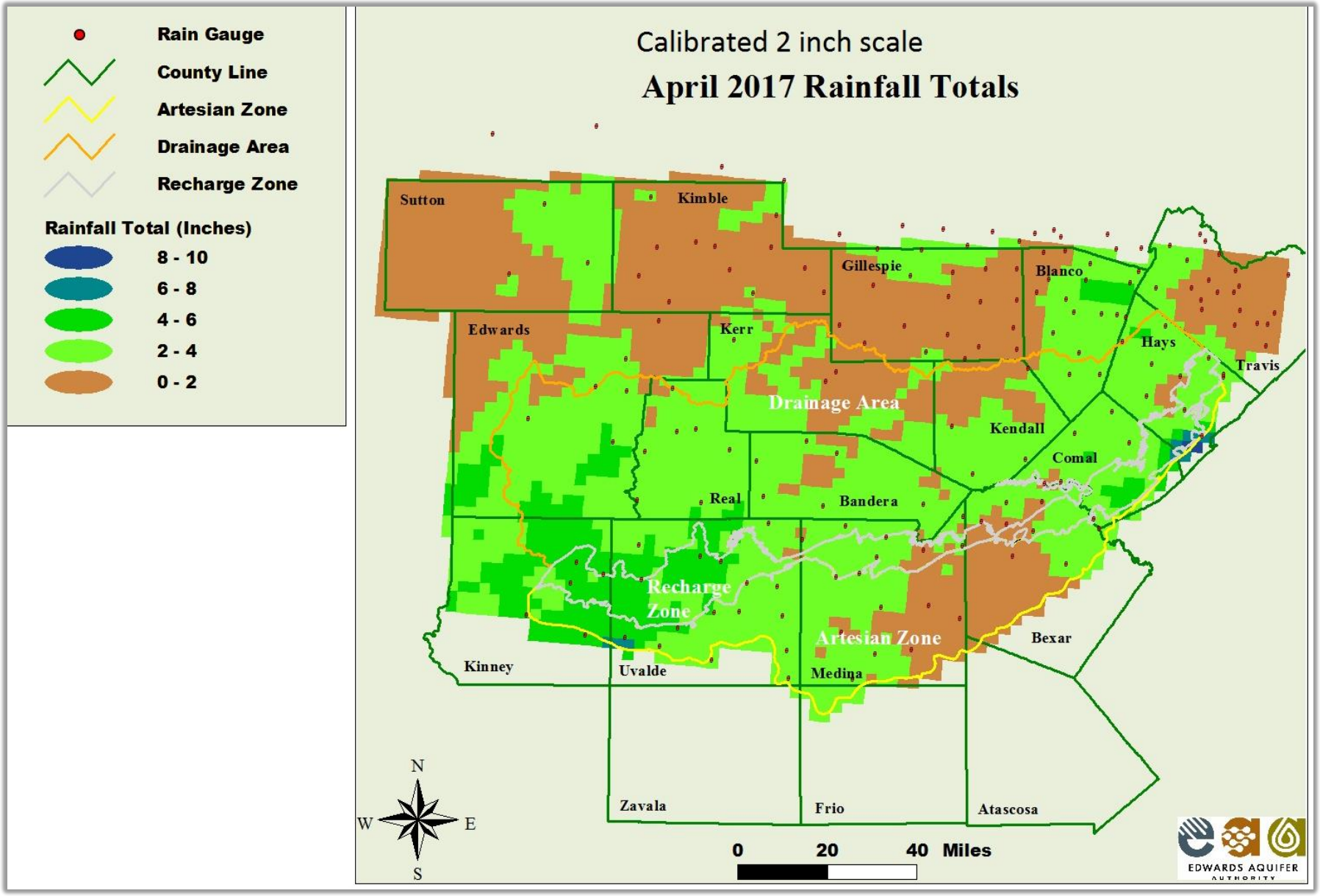
Hydrograph of the San Marcos Springs Discharge and Precipitation at San Marcos

(Rainfall data provided by EAA Rain Gauge HA158 located 0.25 miles west of Bobcat Stadium)



Stage 1 - Critical Period - 10-day avg. < 96 cfs
Stage 2 - Critical Period - 10-day avg. < 80 cfs
Stage 3 - None
Stage 4 - None
Stage 5 - None


Rain Gauge
County Line
Artesian Zone
Drainage Area
Recharge Zone
Rainfall Total (Inches)
9 - 10
8 - 9
7 - 8
6 - 7
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2
0 - 1
Calibrated 1 inch
April 2017 Rainfall Totals
Sutton
Kimble
Gillespie
Blanco
Edwards
Kerr
Hays
Travis
Drainage Area
Kendall
Comal
Real
Bandera
Recharge Zone
Artesian Zone
Bexar
Kinney
Uvalde
Medina
Zavala
Frio
Atascosa
N
W
E
S
0 20 40 Miles
EDWARDS AQUIFER AUTHORITY


Rain Gauge
County Line
Artesian Zone
Drainage Area
Recharge Zone
Rainfall Total (Inches)
8 - 10
6 - 8
4 - 6
2 - 4
0 - 2
Calibrated 2 inch scale
April 2017 Rainfall Totals
Sutton
Kimble
Gillespie
Blanco
Edwards
Kerr
Hays
Travis
Drainage Area
Kendall
Comal
Real
Bandera
Recharge Zone
Artesian Zone
Bexar
Kinney
Uvalde
Medina
Zavala
Frio
Atascosa
N
W
E
S
0 20 40 Miles
EDWARDS AQUIFER AUTHORITY

Real-time Precipitation Gauging System and Hydrologic Data Collection

The Edwards Aquifer Authority (EAA) operates 74 "real-time" precipitation gauges that record data on six-minute intervals and transmit these data to the EAA's office via a radio-telemetry system. Rain gauges are located on the Edwards Aquifer Contributing Zone, Recharge Zone, and Artesian Zone. Acquired data have many uses including aquifer recharge calculations, production of rainfall maps, and in a variety of research projects. The EAA also collects water level data from a series of aquifer monitor wells in the region, including two index wells: Well J-27, in Uvalde County and Well J-17, in Bexar County. Water level data from the Hondo City well in Medina County are also included in this data brief. Through a cooperative agreement with the U.S. Geological Survey, the EAA monitors the discharge at Comal Springs and San Marcos Springs.

Rainfall Evaluation – April 2017 Vieux & Associates Doppler Rainfall Map

The calibrated April 2017 Rainfall Totals Map was prepared by Vieux & Associates for the EAA using NEXRAD Doppler Radar and the EAA's precipitation gauge data. Calibrating the NEXRAD data with the EAA's precipitation gauge data improves the accuracy of the precipitation maps and is calculated using a four-kilometer grid system. Rain gauge locations are indicated on the map.

April may be categorized as a very wet month, as most areas received above "normal" rainfall. The most significant rainfall occurred in two areas: (1) Central to eastern Kinney into western and northcentral Uvalde Counties covering both the Contributing Zone and Recharge Zone where between 3 and 8 inches were recorded; (2) From northeastern Bexar northeastward to southeastern Hays County along the Recharge / Artesian Zone where between 4 and 10 inches were recorded. The entire Contributing Zone received between 1 and 6 inches, the bulk of which occurred in southern Edwards into northern Kinney County. Elsewhere, localized storms produced accumulations of 3 – 5 inches in northwest Medina, southern Kendall, and from central Comal into southern Blanco and northern Hays Counties. The Artesian Zone had recorded amounts of between 2 and 10 inches; the most occurring in southeastern Hays County where between 6 and 10 inches was recorded. However, of the aforementioned areas described, the Recharge Zone amounts were of direct benefit to the Edwards Aquifer System.

Rain Evaluation – Precipitation Gauge Data – May 2017

The month of May came in with the expectation of a dry period. However, mid to late month thunderstorms provided much of the region with above average rainfall. Hence, the May 2017 maximum monthly total rainfall amounts in the EAA's gauges ranged from 0.56 to 7.22 inches. The highest reported 24-hour rainfall events from the EAA's precipitation gauge network in May, by county, were as follows:

Bandera, 1.17 inches; Bexar, 2.54 inches; Blanco, 1.39 inches; Comal, 0.58 inches; Edwards, 2.00 inches; Hays, 0.94 inches; Kendall, 0.93 inches; Kinney, 0.63 inches; Medina, 2.30 inches; Real, 2.50 inches; and Uvalde County, 6.09 inches. The highest 24-hour rain event recorded in the region was 6.09 inches of rain that occurred on May 20th at a gauge located at the southeastern corner of South RR 187 and Nunley Lane, 8.3 miles south of Sabinal in Uvalde County.

Evaluation of May 2017 Aquifer Levels and Spring Discharge

The Aquifer levels are a function of rainfall/recharge amounts, Springflow, and aquifer demand throughout the region. The San Antonio Pool Index Well (J-17) *decreased* 5.7 feet to 671.8 feet above mean sea level (msl) while the City of Hondo Well *decreased* 3.9 feet to 714.6 feet msl. Likewise, the Uvalde Pool Well (J-27), *decreased* 0.4 feet to 876.2 feet msl.

The May daily average springflow for Comal Springs, in turn, *decreased* 59 cubic feet per second (cfs) to 361 cfs, which is 67 cfs *above* the May monthly average discharge of 294 cfs. Likewise, the daily average springflow for San Marcos Springs *decreased* 26 cfs to 256 cfs, which is 74 cfs *above* the monthly average discharge of 182 cfs for May. Please note that the discharge amounts are estimates and may be adjusted up or down as more direct flow measurements are obtained.

Summary of Current Aquifer Levels and Spring Discharges – June 2017

The official daily high water level for the Uvalde Pool Index Well (J-27) was 876.3 ft. msl on Wednesday, June 7, 2017, which is 9.9 ft. *above* the J-27 June monthly average of 866.4 ft. msl. The daily high water level at the San Antonio Pool Index Well (J-17) was 674.0 ft. msl on June 7, 2017; 11.3 ft. *above* the J-17 June monthly average of 662.7 ft. msl. The daily average discharge at Comal Springs on Tuesday, June 6, 2017, was reported to be 376 cfs, 88 cfs *above* the June average of 288 cfs while the daily average discharge at San Marcos Springs on June 6, 2017 was reported to be 254 cfs, which is 61 cfs *above* the June average of 193 cfs. Please note that discharge values are estimates and may be adjusted up or down as more direct flow measurements are obtained.

Summary of Current Regional Aquifer Conditions

Although temperatures remain generally high, above normal precipitation in strategic locations provided some relief such that the Edwards Aquifer region dodges indications of persistent drought. Thus, the Edwards Aquifer System continues to remain above Critical Period Management (CPM) thresholds. The U.S. Department of Agriculture - U.S. Drought Monitor indicated that abnormally dry to moderate drought conditions continue to exist from the Dallas area toward west Texas, in the Hill Country from northern Bexar County northward & eastward, and from the George West/Corpus Christi area southward to Brownsville. Consequently, about 35% of Texas is experiencing some form of seasonal or short-term drought condition.

The Climate Prediction Center (CPC) reported that, “ENSO (El Niño /Southern Oscillation) – neutral and El Niño are nearly equally favored during the Northern Hemisphere summer and fall 2017.” Moreover, the US Seasonal Drought Outlook still shows drought conditions absent in most areas with removal likely in small areas of northcentral Texas. The NWS - Climate Prediction Center’s Three Month Outlook continues to forecast above normal temperatures, with slightly above normal precipitation for most of central to coastal Texas into August 2017.