



The Floods of May and June 2015

A Brief Recap

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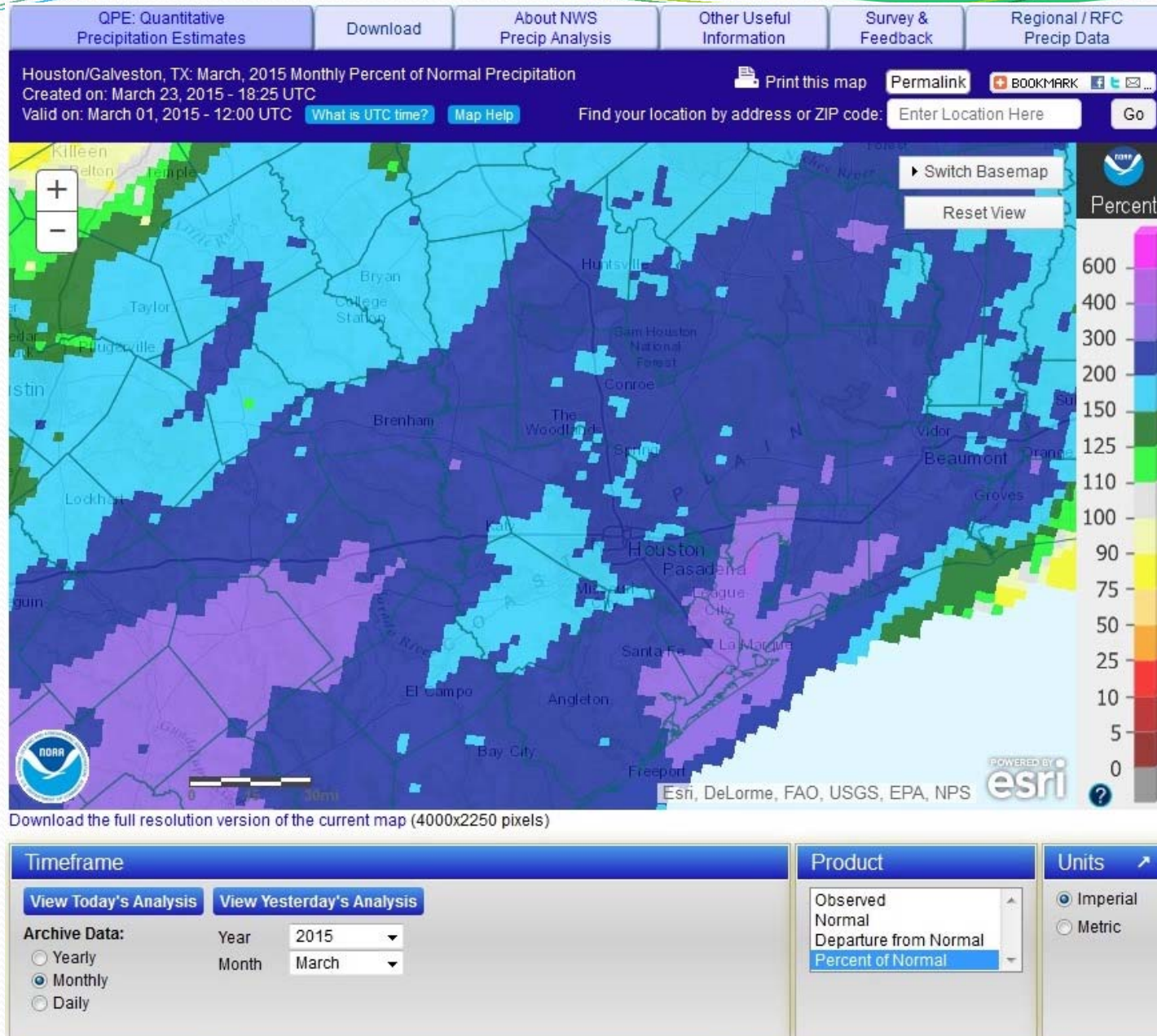
Outline

- The Event – How did we get here?
 - Previous Rainfall
 - Setup
 - Timeline
- Hydrologic Forecast Process
 - Precipitation Processing
 - Hydrologic Forecasts
 - RFC to WFO
- River Response
- Now What?

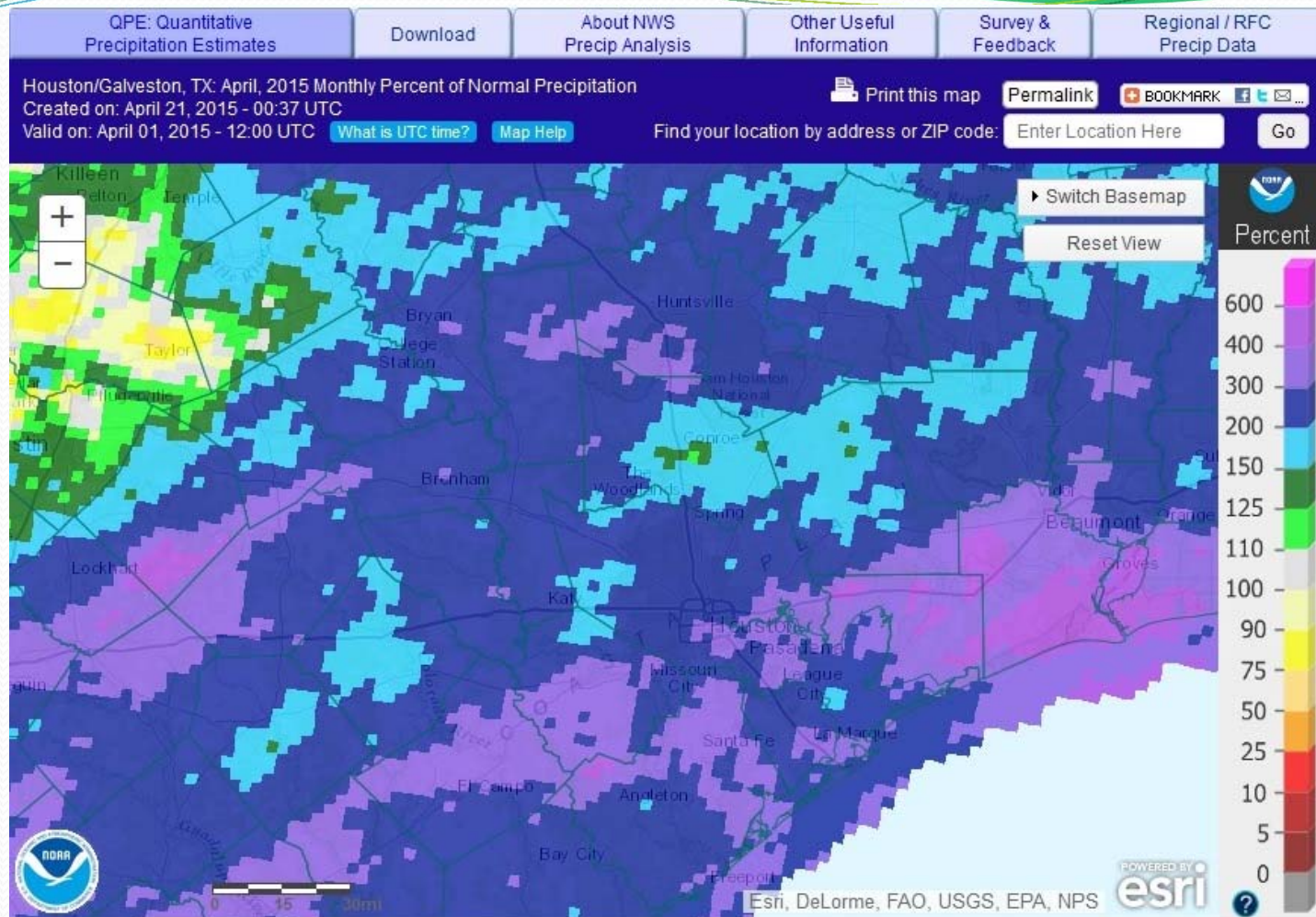
The background of the slide features a series of overlapping, wavy lines in shades of blue and green, creating a sense of depth and movement. The lines are more prominent at the top and fade into a solid blue at the bottom.

Well...How Did We Get Here?

Observed March Rainfall



Observed April Rainfall



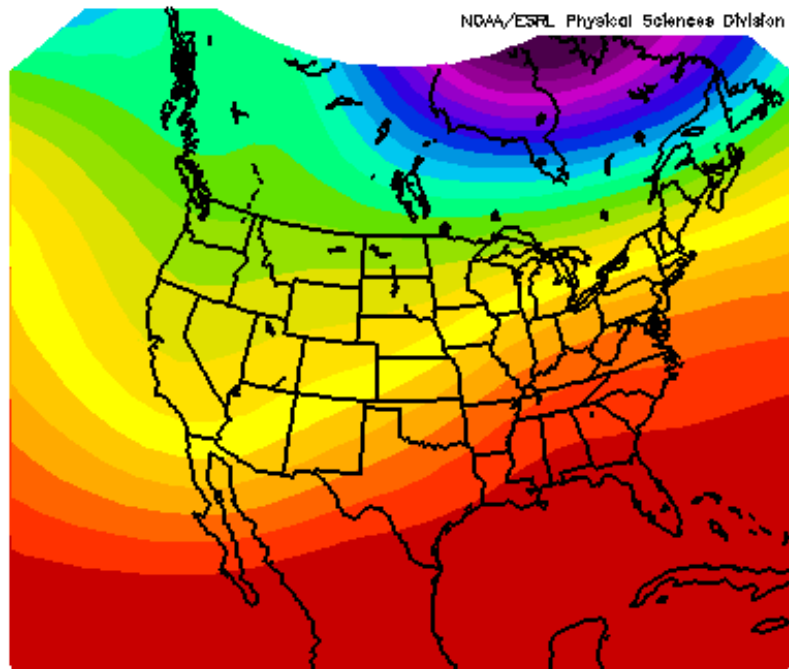
Timeframe		Product	Units
View Today's Analysis View Yesterday's Analysis		Observed Normal Departure from Normal Percent of Normal	<input checked="" type="radio"/> Imperial
Archive Data:			<input type="radio"/> Metric
<input type="radio"/> Yearly	Year: 2015		
<input checked="" type="radio"/> Monthly	Month: April		
<input type="radio"/> Daily			

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The Pump Is Primed!

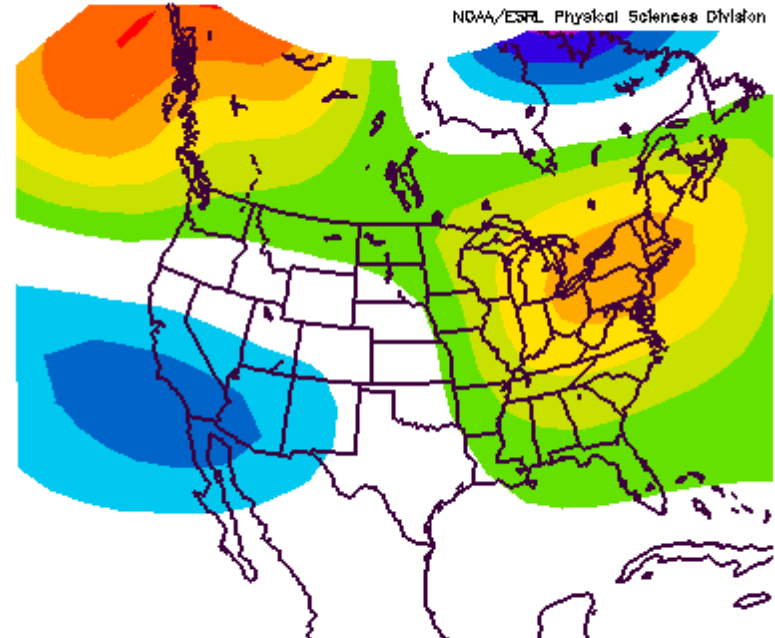
May Setup

NCEP/NCAR Reanalysis
500mb Geopotential Height (m) Composite Mean
NOAA/ESRL Physical Sciences Division



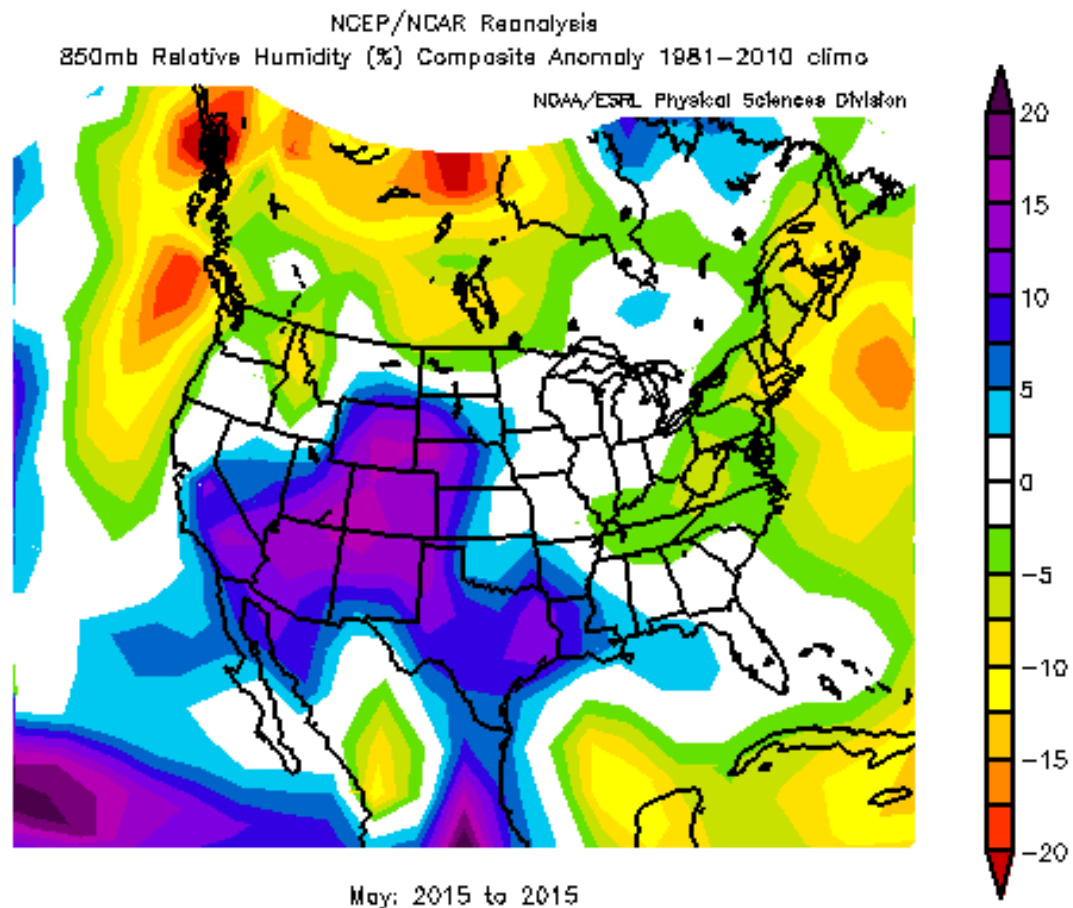
May: 2015 to 2015

NCEP/NCAR Reanalysis
500mb Geopotential Height (m) Composite Anomaly 1981–2010 climo
NOAA/ESRL Physical Sciences Division



May: 2015 to 2015

May Setup





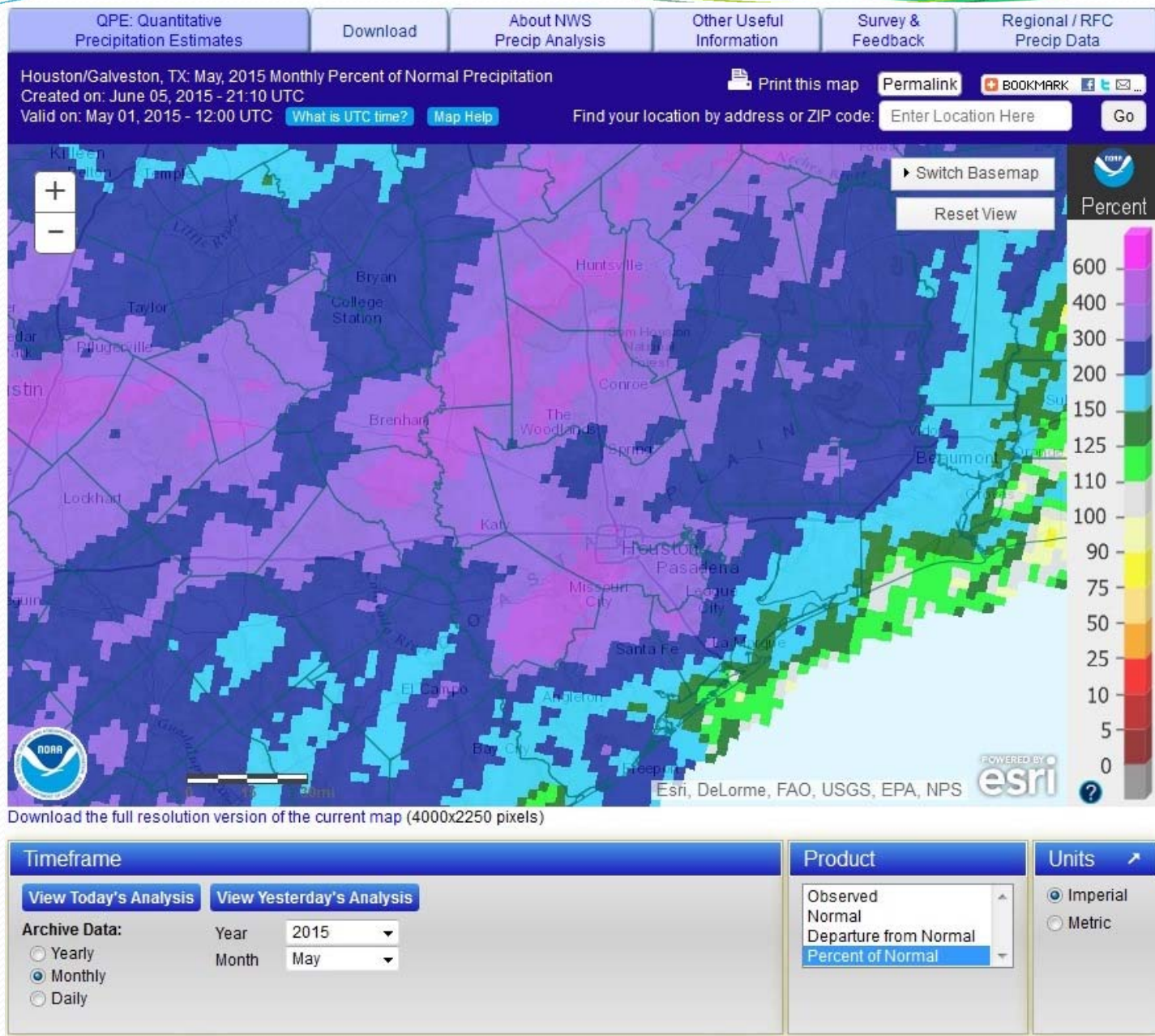
Timeline

Three significant flood events!

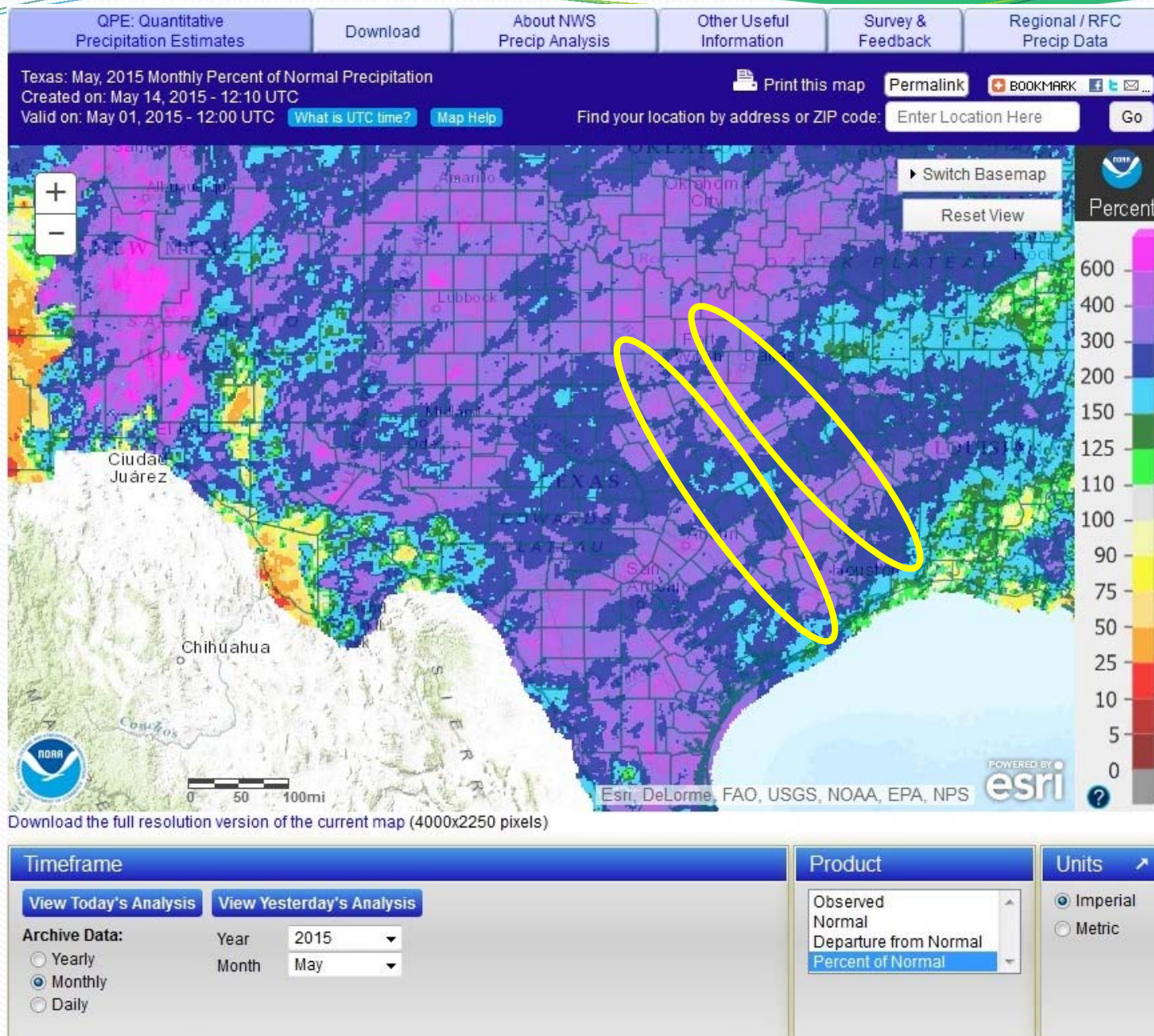
1. May 13th – Webster/Clear Lake Flood
 - Affected; Southern Harris/Northern Galveston Counties, West Fork San Jacinto, San Bernard River
2. May 25th – Memorial Day Flood
 - Affected; West Fork San Jacinto River...including Harris Counties Watersheds, Lower Brazos River, San Bernard River, Lower Colorado River, Lavaca-Navidad Watershed
3. June 16th – 18th – Tropical Storm Bill
 - Affected; Lower Brazos River, San Bernard River, Tres Palacios River, Lavaca-Navidad Watershed

Trinity River remained in flood throughout each event!

Observed May Rainfall



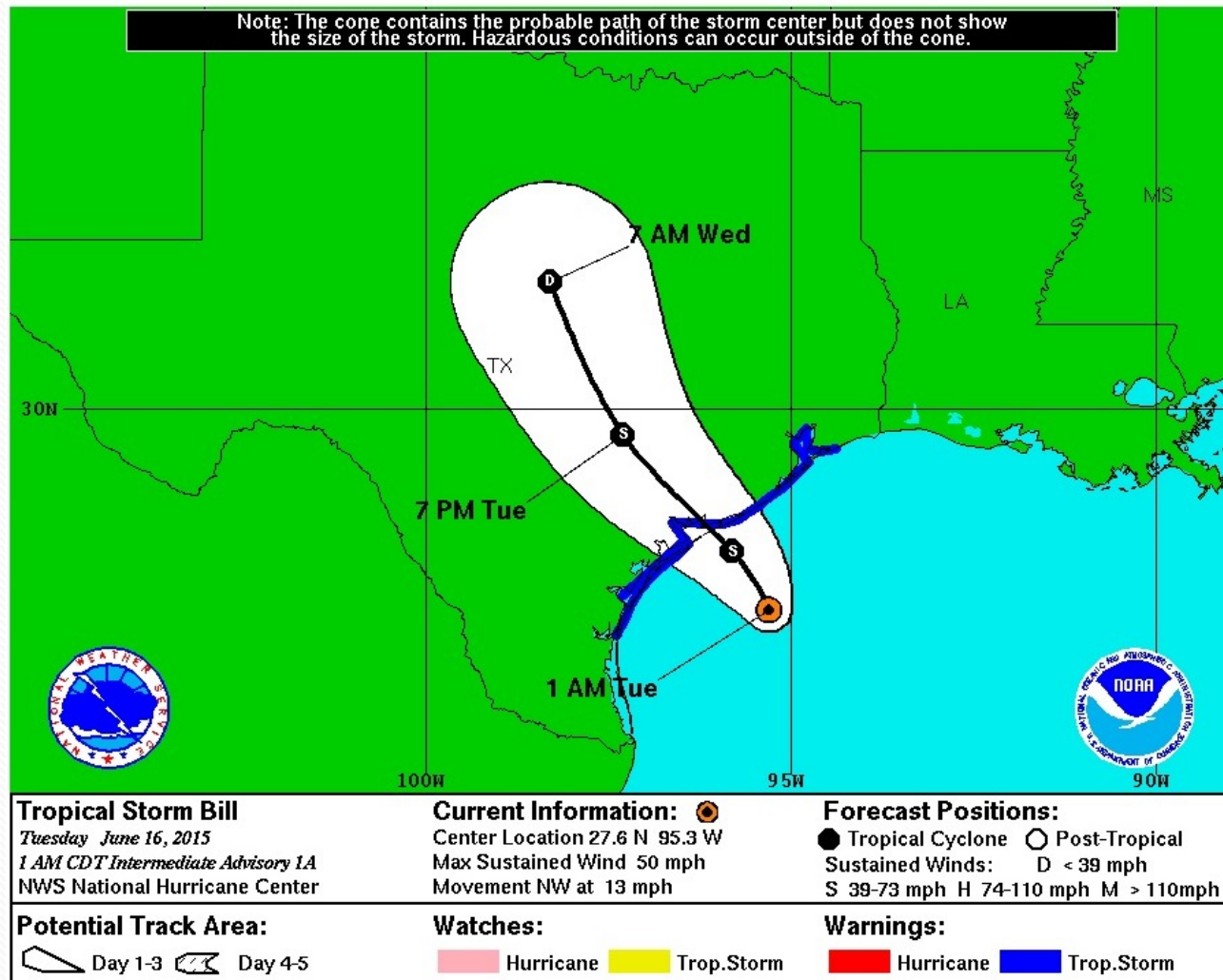
Texas Observed May Rainfall



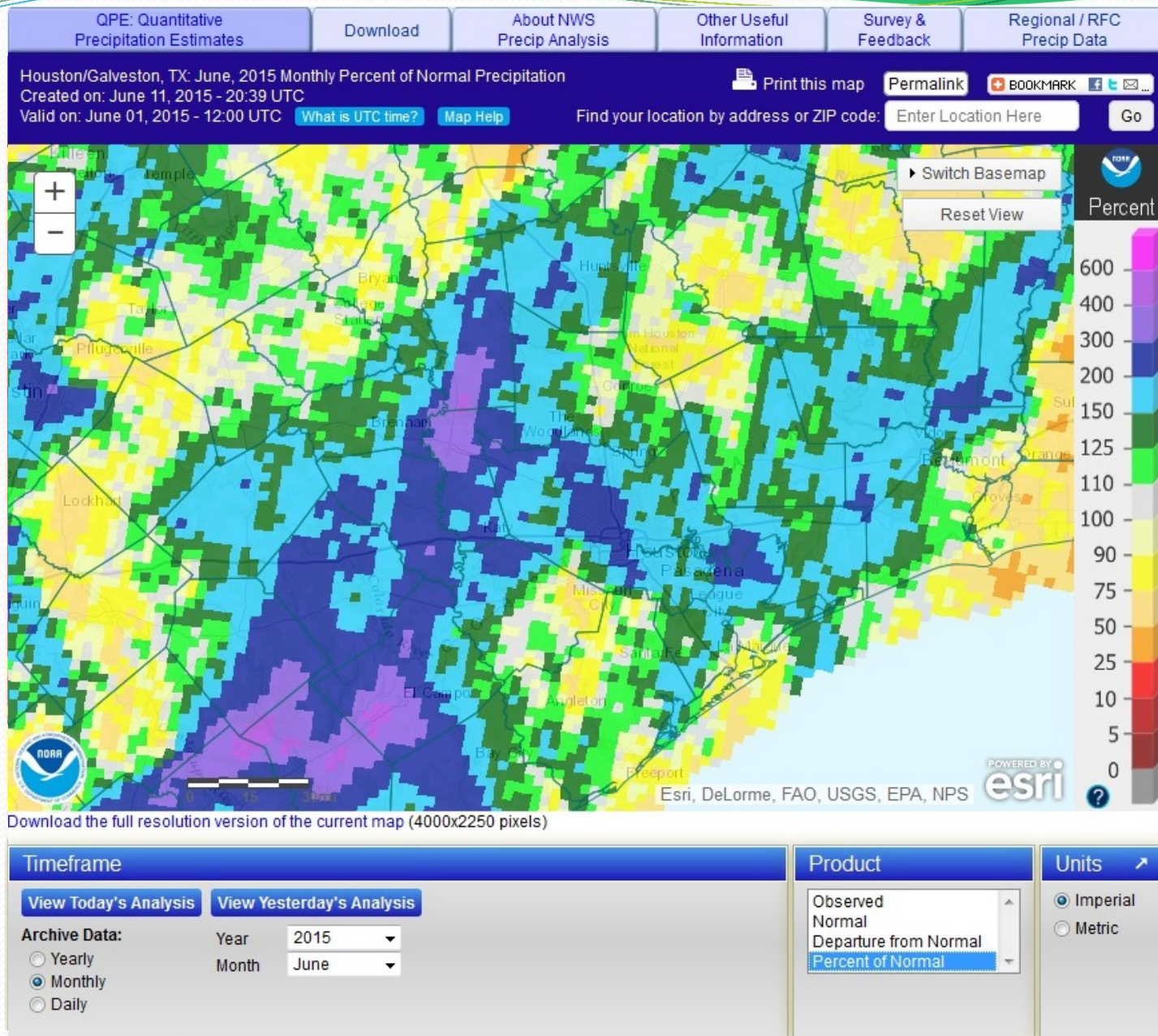
The background of the slide features a series of overlapping, wavy lines in shades of blue and green, creating a sense of movement and depth. The lines are smooth and fluid, with the blue being a deep, rich color and the green being a lighter, more vibrant shade. The overall effect is a modern, abstract design that complements the text.

A Brief Respite...And Then

Tropical Storm Bill



Observed June Rainfall

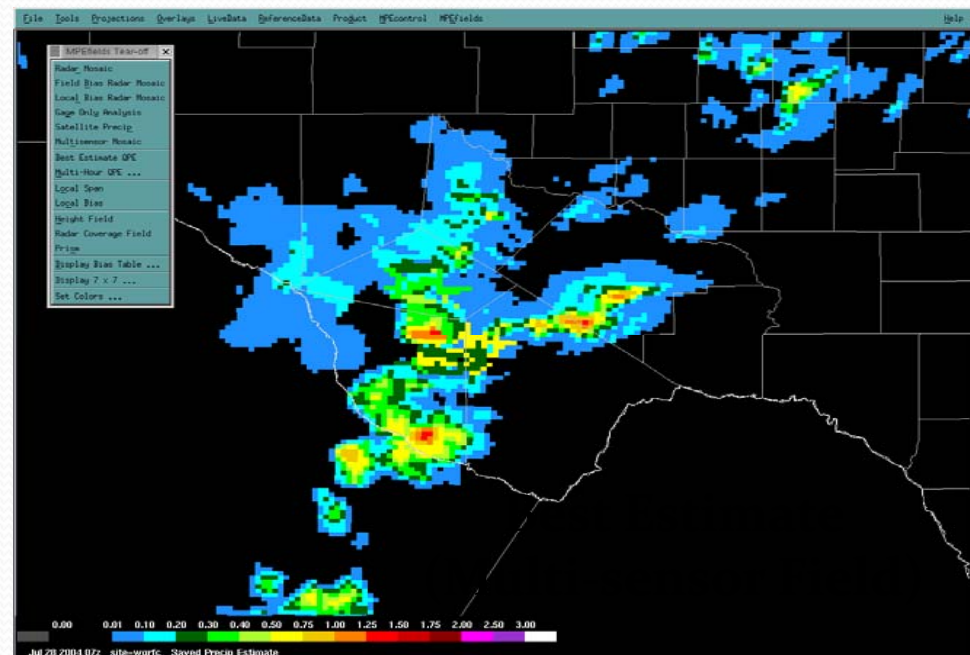
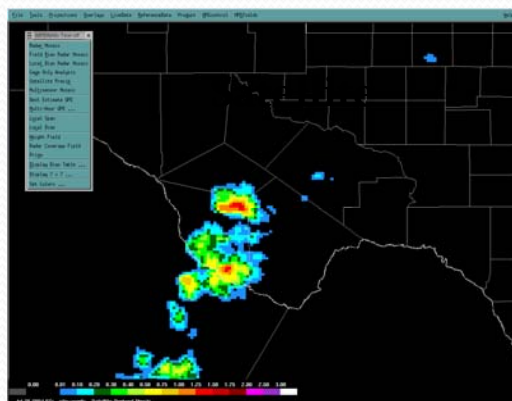
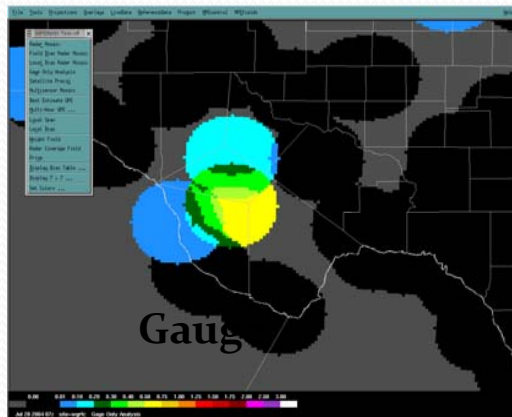
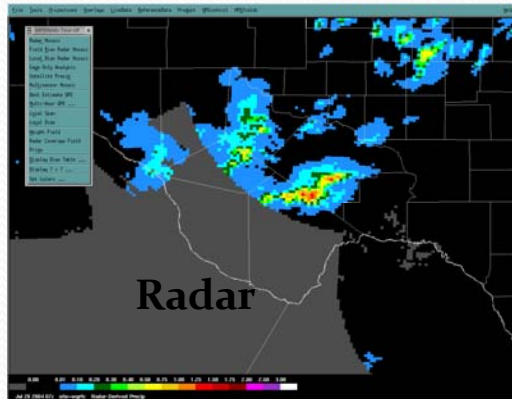




Hydrologic Forecast Process

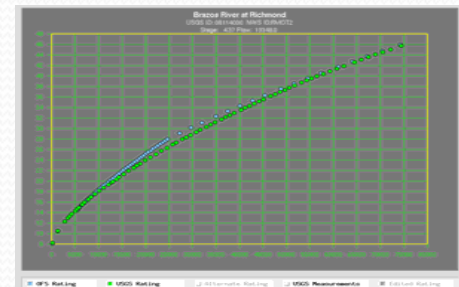
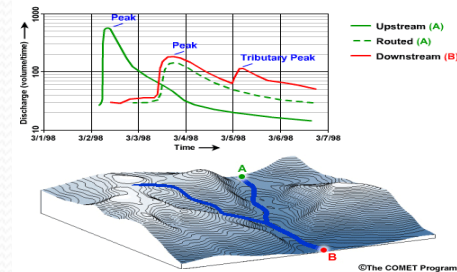
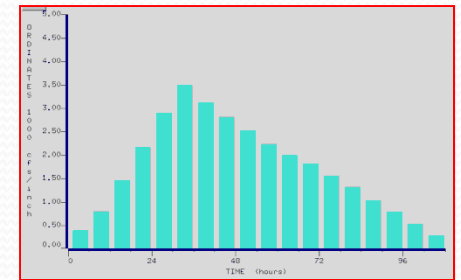
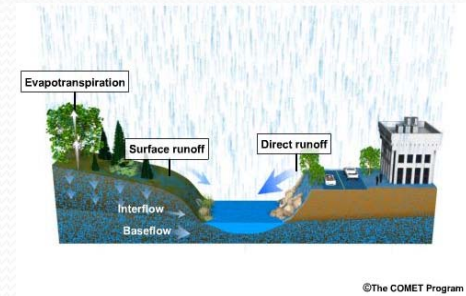
Precipitation Best Estimate

- 4km x 4km spatial resolution
- 1 hour temporal resolution
- Human quality control of data inputs



Hydrologic Forecasts

1. How much rain will reach the river?
 - Rainfall to Runoff Model
2. How fast will water reach the river gage?
 - Unit Hydrograph
3. What about water from upstream locations?
 - Routing
4. Translating water volume into water height
 - Rating Curves

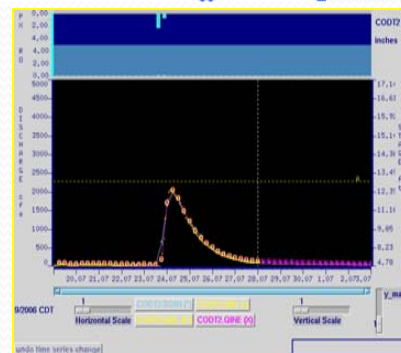
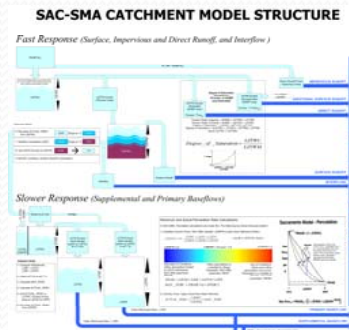
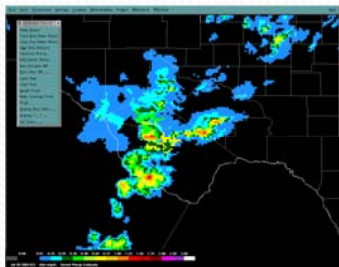


RFC

WFO

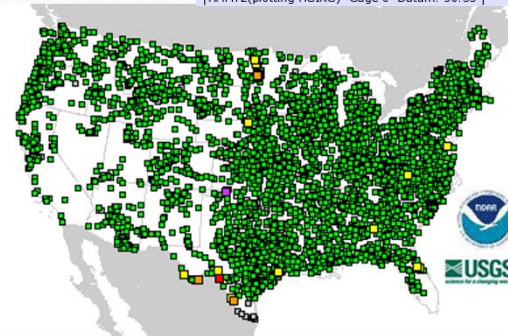
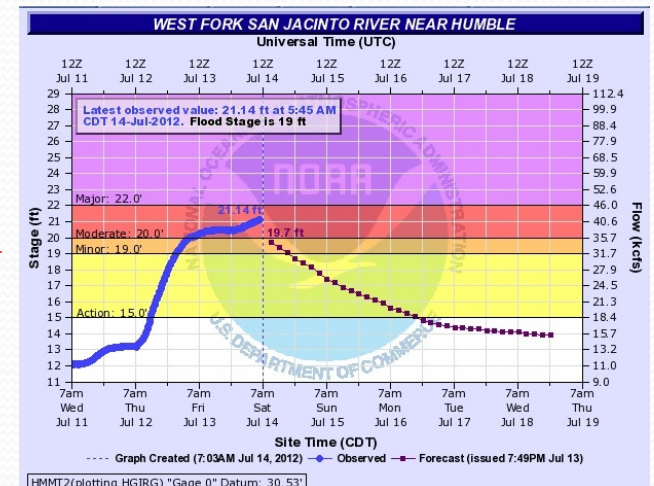
- River Forecast Centers
 - Precipitation data & Forecasts
 - River forecasts issued to WFOs

- Weather Forecast Offices
 - River forecasts ingested
 - Public products/warnings issued

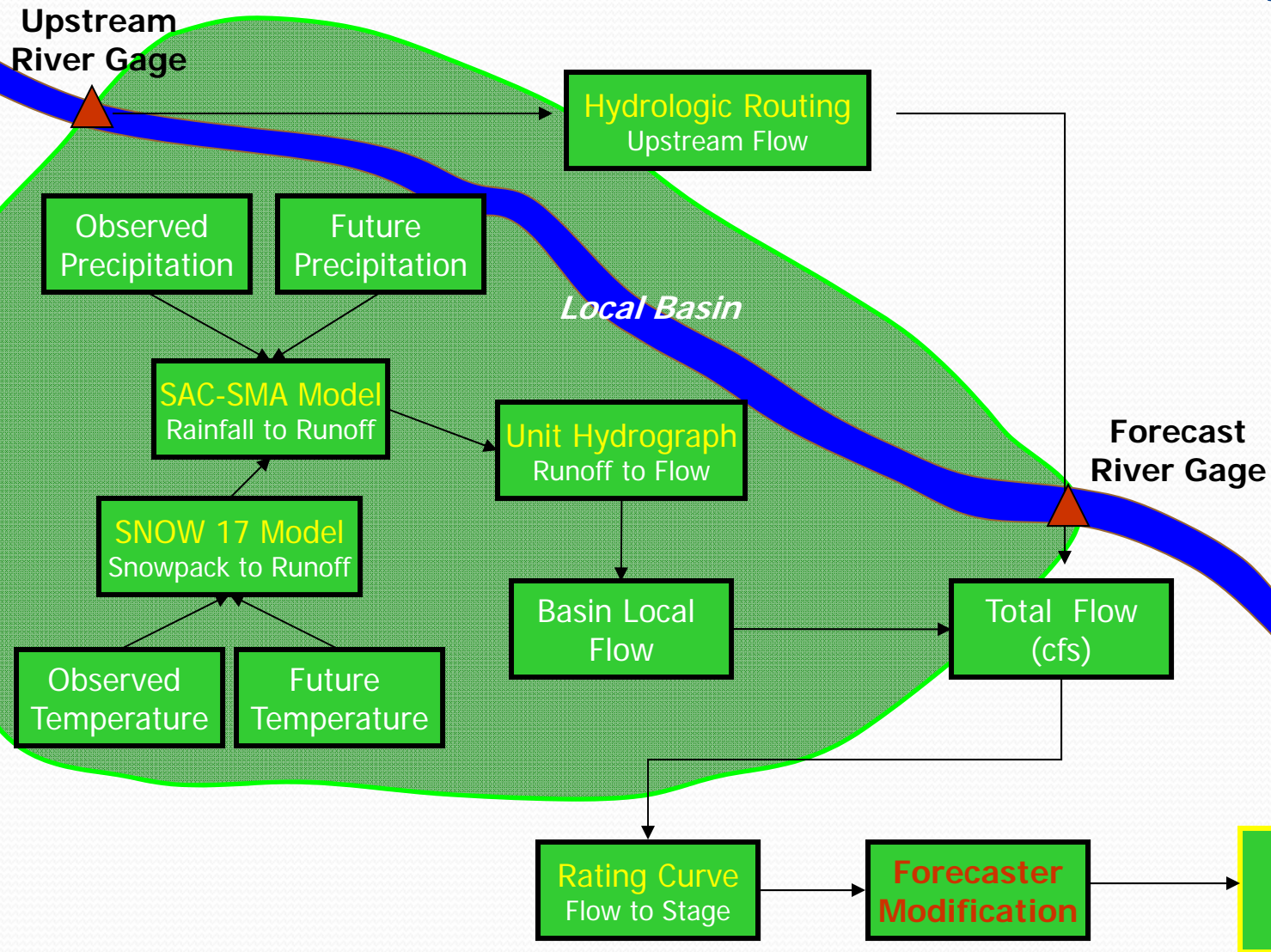


Precipitation estimates and forecasts merged into continuous dataset

Precipitation dataset ingested into hydrologic model



River Forecast Process Recap



Courtesy of Southeast River Forecast Center

The background of the slide features a series of overlapping, wavy lines in shades of blue and green, creating a sense of movement and depth. The lines are more prominent at the top and fade into a solid blue at the bottom.

The Rivers Respond

Trinity River at Riverside

Above Flood Stage (134 Feet)

March 10th – March 15th

Crest 135.8 feet

May 14th – July 28th

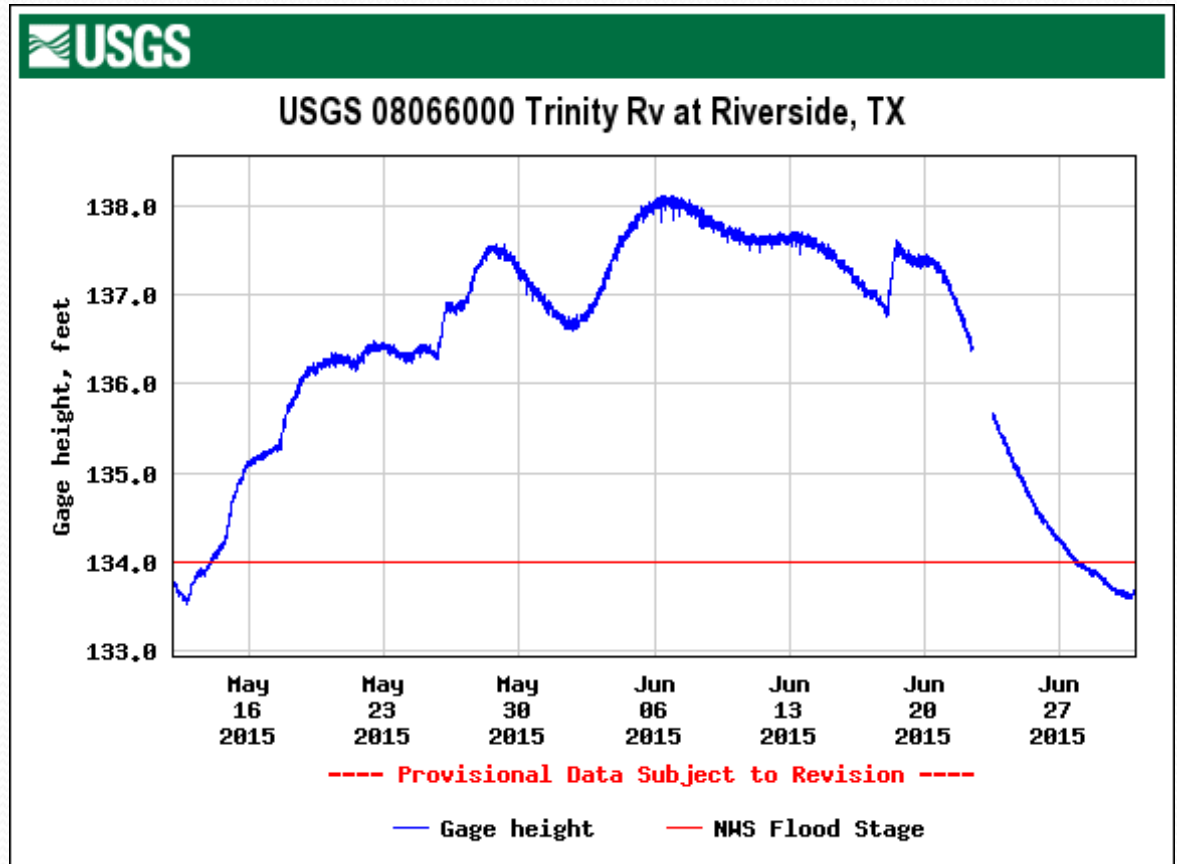
Moderate Flood May 27th – May 30th

June 3rd – June 16th

June 18th – June 21st

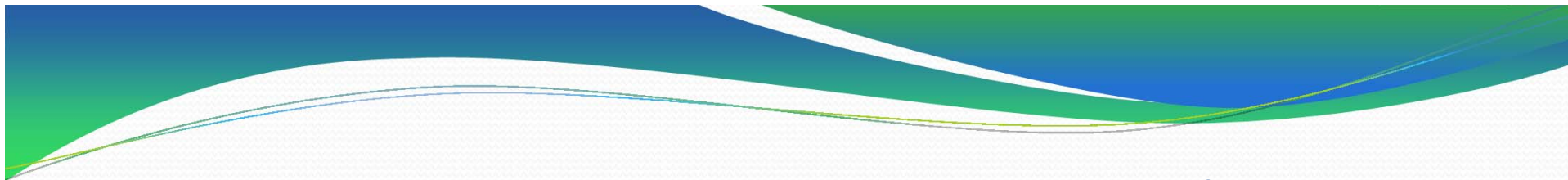
Crest 137.57 Feet May 29th

138.12 Feet June 6th



Above flood stage 45 days!

Moderate Flood 3 times, 19 days total



Trinity River at Liberty

Above Flood Stage (26 Feet)

March 11th – March 20th

Moderate Flood March 12th – 19th

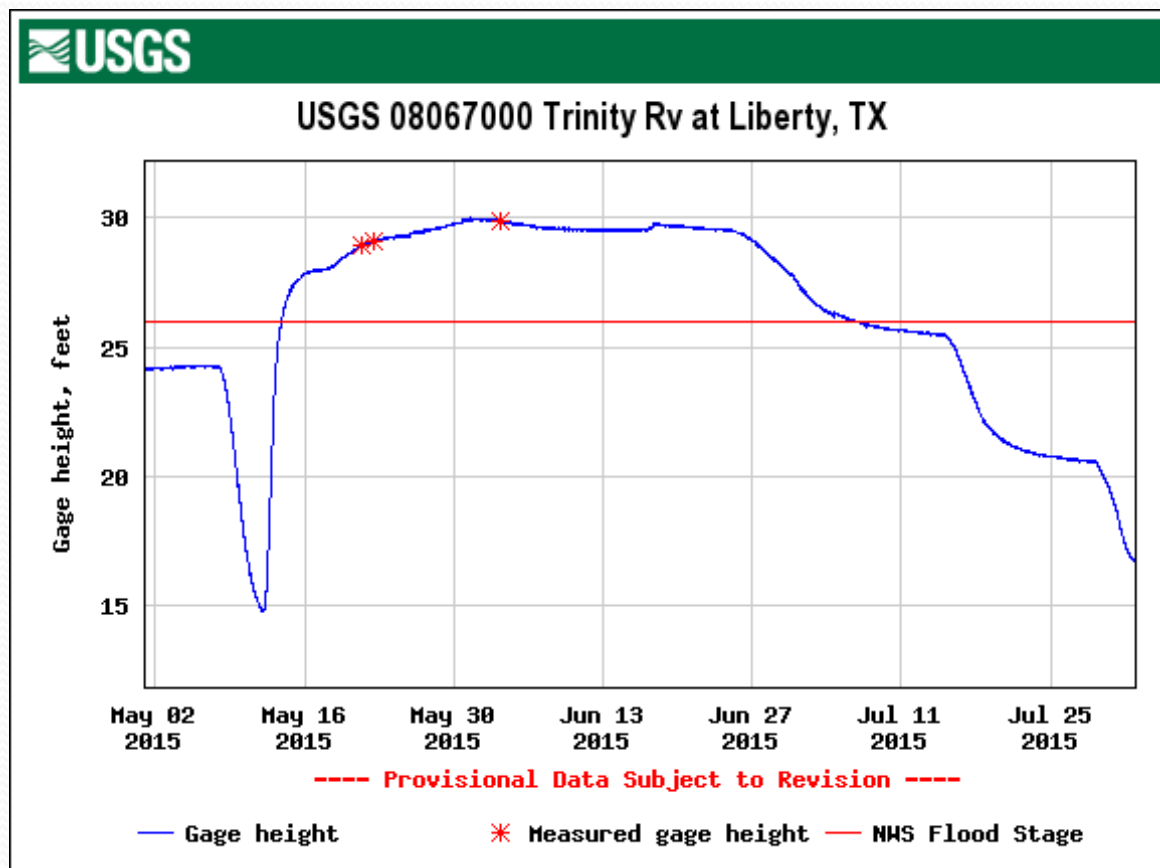
Crest 28.3 feet

May 13th – July 6th

Moderate Flood May 14th – July 2nd

Major Flood May 21nd – June 27th

Crest 30.0 Feet



Above flood stage 54 days!

Moderate Flood 49 Days

Major Flood 37 Days

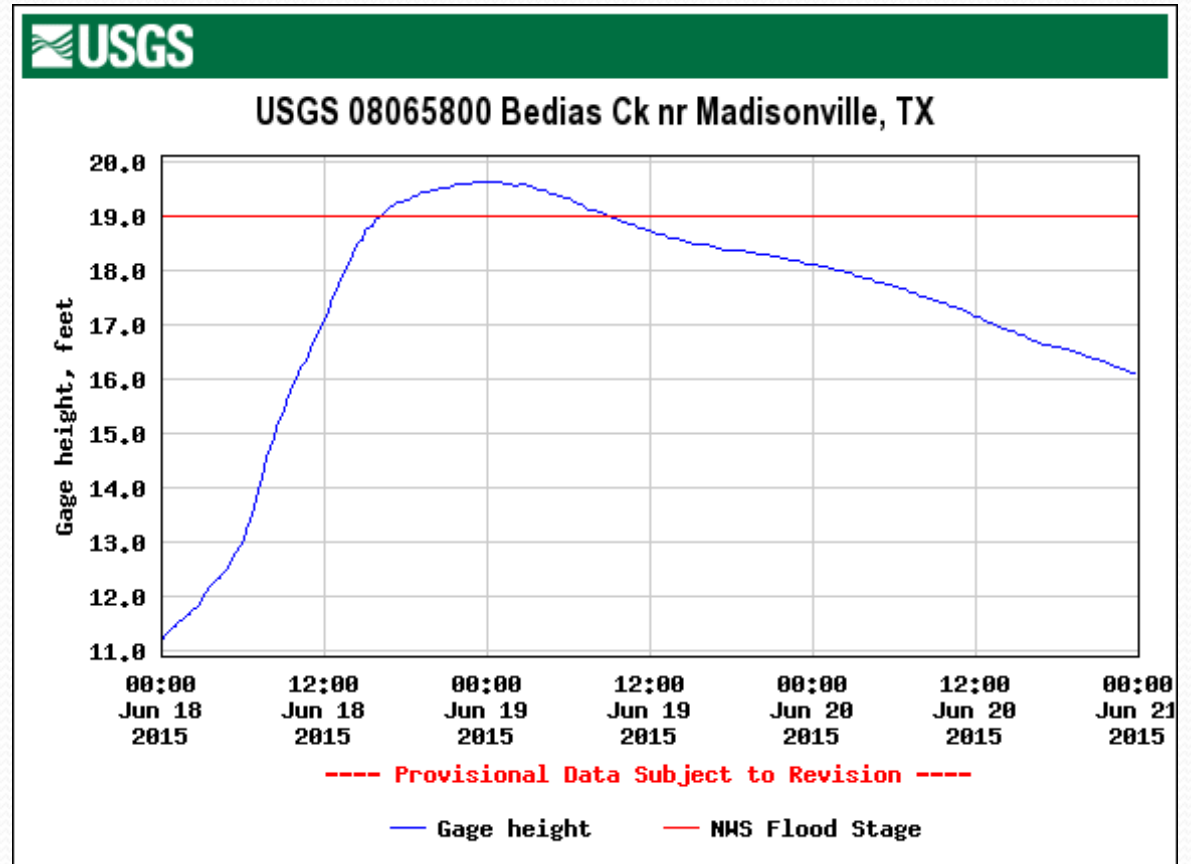
Bedias Creek near Madisonville

Above Flood Stage (19 Feet)

March 10th – March 11th
Moderate Flood March 10th
Crest 21.7 feet

May 26th – May 27th
Crest 20.6 Feet

June 18th – June 19th
Crest 19.6 Feet





Trinity River near Moss Bluff

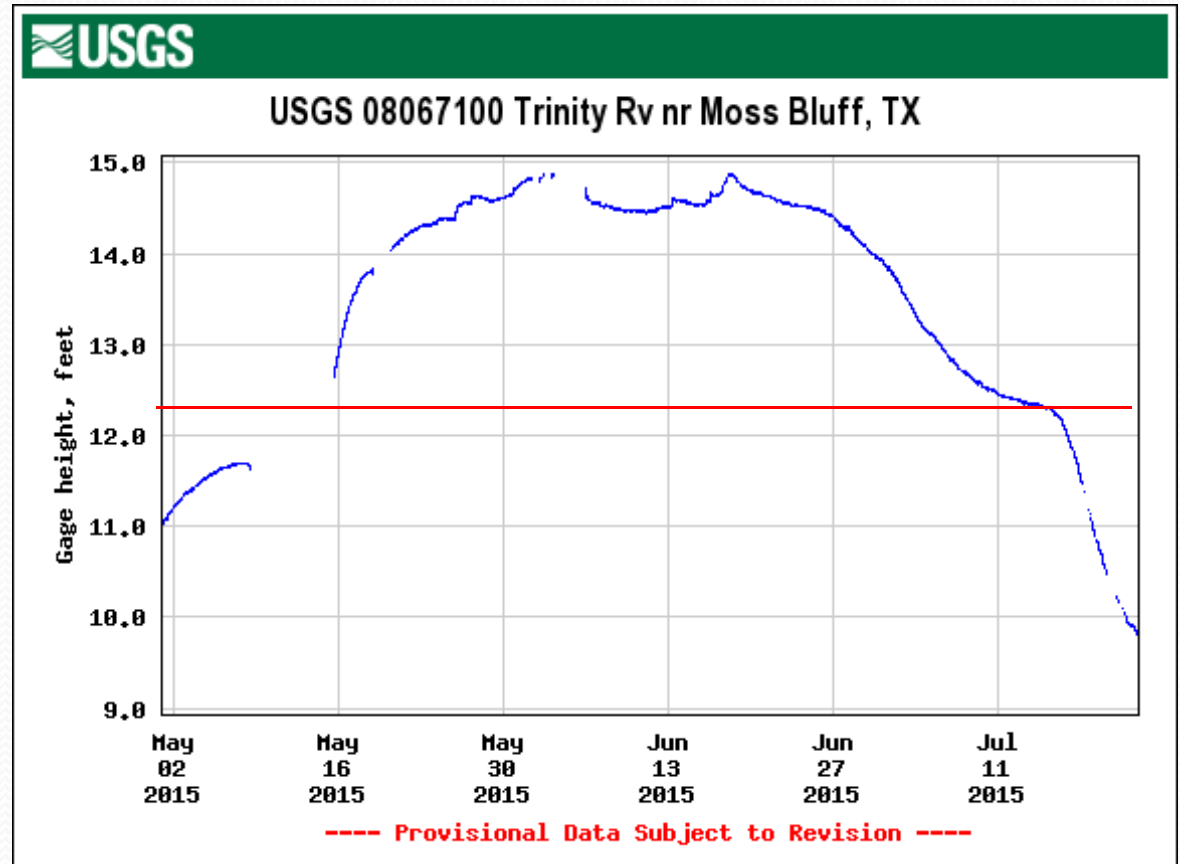
Above Flood Stage (12.2 Feet)

March 13th – March 26th

Crest 14.1 feet

May 15th – July 6th

Crest 14.9 Feet



Above flood stage 61 days!



West Fork San Jacinto near Porter

Above Flood Stage (24 Feet)

May 13th – May 21st

Moderate Flood May 13th – May 19th

Major Flood May 13th – May 15th

Crest 31.1 Feet (provisional)

May 26th – June 1st

Moderate Flood May 26th – May 31st

Major Flood May 26th – May 27th,
May 30th – May 31st.

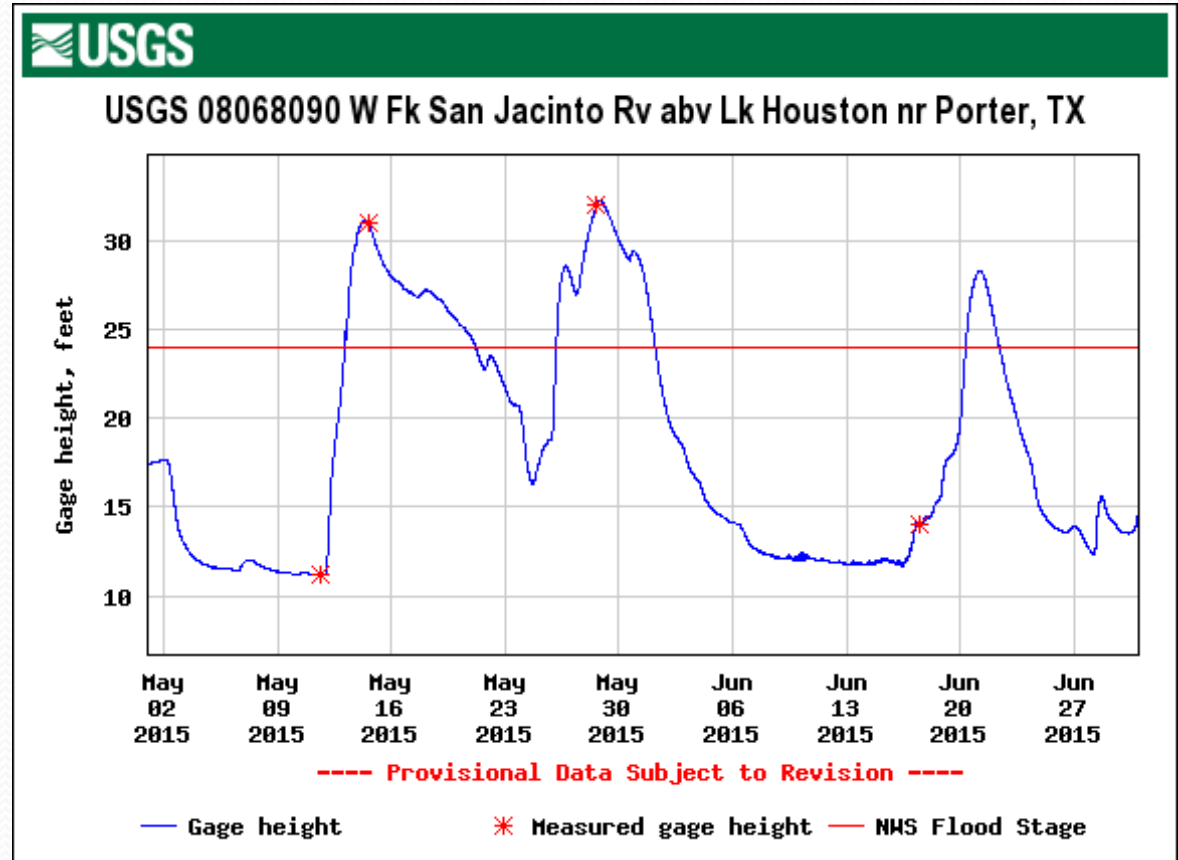
Crest 32.2 Feet (provisional)

June 20th – June 22nd

Moderate Flood June 20th – June 21st

Major Flood June 20th – June 21st

Crest 28.2 Feet (provisional)



Three(Four?)major flood events in less than 2 months!

West Fork San Jacinto at Humble

Above Flood Stage (49.3 Feet)

May 13th – May 16th

Moderate Flood May 14th – May 15th

Crest 50.5 Feet (provisional)

May 17th – May 18th

Crest 49.6 Feet

May 26th – June 1st

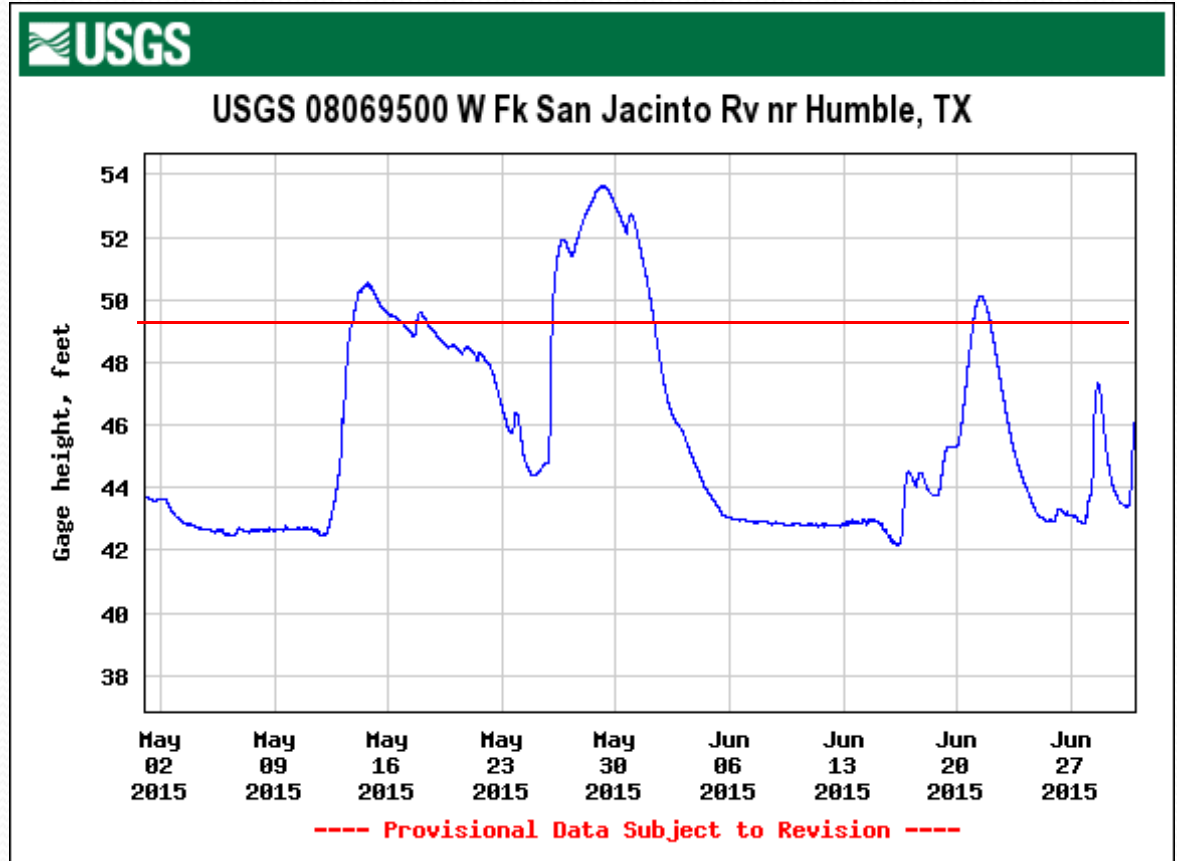
Moderate Flood May 26th – May 31st

Major Flood May 27th – May 31st

Crest 53.6 Feet

June 20th – June 21st

Crest 50.1 Feet



Four flood events from May 1st to June 30th.



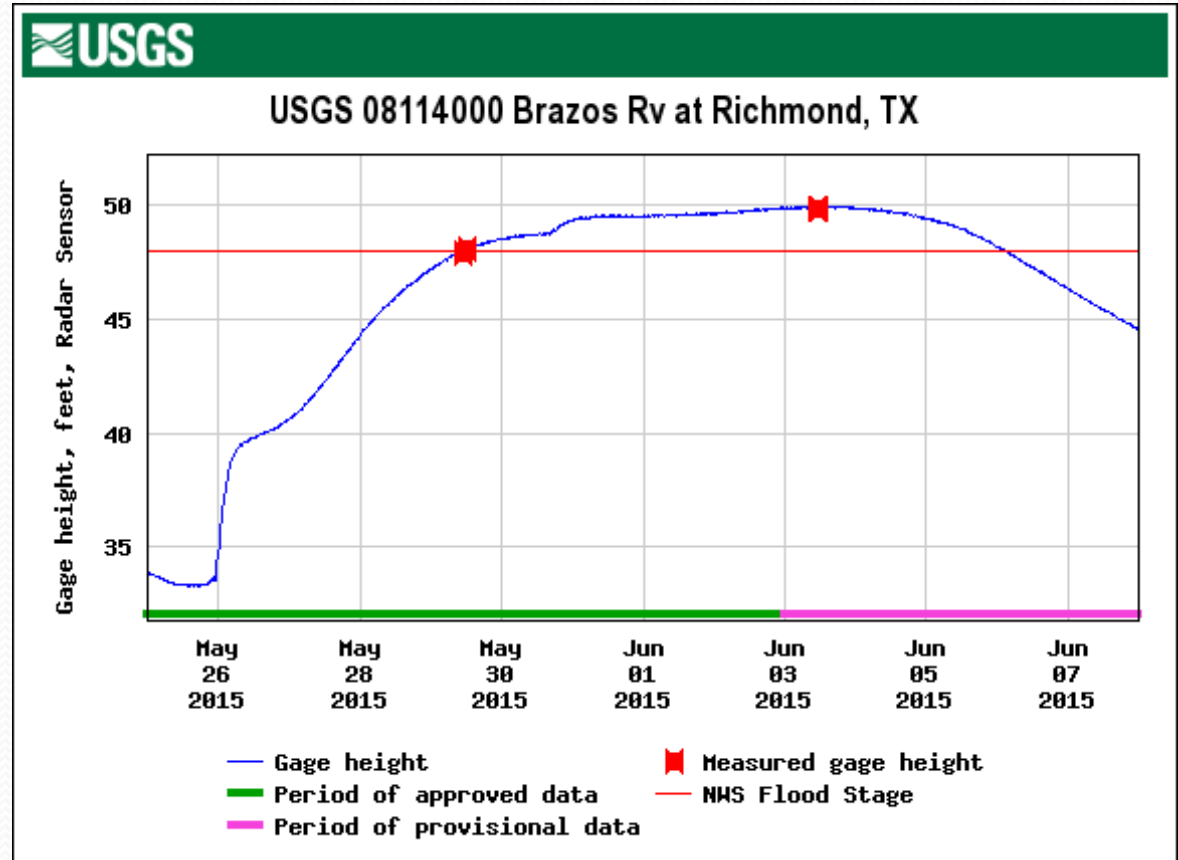
Brazos River at Richmond

Above Flood Stage (48 Feet)

May 29th – June 6th

Moderate Flood May 30th – June 5th

Crest 50.0 (49.97) Feet



Comparable to Christmas 1991 and October 1994 Floods

Brazos River near Rosharon

Above Flood Stage (43 Feet)

May 21st – May 23rd

Crest 44.1 Feet

May 26th – June 12th

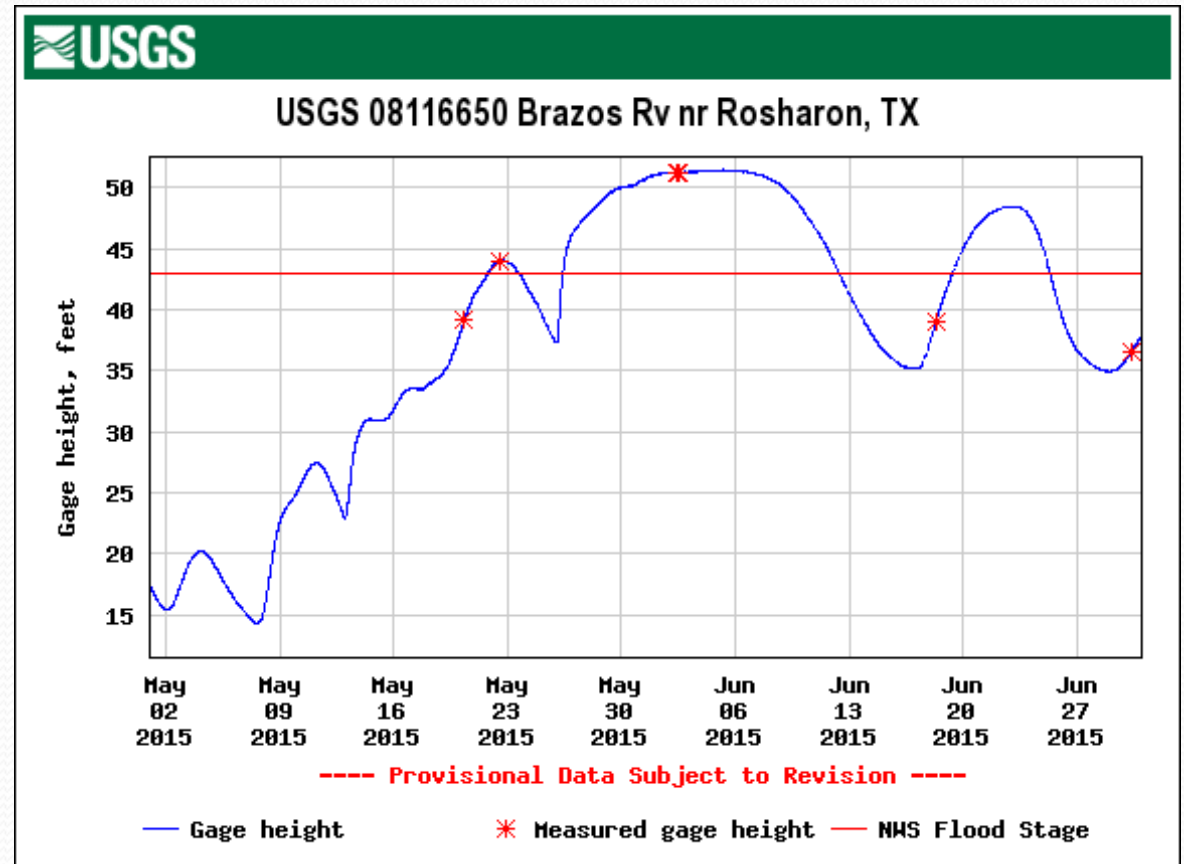
Moderate Flood May 27th – June 10th

Crest 51.5 Feet

June 19th – June 25th

Moderate Flood June 20th – June 24th

Crest 48.5 Feet



Comparable to Christmas 1991 and October 1994 Floods

Above Flood Stage (18 Feet)

March 10th

Crest 18.4 feet

March 12th – March 16th

Crest 22.0 feet

March 24th – March 26th

Crest 20.0 feet

April 17th – April 25th

Moderate Flood April 18th – April 24th

Crest 30.9 feet

April 27th – April 28th

Crest 20.3 feet

May 26th – June 5th

Moderate Flood May 26th – May 28th

May 31st – June 1st

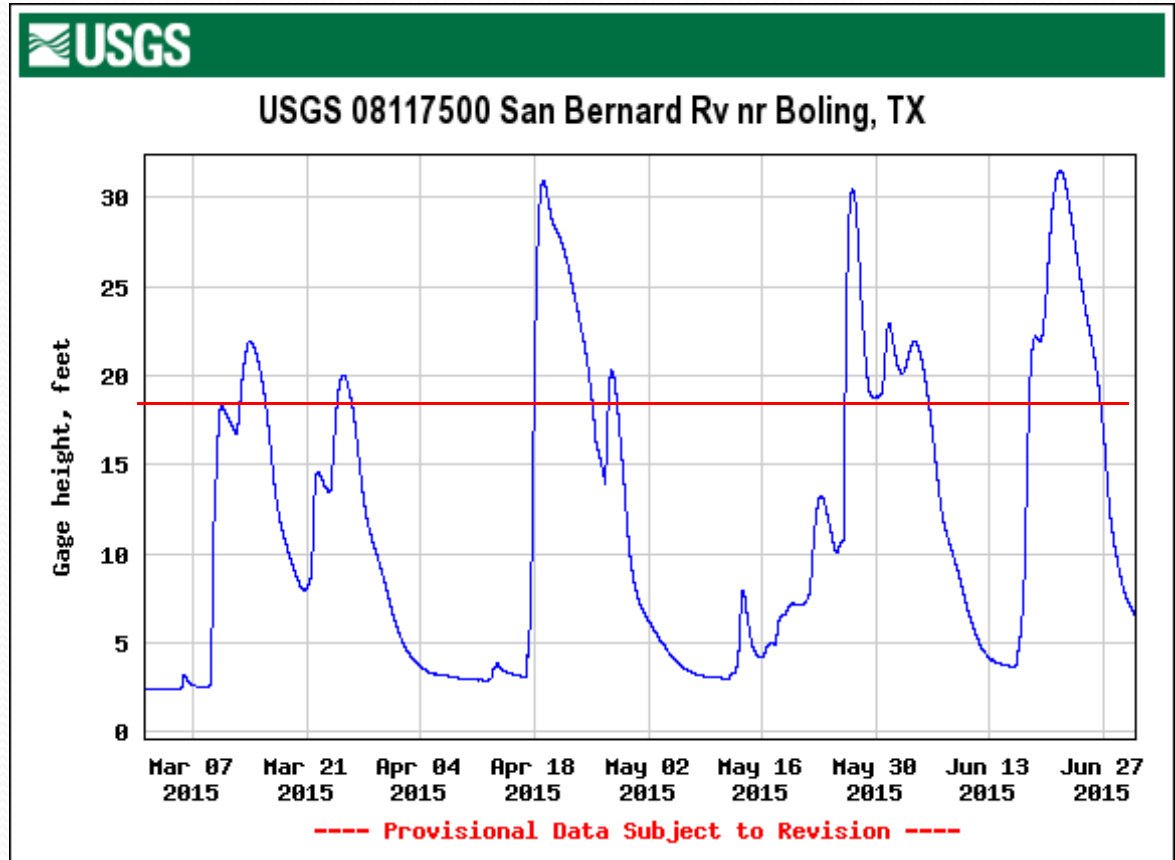
Crest 30.5 Feet

June 17th – June 26th

Moderate Flood June 18th – June 25th

Crest 31.5 feet

San Bernard River near Boling



Seven flood events between March 1st and June 30th!

West Mustang Creek near Ganado

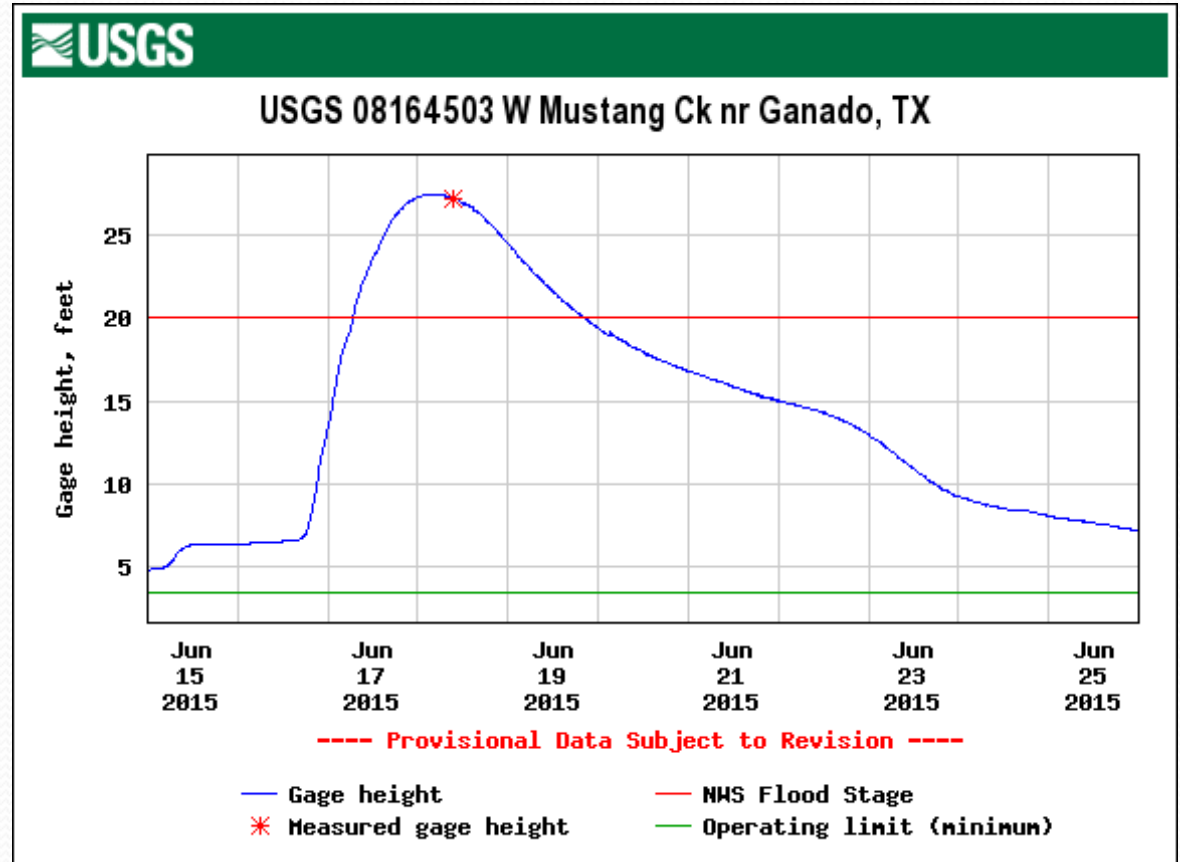
Above Flood Stage (20 Feet)

June 17th – June 21st

Moderate Flood June 17th – June 19th

Major Flood June 18th – June 19th

Crest 27.5 Feet



U.S. Highway 59 near the Wharton/Jackson County line was closed for several hours at West Mustang Creek.

The background of the slide features a series of overlapping, wavy lines in shades of blue and green, creating a sense of depth and movement. The lines are most prominent at the top and bottom edges, framing the central text.

Now What?



Lessons Learned/Action Items

- Quickly overwhelmed
 - Memorial Day Flood
 - 30 river flood warnings in 61/2 hours

Month	#FLWS*	%Verified
May	100	58%
June	37	78%

* Includes categorical change

Lessons Learned/Action Items

Rapid Response Watersheds

Sensor	Reading Date	Stream Elevation
2149	5/25/2015 11:00 PM	109.10'
2149	5/25/2015 10:50 PM	109.21'
2149	5/25/2015 10:45 PM	109.12'
2149	5/25/2015 10:25 PM	108.72'
2149	5/25/2015 10:25 PM	108.62'
2149	5/25/2015 10:15 PM	108.28'
2149	5/25/2015 10:10 PM	107.88'
2149	5/25/2015 10:05 PM	107.34'
2149	5/25/2015 10:05 PM	106.65'
2149	5/25/2015 10:00 PM	105.68'
2149	5/25/2015 9:50 PM	104.57'
2149	5/25/2015 9:50 PM	103.69'
2149	5/25/2015 9:35 PM	102.11'
2149	5/25/2015 9:30 PM	101.65'

South Mayde Creek,
Flood Stage 107 feet.
Non-flood to near
moderate flooding
(109 feet) in less than
30 minutes.

management officials when making decisions during flooding or other weather-related events.



Lessons Learned/Action Items

- Public learning curve due to datum changes at some locations
- Revise procedures for Harris County
 - Basin wide warnings
 - Channel Status Map
- Meet with Emergency Managers
 - Verify/Update Flood Stages
 - Verify/Update Impacts
 - Lake Creek Gage

Showing channel status at 10/25/2015 1:16 AM CDT

This map displays the Houston area with various channel status indicators. Green squares represent active channels, while red exclamation marks indicate closed channels. The map includes major highways such as I-10, I-25, I-45, and I-610, as well as local roads like Loop West and Loop East. Key locations labeled include Houston, The Woodlands, Spring Branch, and The Woodlands. The map also shows the Gulf of Mexico to the south and the Texas coastline to the east.

Trinity River near Riverside Impacts

Flood Impact Statement Trinity River near Riverside Walker County, Texas

IMPACT VALUE: 140.00 Feet

Major lowland flooding begins with widespread flooding in Trinity and Walker Counties. Water is in several homes in the Deep River Plantation and Green Rich Shores Subdivisions. Roads into several subdivisions in Walker and Trinity Counties and secondary roads along the river are inundated.

IMPACT VALUE: 137.00 Feet

Moderate lowland flooding begins as several homes in the Green Rich Shores Subdivision in Walker County flood and water covers Thomas Lake Road. The lowest buildings off FM 980 northwest of Riverside flood.

IMPACT VALUE: 136.00 Feet

The lowest homes in the Green Rich Shores Subdivision are flooded and Thomas Lake Road is threatened. Low roads in the Deep River Plantation Subdivision are inundated. The lowest roads into properties off FM 980 northwest of Riverside are inundated and the lowest buildings are threatened.

IMPACT VALUE: 135.00 Feet

Significant backwater up Thomas Lake floods the lowest areas in the Green Rich Shore Subdivision in Walker County with the boat ramp completely inundated. The lowest lying areas in the Deep River Plantation Subdivision and FM 980 northwest of Riverside are threatened.

IMPACT VALUE: 134.00 Feet

Minor lowland flooding begins with the boat ramp in the Deep River Plantation Subdivision in Walker County inundated. Backwater flooding up Thomas Lake in Walker County floods the boat ramp in the Green Rich Shores Subdivision in Walker County.

IMPACT VALUE: 133.00 Feet

Bankfull stage, water begins to overflow the main channel in the vicinity of the gage.

Trinity River near Riverside Impacts

Updated Flood Impact Statement Trinity River near Riverside Walker County, Texas

Impact Value: 140.0 Feet

Major lowland flooding begins with widespread flooding in Trinity and Walker Counties. Water is in numerous homes in the Deep River Plantation and Green Rich Shores Subdivisions. Roads into several subdivisions in Walker and Trinity Counties and secondary roads along the river are inundated.

Impact Value: 138.0 Feet

Moderate lowland flooding continues with water 3 to 4 feet below the State Highway 19 Bridge and Plantation Drive near FM 230 is inundated. FM 2978 is flooded and impassable. Up to one foot of water is flowing over Thomas Lake Road which remains impassable. Several roads into the Green Rich Shores and Deep River Plantation subdivisions remain inundated and impassable. Many home in the Green Rich Shore subdivision have up to one foot of water and homes in the Deep River Plantation subdivision are threatened.

Impact Value: 137.0 Feet

Moderate lowland flooding continues as several homes in the Green Rich Shores Subdivision in Walker County flood and water covers Thomas Lake Road. The lowest buildings off FM 980 northwest of Riverside flood.

Impact Value: 136.8 Feet

Moderate lowland flooding continues as the approaches to the FM 3978 bridge upstream of the gage are inundated and impassable. The lowest homes in the Green Rich Shores subdivision are flooded with up to one half foot of water. Thomas Lake Road remains flooded and the lowest roads into properties off FM 980 are inundated and impassable.

Impact Value: 136.00 Feet

Moderate lowland flooding begins in the vicinity of the gage. The lowest homes in the Green Rich Shores Subdivision are flooded and Thomas Lake Road is inundated and impassable. Low roads in the Deep River Plantation Subdivision are inundated. The lowest roads into properties off FM 980 northwest of Riverside are inundated and the lowest buildings are threatened.

Impact Value: 135.0 Feet

Minor lowland flooding continues as significant backwater up Thomas Lake floods the lowest areas in the Green Rich Shores subdivision with the boat ramp completely inundated. The lowest lying areas in the Deep River Plantation subdivision and FM 980 northwest of Riverside are threatened.

Impact Value: 134.0 Feet

Minor lowland flooding continues with the boat ramp in the Deep River Plantation subdivision inundated. Backwater flooding up Thomas Lake in Walker County floods the boat ramp in the Green Rich Shores subdivision.

Impact Value: 133.50 Feet

Minor lowland flooding begins in the vicinity of the gage with water in the Green Rich Shores subdivision. Backwater flooding up Wright's Creek impacts Plantation Drive in the Deep River Plantation subdivision.

Impacts Value: 132.0 Feet

Bankfull stage, water begins to overflow the main channel in the vicinity of the gage.

Action Stage lowered from 133.0 feet to 132.0 feet.

Minor flood stage lowered from 134.0 feet to 133.5 feet.

Moderate flood stage lowered from 137.0 feet to 136.0 feet.

West Fork San Jacinto River near Porter Impacts

Flood Impact Statement West Fork San Jacinto River near Porter Montgomery County, Texas

IMPACT: 28.00 Feet

Major lowland flooding begins with water over the road near the gage.

IMPACT: 26.00 Feet

Moderate lowland flooding begins.

IMPACT: 24.00 Feet

Minor lowland flooding begins.



West Fork San Jacinto River near Porter Impacts

Post flood surveys indicated
flood levels set way to low.

Preliminary new levels:

Action Stage ~26.8 feet

Minor Flood ~33.0 feet

Moderate flood ~37.0 feet

Major Flood ~48.72 Feet

Anticipate datum change at
location.

Flood Impact Statement West Fork San Jacinto River near Porter Montgomery County, Texas

IMPACT: 28.00 Feet

Major lowland flooding begins with water over the road near the gage.

IMPACT: 26.00 Feet

Moderate lowland flooding begins.

IMPACT: 24.00 Feet

Minor lowland flooding begins.

Brazos River in Richmond Impacts

Flood Impact Statement Brazos River at Richmond Fort Bend County, Texas

Impact Value: 50.0 Feet

Major lowland flooding begins as homes in Richmond begin to flood and many homes in Simonton and Thompsons have water in them. Homes in the Oyster Creek Farms subdivision have water in them due to significant flooding up Flat Bank Creek and there is major flow across the flood plain into Oyster Creek near Harris Reservoir and the Ramsey Unit Prison Farm.

Impact Value: 49.0 Feet

Moderate lowland flooding begins in the vicinity of the gage. Massive lowland flooding occurs with many homes in Simonton and Thompsons flooded. There is major flow across the flood plain into Oyster Creek near Harris Reservoir and the Ramsey Unit Prison Farm.

Impact Value: 48.0 Feet

Minor lowland flooding begins in vicinity of gage with homes threatened upstream in Simonton and downstream in Thompsons. Water passes through the flood plain and enters Oyster Creek north of Harris Reservoir. |

Impact Value: 47.60 Feet

Water is in the Simonton area upstream from the gage and enters Oyster Creek through culverts and through the flood plain north of Harris Reservoir.

Impact Value: 46.10 Feet

Minor flow passes into Oyster Creek through culverts and water is very close to passing through flood plain just north of Harris Reservoir into Oyster Creek.

Brazos River in Richmond Impacts

Minor flood stage lowered from 48.0 feet to 45.0 feet.

Moderate flood stage lowered from 49.0 feet to 48.0 feet.

Updated Flood Impact Statement Brazos River at Richmond Fort Bend County, Texas

Impact Value: 50.0 Feet

Major lowland flooding begins as homes in Richmond begin to flood and many homes in Simonton and Thompsons have water in them. FM 1458 near FM 1093 in Austin County remains inundated and closed. Strange Drive, Greenwood Drive, and 2nd Street in Richmond; 6th Street, Avenue B, and River Road in Rosenberg; and Pittman Road in Thompsons are inundated with over one foot of water. Homes along Carrol and McKeever Roads in southeast Fort Bend County are close to taking water.

Impact Value: 49.0 Feet

Moderate lowland flooding continues with widespread inundation of the flood plain. Homes in Simonton and Thompsons flooded. FM 1458 near FM 1093 in Austin County is closed with close to one foot of water over the road. Six inches to one foot of water covers Strange Drive, Greenwood Drive, and 2nd Street in Richmond and 6th Street, Avenue B, and River Road in Rosenberg. Pittman Road in Thompsons is inundated and homes on Carrol and McKeever Roads near FM 2759 in southeast Fort Bend County are threatened.

Impact Value: 48.0 Feet

Moderate lowland flooding begins in vicinity of gage with homes threatened upstream in Simonton and downstream in Thompsons. Strange Drive, Greenwood Drive, and 2nd Street in Richmond and 6th Street, Avenue B, and River Road in Rosenberg are inundated. FM 1458 near FM 1093 in Austin County has close to one half foot of water over the road.

Impact Value: 47.00 Feet

Minor lowland flooding continues as the Brazos River begins filling Frydek Bottom upstream of Valley Lodge. Gates are closed and pumping continues in Simonton and FM 1458 near FM 1093 in Austin County is inundated. Baudet Road and Red Bird Lane have close to one foot of water over them.

Impact Value: 46.00 Feet

Minor lowland flooding continues with water in the Simonton area upstream of the gage. Simonton closes their gates and pumping begins. Water is over Baudet Road southeast of Richmond and Red Bird Lane in Fulshear. Significant portions of the flood plain near Thompsons are inundated requiring relocation of cattle out of low lying areas. FM 1458 near FM 1093 in Austin County is threatened. The U.S. Highway 59 turnaround is inundated.

Impact Value: 45.0 Feet

Minor lowland flooding begins as water escapes the main channel below the gage. Livestock operations near Thompsons are affected and precautions should be taken to protect cattle, including potential relocation in low lying areas. Baudet Road southeast of Richmond and Redbird Lane in Fulshear are threatened. The southbound U.S. Highway 59 turnaround is threatened.

BRAZOS RIVER NEAR ROSHARON IMPACTS

Flood Impact Statement Brazos River near Rosharon Fort Bend County, Texas

Impact Value: 55.0 Feet

Major lowland flooding begins in the vicinity of the gage with widespread inundation of the flood plain.

Impact Value: 50.80 Feet

Moderate lowland flooding continues as minor flow passes through the culvert near the Ramsey Unit Prison Farm into Oyster Creek and water flows over the flood plain into Oyster Creek.

Impact Value: 47.0 Feet

Moderate lowland flooding begins in the vicinity of the gage.

Impact Value: 43.0 Feet

Minor lowland flooding begins in vicinity of gage as flow escapes the main channel.

BRAZOS RIVER NEAR ROSHARON IMPACTS

Updated Flood Impact Statement Brazos River near Rosharon Brazoria County, Texas

Impact Value: 52.0 Feet

Major lowland flooding continues in the vicinity of the gage with massive inundation of the Brazos River and Oyster Creek flood plains below FM 1462. Homes in the Columbia Lakes, Mallard Lakes, and Great Lakes subdivisions near West Columbia begin flooding.

Impact Value: 51.3 Feet

Major lowland flooding begins in the vicinity of the gage with up to one half foot of water flowing over FM 1462 between the Brazos River and Oyster Creek. River Oaks Road in Fort Bend County as well as County Road 25, County Road 380A and County road 42 in Brazoria County remain flooded and impassable. The wilderness Golf Course in Lake Jackson begins flooding. The bridge over Cow Creek at County Road 25 is flooded and impassable and water is one to two feet under homes along Cow Creek. Roads into the Columbia Lakes, Mallard Lakes, and Great Lakes subdivisions near State Highway 35 and County Road 25 near West Columbia roads into the Mallard Lakes subdivisions are inundated and homes are threatened.

Impact Value: 50.8 Feet

Moderate lowland flooding continues water flows over the flood plain into Oyster Creek. FM 1462 at Oyster Creek east the gage in Brazoria County is inundated. River Oaks Road in Fort Bend County as well as County Road 25 and County Road 380A in Brazoria County remain flooded and impassable. County Road 42 upstream of the gage in Brazoria County is inundated with close to one half foot of water.

Impact Value: 50.5 Feet

Moderate lowland flooding continues as County Road 42 in Brazoria County upstream of the gage is inundated. River Oaks Road in Fort Bend County and the bridge over Cow Creek at County Road 25 in Brazoria County remain flooded and impassable. County Road 380A near Damon in Brazoria County is inundated with one half to one foot of water and is impassable.

Impact Value: 49.6 Feet

Moderate lowland flooding continues with River Oaks Road in the Pecan Bend Subdivision in Fort Bend County is flooded and impassable. The bridge over Cow Creek at County Road 25 in Brazoria County is flooded and impassable. County Road 380A near Damon in Brazoria County is inundated.

Impact Value: 48.5 Feet

Moderate lowland flooding continues as the bridge over Cow Creek at County Road 25 in Brazoria County is flooded. River Oaks Road in the Pecan Bend subdivision in Fort Bend County is inundated with close to one half foot of water.

Impact Value: 48.0 Feet

Moderate lowland flooding continues as water covers River Oaks Road in Pecan Bend Subdivision in Fort Bend County and County Road 25 at Cow Creek in Brazoria County.

Impact Value: 47.0 Feet

Moderate lowland flooding begins in the vicinity of the gage.

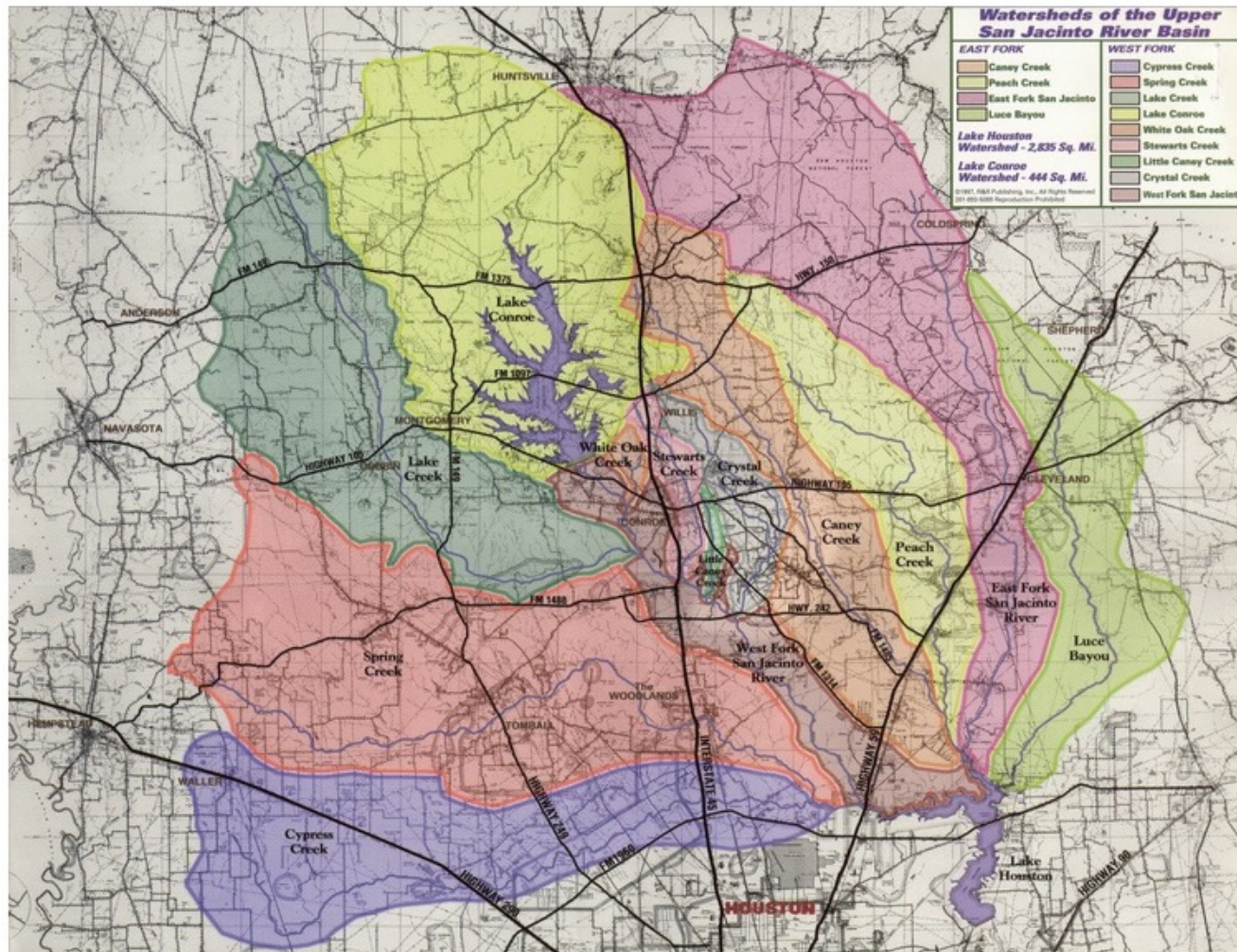
Impact Value: 46.5 Feet

Minor lowland flooding continues as Brazos Bend State Park is closed to the public.

Impact Value: 43.0 Feet

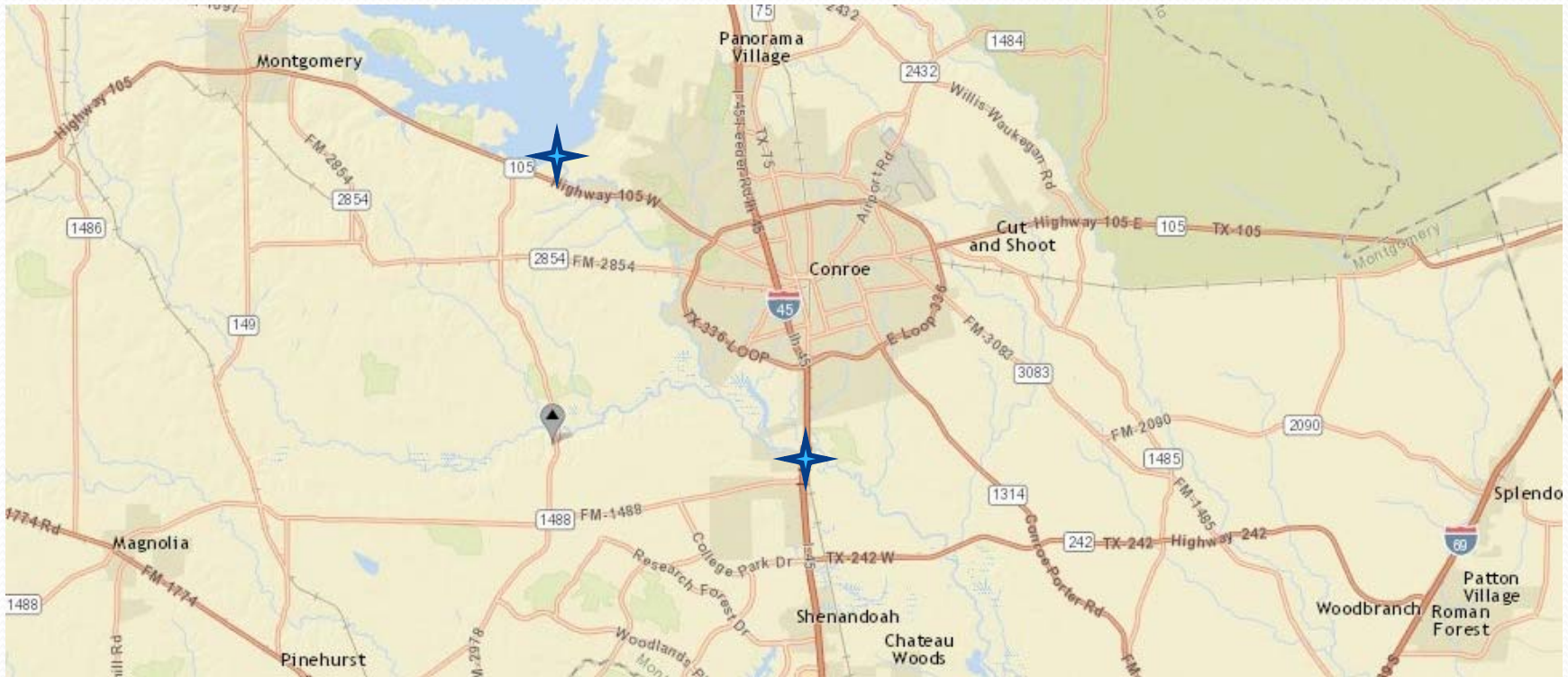
Minor lowland flooding begins in vicinity of gage as flow escapes the main channel. Cattle should be removed from low areas in the flood plain.

Major flood stage lowered from 55.0 feet to 51.3 feet.



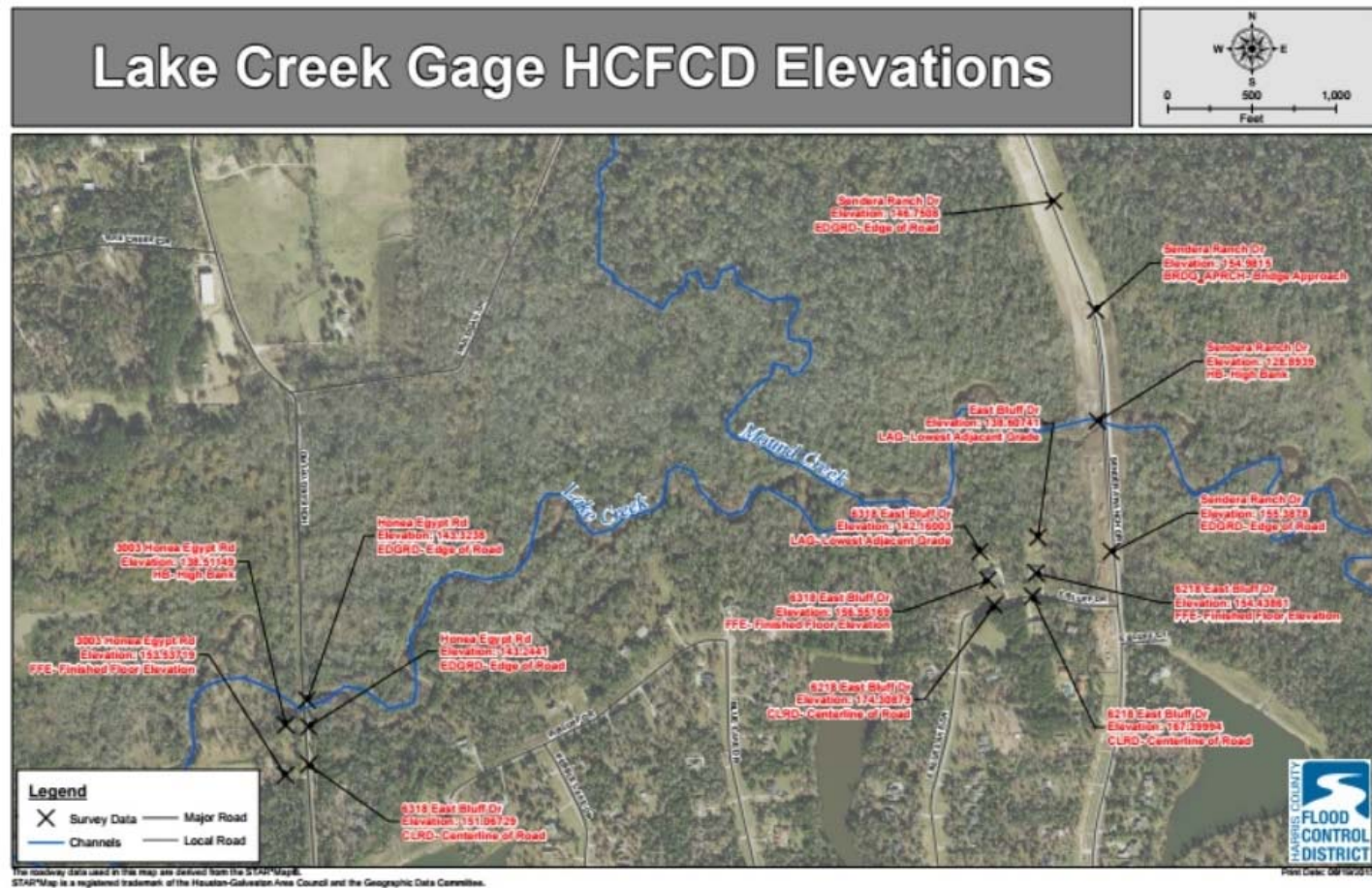


New Gaging



Lake Creek @ Sendera Ranch Road

Lake Creek @ Sendera Ranch Road



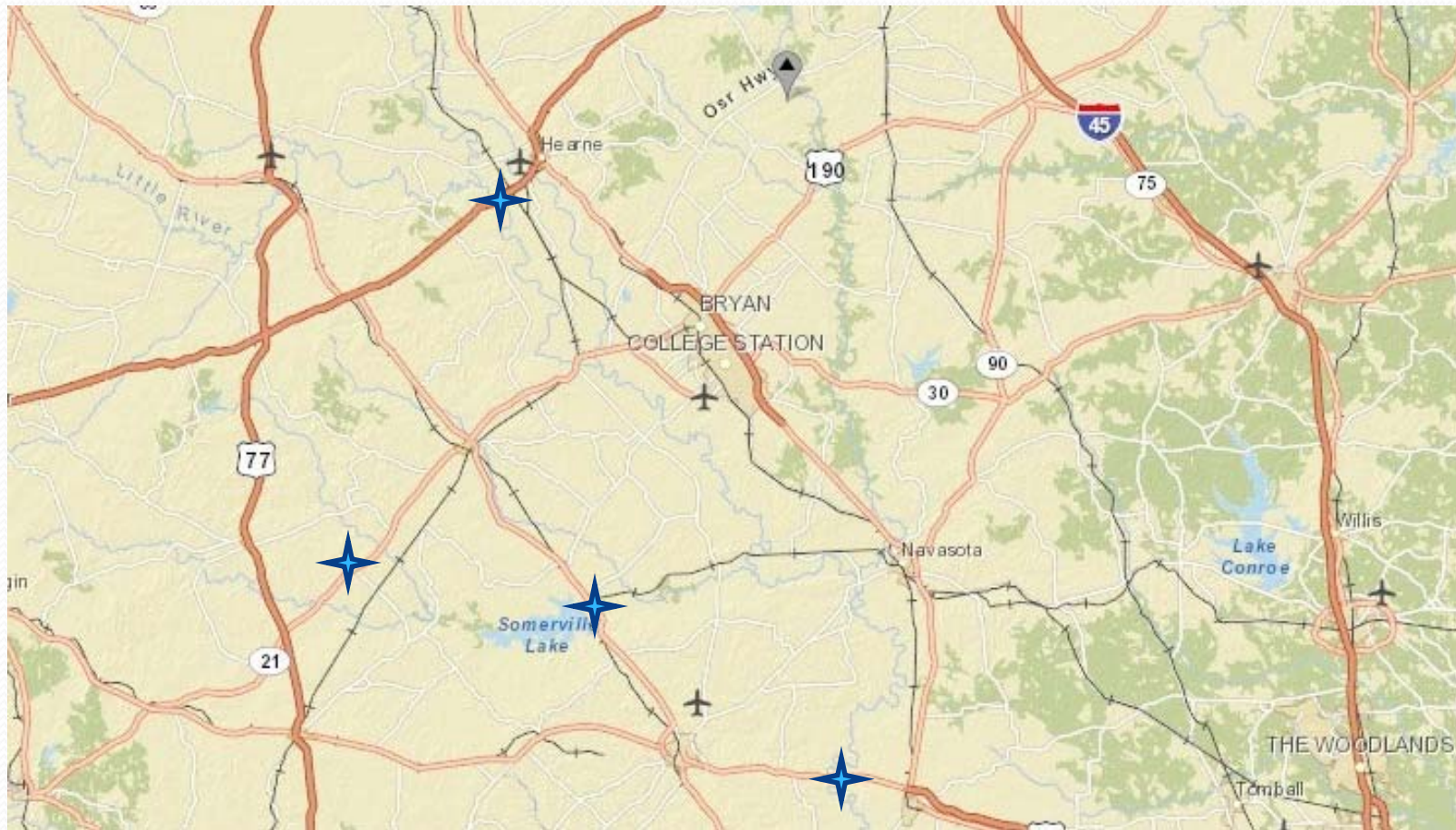
Action Stage 128.9 Feet

Minor Flood Stage 138.6 feet

Moderate Flood Stage 142.2 Feet

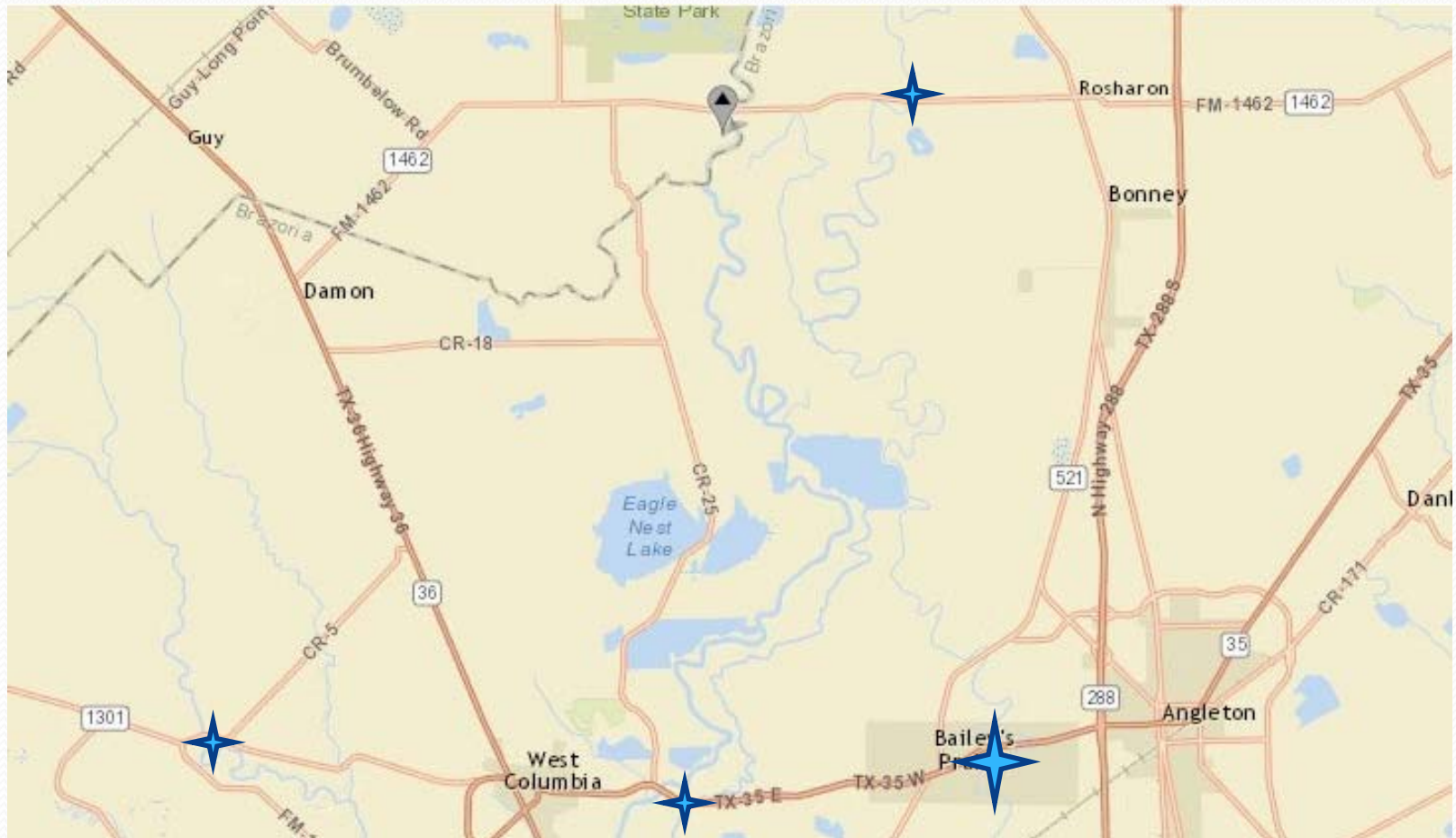
Major Flood Stage 154.4 Feet

Potential New Gaging



Brazos/Grimes Counties

Potential New Gaging



Brazoria County



Questions?

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