



Flood Alley Flash

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Inside This Issue:

Hurricane Season 2010 Update	1-3
New Braunfels June 9th Flood	4
Staying Safe in Flash Floods	5-6

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HURRICANE SEASON 2010: HALFWAY THERE!



Figure 1: Satellite image taken August 30th, 2010. Counter-clockwise from the top are: Hurricane Danielle, Hurricane Earl, and the beginnings of Tropical Storm Fiona.

As the 2010 hurricane season approached, it was predicted to be a very active season. In fact, experts warned that the 2010 season could compare to the 2004 and 2005 hurricane seasons. After coming out of a strong El Niño and moving into a neutral phase NOAA predicted 2010 to be an above average season. Specifically, NOAA predicted a 70% chance of 14 to 23 named storms, where 8 to 14 of those storms would become hurricanes. Of those hurricanes, three to seven were expected to become major hurricanes. The outlook ranges are higher than the seasonal average of 11 named storms, six hurricanes and two major hurricanes. What has this hurricane season yielded so far? As of the end of September, seven hurricanes, six tropical storms and two tropical depressions have developed. Four of those hurricanes became major hurricanes.

Continued on page 2

Hurricane Season, continued from page 1

BY: AMANDA FANNING

The first hurricane to form this season was a rare and record-breaking storm. Hurricane Alex began as a tropical depression in the Caribbean Sea on June 25th. It made its first landfall in Belize on June 26th as a Tropical Storm. However, as the system moved inland, it weakened to a depression. Once Alex moved into the Bay of Campeche, it regained strength and once again became a tropical storm. By June 29th, Alex strengthened and became the first hurricane of this season. The next day, Alex made landfall near Soto la Marina, Mexico, as a Category 2 hurricane. The highest rainfall total within the United States was 6.8 inches at Brownsville Airport, occurring within a 36-hour period. Rainfall totals across northeastern Mexico were estimated to be as high as over 20 inches (see figure 2). The heavy rain caused catastrophic flooding in Monterrey, Mexico. The main impact from this storm for the U.S. was several weeks of flooding along the Rio Grande from Lake Amistad to Brownsville. Alex maintained the strongest winds for an Atlantic hurricane in the month of June since Hurricane Alma (1966). Hurricane Alex also became the second most intense June storm since 1871, and the most intense since Hurricane Audrey (1957).

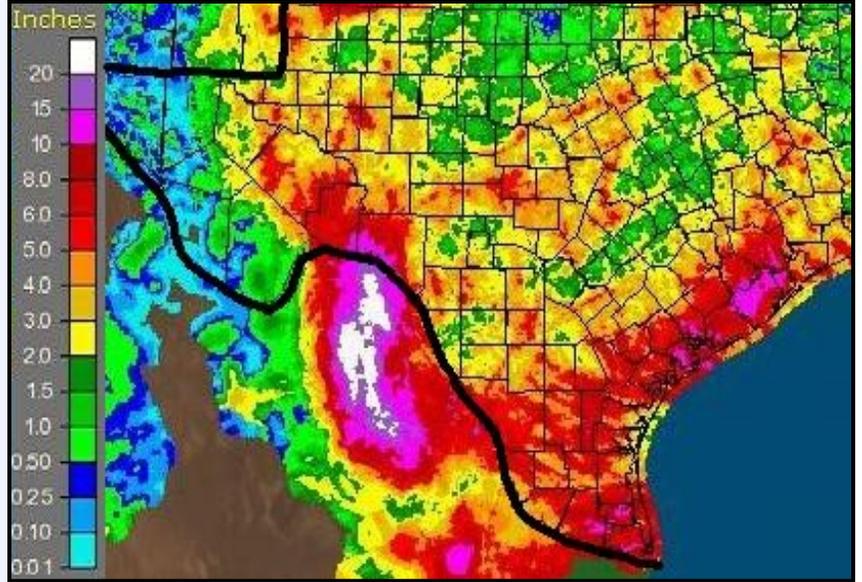


Figure 2. Estimated rainfall totals from Hurricane Alex. Note that the white shading across northeastern Mexico indicates totals of over 20 inches.

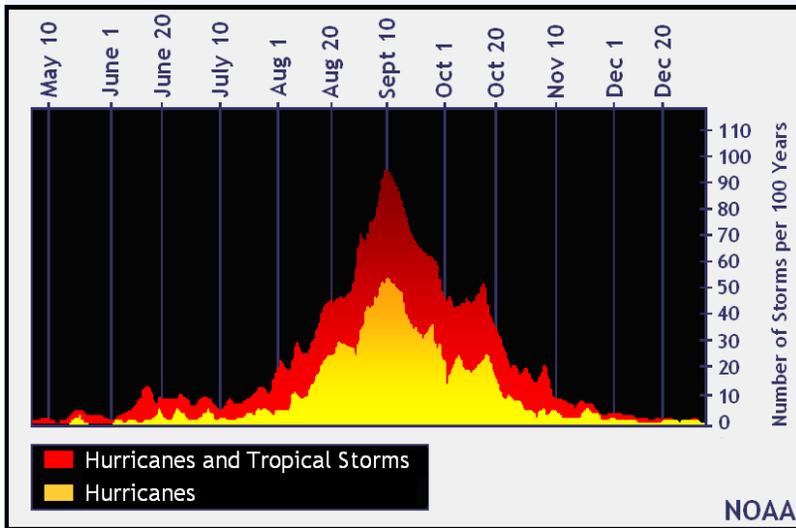


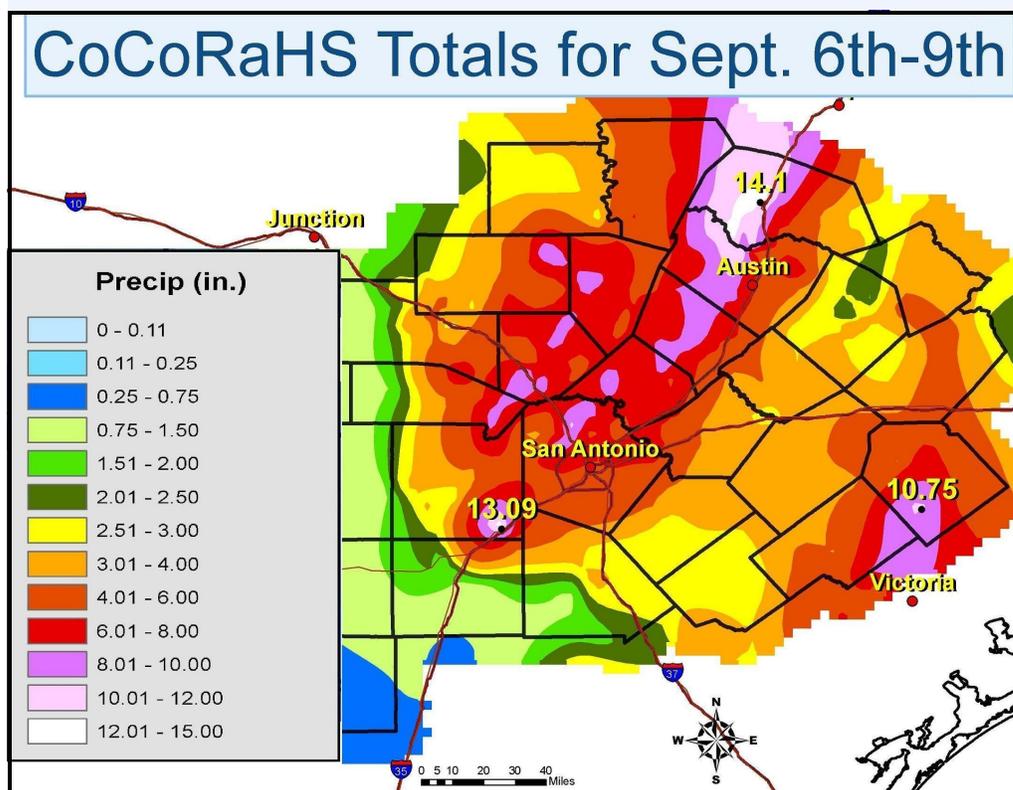
Figure 3. The statistical peak for tropical cyclone activity in the Atlantic (including the Gulf of Mexico) Basin is mid-August through late October.

Category 3 on August 28th. Hurricane Earl quickly followed Danielle and intensified to a Category 4 hurricane by August 30th. By September 3rd, Earl weakened to a tropical storm and made landfall in Nova Scotia the next day.

Continued on Page 3

Continued from page 2

Tropical Storm Hermine was the second tropical cyclone of the season to affect South Central Texas. The system developed as a tropical depression at 10 pm on Sunday, September 5th, and then rapidly strengthened to a tropical storm by 4 am on September 6th. Less than 24 hours after becoming a tropical depression, Tropical Storm Hermine made landfall in northeastern Mexico at 8:30 pm on September 6th. Hermine tracked northwestward overnight, and brought tropical storm force winds to South Central Texas on September 7th. The highest measured wind gust across South Central Texas from Hermine was 64 mph, recorded at the San Antonio International Airport. While the strong winds caused power outages across the region, the biggest impact to South Central Texas was the extreme rainfall. Relentless heavy rain began to fall during the afternoon on Tuesday, September 7th, and caused widespread flash flooding later that evening. Hermine weakened to a tropical



depression that night and continued to track to the north. Even though the core of the system was nearing the Red River Valley by Wednesday, September 8th, deep tropical moisture remained over South Central Texas. This caused heavy rainfall to persist through Thursday, September 9th. The highest rainfall totals were generally along and north of the I-35 corridor between Waco to south of the San Antonio metro area (see figure 4). A Cooperative Observer near Lake Georgetown reported an event total (September 7th through the 9th) of 16.37 inches; 14.57 of which fell in 24 hours. In addition to the record breaking rainfall, a tornado formed near the town of Moulton. For further and more detailed information on the damages from Tropical Storm Hermine, please click on the following link to visit our [Weather Events website](#).

Figure 4. Map of the multi-day event total rainfall from Tropical Storm Hermine measured by CoCoRaHS observers. Higher totals may have occurred at non-CoCoRaHS sites.

Another interesting feature of the 2010 hurricane season is the formation and strengthening of Hurricanes Igor and Julia. Hurricane Igor formed on September 8th and Julia formed September 12th. On September 15th, these storms were both Category 4 hurricanes. This was the first time since 1926, and only the second time since 1871, that two Atlantic hurricanes have simultaneously been Category 4 or higher. Hurricane Igor went on to make landfall in Bermuda and continued north while Julia dissipated without making landfall.

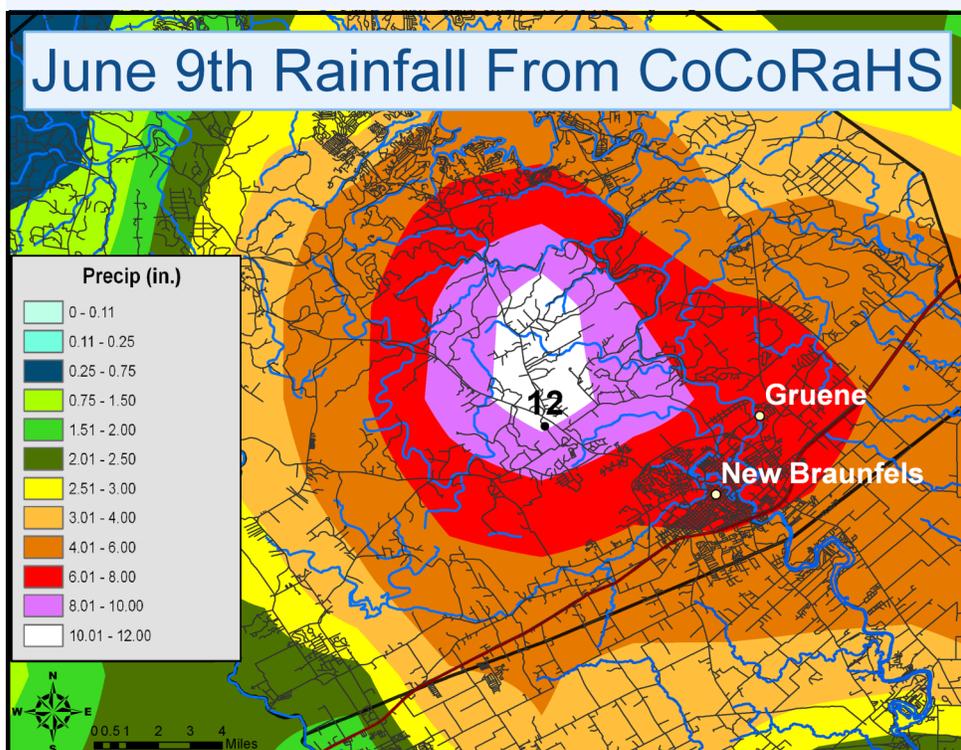
NOAA is expecting the second half of the season to continue being active. [NOAA's outlook](#), which was updated in August, predicts a 70% chance of 14 to 20 named storms. Of those, 8 to 12 will strengthen to hurricanes. In addition, out of those hurricanes, four to six could become major hurricanes. Since tropical cyclones can develop rapidly, being prepared is essential during the height of hurricane season.

New Braunfels June 9th Flood

BY: CHRISTOPHER MORRIS AND MARIANNE SUTTON

Earlier this year, a significant rainfall event unfolded across South Central Texas and the Hill Country late in the evening of June 8th, and lasted through the afternoon hours of June 9th. A slow moving upper level low pressure system was progressing northeast across the region and combined with abundant tropical moisture. This resulted in a large complex of showers and thunderstorms which caused catastrophic flooding for portions of South Central Texas, particularly across Comal and Guadalupe Counties.

The storm complex of June 8th-9th encompassed nearly the entire Interstate 35 corridor beginning south of San Antonio, stretching northward into Travis and Williamson counties. The storms were very slow moving and produced intense rainfall over the same area for numerous hours. Rainfall reports showed that the



Above: Composite map of rainfall reports from the CoCoRaHS volunteer network for the evening of June 8th through early June 9th.

affected area received 2 to 8 inches over an 18 hour period. An extreme of 12 inches fell approximately 2 miles north-west of New Braunfels. The Guadalupe River in New Braunfels breached its banks forcing residents to evacuate their homes to escape the flood waters. Flash flooding damaged approximately 150 homes and businesses, and forced the closure of multiple roadways. The total cost of damage for private and city property was estimated at over 10 million dollars.

In addition to the homes and businesses, several area campgrounds and RV parks along the Guadalupe River were inundated in a matter of minutes.

A husband and a wife who were camping along the Guadalupe River near Gruene were swept away as the river quickly rose. The woman was rescued downstream; the man became the only fatality from the flooding. Campgrounds, especially those along a river or other low-lying areas, can quickly become death traps with little warning. When camping, it is imperative to take along a NOAA weather radio to alert you of an emergency. Many campgrounds lack warning systems and therefore cannot notify you in the event of an emergency. Having even a few additional minutes to evacuate can mean the difference between life and death.

Additional rainfall maps and damage photos can be found on our [Weather Event website](#), or a direct link to the document can be found [here](#).

Rain At Night Will Blind Your Sight

BY: DAVID SCHUMACHER

In a recent assessment of the flooding that occurred in the southeastern United States in September of 2009, it was noted that eight of the eleven total deaths were a result of people driving vehicles across flooded roads in poor visibility due to heavy rain. Additionally, ten of the eleven deaths occurred at night. “Turn Around, Don’t Drown” is a simple concept during the day when it is easier to recognize flooding, but it becomes even more important at night when flooding dangers are harder to recognize. We often take for granted the fact that heavy rain at night can catch us off guard, but it’s undeniable that heavy rain and flooding at night can be a deadly combination for motorists. Unfortunately, our desire to get home or to our destination can cloud our better judgment.



Above: A car trapped in flood waters at night. Photo courtesy of the New Braunfels Herald-Zeitung.

Although most people would not intentionally drive across a flooded road or low water crossing, people will often continue to drive “normally” despite very poor visibility due to rain and darkness. This fact can be compounded when traveling on familiar roads because flash flooding can take on unfamiliar or “never seen before” proportions.

The following is a testimony of Marilyn and Tom, interviewed by the Red Cross after Tropical Storm Allison struck Texas in late June of 2001.

“Flooding never happens here. Tom was trying to get home. He drives the road near the stream every day. We knew it had been raining a lot, but it had been so dry, we were actually happy about the rain. Tom saw some water on the road, but thought it wasn’t deep. And, after all, he was in a truck, high up off the ground. But then his truck started to float, and before he knew it, his truck washed downstream with him in it. Fortunately, his truck got stuck on a rock or something, and someone saw him and threw him a line. Tom got out okay. But we really learned from this, not to drive in floods.”

Clearly, Tom was very fortunate. The flood fatality statistics mentioned above are *not* an anomaly. Flash flooding is the leading cause of weather-related deaths across the U.S., and nearly half of them are vehicle-related. When scaled down to the local area of South Central Texas, the percentage of weather-related fatalities due to flash flooding rises to as high as 75%. Of those flood deaths, 76% since 1973 were vehicle-related.

So what can you do to prevent being a flash flood statistic? The following page lists a few suggestions to keep you and your family safe.

Continued on Page 6

Continued from page 5

Flood Safety Awareness Tips:

1. **Turn Around, Don't Drown.** This slogan seems simple, but it could be the best advice to keep in mind during a flood. Don't become fixated on your destination. When obvious warning signs tell you that you should turn around, listen to your conscience and don't become another flood fatality! Turn around, don't drown.

2. **Be aware of the weather forecast. Are Flash Flood Watches in effect?**

Action: Should I delay my travel plans if watches are in effect? If heavy rains are expected to develop, can I plan on being off the road by dark?

3. **Has heavy rain already started to fall or are Flash Flood Warnings in effect for the area?**

Action: Strongly consider delaying your trip, especially if it will be dark while on the road, and you are traveling on rural roads.



It's easy to spot the flooded road in the picture on the left. Can you see the flooded road, or the road at all, in the picture on the right?

4. **You are driving and suddenly it begins to rain so heavily you can't see.**

Action: Slow down. Pull off into a safe area such as a lighted parking lot as soon as possible until the rain subsides. You can also pull off to a paved shoulder, rather than stopping on the road.

5. **Be informed of the latest weather information.**

Action: Listen for weather updates on the radio. Know which radio stations broadcast weather information during severe weather and have those stations set as presets.

6. **Never** assume a road can't flood. During "unusual" flooding, roads which never have flooded before may flood for the first time. Urbanization of rural areas along with drainage improvements can often increase and change flood water runoff, and cause flooding to occur in areas that have not previously flooded.