HYDROLOGIC DATA BRIEF FOR THE EDWARDS AQUIFER THROUGH JUNE 2016

Prepared by
David L. Gregory
Ron Gloyd
Geary Schindel, P.G.
Edwards Aquifer Authority

July 6, 2016

UVALDE COUNTY RAINFALL (in inches) for 2016

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	0.86	1.60	0.68	1.99	7.21	3.01						
Historical Monthly Avg	1.13	1.24	1.32	2.36	3.16	2.83	1.95	2.16	2.60	2.57	1.41	1.34
Difference	**-0.27**	**0.36**	**-0.64**	**-0.37**	**4.05**	**0.18**						

Historical Yearly Average	**24.07**
Total for January - June 2016	**15.35**
Historical Average January - June	**12.04**
Total Difference for Year to Date	**3.31**
Percent of Average Year to Date	**127%**

Data from EAA rain gauge UV033 located 4.4 miles south of the City of Uvalde.

MEDINA COUNTY RAINFALL (in inches) for 2016

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	0.54	1.42	1.51	2.87	6.95	1.74						
Historical Monthly Avg	1.43	1.94	1.53	2.66	3.79	3.38	1.88	2.76	3.00	3.03	1.73	1.43
Difference	**-0.89**	**-0.52**	**-0.02**	**0.21**	**3.16**	**-1.64**						

Historical Yearly Average	**28.56**
Total for January - June 2016	**15.03**
Historical Average January - June	**14.73**
Total Difference for Year to Date	**0.30**
Percent of Average Year to Date	**102%**

Data from National Weather Service (NWS) rainfall station at Hondo Airport.

BEXAR COUNTY RAINFALL (in inches) for 2016

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	1.38	1.55	3.56	6.19	9.14	2.39						
Historical Monthly Avg	1.61	1.90	1.68	2.53	3.99	3.57	1.83	2.58	3.29	3.29	2.11	1.72
Difference	**-0.23**	**-0.35**	**1.88**	**3.66**	**5.15**	**-1.18**						

Historical Yearly Average	**30.10**
Total for January - June 2016	**24.21**
Historical Average January - June	**11.71**
Total Difference for Year to Date	**12.50**
Percent of Average Year to Date	**207%**

Data from NWS rainfall station located at San Antonio International Airport.

COMAL COUNTY RAINFALL (in inches) for 2016

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	1.00	1.01	2.76	4.42	5.60	2.00						
Historical Monthly Avg	2.36	2.09	1.92	2.68	4.86	4.64	2.02	2.16	3.39	3.84	2.79	2.75
Difference	**-1.36**	**-1.08**	**0.84**	**1.74**	**0.74**	**-2.64**						

Historical Yearly Average	**35.50**
Total for January - June 2016	**16.79**
Historical Average January - June	**13.91**
Total Difference for Year to Date	**2.88**
Percent of Average Year to Date	**121%**

Data from NWS rainfall station located in New Braunfels.

HAYS COUNTY RAINFALL (in inches) for 2016

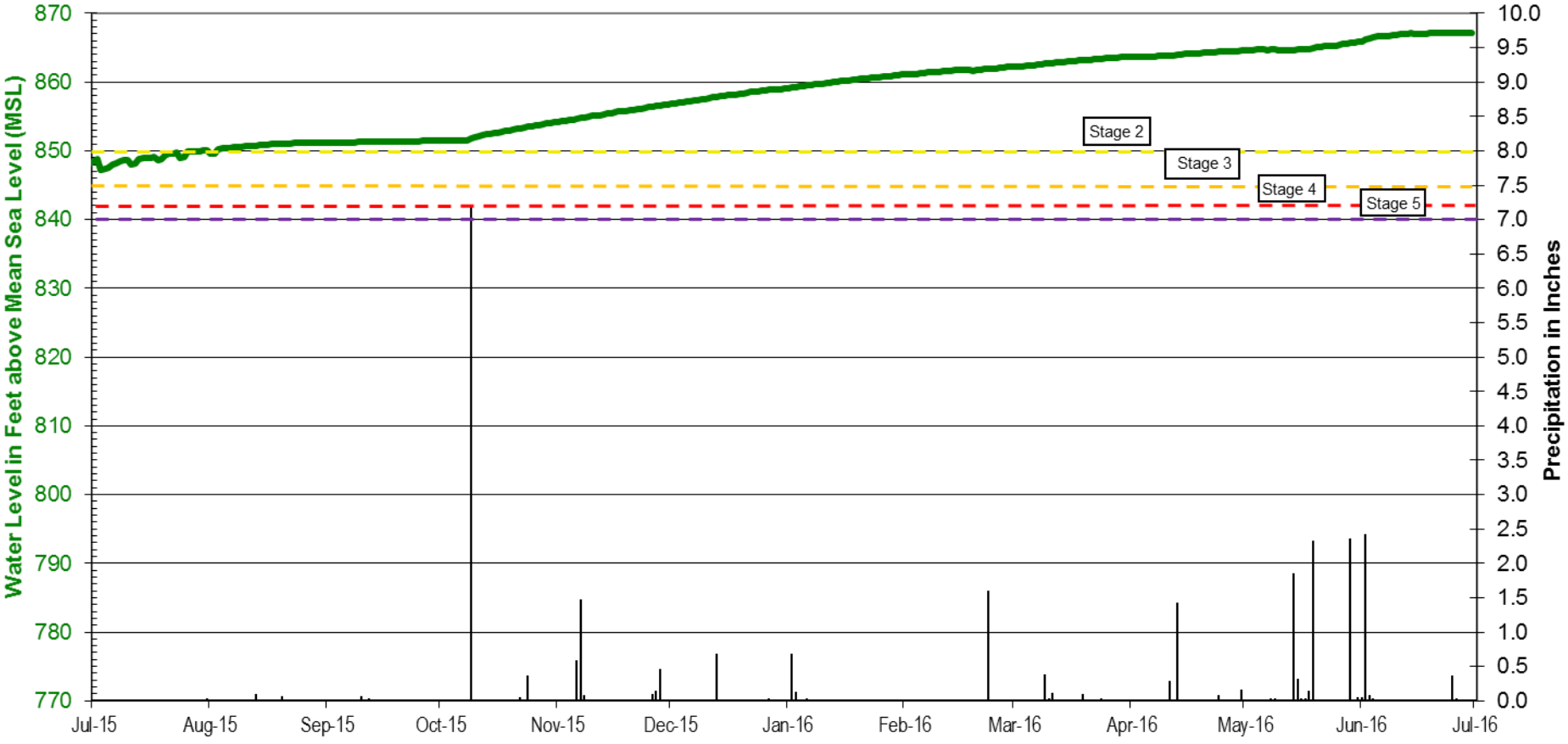
	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	0.96	1.37	1.84	0.97	6.95	1.57						
Historical Monthly Avg	2.00	2.93	1.84	3.29	3.68	3.56	1.77	2.31	4.52	3.61	2.23	2.01
Difference	**-1.04**	**-1.56**	**0.00**	**-2.32**	**3.27**	**-1.99**						

Historical Yearly Average	**33.75**
Total for January - June 2016	**13.66**
Historical Average January - June	**17.30**
Total Difference for Year to Date	**-3.64**
Percent of Average Year to Date	**79%**

Data provided by EAA rain gauge HA158 located 0.25 miles west of Bobcat Stadium.
FAA Rainfall Station: San Marcos Airport - out of service.

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

(EAA Rain Gauge: UV033 located 4.4 miles south of the City of Uvalde)



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

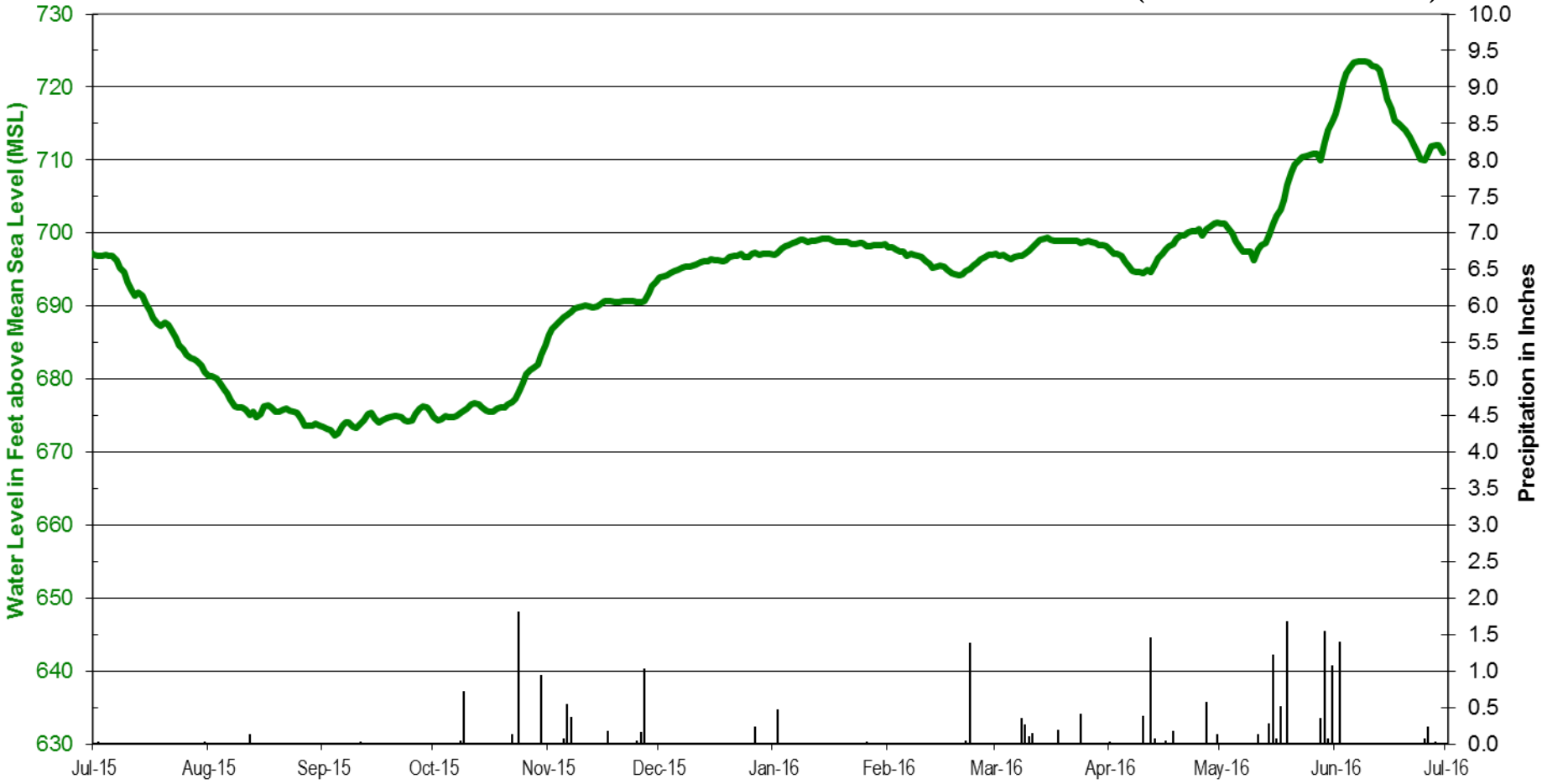
Historical High - 889' MSL (6/15/87)
Historical Low - 811' MSL (4/13/57)

J-27 Water Level

Precipitation at Uvalde

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

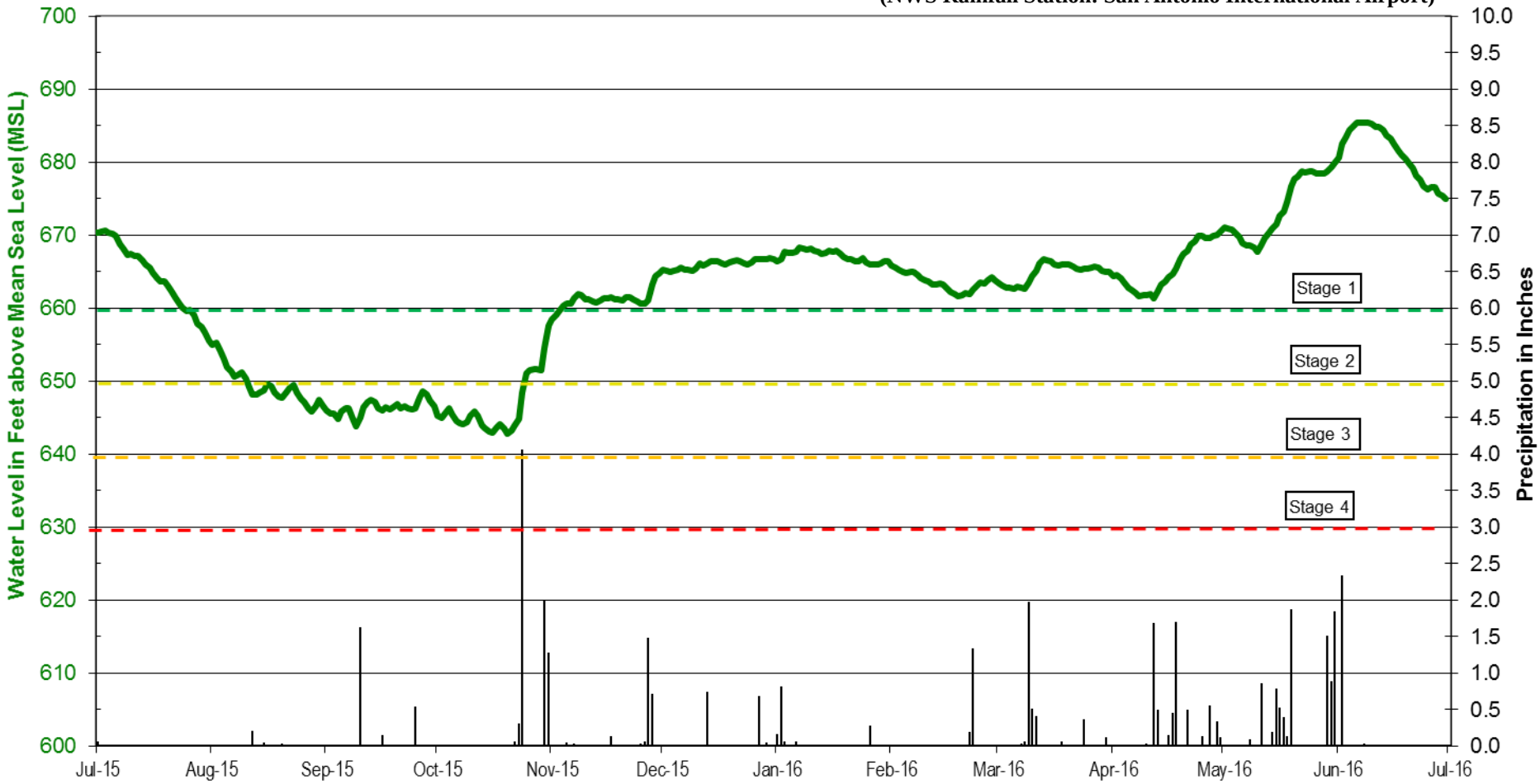
(NWS Rainfall Station: Hondo)



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

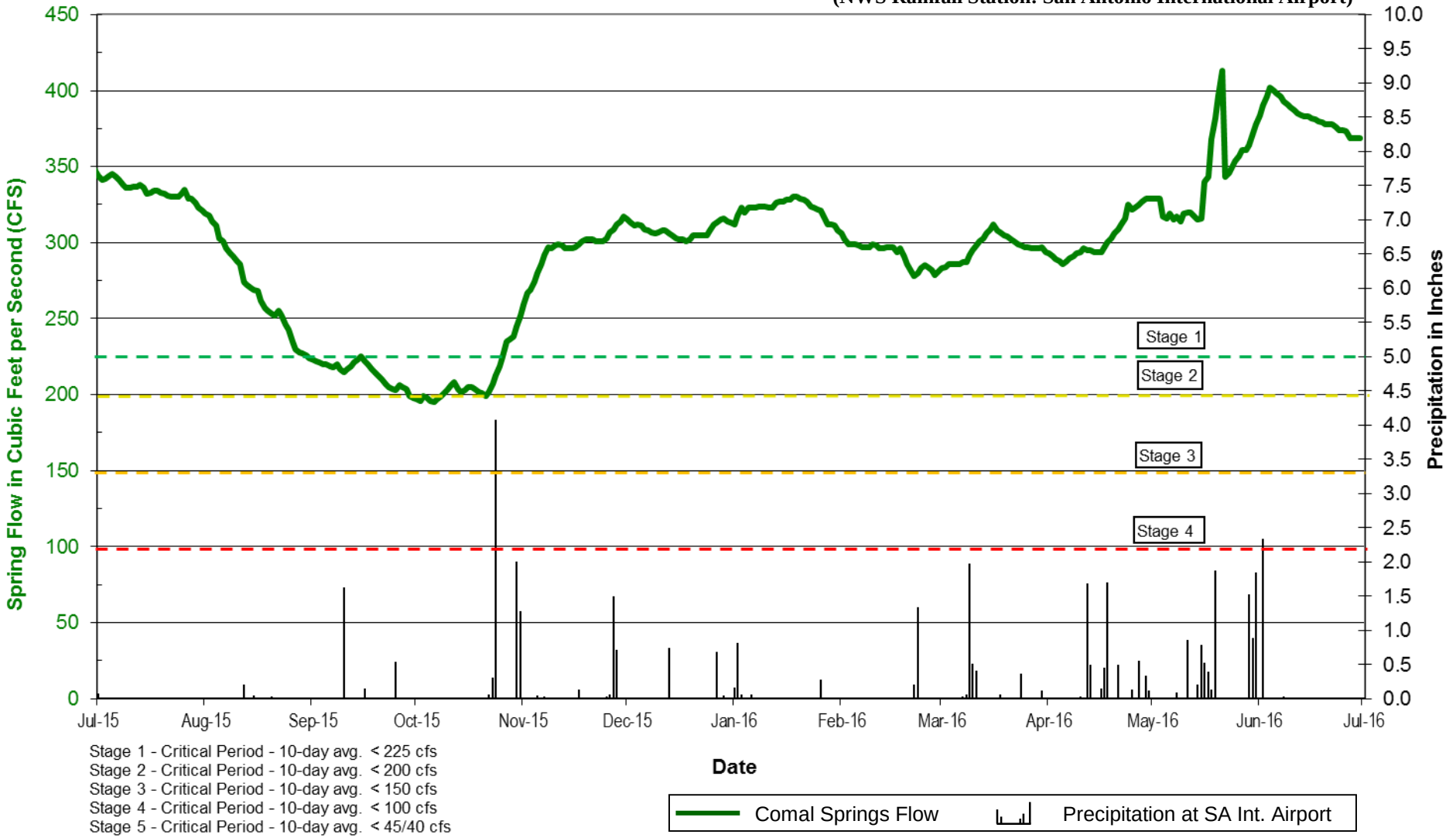
Historical High - 703.3' MSL (6/14/92)
Historical Low - 612.5' MSL (8/17/56)

J-17 Water Level

Precipitation at SA Int. Airport

Hydrograph of the Comal Springs Discharge and Precipitation at San Antonio

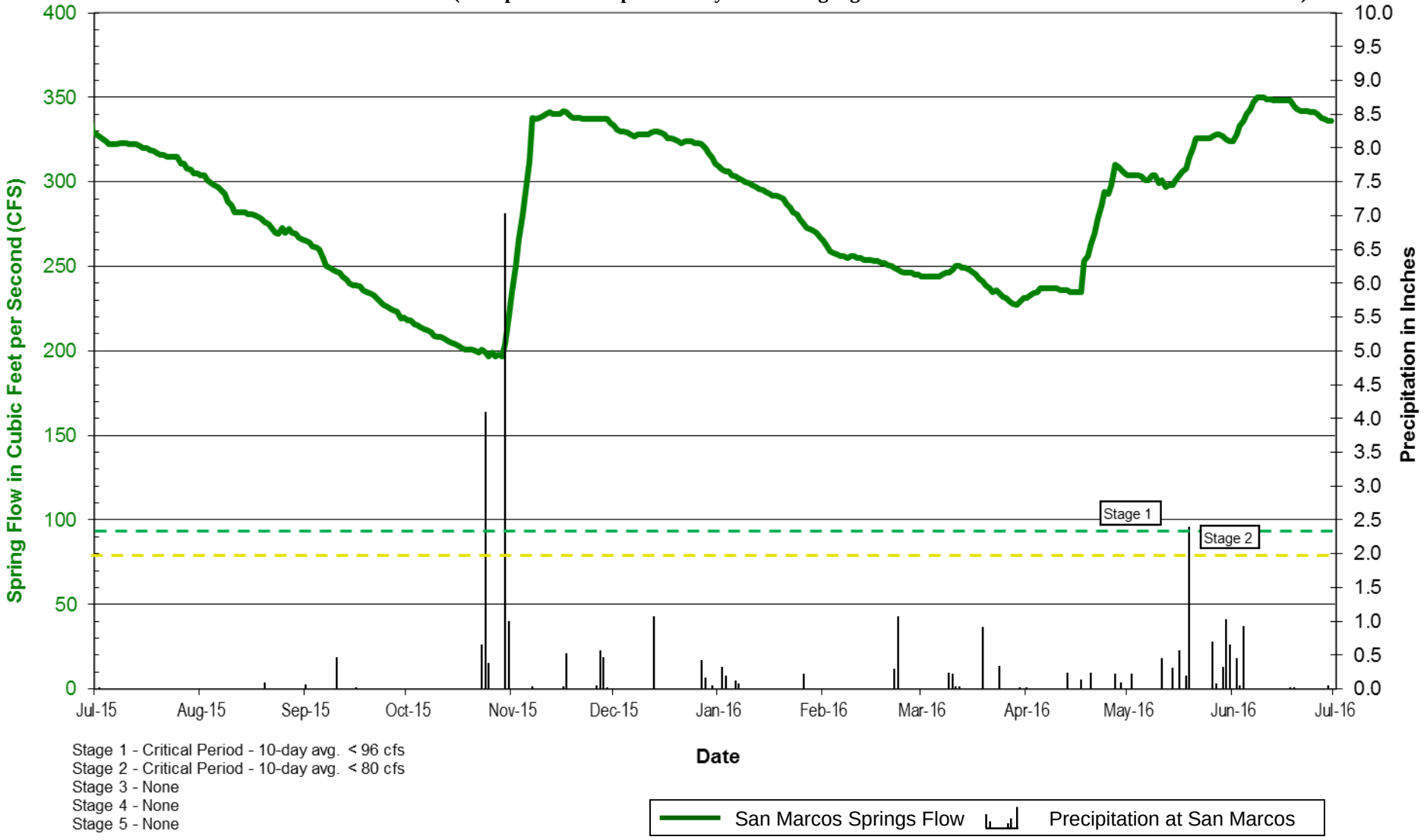
(NWS Rainfall Station: San Antonio International Airport)



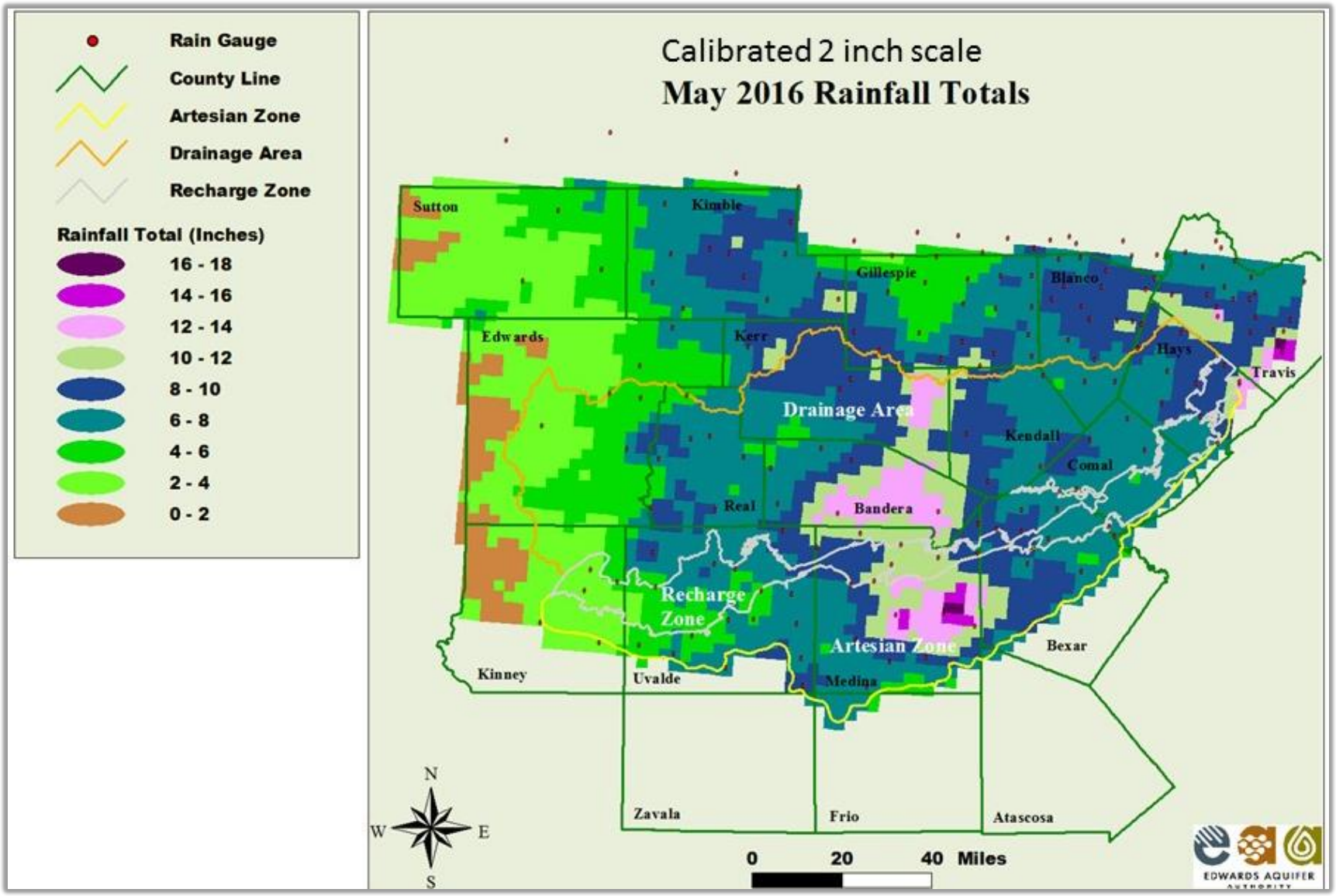
Stage 1 - Critical Period - 10-day avg. < 225 cfs
Stage 2 - Critical Period - 10-day avg. < 200 cfs
Stage 3 - Critical Period - 10-day avg. < 150 cfs
Stage 4 - Critical Period - 10-day avg. < 100 cfs
Stage 5 - Critical Period - 10-day avg. < 45/40 cfs

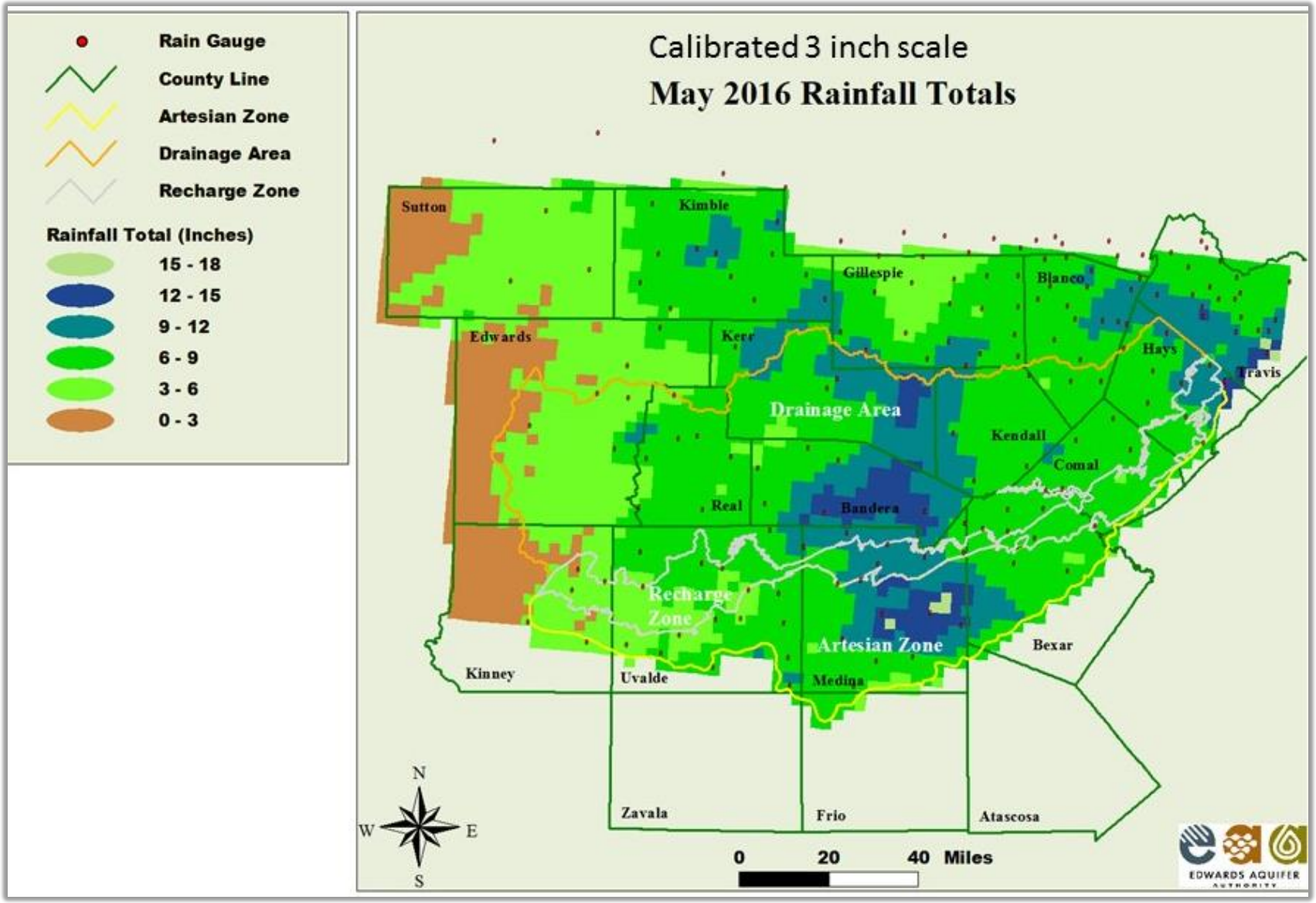
Hydrograph of the San Marcos Springs Discharge and Precipitation at San Marcos

(Precipitation 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)
16 - 18
14 - 16
12 - 14
10 - 12
8 - 10
6 - 8
4 - 6
2 - 4
0 - 2
Calibrated 2 inch scale
May 2016 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)
15 - 18
12 - 15
9 - 12
6 - 9
3 - 6
0 - 3
Calibrated 3 inch scale
May 2016 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 – May 2016 Vieux & Associates Doppler Rainfall Map

The calibrated May 2016 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 map and is calculated using a four-kilometer grid system. Rain gauge locations are indicated on the map.

For the second straight month, above average precipitation fell in the month of May. This time the heaviest rainfall totals occurred in the central and extreme eastern areas of the Edwards Aquifer system. The Contributing Zone (Drainage Area) in eastern Kerr and central Bandera Counties recorded between 8 and 14 inches of rainfall. The Drainage Area west of Bandera County recorded anywhere between 2 and 10 inches while the same area east of the Bandera-Kerr locale recorded between 4 and 10 inches. The Recharge Zone received a good portion as increasing amounts between 2 and 12 inches were recorded from the west to northeastern Medina County and amounts between 6 and 10 inches fell in the eastern area. All areas of the Artesian Zone received beneficial rainfall as between 2 and 18 inches was recorded (the most in eastern Medina County at 14 to 18 recorded inches).

Rain Evaluation – June 2016 Precipitation Gauge Data

June rainfall totals were above average in Uvalde, while below average rainfall was recorded in the San Antonio Pool. The June 2016 maximum monthly total rainfall amounts in the EAA's gauges ranged from 0.13 to 3.56 inches. The highest reported 24-hour rainfall event from the EAA's precipitation gauge network in June, by county, were as follows: Bandera, 0.92 inches; Bexar, 2.43 inches; Blanco, 1.44 inches; Comal, 1.43 inches; Edwards, 2.94 inches; Hays, 0.93 inches; Kendall, 0.84 inches; Kinney, 1.98 inches; Medina, 1.69 inches; Real, 1.17 inches; and Uvalde County, 2.43 inches. The highest 24-hour rain event recorded in the region was 2.94 inches of rain that occurred on June 1 at a gauge in the Rock Springs Country Club southwest of the Edwards County Airport off of HWY 55 in Edwards County.

Evaluation of June 2016 Aquifer Levels and Spring Discharge

Varying amounts of rain fall across the region in the month of June and aquifer levels and springflow discharges responded accordingly. The San Antonio Pool Index Well (J-17) *decreased* 4.9 feet to 675.0 feet above mean sea level (msl) while the City of Hondo Well *decreased* 4.3 feet to 711.0 feet msl. The Uvalde Pool Well (J-27), however, *increased* 1.4 feet to 867.2 feet msl.

The June daily average springflow for Comal Springs, *decreased* 9 cubic feet per second (cfs) to 369 cfs, which is 82 cfs *above* the June monthly average discharge of 287 cfs. However, the daily average springflow for San Marcos Springs *increased* 12 cfs to 336 cfs, which is 145 cfs *above* the monthly average discharge of 191 cfs for June. 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 Discharge

The official daily high water level for the Uvalde Pool Well (J-27) was 867.2 ft. msl on July 6, 2016, which is 1.1 ft. *above* the J-27 July monthly average of 866.1 ft. msl. The daily high water level at the San Antonio Pool Index Well (J-17) was 671.8 ft. msl on July 6, 2016; 11.6 ft. *above* the J-17 July monthly average of 660.2 ft. msl. The daily average discharge at Comal Springs on July 5, 2016, was 373 cfs, 97 cfs *above* the July average of 276 cfs while the daily average discharge at San Marcos Springs on July 5, 2016 was 315 cfs, 131 cfs *above* the July average of 184 cfs.

Summary of Current Regional Aquifer Conditions

The month of June brought below average rainfall to the San Antonio Pool of the Edwards Aquifer system. However, because of spring rainfall amounts across the region, the Edwards Aquifer Region remained above Critical Period Management (CPM) thresholds. The U.S. Department of Agriculture - U.S. Drought Monitor indicated that the spring rains of 2016 led to the removal of drought conditions across the State of Texas. As a result, about 98% of Texas remains free of drought.

The Climate Prediction Center (CPC) reports that as “the El Niño event of 2015–2016 is officially over, La Niña is favored to develop during the Northern Hemisphere summer 2016, with about a 75% chance of La Niña during the fall and winter 2016-17.” Because of the widespread spring rainfall, the US Seasonal Drought Outlook did not show any measure of development as drought conditions remain non-existent throughout Texas. The National Weather Service - Climate Prediction Center’s Long Range Outlook forecasts equal chances of above, below, or normal temperatures in the mid to lower areas from the San Antonio to the Trinity River Basins, but above normal temperatures across the rest of Texas into early fall 2016. However, the CPC forecasts above normal precipitation in the east to southeastern area of south central Texas into September 2016.