Introduction:

Multiple heavy rain events over the Southern Plains of the United States during the late spring and early summer of 2015 resulted in major flooding along the Lower Red River and its major tributaries. In the neighboring cities of Shreveport and Bossier City, the river flooded for the first time in twenty-five years, and rose to levels not experienced since 1945 before cresting in early June. A second flood wave arrived with Tropical Strom Bill, which brought more heavy rainfall and renewed flooding along the Red River that continued into early July. On average, the Red River at Shreveport rises to 33 feet (Major Flood stage) once in a 35-year period.¹ During and after the flood, some members of the public and emergency management community expressed frustration and confusion with the forecasts. We will examine the impacts of the flood in the Shreveport-Bossier area, how the flooding threat was communicated to the general public and core partners as well as feedback received from local decision makers.



NWS Southern Region: Current 60-Day Observed Precipitation Valid at 7/9/2015 1200 UTC- Created 7/9/15 18:34 UTC





Figure 2: Maps showing 60-Day Observed Precipitation and Percent of Normal Precipitation across the South Central United States for the period from May 10-July 8, 2015. Notice the axis of high rainfall totals from the Red River in North Central Texas/South Central Oklahoma northeastward into East Central Oklahoma.

The Red River Flood of 2015: Communication and Impacts

Nuttall C., Palmer C. K., Parker, W. National Oceanic and Atmospheric Administration, National Weather Service-Shreveport, LA

Figure 1: A map of the NWS Shreveport County Warning Area. Gold represents the counties and parishes that contain the Red River. The green parish indicates Caddo Parish where Shreveport is located, and the Red Parish indicates Bossier Parish where







Figure 3: Clockwise from upper-left: The flooded Red River flowing through downtown Shreveport-Bossier City; Westbound lanes of Interstate 220 submerged just east of the Red River bridge; floodwaters in and near homes in the River Bluff Subdivision in north Bossier City (portions of the levee system are visible on the right); flooding at a wastewater treatment plant in south Shreveport. Photos are courtesy of the Caddo Parish Sheriff's Office of Homeland Security and Emergency Preparedness.

Impacts:

- The Red River at Shreveport crested at 37.14 feet (Major Flood) on June 10, 2015, with a secondary crest of 31.05 feet (Minor Flood) on June 30 following Tropical Storm Bill.
- Several high traffic roadways were partially or totaled submerged, including the westbound lanes of Interstate 220 in Bossier City.
- Floodwaters rose to within 2 feet of overtopping one portion of the levee.
- Wastewater treatment plants in Bossier and Caddo Parishes would have been compromised without sandbagging and pumping efforts.
- Over 190 homes were affected. The hardest hit areas included the Martin Luther King, Jr. and Allendale subdivisions in Shreveport and the River Bluff subdivision, Cash Point RV Park, and Red River South Marina areas in Bossier City.
 - river-side of the levee system.
- \$8.2 million in property damages in Caddo Parish and \$5.6 million in Bossier Parish.





• River Bluff, Cash Point RV Park, and Red River South Marina were built on the

Figure 4: A hydrograph for the Red River at Shreveport depicting the rise and primary crest of the river. Notes on the graph indicate the issuance of the first Flood Warning (May 20th) and the issuance of the final crest forecast (June 7th) of 37.0 feet. The forecast crest rose several times between May 31st and the crest on June 10th.

Communication:

NWS Shreveport produced and updated a graphic depicting current stage levels and crest forecasts several times a day, publishing this graphic on our web and social media pages. Forecasters briefed emergency managers and government officials, including the Governor of Louisiana, on a daily basis at Emergency Operations Centers in Bossier and Caddo Parishes. Email updates were sent to local officials at least twice daily.

Elected officials expressed frustration and were critical of the NWS because several upward adjustments were made to the crest forecast. Why did the crest forecast increase so many times? First, heavy rains kept falling upstream. As the water rose, it was apparent the river's rating curve was unrepresentative, and corrections were needed. Inflow into Shreveport was comparable to the flood of 1990, but waters rose over three feet higher. Why?

- eliminated large portions of the flood plain.
- changed the structure of the channel itself.



Figure 5: The river fronts of Downtown Shreveport and Bossier City during the 1990 flood. Notations indicate present-day development along the Red **River. Photo is courtesy KTBS-3**².

What Did We Learn:

NWS-Shreveport hosted an after-action review with local officials. Discussion centered on communication of the crest forecast, what methods worked, and suggestions for improvement. • All partners agreed that presentation of hydrographs and in-person briefings were extremely important. In-person briefings were preferred over the daily emails.

References:

¹Ethridge, E. and C. S. Ross, 1995: Concerning the Red River. NWS Internal Report. ²KTBS-3, 2015: Red River Flood of 1990 revisited. Accessed 28 December 2015. [Available online at http://www.ktbs.com/story/28398931/red-river-flood-of-1990-revisited.]



 Considerable commercial and residential development in Downtown Shreveport and Bossier City along the river since the 1990 flood narrowed the river channel and altered or

• Build-up of silt and sand from previous high water events over the previous 25 years

 Several jetties constructed to keep the main river channel from silting in caused a secondary constriction of the river south of Shreveport.

• A series of lock-and-dams built in the mid 1990s to make the river navigable for shipping to Shreveport may be a factor in the silting as well, but the full effects are unknown.

Figure 6: The river fronts of Downtown Shreveport and Bossier City in 2009. The same structures notated in Figure 5 are shown here in their present-day locations. Photo is courtesy of the City of Bossier City.

• Some confusion between the terms "pool stage", "river stage", "elevation", and "crest." • Participants were asked if attaching a confidence level to the forecast would have been helpful, but no definitive responses were received.

• Some partners wanted a "margin-of-error" display on hydrographs.

• Some partners wanted the "worse-case scenario" in addition to the "most-likely" forecast. • Customers indicated interactive inundation maps at various river stages would be useful.

Contributions:

Thanks to Tony Hurt and Julianna Glinskas for providing the hydrograph/flood warning timeline graphic.