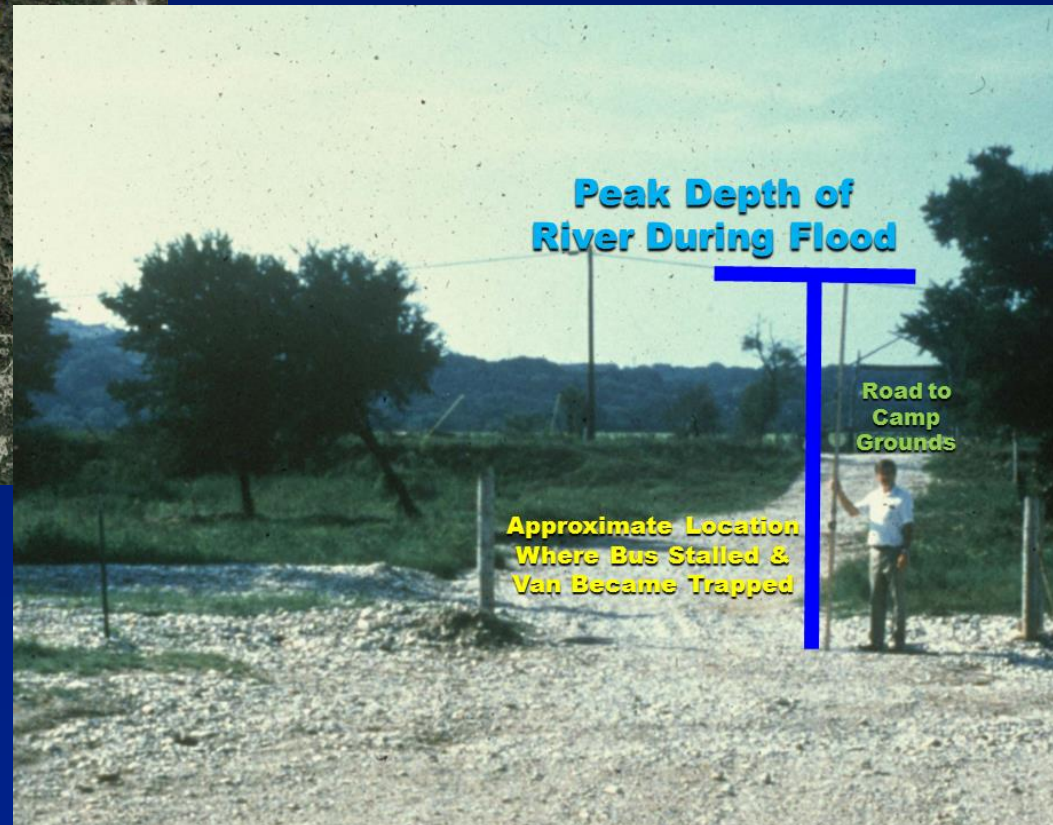


July 17, 1987 Church Bus Tragedy



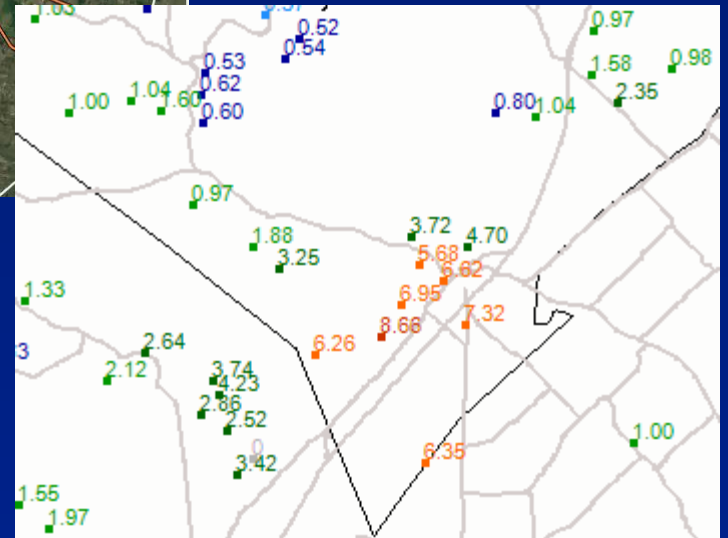
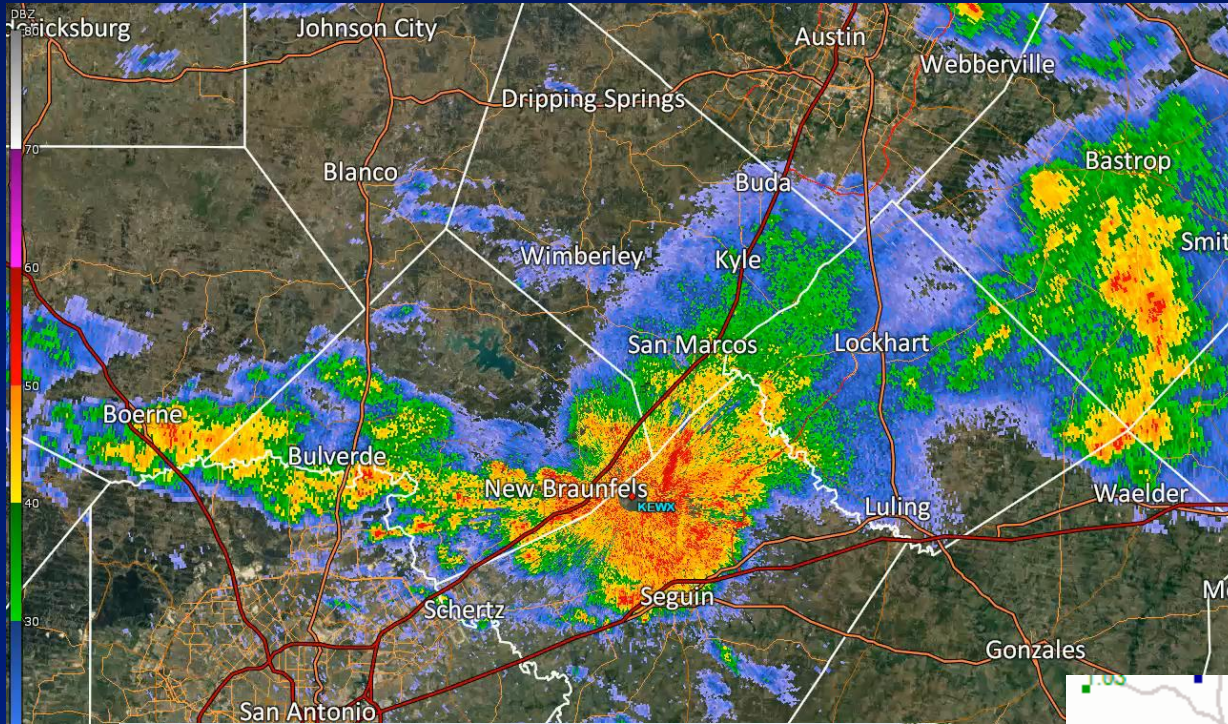
10 Teenagers Died



Ways to Get Flash Flooding

- Cell Mergers (storms combine)
- Training (move over same area)
- **Stationary (storms don't move)**
- Tropical System (efficient system)
- Stalled Weather System
- Upstream Rain Events
- Burn Scar

San Marcos event April 11 2017

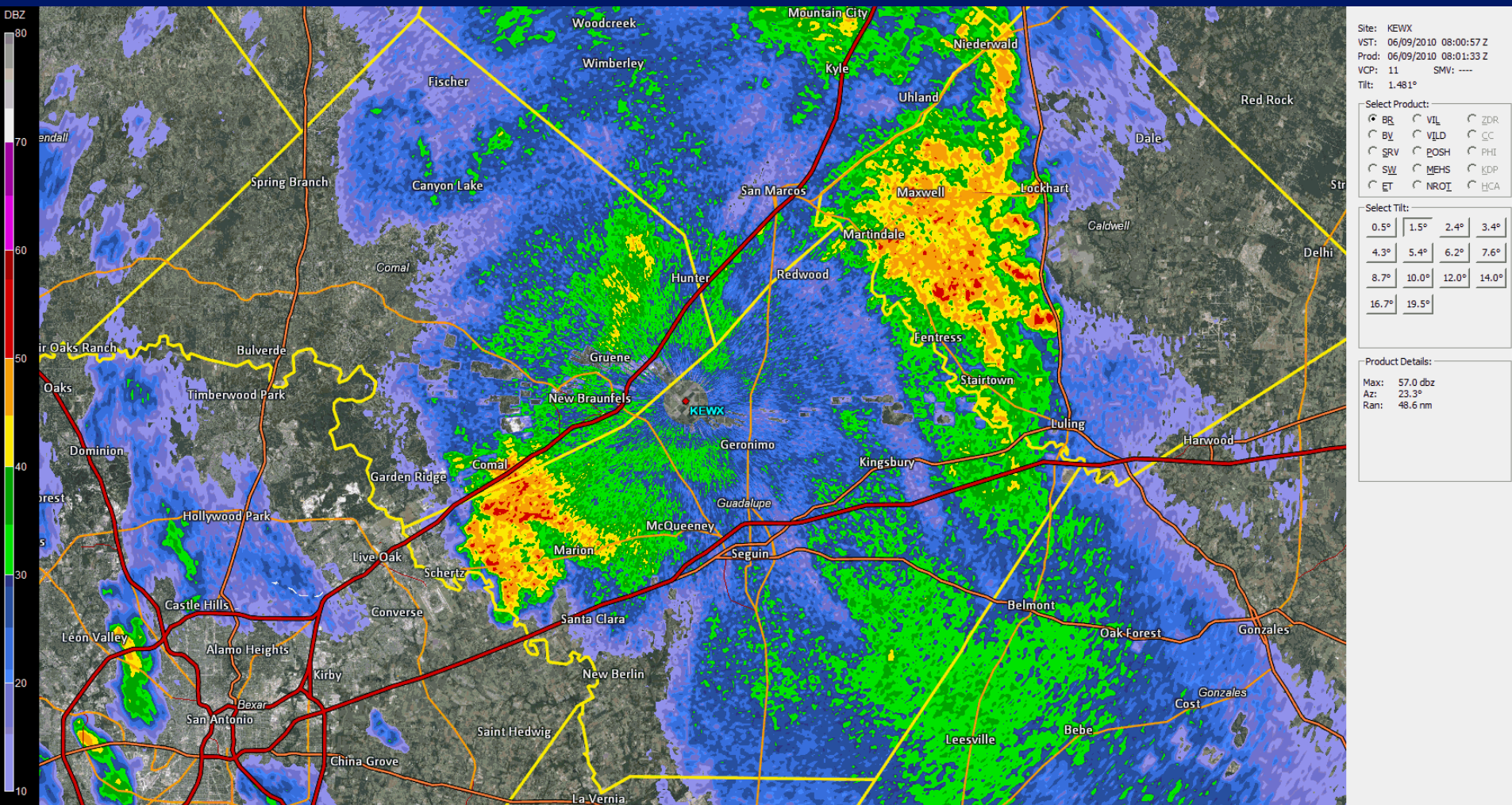


“Small” Flood – 6/9/2010 New Braunfels

**20 foot rise on
Guadalupe River**

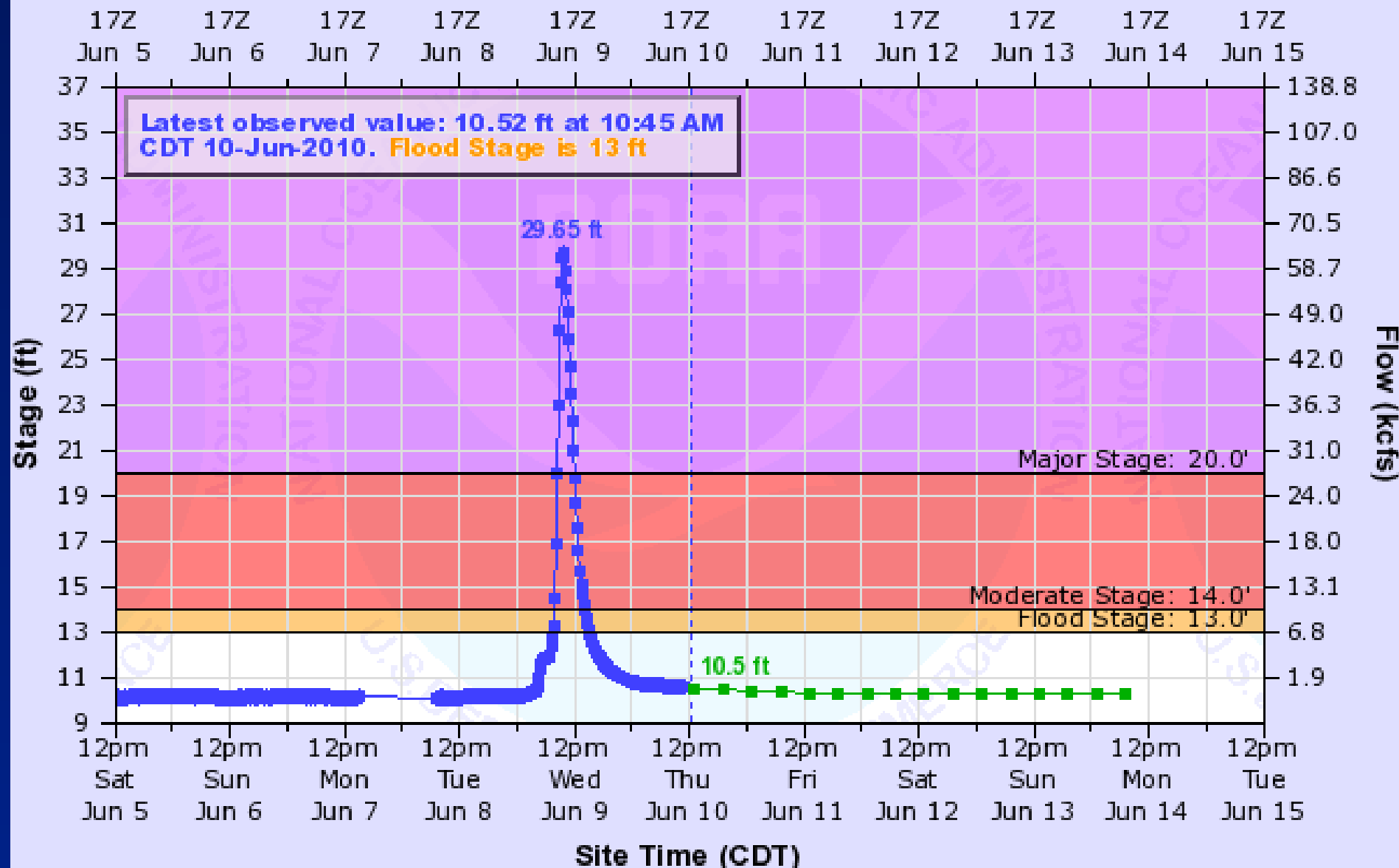


5 hours of Rainfall...4am-9am



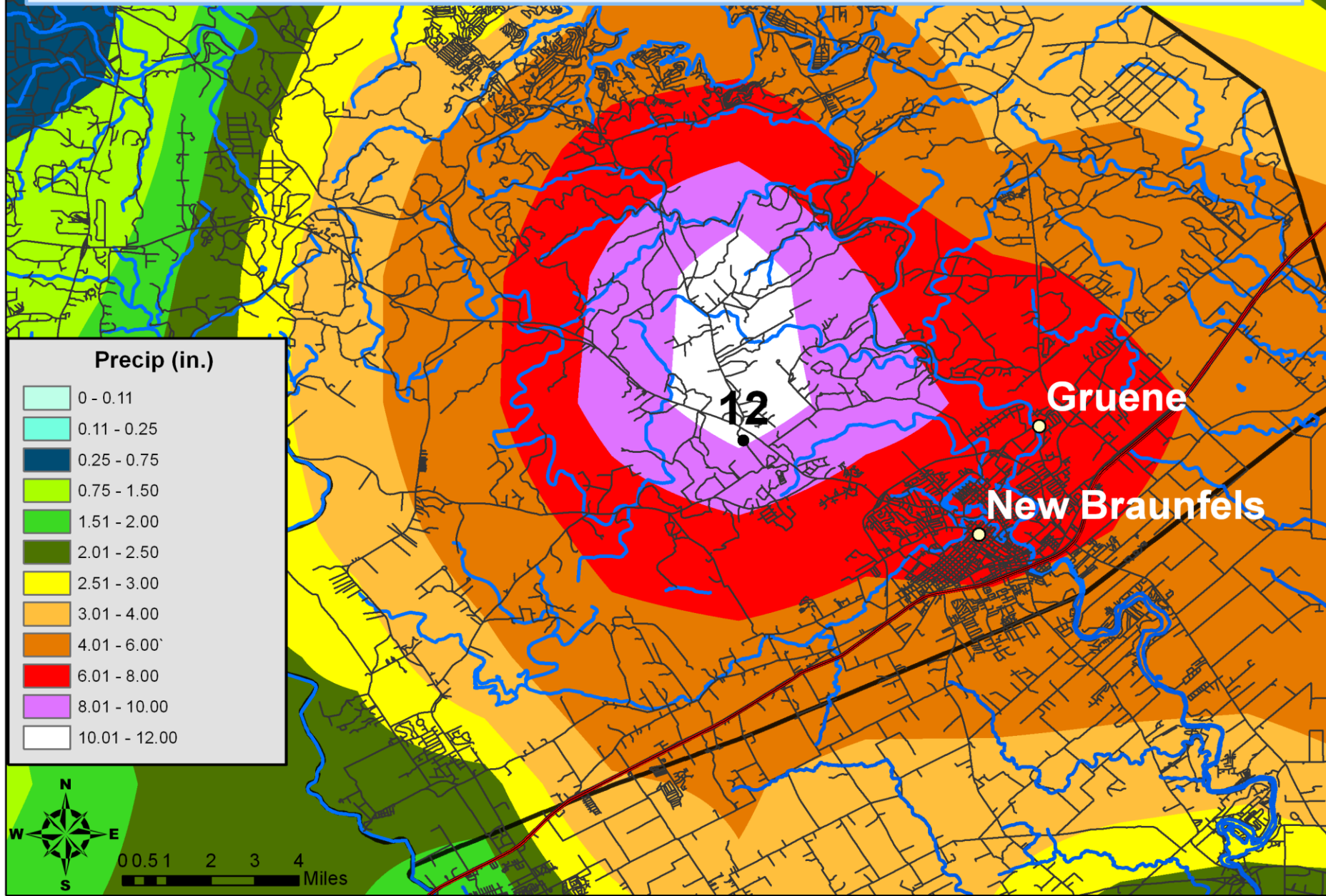
GUADALUPE RIVER BELOW COMAL RIVER AT NEW BRAUNFELS

Universal Time (UTC)



--- Graph Created (12:02PM Jun 10, 2010) --- ● Observed --- Forecast (issued 9:22PM Jun 9)

June 9th Rainfall From CoCoRaHS



Whats Wrong with this Picture?



Campsites Swept Clean



Life Preserver



Boat on Top



“Rain Bomb” at Marble Falls – June 27, 2007

19 inches in 8 hours!

**\$130 Million Damage
in Burnet Co.**



Austin's Memorial Day Flood, May 24 1981



**10 inches in 4 hours
13 deaths**

**Changed
Austin Forever**



Ways to Get Flash Flooding

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- Burn Scar

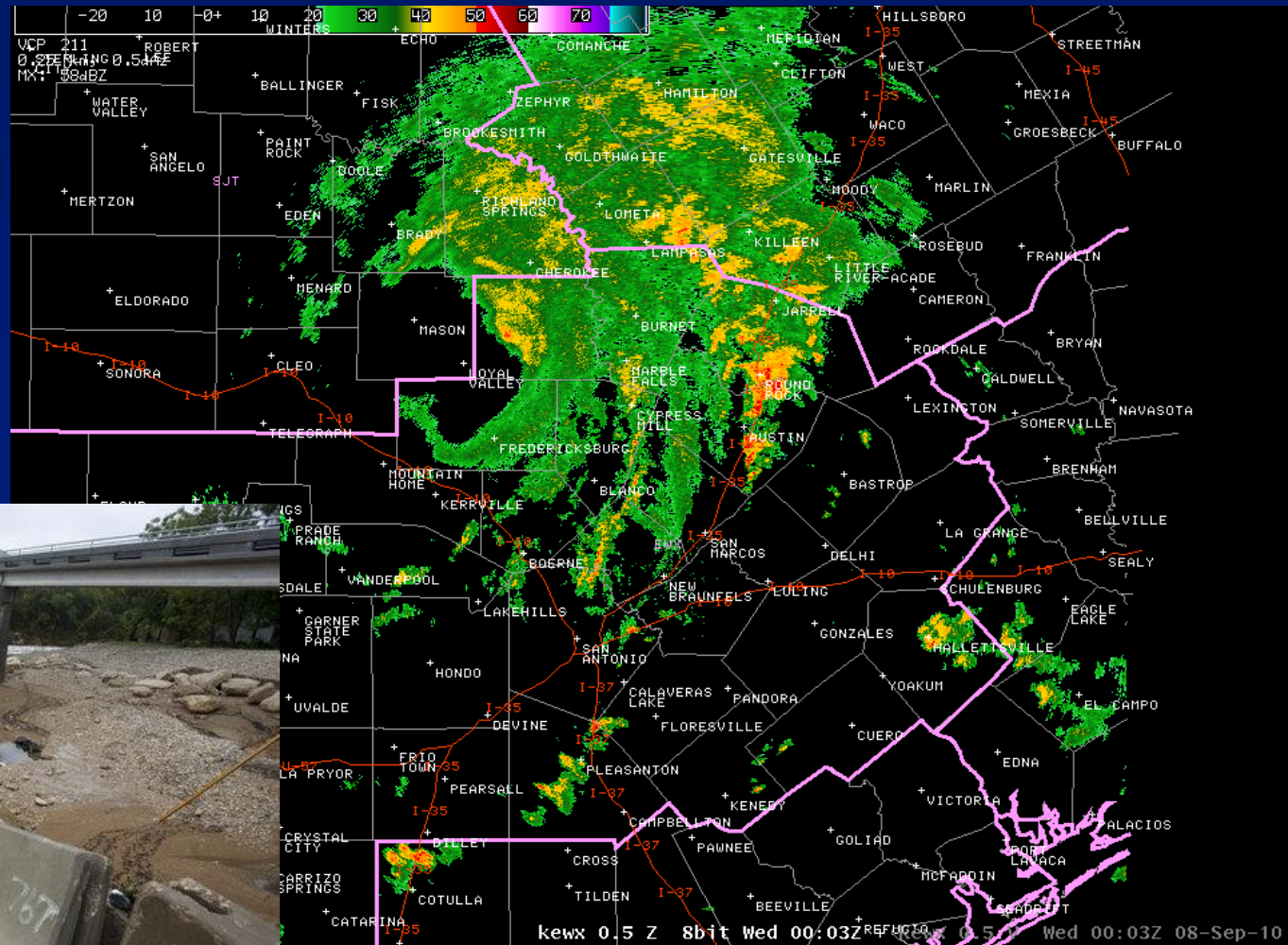
Inland Flooding

- On many occasions, tropical storms and hurricanes have stalled over Texas producing record rainfall, and disastrous flooding.

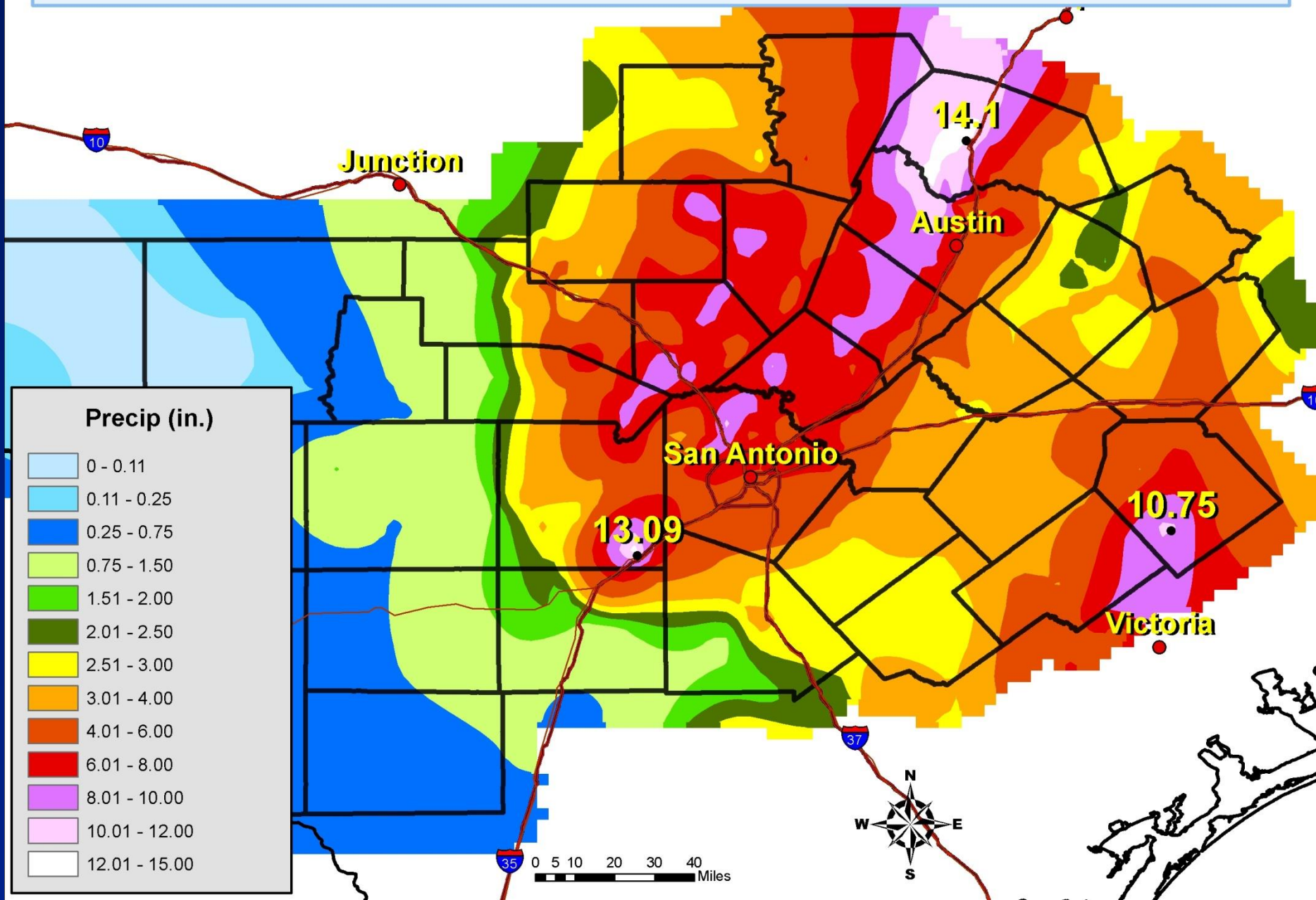
2017 Harvey -	50" + in Houston area
1921 Hurricane –	36.40" in Hill Country
1954 Alice –	35" near Del Rio
1967 Beulah –	30" over Nueces River
1978 T.S. Amelia –	42" in Hill Country
1979 T.S. Claudete –	43" near Houston
1998 T.S. Charlie –	18" in 4hrs Del Rio
2001 T.S. Allison –	30+” in Houston

Tropical Storm Hermine, Sept 2010

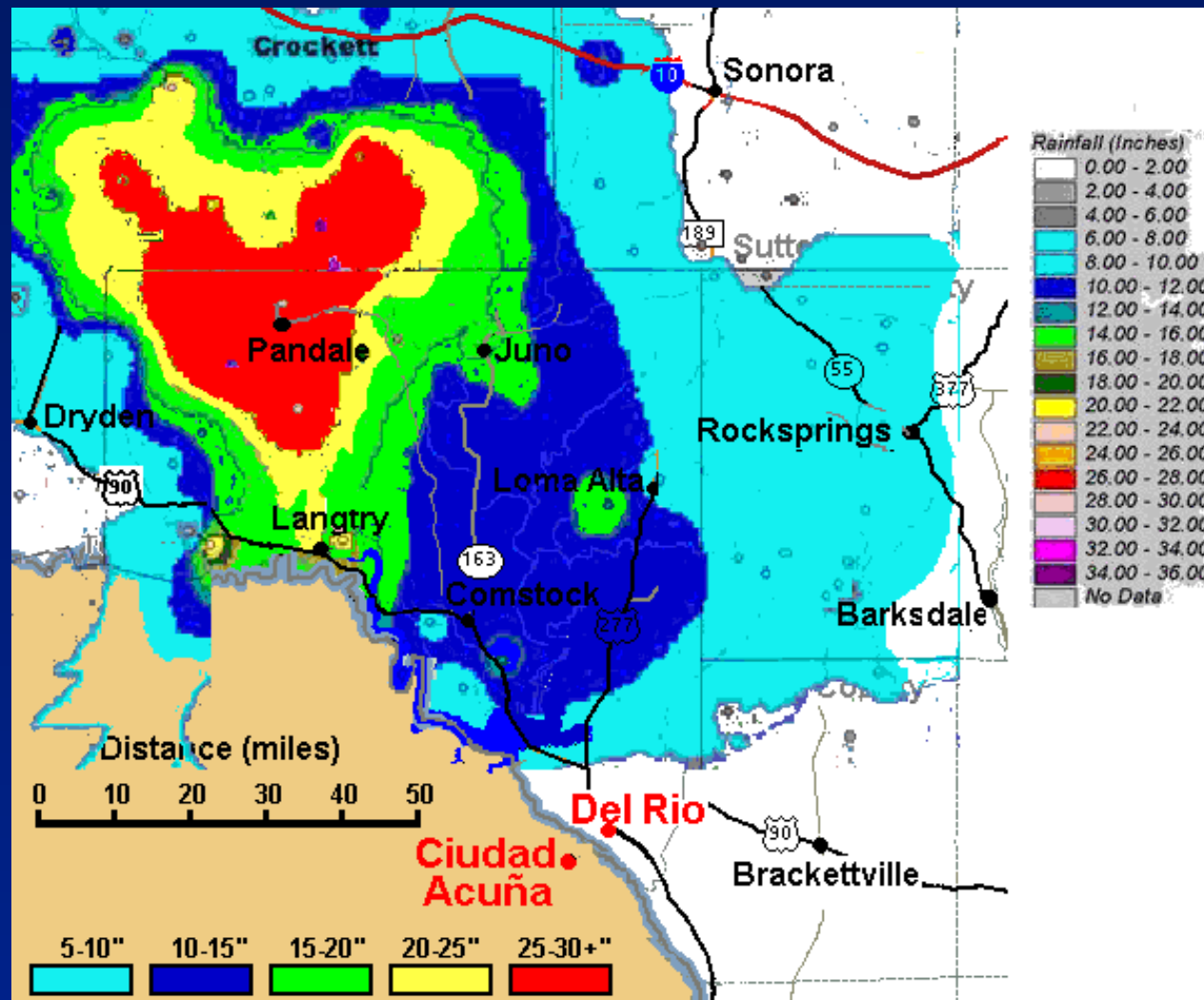
- 5 deaths
- Rescues
- 8-15" rain
- Rivers in flood
- Millions \$\$



CoCoRaHS Totals for Sept. 6th-9th

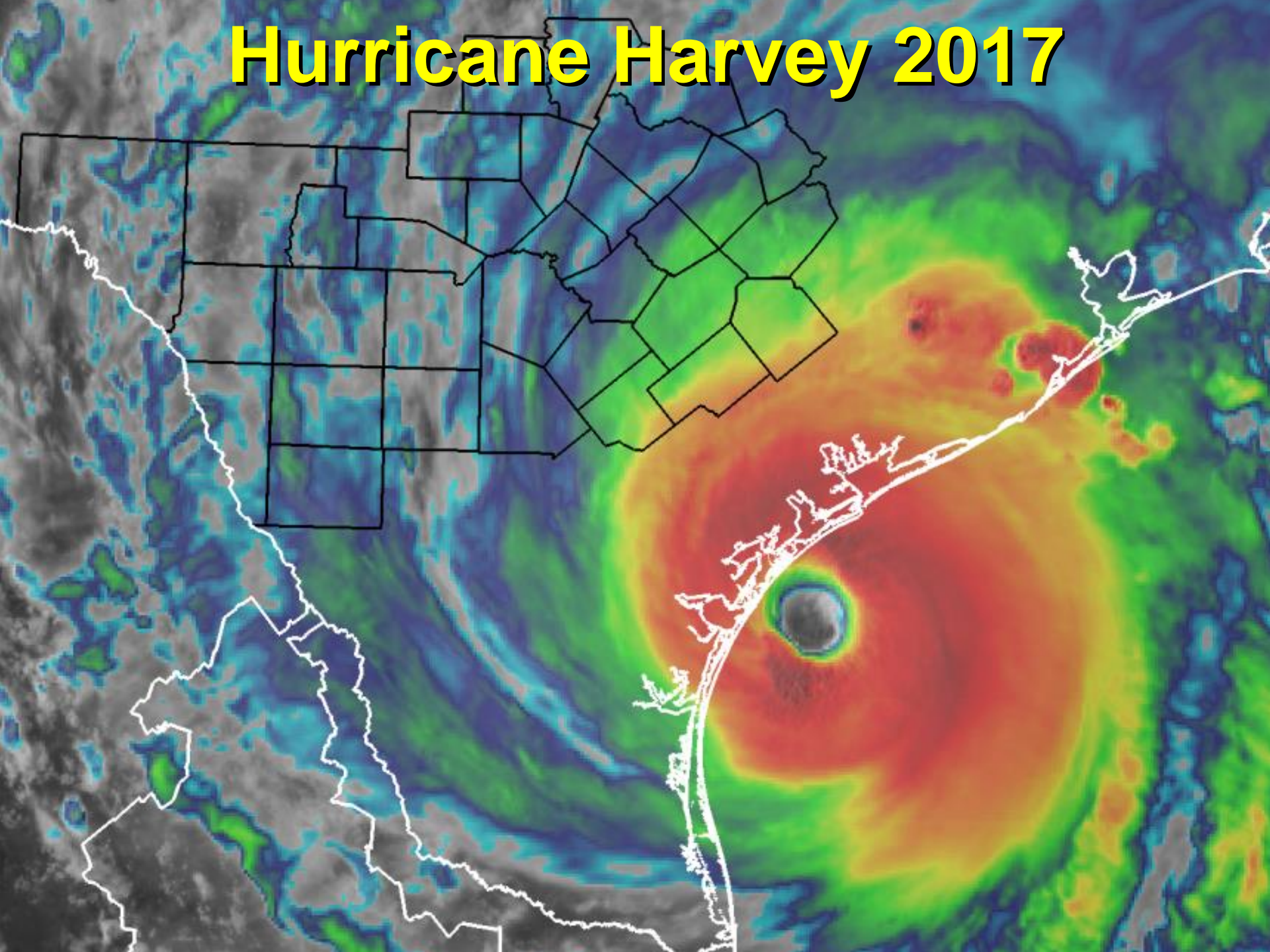


In the middle of the worst drought in Texas history...1954 Hurricane Alice



The Rio Grande reached its record crest - over 1,000,000 cfs!!

Hurricane Harvey 2017



3-Day Radar Loop

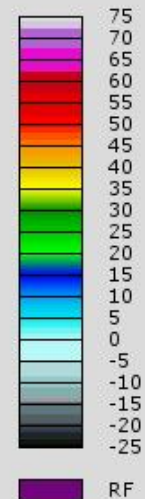
**Most rainfall
near, north,
and east of
the center**



NEXRAD LEVEL-II
KCRP - CORPUS CHRISTI, TX
08/25/2017 18:01:59 GMT
LAT: 27/47/02 N
LON: 97/30/38 W
ELEV: 45 FT
VCP: 212

REFLECTIVITY
ELEV ANGLE: 0.51
SWEEP TIME: 18:02:01 GMT

Legend: dBZ



Harvey Rainfall Overview

Harvey – 7 Day Precipitation through 9/1/17

Observed Precipitation

National Weather Service

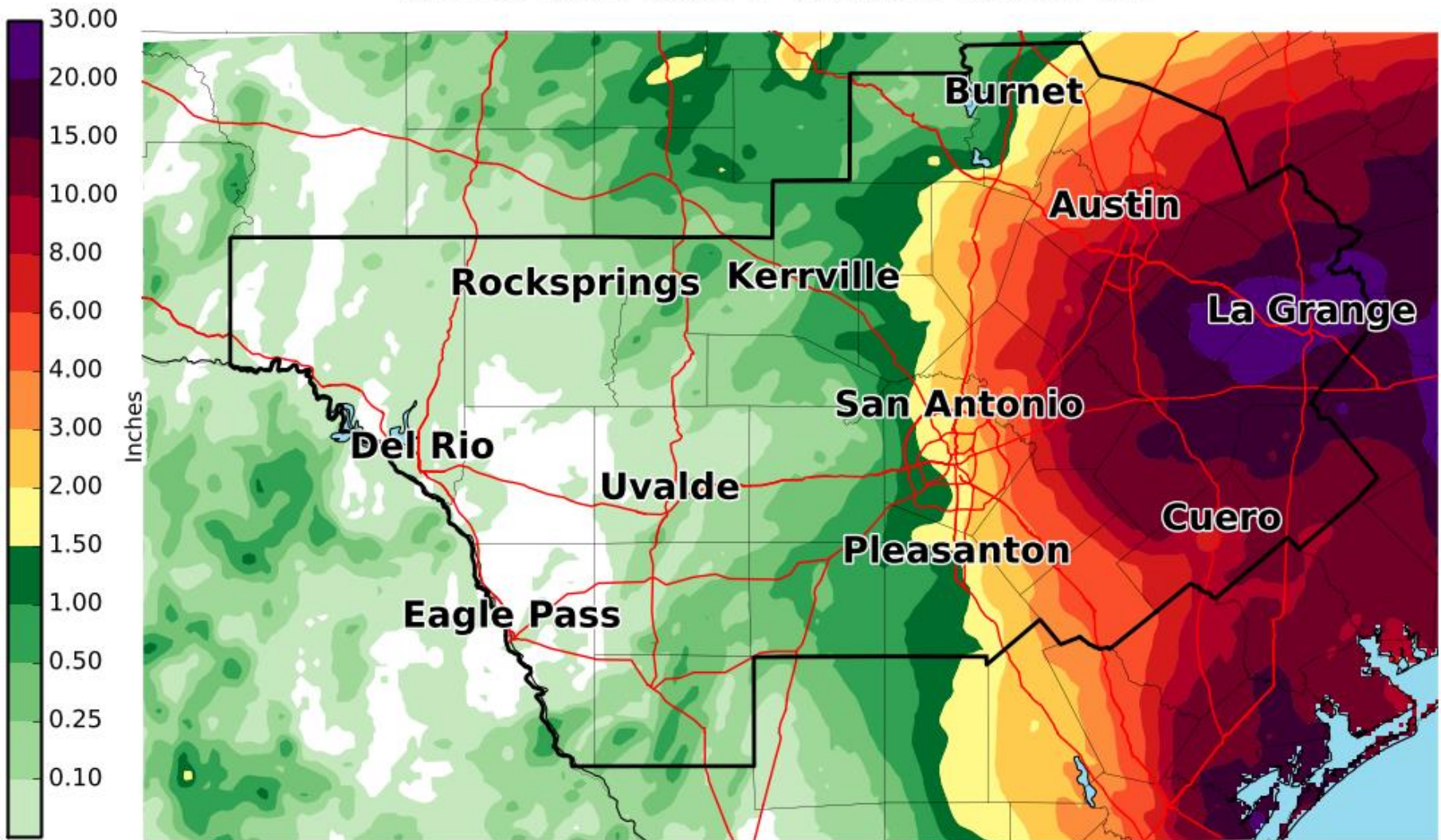
Valid Ending Friday September 1st, 2017 at 3 PM CDT



Historic Rain

Estimated Rainfall

Valid: 08/24/2017 07:00 PM - 08/29/2017 01:00 AM CDT

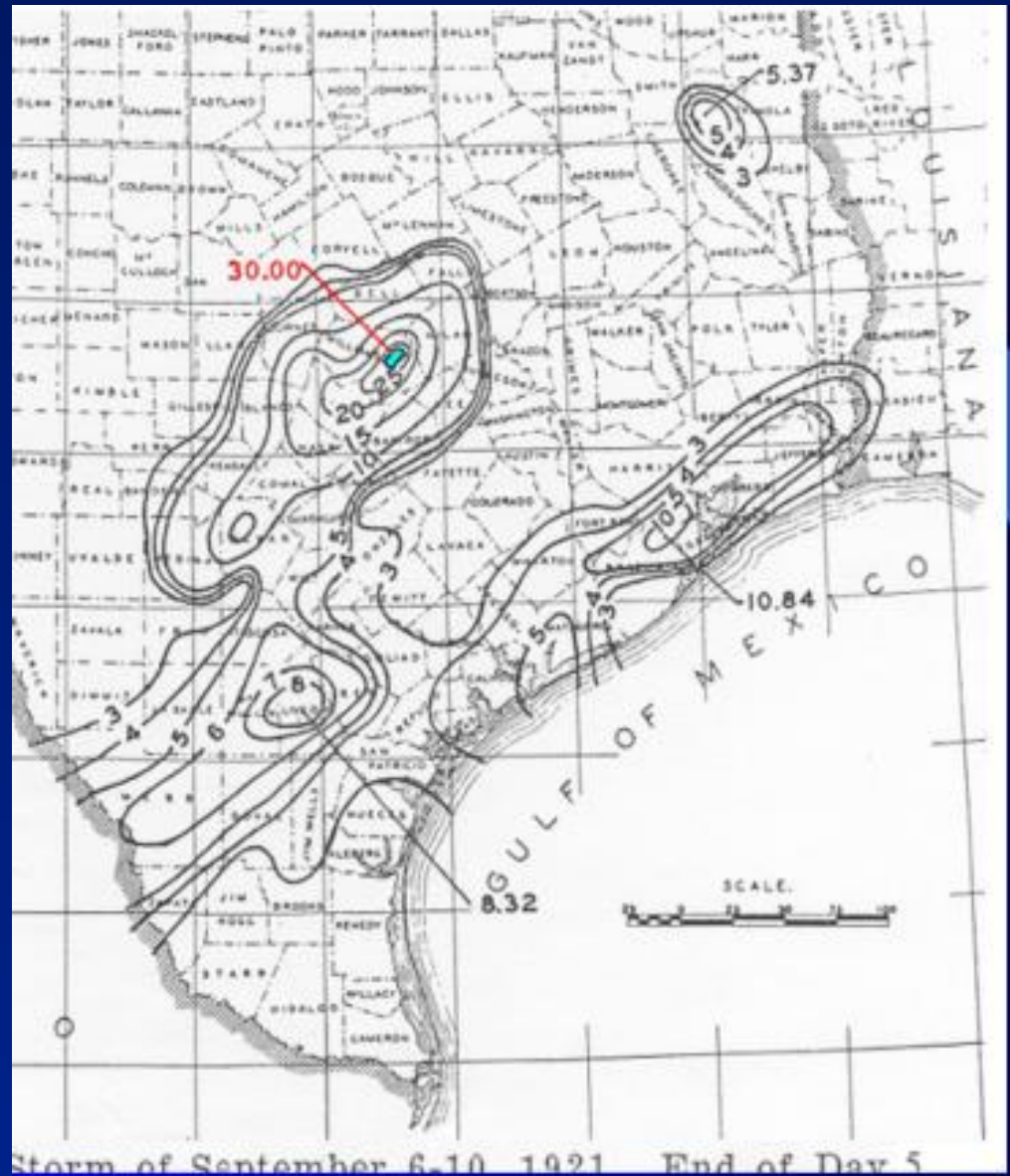


National Weather Service
Austin/San Antonio
08/29/2017 08:48 AM CDT

Follow Us:   
weather.gov/ewx

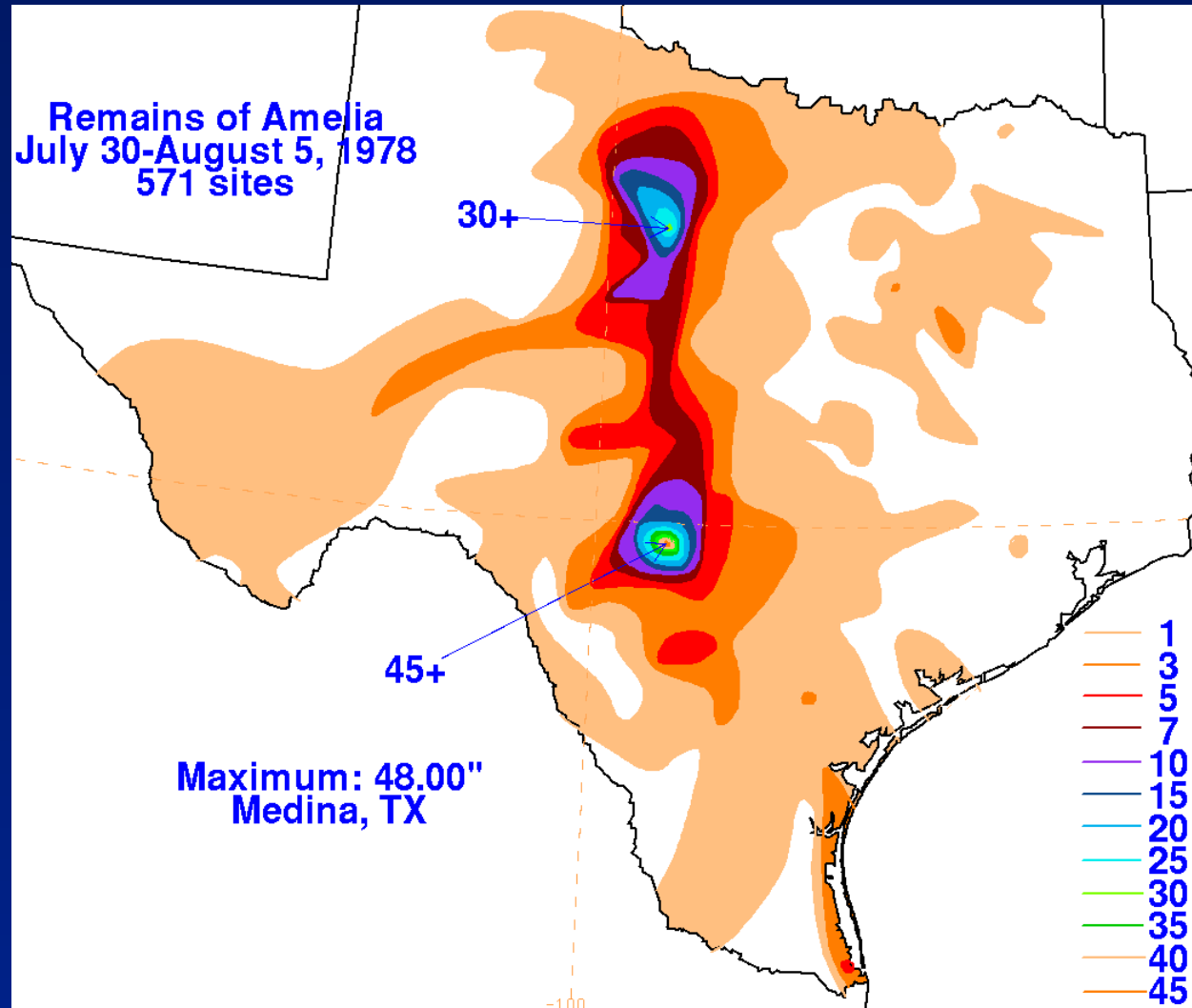
1921 Hurricane

- U.S. 18 Hour Rainfall Record
 - ◆ Williamson County - 36.4"
- 215 fatalities, 159 along the Little River



1978 Remnants of TS Amelia

- **Record flooding in Bandera**
- **27 total fatalities in the Hill Country**



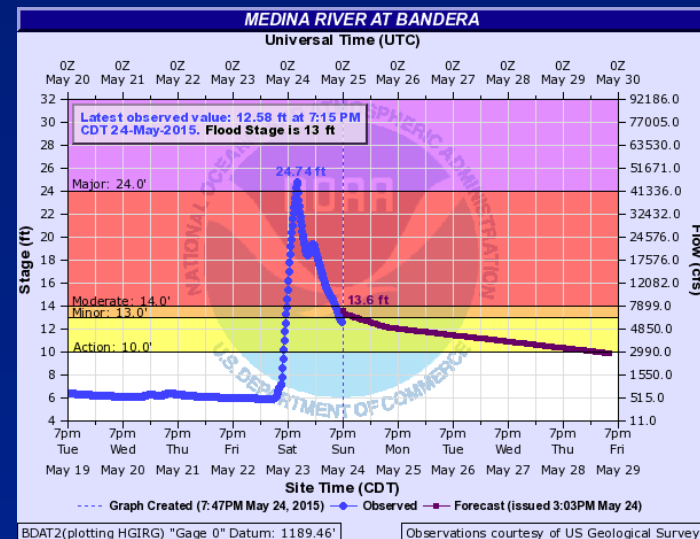
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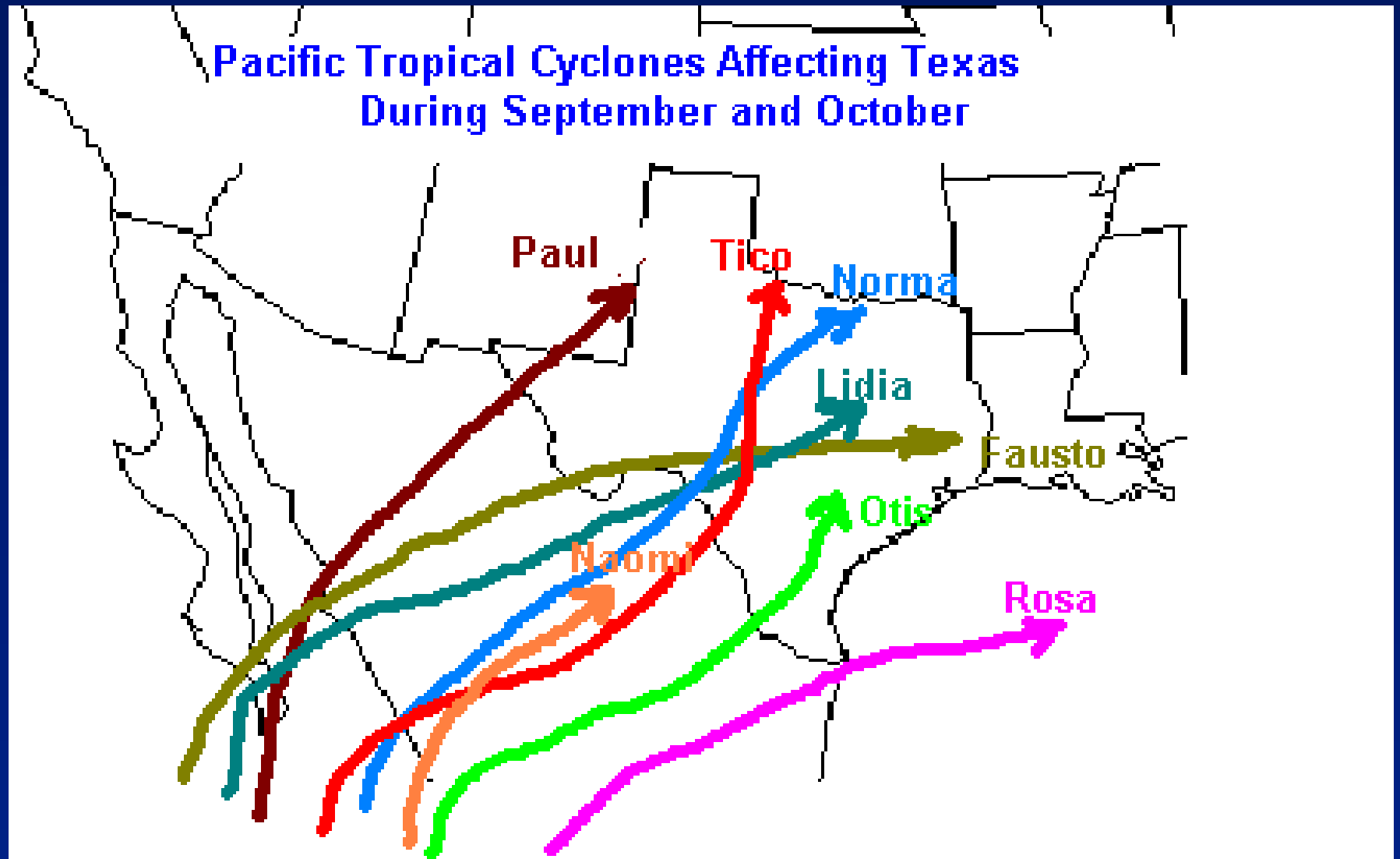


**Flood Height in
2015 was 24 Ft...**

**In 1978, River
reached 46.62 Ft**



We have to watch the Pacific



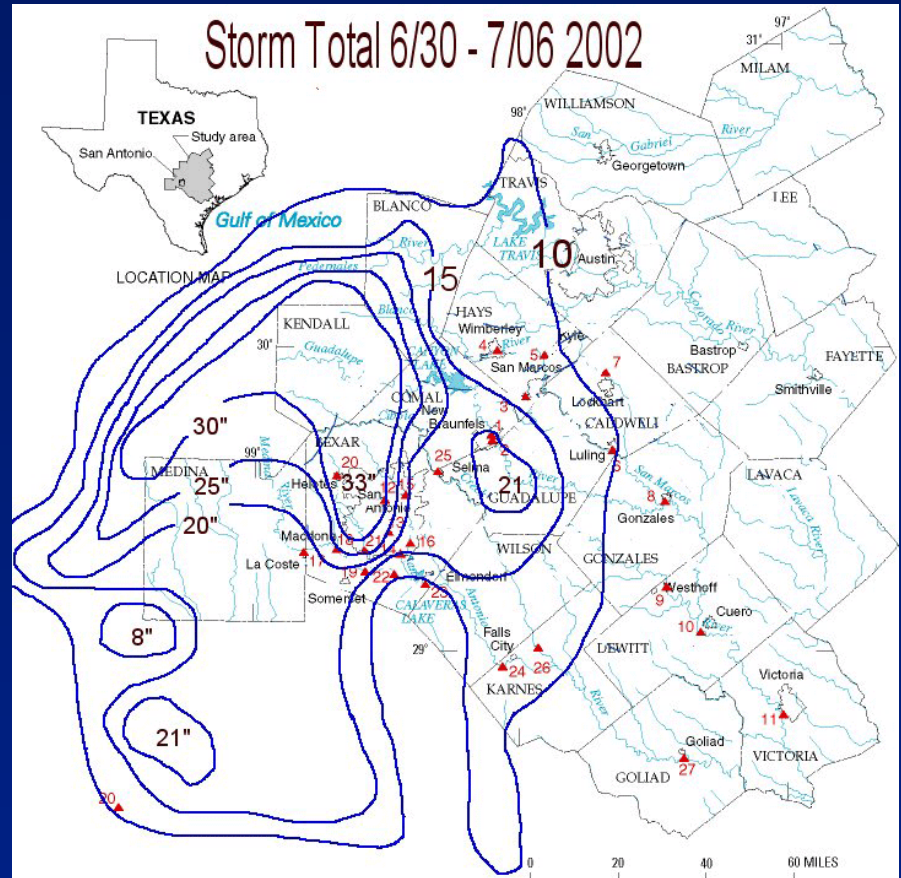
Ways to Get Flash Flooding

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- Burn Scar

Record Rainfall...It Will Happen Again!

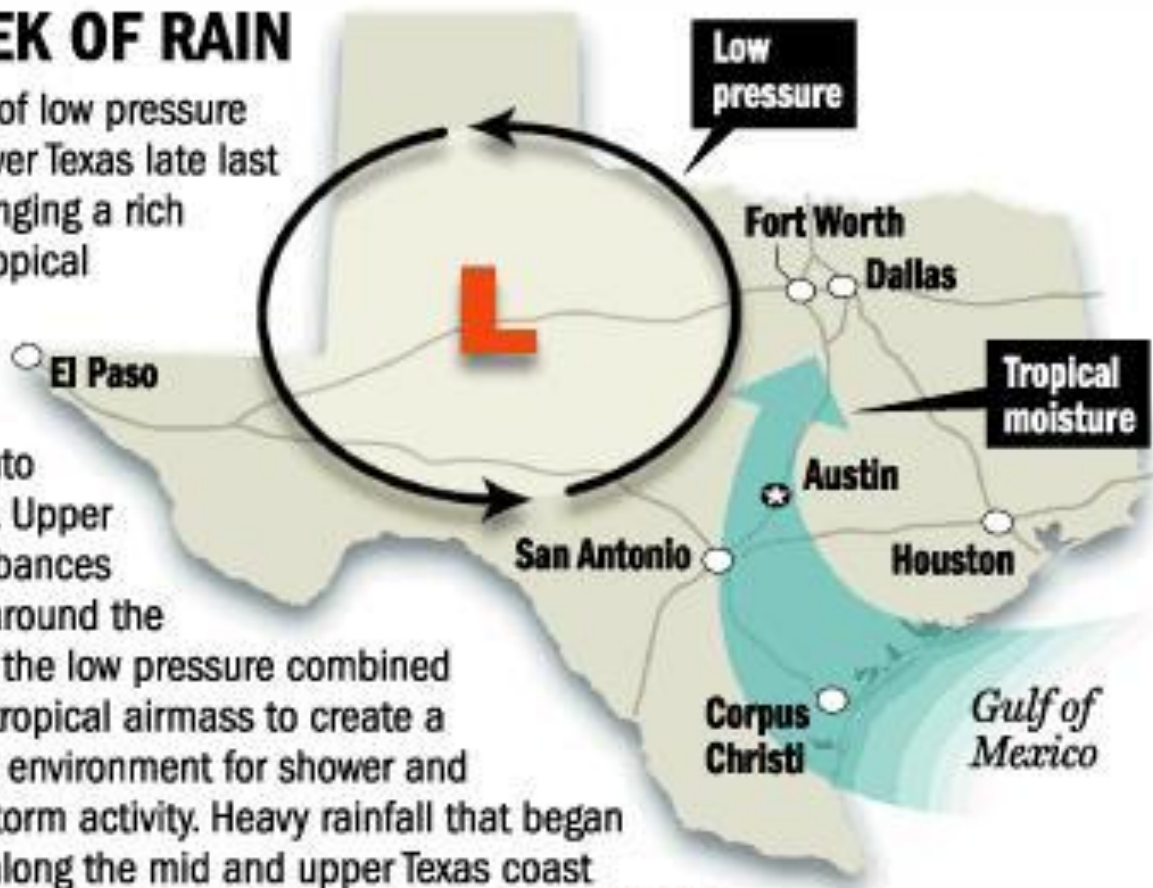
“Large” Flood – June 30 to July 6, 2002

- 9 deaths
- 30+ inches of rain
- Canyon Lake overflow
- 100 Million \$\$ in damage



A WEEK OF RAIN

A trough of low pressure settled over Texas late last week, bringing a rich flow of tropical moisture from the Gulf of Mexico into the state. Upper air disturbances rotating around the center of the low pressure combined with the tropical airmass to create a favorable environment for shower and thunderstorm activity. Heavy rainfall that began May 31 along the mid and upper Texas coast moved into the Hill Country on Sunday, where heavy rain fell for most of the week. The system was forecast to remain nearly stationary through Friday before weakening and moving to the west on Saturday.



SOURCE: Texas Department Of Public Safety, Division Of Emergency Management