

LOWER BRAZOS RIVER FLOODPLAIN PROTECTION PLANNING STUDY

Rosenberg, Texas
April 13, 2017

Reasons for the Study

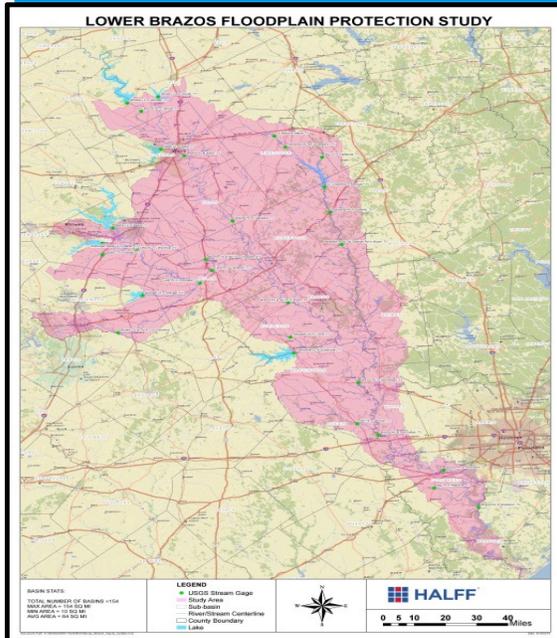
- * One of the fastest growing areas in the country
- * Hydrologic and hydraulic models/data are dated outside of Fort Bend County
- * Need for consistent modeling methodology across county boundaries
- * Need to assess lower Brazos watershed from a comprehensive basinwide perspective (existing conditions and alternatives)
- * 10,000 square miles of uncontrolled drainage area



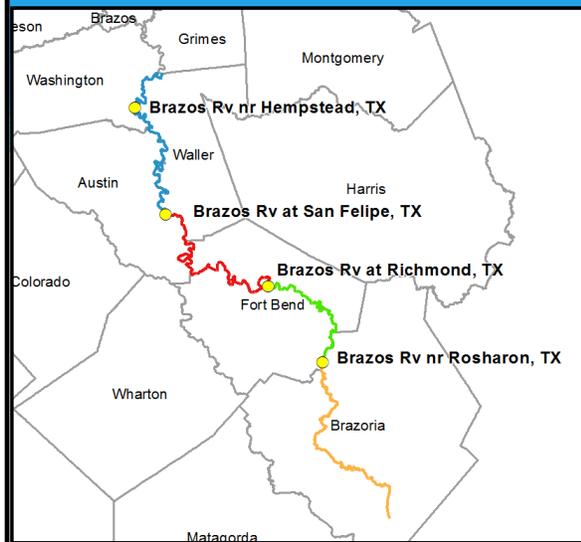
Goals of the Study

- * Quantify existing flooding issues and flood damage reduction alternatives
- * Update hydrologic and hydraulic data for the lower Brazos River (above Hempstead gauge to mouth across 5 counties)
- * Calibrate new models to historical events and provide flood volumes, flood depths, and flood durations
- * Facilitate land use planning, emergency response, and sound floodplain management

Lower Brazos River Floodplain Protection Planning Study



Lower Brazos River Floodplain Protection Planning Study



Where are We Today?

- * Basin wide hydrology is 95% complete
- * Hydraulics models are 95% complete from the Washington/Waller County Line to the Gulf of Mexico
- * Floodplain mapping in progress
- * Flood Damage Analysis Modeling is underway.
- * Environmental Constraints Analysis is underway.

Lower Brazos River Floodplain Protection Planning Study

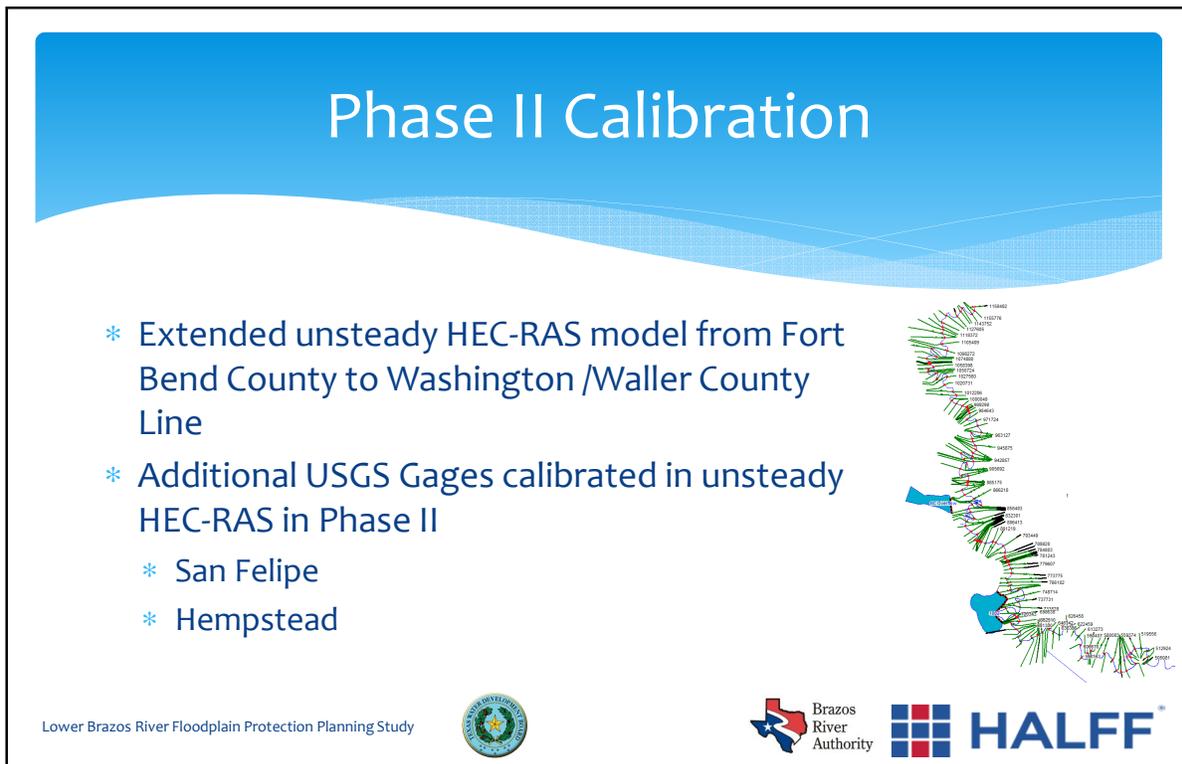
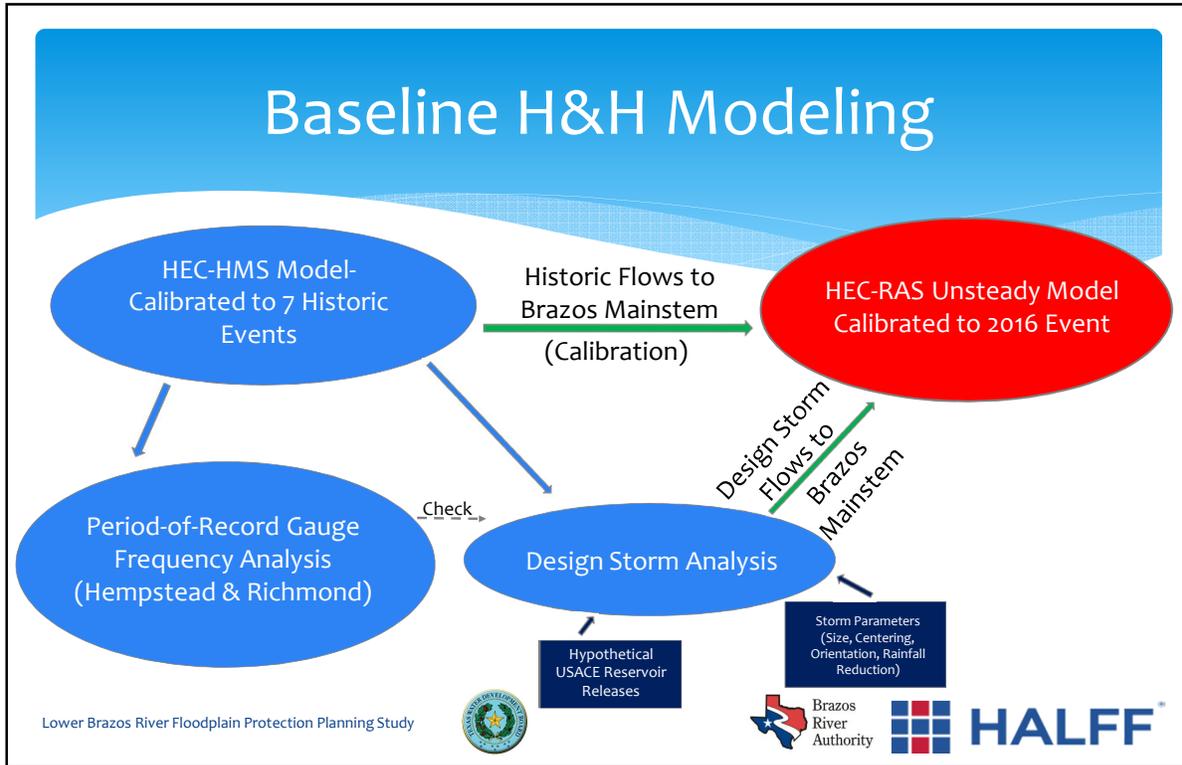


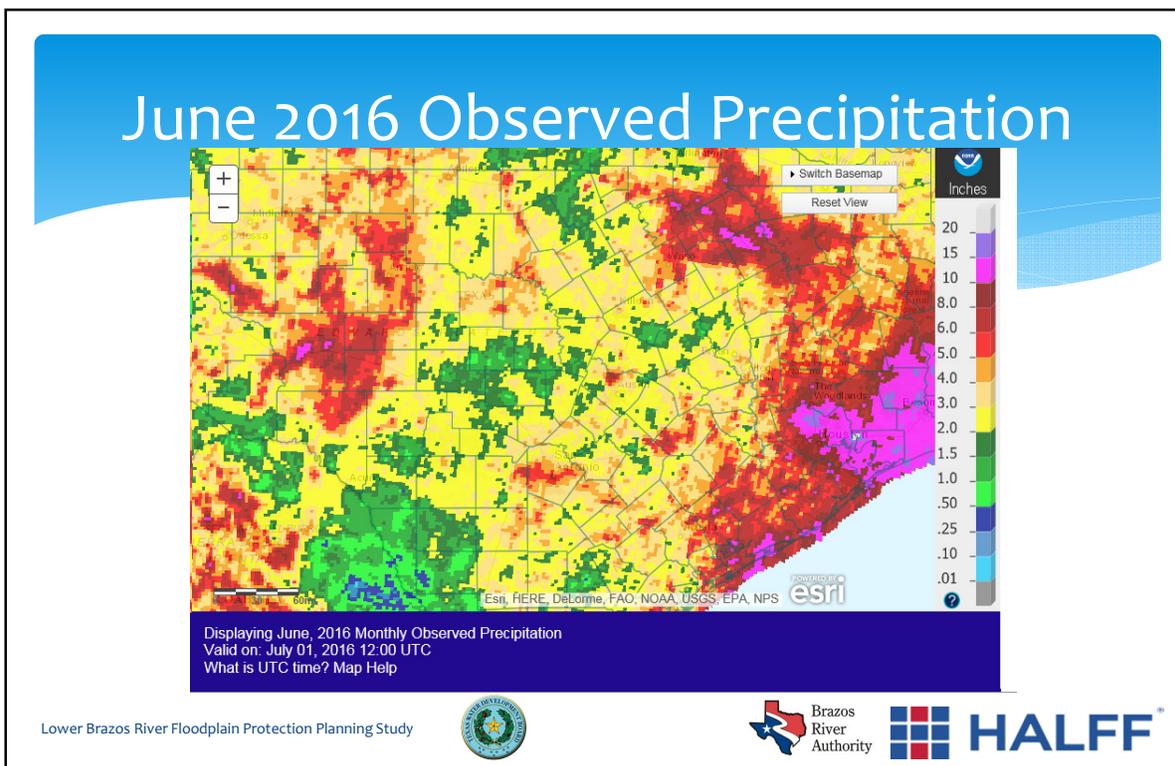
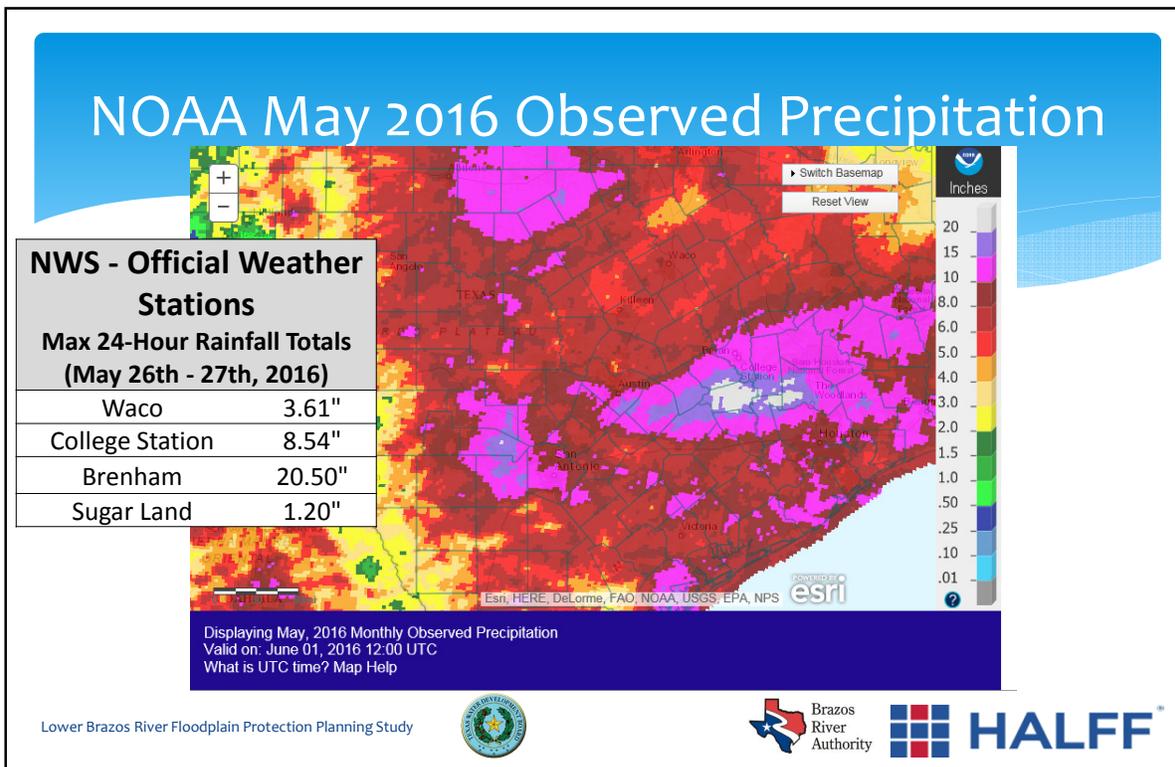
Schedule

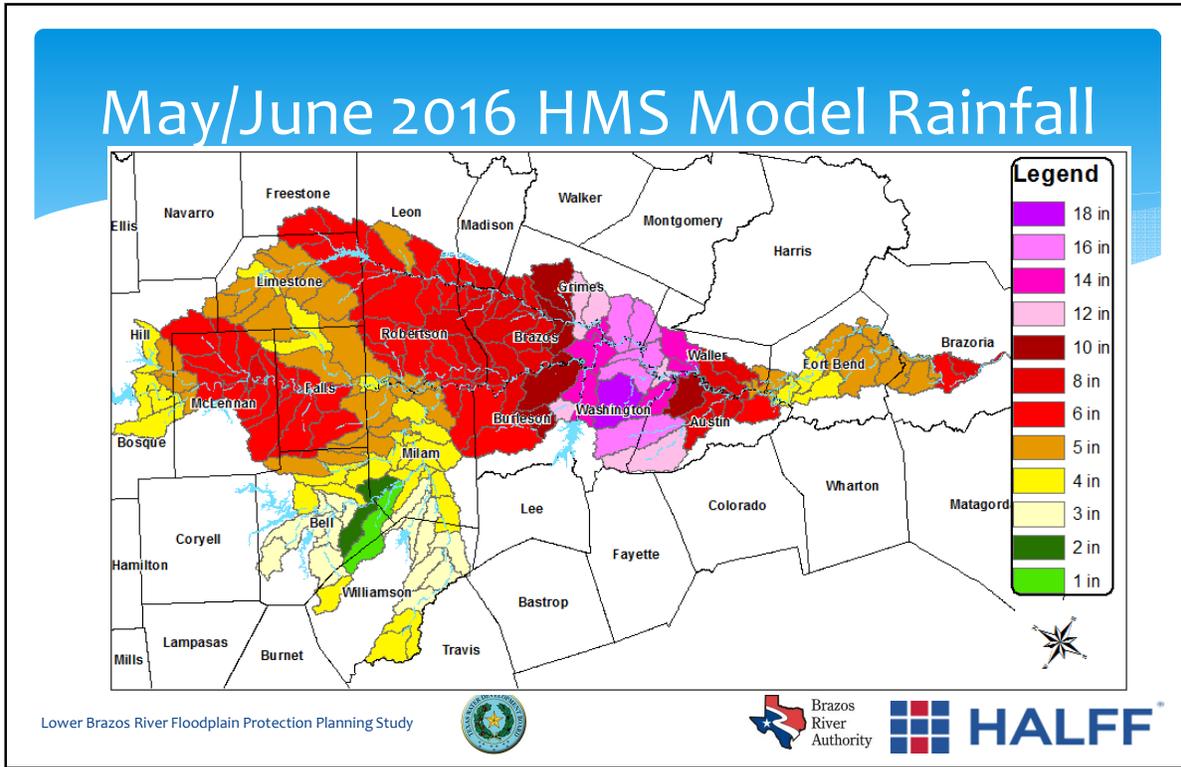
- * Phase II Field Surveys – Complete
- * Finalize Hydrology –Complete
- * Hydraulics – May 2017
- * Alternatives Formulation – August 2017
- * Flood Damage Analysis Modeling – November 2017
- * Environmental Constraints Analysis – January 2018
- * Draft Report – January 2018
- * Final Report – March 2018

Lower Brazos River Floodplain Protection Planning Study









May-June 2016 Calibration

- * High Water Mark Survey
- * Georeferenced Flood Photos
- * Fort Bend County Sheriffs Office
- * Fort Bend County
- * Velasco Drainage District
- * Twitter
 - * Photos from Space Station
- * YouTube Videos
 - * Drone Flights
- * Facebook Photos

* Source: NASA Space Station Photo Posted on Twitter 5/28/2016
* Waller/Austin Co.

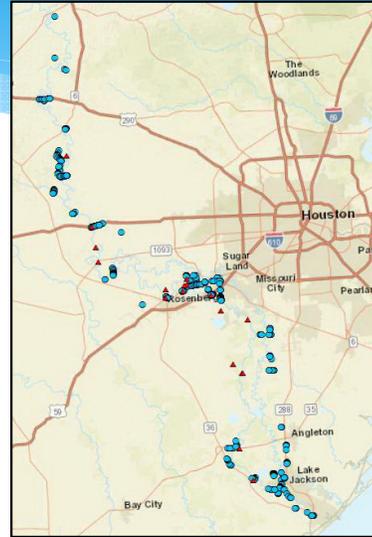
Lower Brazos River Floodplain Protection Planning Study

Brazos River Authority

HALFF

Halff Flood Photos & Survey

- * Halff made several field visits to document the May/June 2016 flood event
- * 18 High Water Mark Survey points
- * 850 Flood Photos of the Brazos River
 - * Georeferenced location of photos
 - * Time Stamp with Date and Time



Lower Brazos River Floodplain Protection Planning Study



Brazos Rv Nr Hempstead, Tx

- * Waller County, TX
- * Located on US Hwy 290
- * Contributing Drainage Area = 34,314 sq mi
- * Gage Datum = 107.90 NGVD29
- * Period of Record – 1938 through Current Date
 - * 79 Years of Record



Lower Brazos River Floodplain Protection Planning Study



Hempstead Flood Photos

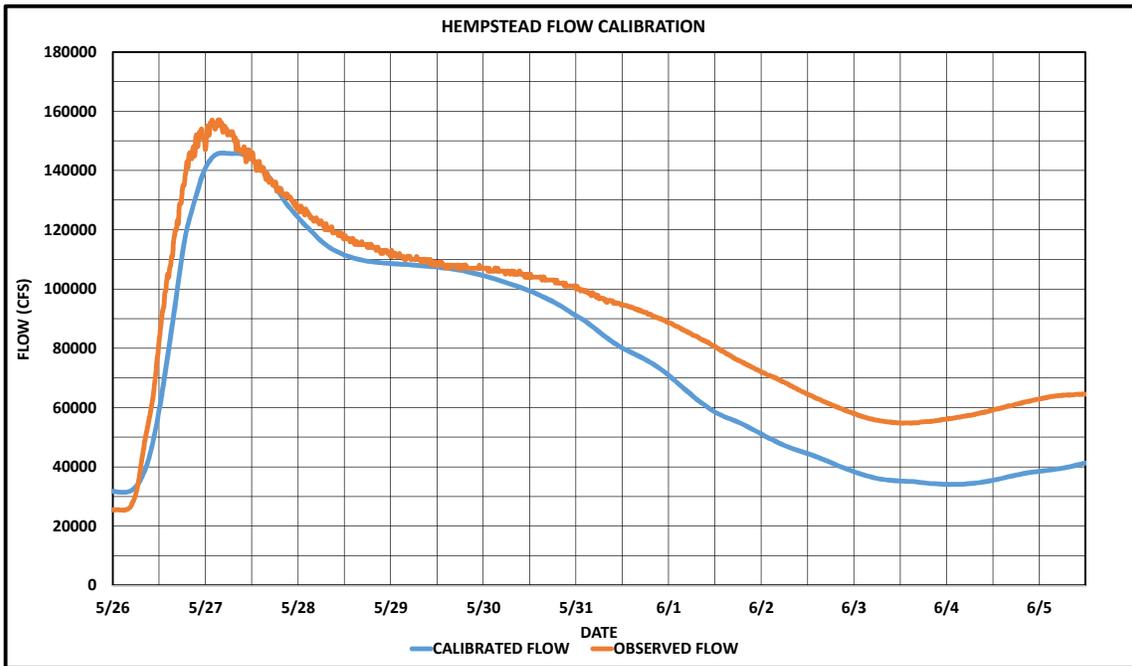


SH 159 – June 3, 2016



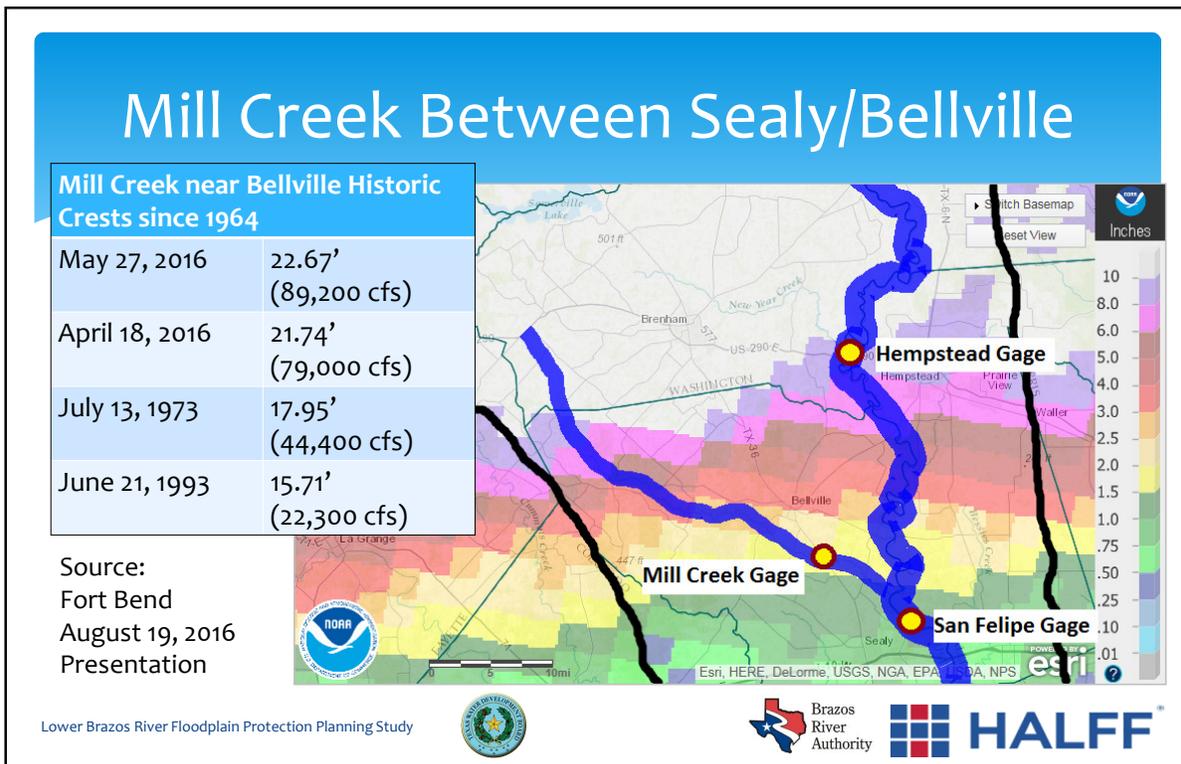
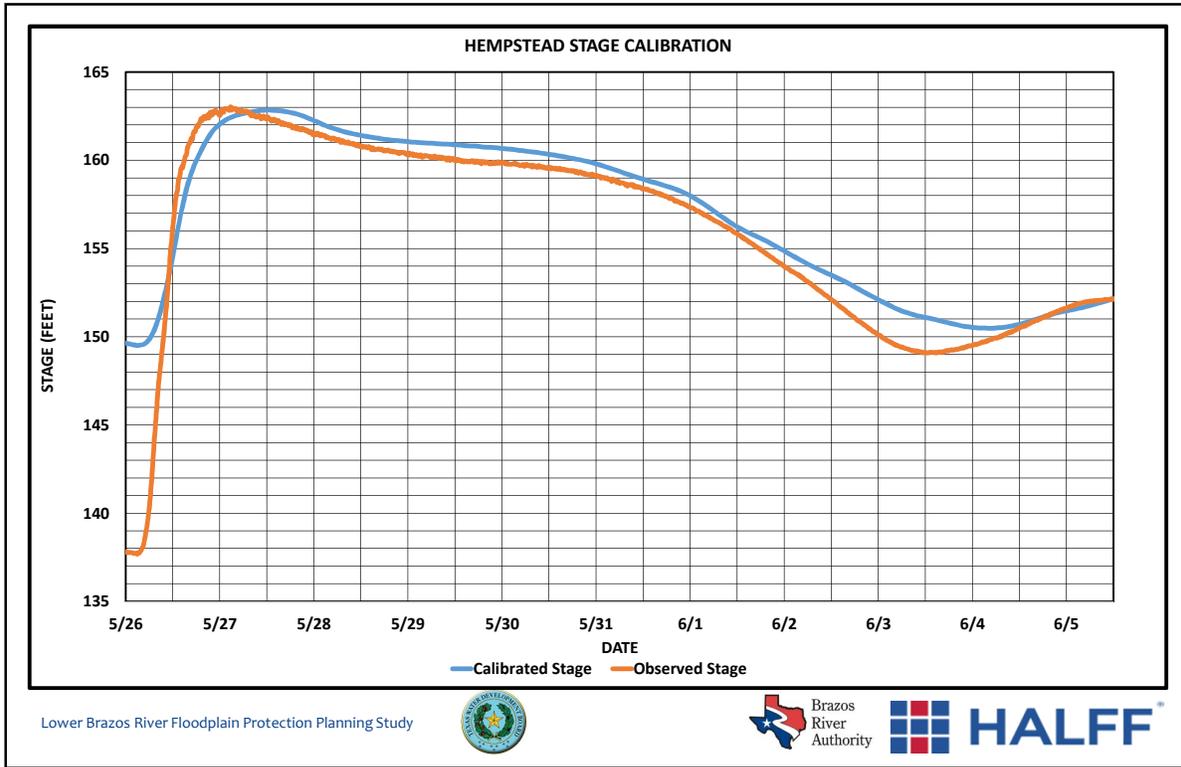
FM 529– June 3, 2016

Lower Brazos River Floodplain Protection Planning Study



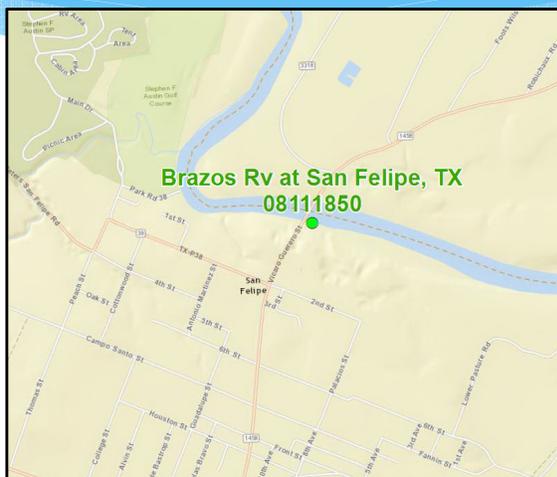
Lower Brazos River Floodplain Protection Planning Study





Brazos Rv at San Felipe, TX

- * Austin County, TX
- * Located on FM 1458
- * Contributing Drainage Area = 44,670 sq mi
- * Gage Datum = 0 feet above NGVD88
- * Period of Record – August 2013 through Current Date
 - * 4 Years of Record



Lower Brazos River Floodplain Protection Planning Study

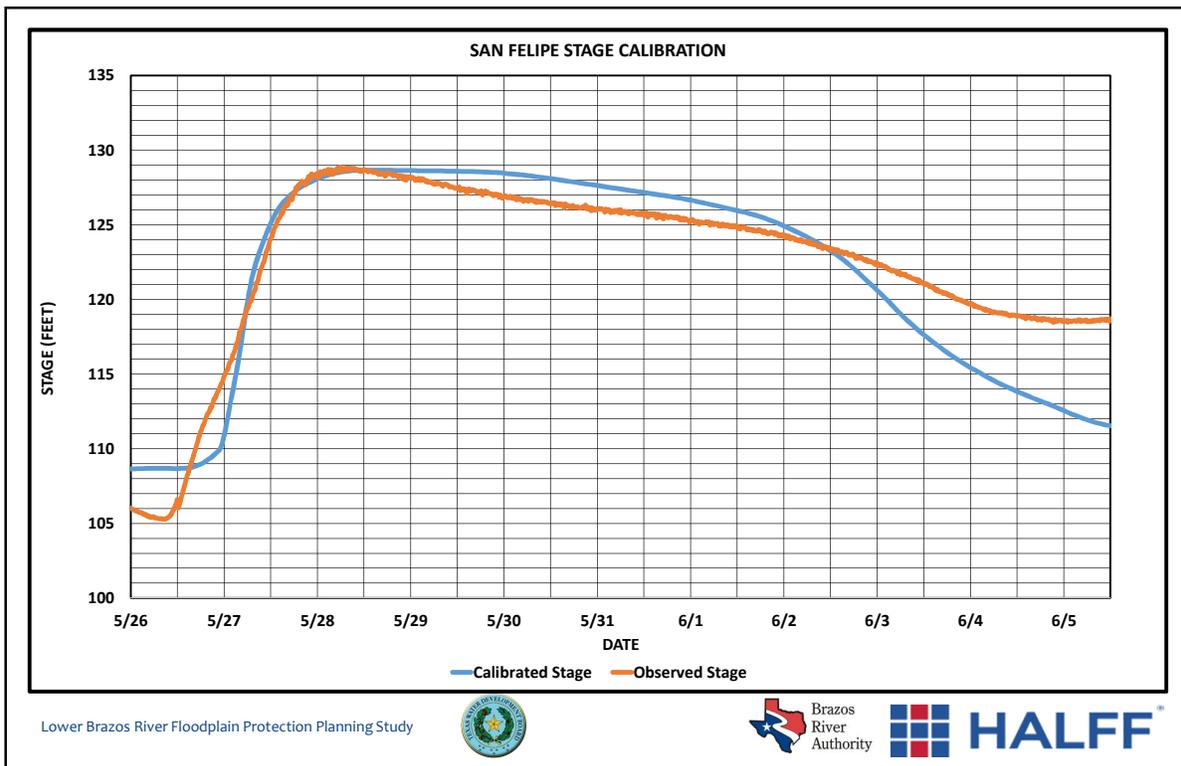
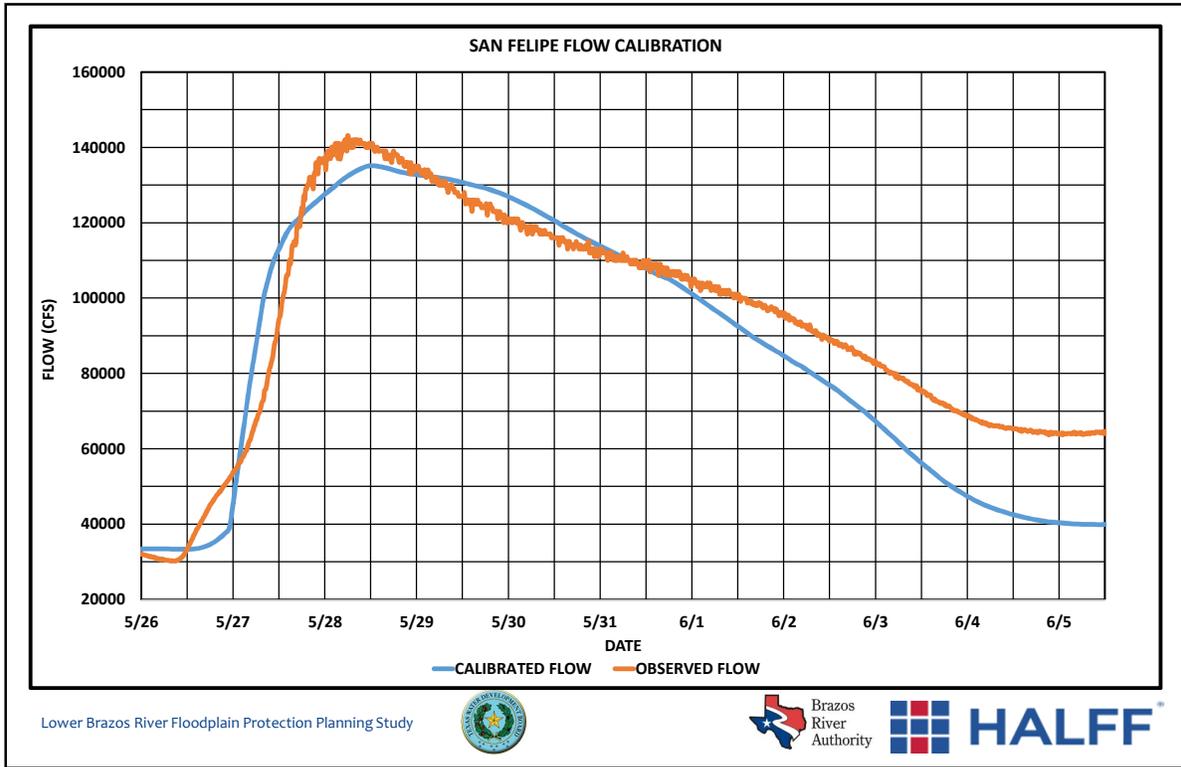


June 3, 2016 – FM 1458



Lower Brazos River Floodplain Protection Planning Study





Brazos Rv at Richmond, TX

- * Fort Bend County, TX
- * Located on Highway 90A
- * Contributing Drainage Area = 35,541 sq mi
- * Gage Datum = 27.94 feet above NGVD29
- * Period of Record – 1922 through Current Date
- * 95 Years of Record



Lower Brazos River Floodplain Protection Planning Study



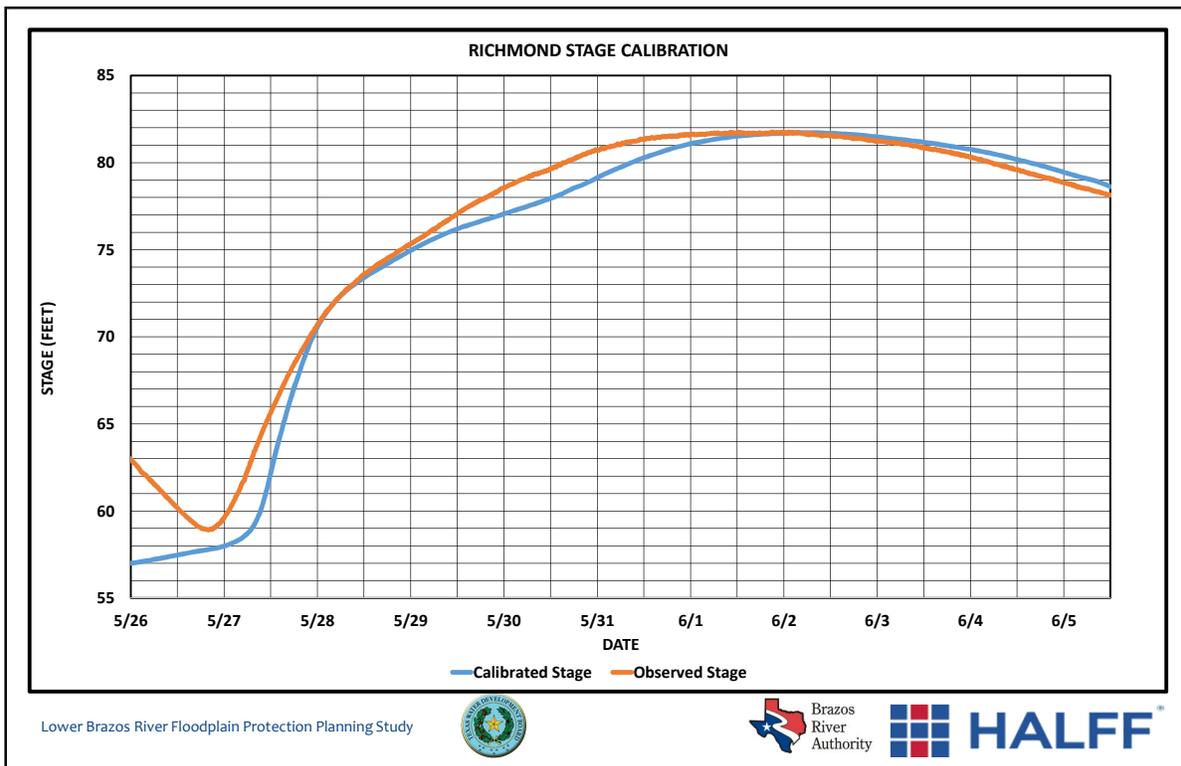
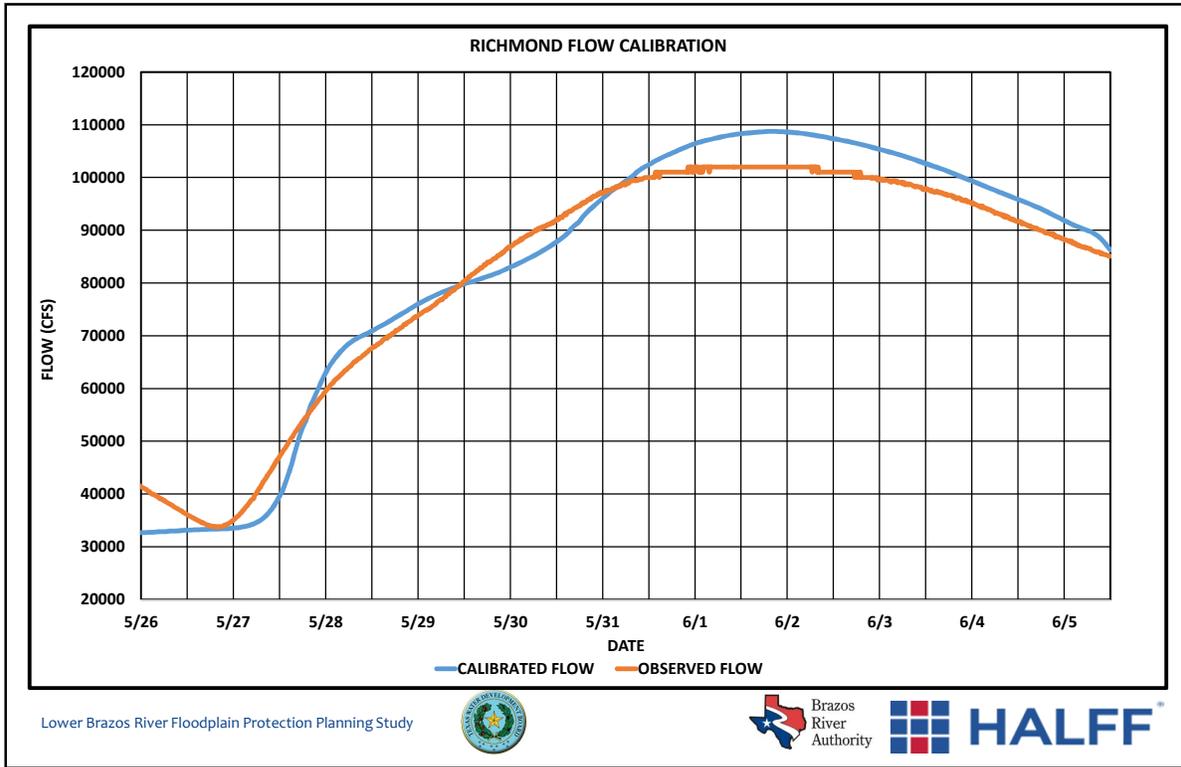
May 31, 2016 – US-90A

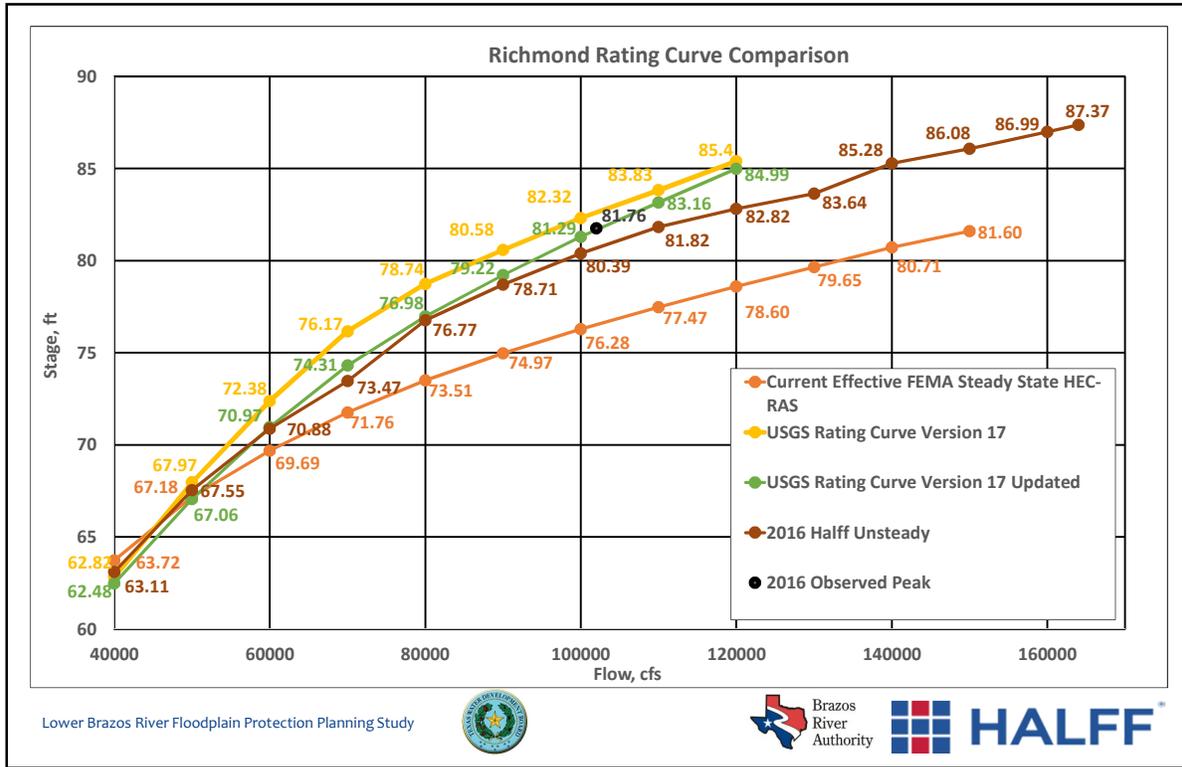


US 90 - Looking Upstream Along the Brazos Rv

Lower Brazos River Floodplain Protection Planning Study





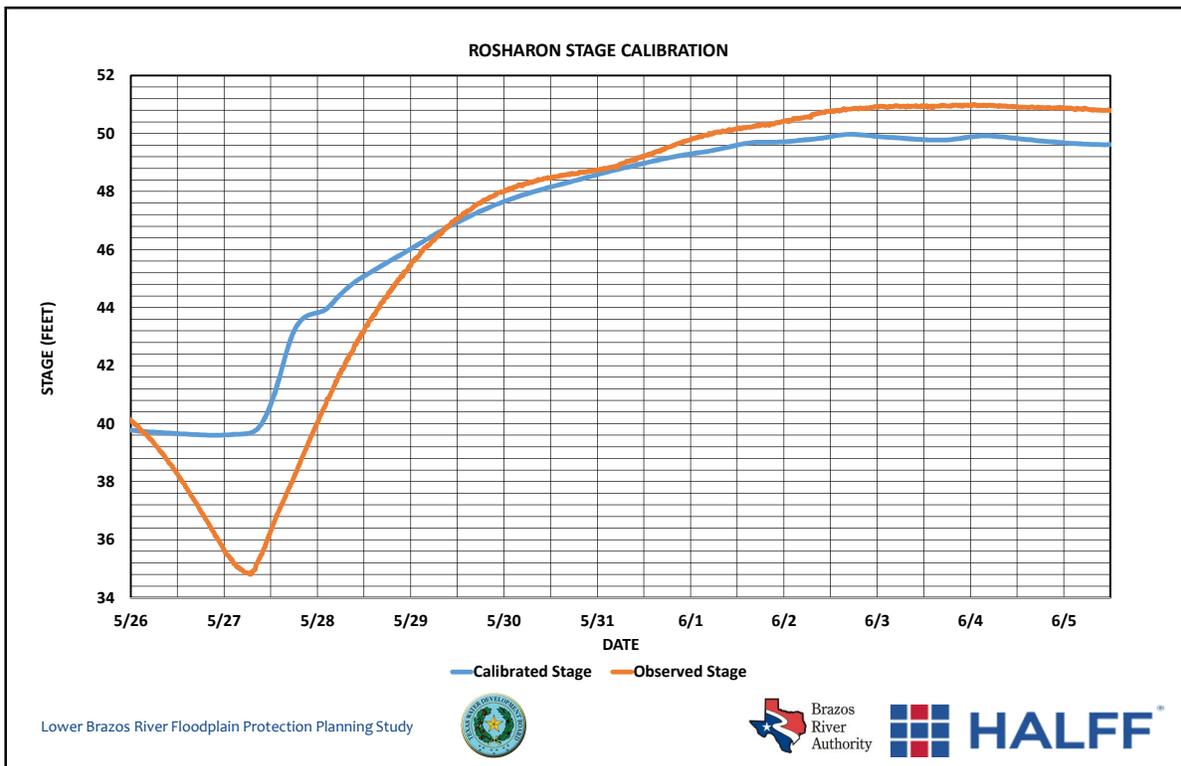
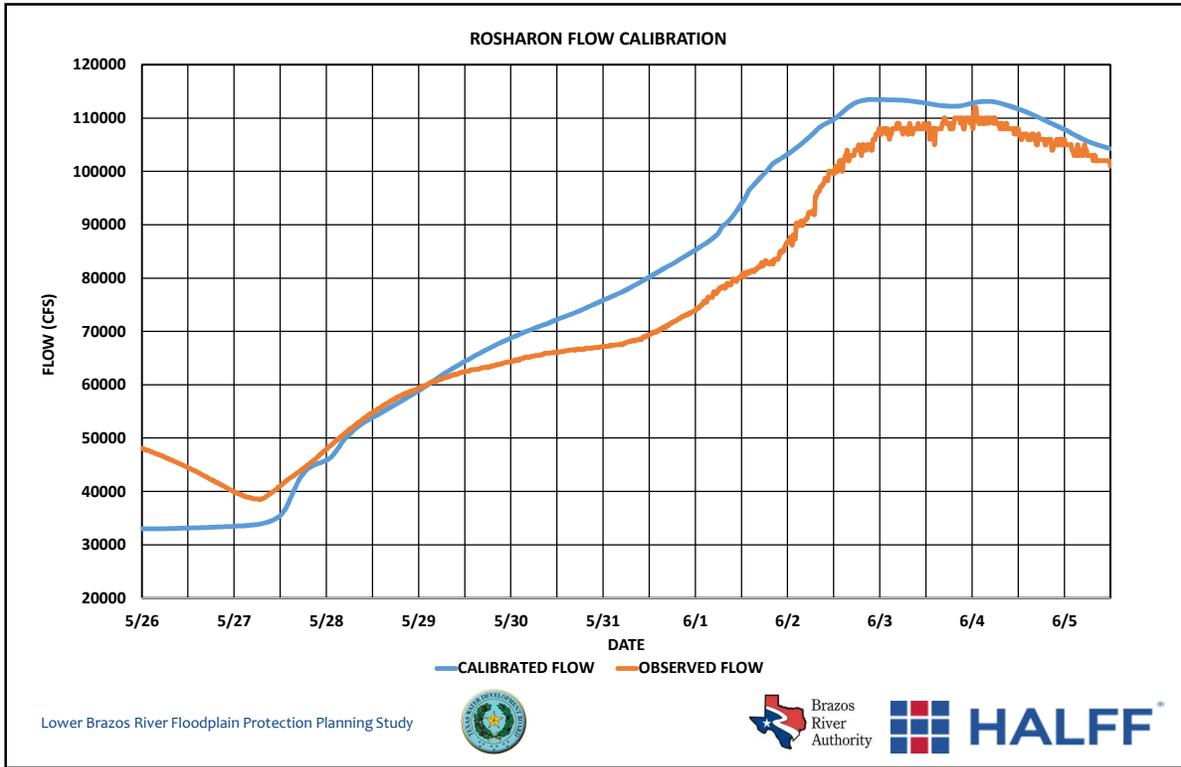


Brazos Rv at Rosharon, TX

- * Brazoria County, TX
- * Located at FM 1462
- * Contributing Drainage Area = 35,773 sq mi
- * Gage Datum = 0 feet above NGVD29
- * Period of Record – 1967 through Current Date
- * 49 Years of Record

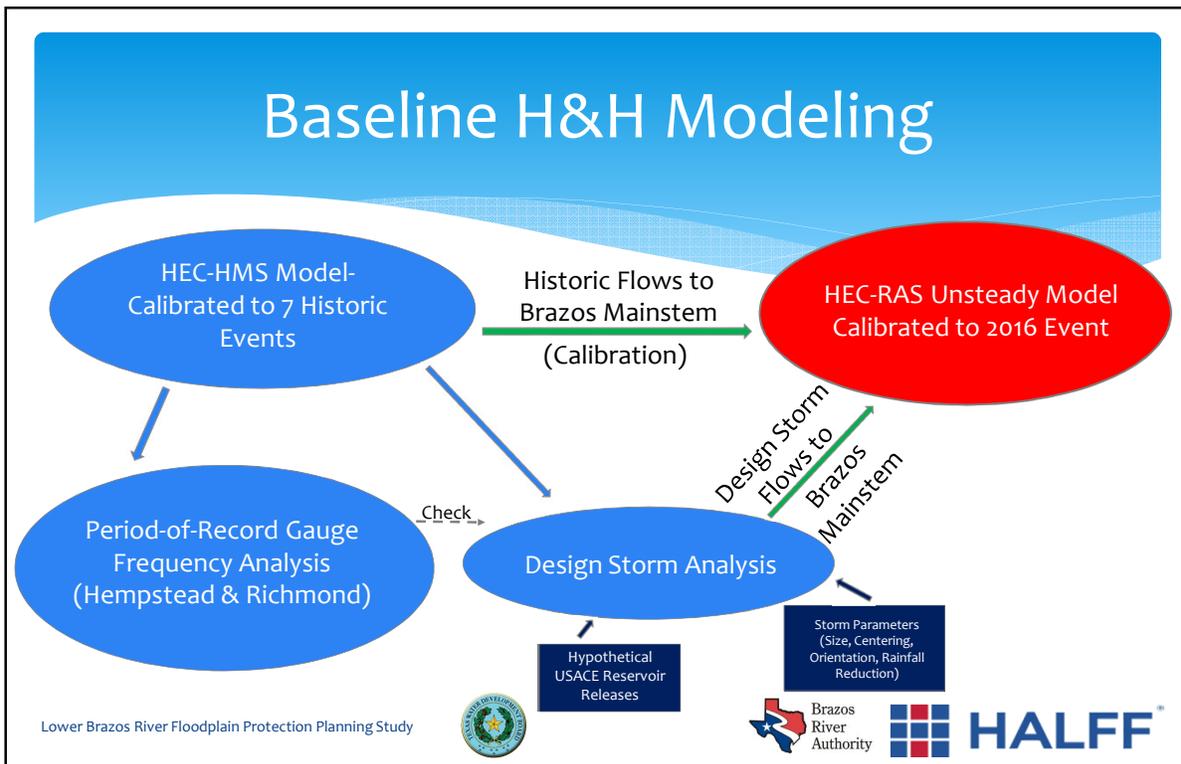
Brazos Rv nr Rosharon, TX
08116650

Lower Brazos River Floodplain Protection Planning Study



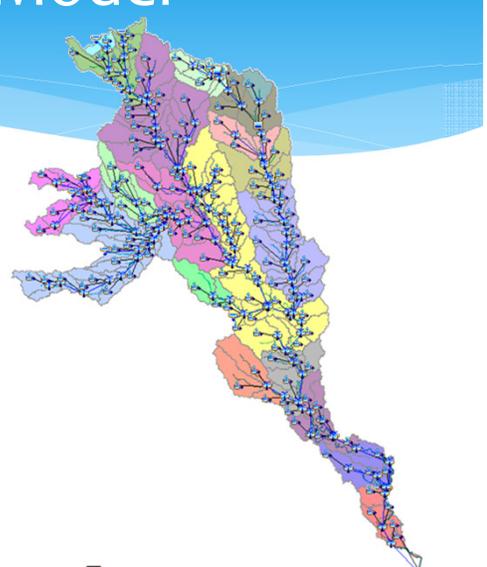
2016 Floodplain Maps

The figure displays three maps of floodplains for the Lower Brazos River. The first map is for Brazoria County, the second for Fort Bend County, and the third for Austin/Walker Counties. Each map shows the river network and surrounding floodplains with various colors and patterns. Below the maps are logos for the Lower Brazos River Floodplain Protection Planning Study, HALFF, and the Brazos River Authority.



Hydrologic Model

- * Lower Brazos HMS Model
 - * 9,766 sq. mi. below 7 USACE reservoirs
 - * 154 sub-basins (63 sq. mi. avg. size)
 - * 114 routing reaches (over 1,240 river miles modeled)
 - * Reach Routing
 - * Muskingum – Brazos & Navasota
 - * Modified Puls - Elsewhere
 - * Above Hempstead Gauge
 - * Initial and Constant Loss Method
 - * Snyder Unit Hydrograph Method
 - * Below Hempstead Gauge
 - * Exponential Loss Method
 - * Clark Unit Hydrograph Method



Lower Brazos River Floodplain Protection Planning Study

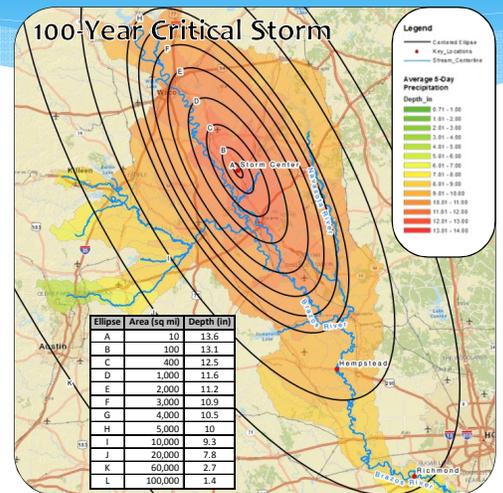


33




Design Storm Analysis

- * Lower Brazos Critical Storm
 - * Located near Hwy. 6 and 14
 - * Near Bremond
 - * Orientated 330° CW from N
 - * Location and Orientation used for all frequencies
 - * Maximum 5-Day Depths
 - * 10-yr = 8.4” 50-yr = 12.0”
 - * 100-yr = 13.6” 500-yr = 17.7”



Ellipse	Area (sq mi)	Depth (in)
A	10	13.6
B	100	13.1
C	400	12.5
D	1,000	11.6
E	2,000	11.2
F	3,000	10.9
G	4,000	10.5
H	5,000	10
I	10,000	9.3
J	20,000	7.8
K	60,000	2.7
L	100,000	1.4

Lower Brazos River Floodplain Protection Planning Study



34




Preliminary Discharge Comparison

Hempstead

Return Period	2009 Waller Co. FIS	Gage Freq. Storm Analysis	Design Storm Analysis
10-Year	110,000	94,000	121,000
50-Year	182,473	131,000	149,000
100-Year	206,962	145,000	179,000
500-Year	260,000	173,000	236,000

San Felipe

Return Period	Design Storm Analysis
10-Year	119,000
50-Year	147,000
100-Year	177,000
500-Year	233,000



Preliminary Discharge Comparison

Richmond

Return Period	2014 Ft. Bend Co. FIS	Gage Freq. Storm Analysis	Design Storm Analysis
10-Year	103,000	84,000	110,000
50-Year	147,000	110,000	142,000
100-Year	164,000	119,000	163,000
500-Year	202,000	139,000	215,000

Rosharon

Return Period	2014 Ft. Bend Co. FIS	Design Storm Analysis
10-Year	103,000	109,000
50-Year	145,000	142,000
100-Year	162,000	163,000
500-Year	200,000	217,000



Next Steps

- * Finalize Hydrology, Hydraulics, and Floodplain Mapping – May 2017
- * Alternatives Formulation – August 2017
- * Flood Damage Analysis Modeling – November 2017
- * Environmental Constraints Analysis – January 2018
- * Draft Report – January 2018
- * Final Report – March 2018

Lower Brazos River Floodplain Protection Planning Study



Flood Reduction Alternatives

- * Structural
 - * New levees or improvements to existing levees
 - * Large scale detention or off-channel storage
- * Non-Structural
 - * Buyouts of floodprone areas
 - * Elevation of structures in floodprone areas

Lower Brazos River Floodplain Protection Planning Study



Flood Damage Analysis

- * Developing a building layer to determine potential flood damages
 - * Utilizing current data from appraisal districts in Brazoria, Fort Bend, Waller, Austin and Washington Counties
- * Identifying Repetitive Loss Areas along the Brazos River to help determine flood alternative locations

Lower Brazos River Floodplain Protection Planning Study



Environmental Constraint Analysis

- * Desk level environmental analysis is underway to determine environmental sensitive areas
- * Environmental field visits will be completed on selected alternative areas

Lower Brazos River Floodplain Protection Planning Study



