

<b>NWS FORM E-5</b> (11-88) (PRES. by NWS Instruction 10-924)	<b>U.S. DEPARTMENT OF COMMERCE</b> NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL WEATHER SERVICE	HYDROLOGIC SERVICE AREA (HSA) <b>Tulsa, Oklahoma (TSA)</b>
		REPORT FOR: MONTH                      YEAR <b>September              2008</b>
<b>MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS</b>		SIGNATURE <b>Steven F. Piltz</b> (Meteorologist-in-Charge)
TO:      Hydrometeorological Information Center, W/OH2 NOAA / National Weather Service 1325 East West Highway, Room 7230 Silver Spring, MD 20910-3283		DATE <b>October 2, 2008</b>

*When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (NWS Instruction 10-924)*

Normal rainfall for September ranges from 4.2 inches in Okmulgee County to 5.4 inches in Delaware County. In the Ozark region of northwest Arkansas, rainfall averages 4.5 inches for the month. The first half of September 2008 was marked by significant rainfall from three tropical systems. Monthly average rainfall values were reached within the first few days of September 2008 across the eastern half of the HSA due to the remnants of Hurricane Gustav (see below for the specific details on the rainfall and flooding from Hurricane Gustav). Following Gustav, early morning convection affected the far northern portion of the HSA on both September 6<sup>th</sup> and 7<sup>th</sup>, bringing a total of 0.5 to 1 inch, with isolated higher amounts, north of a Pawnee, OK to Bentonville, AR to Huntsville, AR line. The highest rainfall affected Pawnee County, where rainfall totals were around 3 inches.

As moisture associated with Tropical Depression Lowell in the Eastern Pacific streamed into the Southern Plains, scattered showers and thunderstorms affected the area on the 9<sup>th</sup> – 10<sup>th</sup> ahead of Hurricane Ike. Rainfall during this time was generally less than half an inch with isolated higher amounts to around 3 inches. A stationary front interacting with Lowell’s moisture brought heavy rainfall across Kansas into north central OK on the 11<sup>th</sup>-12<sup>th</sup>. While the heaviest precipitation remained just northwest of the HSA, widespread rainfall of 0.75 inches and isolated areas of 2 inches fell along and north of the Interstate 44 corridor on the 11<sup>th</sup>. This stationary front moved into northeast OK as a cold front at about the same time Tropical Storm Ike moved into southeast OK and west central AR. The Arkansas River near Ralston reached minor flood stage due to the heavy rainfall from the nearly stationary front (refer to the E-3 report for details). Tropical Storm Ike, which followed a path similar to that of Gustav, moved through the region on the 13<sup>th</sup> -14<sup>th</sup>, bringing additional heavy rainfall to the area (please see below for the specific details concerning the rainfall and flooding from Ike). The second half of September was dry, the complete opposite of the first half of the month, with only a day or two with a few light isolated showers in the higher terrain areas of the HSA.

Using the observed precipitation (Fig. 1a) and percent of normal (Fig. 1b) graphics from the ABRFC, one can see that the majority of the rainfall this month affected the far northern portion as well as the eastern half of the HSA. Far eastern OK and western AR ended the month 150% to near 300% of normal for September. Of note, 8.11” of rain fell at Fort Smith, AR (FSM), making this September the 4<sup>th</sup> wettest since records began in 1882. Conversely, the western portion of the HSA had below normal precipitation, with some areas only receiving 75% to near 50% of the monthly normal.

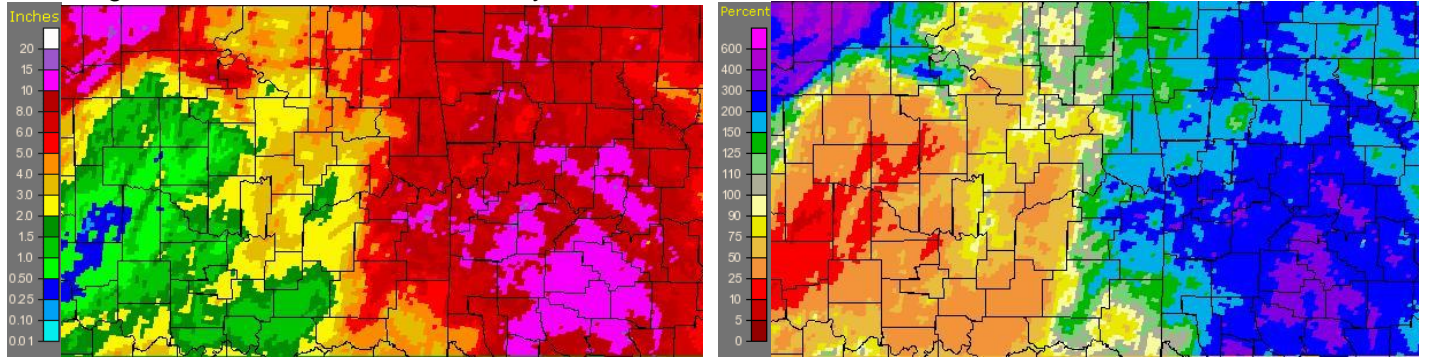


Fig. 1a. September 2008 Observed rainfall (ABRFC)      b. September 2008 Percent of Normal rainfall (ABRFC)

Despite a very wet start to the month, the northeast OK climate division ranked as the 33<sup>rd</sup> wettest September (records began in 1921); the east central OK division ranked as the 32<sup>nd</sup> wettest; and the southeast OK ranked as the 25<sup>th</sup> wettest, according to the Oklahoma Climatological Survey (OCS). However, year-to-date values (Jan 1-Sep 30, 2008) were still high, with the northeast OK division still ranked as the wettest year-to-date period on record with 49.02" (16.58" above normal!); the east central OK division ranked 6<sup>th</sup> wettest with 45.28"; and the southeast OK division ranked 8<sup>th</sup> wettest with 47.09". For the water year October 1, 2007 through September 30, 2008, the northeast OK climate division ranked 5<sup>th</sup> wettest with 57.05"; the east central OK division ranked 12<sup>th</sup> wettest with 52.83"; and the southeast OK division ranked 15<sup>th</sup> wettest with 56.70".

Some of the larger precipitation reports (in inches) for the month included:

Eureka Springs, AR 3WNW (coop)	10.82	Wister, OK (mesonet)	10.52	Fanshawe, OK (coop)	10.37
Spiro, OK (mesonet)	9.29	Fayetteville, AR (ASOS)	9.24	McCurtain, OK 1SE (coop)	9.21
Pawnee, OK (coop)	8.89	Greenwood, AR (coop)	8.57	Midland, AR (coop)	8.45

At the end of September, most of the major reservoirs were around 100 percent of their conservation pool. However, Pensacola Dam was at 22% of its flood pool; Oologah Lake was at 20% of its flood pool; Kaw Lake was at 12% of its flood pool; and Heyburn Lake was at 80% of its conservation pool.

The U.S. Drought Monitor (USDM) issued September 30, 2008 showed no drought in the HSA. The Climate Prediction Center (CPC) outlook for both the October (issued Sep 30) and the Oct-Nov-Dec 3-month period (issued Sep 18) shows an equal chance for above, near, and below normal temperatures and precipitation.

**Effects of Hurricane Gustav on Eastern Oklahoma and Northwest Arkansas**

The beginning of September 2008 was marked by the remnants of Hurricane Gustav, which moved through the Gulf of Mexico and made landfall in Louisiana on September 1 (Labor Day). Gustav then slowly moved to the northwest, spreading heavy rain into the Tulsa HSA beginning on September 2. From 7am on the 2<sup>nd</sup> through 7am on the 3<sup>rd</sup>, locations east of a Hugo, OK to Bentonville, AR line received 1.5 inches to over 8 inches of precipitation from the tropical system, with lesser amounts across the remainder of the area (see Fig. 2a). The heaviest rainfall during this time frame fell across Haskell, Latimer, Le Flore, and Sebastian Counties, where widespread 24-hour totals ranged from 3 to over 8 inches (Fig. 2a). Fort Smith, AR (FSM ASOS) recorded a record 24-hour rainfall for September of 5.20", breaking the old 24-hour record for the month of September of 3.95".

The center of Tropical Depression Gustav was located at the intersection of the state borders of Oklahoma, Texas, and Arkansas on the morning of the 3<sup>rd</sup> (see Fig. 3), then slowly moved to the northeast, exiting the HSA by early on the 4<sup>th</sup>. As rain continued to fall during much of the day on the 3<sup>rd</sup> (Fig. 2b, and Fig. 3), flash flooding occurred across east central OK, west central AR, and northwest AR, primarily affecting low-lying areas, such as low-water crossings. Despite receiving 1.5 to around 5 inches of rainfall during the day on the 3<sup>rd</sup>, significant flooding problems did not occur since overall the rainfall was slow and steady, although a number county roads were damaged. In addition to the minor flash flooding, the Poteau River near Panama reached its moderate flood stage on the morning of September 4<sup>th</sup> (see Fig. 4 and refer to the E-3 report for additional information).

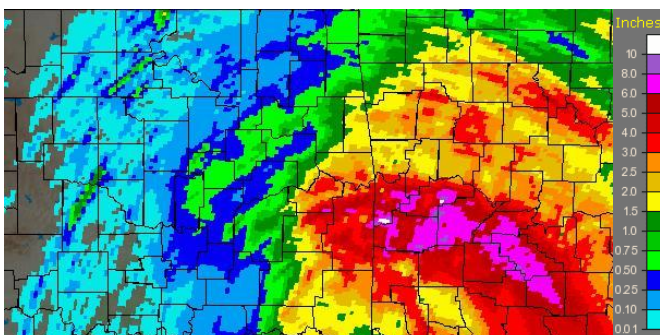


Fig. 2a. 24 hour Observed Precipitation from 7am CDT 09/02/08 through 7am CDT 09/03/08 (ABRFC)

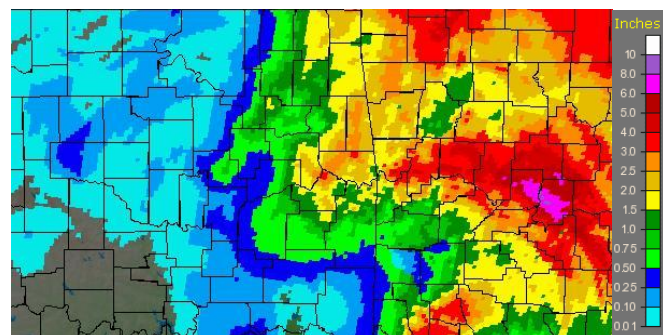


Fig. 2b. 24 hour Observed Precipitation from 7am CDT 09/03/08 through 7am CDT 09/04/08 (ABRFC)



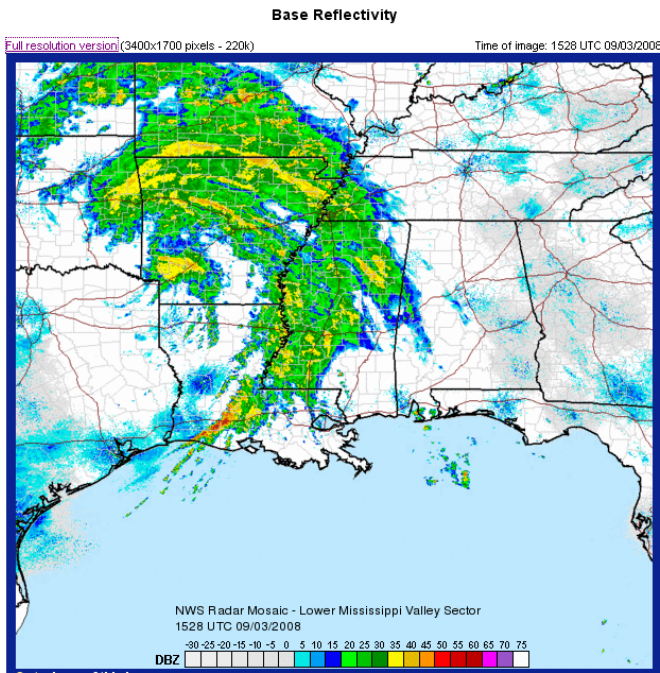


Fig. 3. Radar image from 1528 UTC 09/03/08. The center of Gustav is located near the intersection of the OK, AR, and TX state lines.

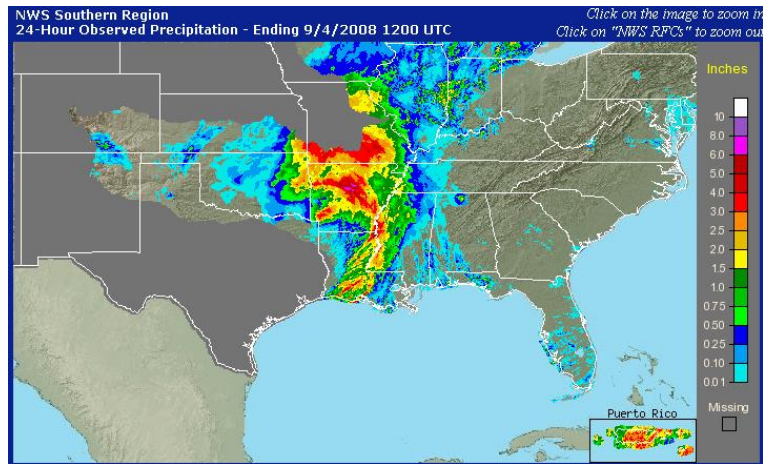


Fig 5a. 24 hour rainfall ending at 7am 09/04/08

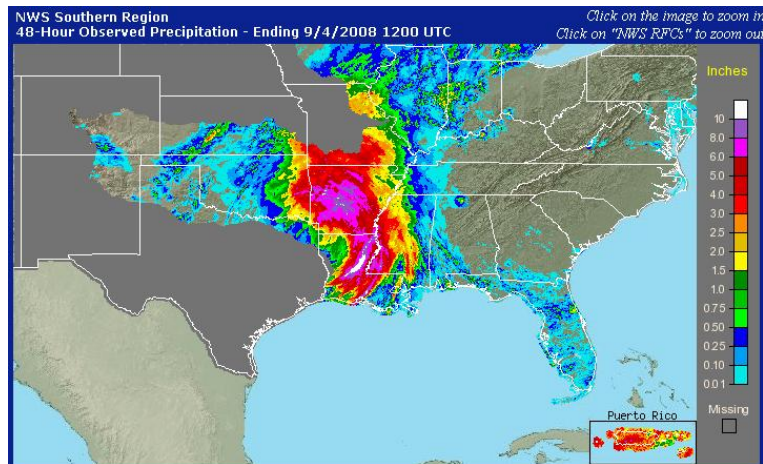


Fig. 5b. 48 hour rainfall ending at 7am 09/04/08

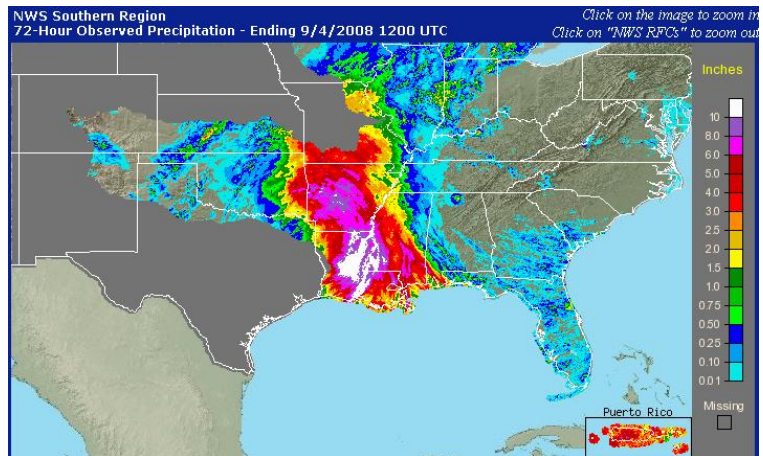


Fig 5c. 72 hour rainfall ending at 7am 09/04/08

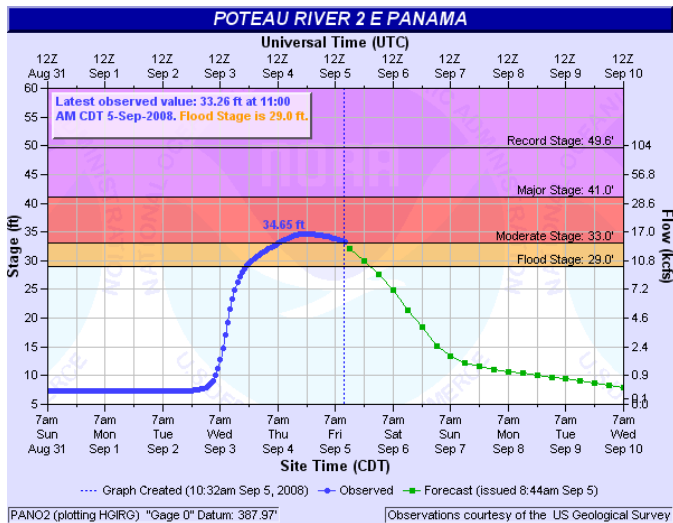


Fig. 4. Hydrograph for Poteau River near Panama

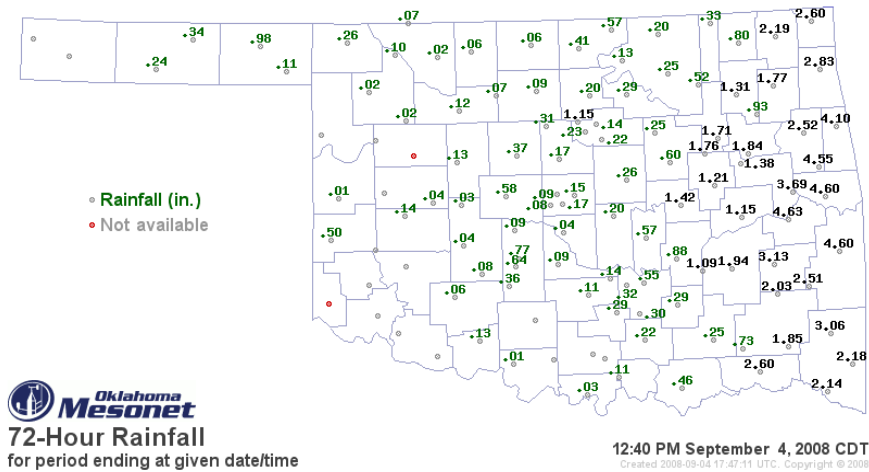


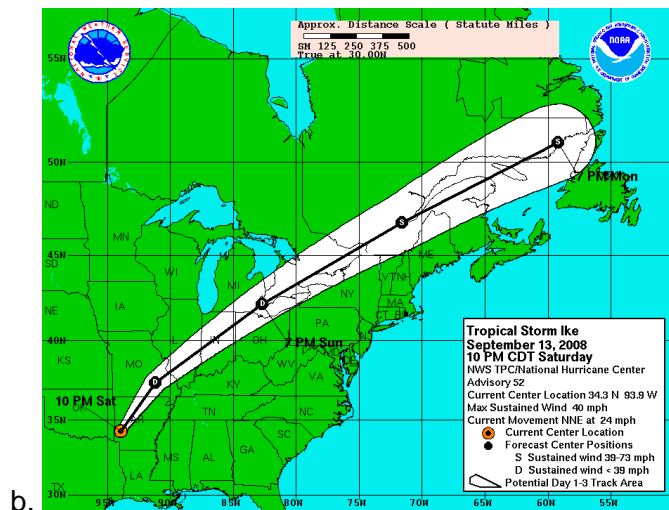
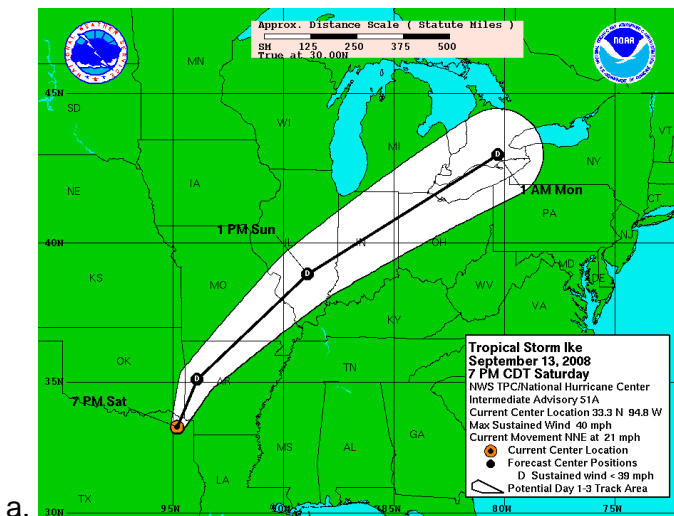
Fig. 6. Oklahoma Rainfall totals from Gustav courtesy of the OCS

For the entire event (September 2-4, 2008), widespread rainfall totals of 2 to 5 inches occurred across far eastern Oklahoma and western Arkansas, with higher amounts affecting locations across northwest and west central Arkansas. The highest rainfall totals reported were as follows: 6NE Pettigrew, AR 6.64"; Greenwood, AR 6.39"; Spiro, OK 6.17"; 3WNW Eureka Springs, AR 5.88; Fort Smith, AR Regional Airport (FSM) 5.72". RFC precipitation estimates for 1, 2, and 3 days are shown in Fig. 5a-c and storm total measurements from the Oklahoma Climatological Survey's Oklahoma Mesonet are shown in Fig. 6

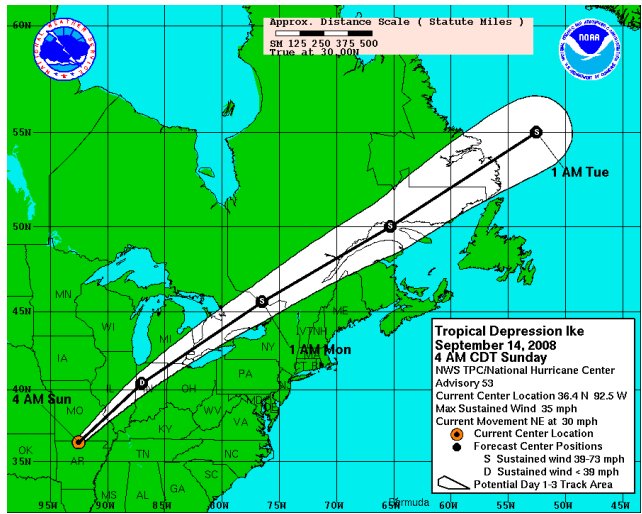
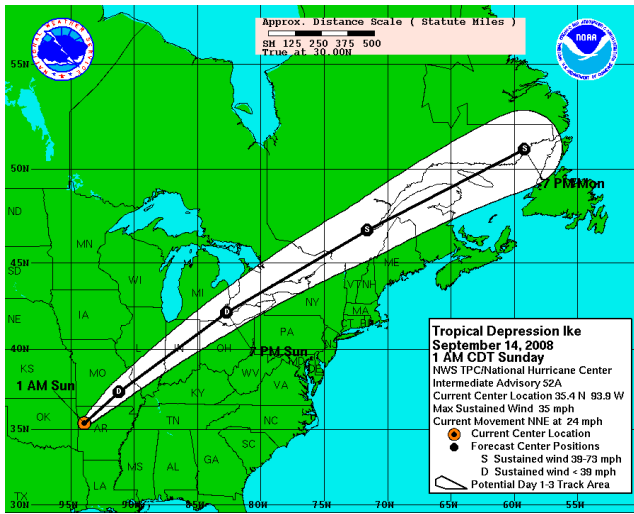
### Effects of Hurricane Ike on Eastern Oklahoma and Northwest Arkansas

The center of Tropical Storm Ike moved across far southeast OK during the evening of the 13<sup>th</sup> and quickly moved northeast through west central AR during the overnight hours (Figs. 7a-d). By the morning of the 14<sup>th</sup>, Ike was located across Missouri and all of the precipitation had ended across the Tulsa HSA. Widespread rainfall of 2 to 4 inches affected far eastern OK and western AR, with amounts generally less than 2 inches elsewhere across the HSA (see Figs. 8 and 10). 3-day rainfall totals from Ike and the stationary front ending on the morning of the 15<sup>th</sup> are shown in Fig. 9.

Flash flooding was a concern across eastern OK and western AR, with reports of flooded streets in Sequoyah Co., OK and Washington Co., AR. Mainstem river flooding also occurred due to Ike. The Neosho River near Commerce and the Illinois River near Watts reached moderate flood, with minor flooding along the Illinois River near Tahlequah and the Poteau River near Panama (refer to the E-3 report for details). Impact statements for the affected areas were accurate based on coordination calls with local Emergency Management officials.







c. d. Fig. 7 a-d. Ike positions September 13-14, 2008 from the National Hurricane Center.

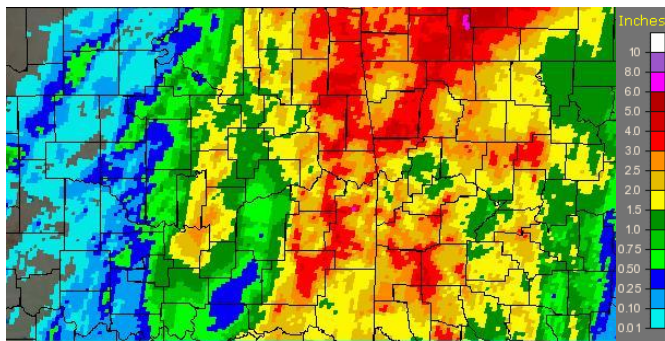


Fig. 8. 24-hour rainfall ending at 7AM September 15, 2008, courtesy of the RFCs.

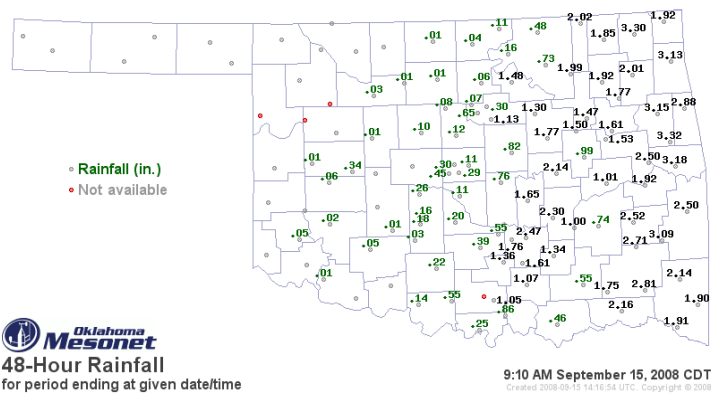


Fig. 10. 48-hour Rainfall measurements from the Oklahoma Mesonet (courtesy of OCS) ending at 9:10AM September 15, 2008.

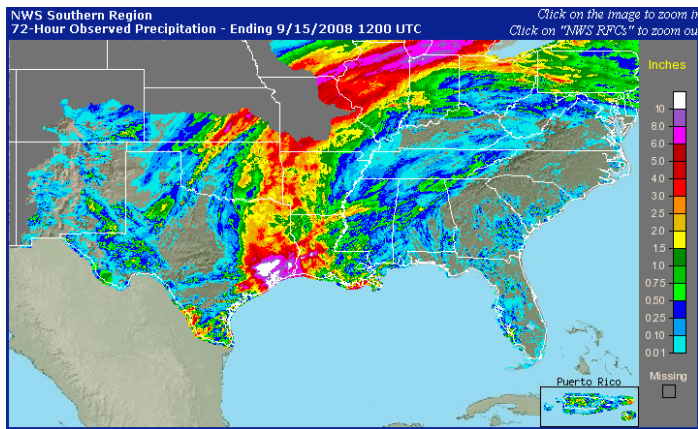


Fig. 9. 72-hour Rainfall from ending at 7AM September 15, 2008, courtesy of the RFCs.

Products issued:

- 18 River Flood Warnings
- 77 River Flood Statements
- 29 River Statements
- 4 Hydrologic Outlooks

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