



# TEXAS CoCoRaHS OBSERVER

Summer 2015



*"Because every drop counts, as do all Zeros."*

## Welcome to the Texas CoCoRaHS Observer news-letter.

The purpose of this news-letter is to keep observers informed of the latest news, events and happenings related to the CoCoRaHS program here in Texas, as well as news about the latest weather patterns affecting each region of Texas.

If you have questions, comments or suggestions, feel free to contact us via the emails listed on the back page.

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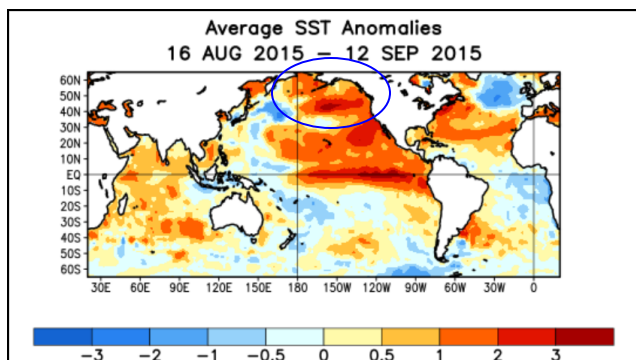
## El Niño's influence on Texas weather

During the month of August into September atmospheric and oceanic anomalies reflect a strong El Niño in progress and continuing. All models surveyed predict El Niño to continue into the Northern Hemisphere spring of 2016, and all multi-model averages predict a peak in late fall/early winter. A consensus among forecasters unanimously favors a 95% chance that El Niño will continue through Northern Hemisphere winter 2015-16, gradually weakening through spring 2016. See Figures 1 and 2.

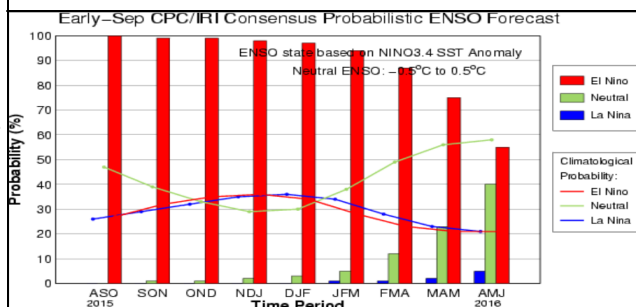
The month of June to early July had above normal rainfall and slightly cooler than average temperatures across the state. Most of Texas had below normal rainfall for the month of August with extreme SE Texas coastal areas and the northern part of the panhandle having above normal rainfall. Texas overall for the summer months was near average on rainfall while above average on temperatures. See Figures 3 and 4. The dry period of weather from mid-July to mid-August has brought drought conditions in parts of east and northeast Texas once again, Figure 5 (on page 2)

The strengthening El Niño during the summer months had a very minor influence on U.S. summer weather patterns but has had a profound effect on the Atlantic tropical basin by shredding apart storms such as Hurricane Danny and Tropical Storm Erica before they could threaten the U.S. mainland. This is perhaps a reason why Texas was very dry from mid-July to mid-August and averaged above normal temperatures during this timeframe, Fig 6 and 7.

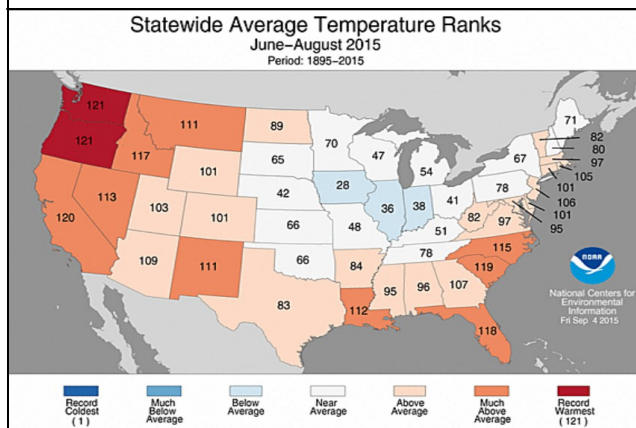
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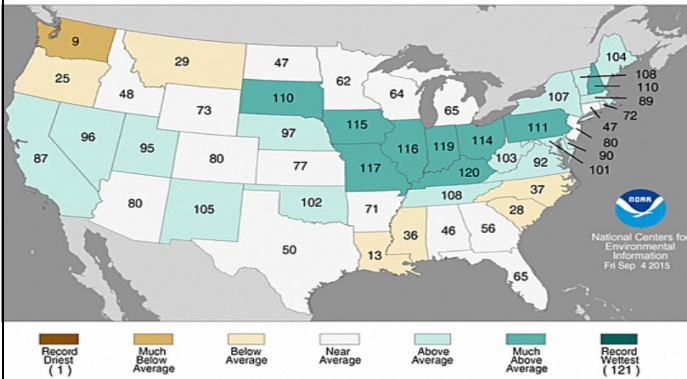
**Above..Figure 1: Average sea surface temperature anomalies, with the largest anomalies along the equator and near Gulf of Alaska.**



**Above..Figure 2: Probability of an El Niño event  
Below..Figure 3: summer temperature rankings**



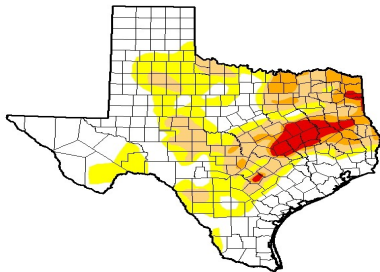
### Statewide Precipitation Ranks June–August 2015 Period: 1895–2015



**Above...Figure 4: Summer precipitation rankings**  
**Below...Figure 5: current drought conditions across Texas. Drought worst over Brazos Valley region and east Texas.**

### U.S. Drought Monitor Texas

September 15, 2015  
(Released Thursday, Sep. 17, 2015)  
Valid 8 a.m. EDT



	El Paso	San Antonio	Fort Worth	Dallas	Houston	San Diego
Current	46.77	51.23	26.71	16.46	3.92	0.00
Last Week	62.51	47.43	27.14	13.23	2.50	0.00
3 Months Ago	63.20	6.00	0.29	0.00	0.00	0.00
Start of Calendar Year	34.37	65.63	44.68	25.73	11.75	3.17
Start of Water Year	28.92	71.08	48.95	29.54	11.26	2.69
One Year Ago	17.71	62.29	56.83	35.00	13.05	1.79

*Intensity:*  
D0 Abnormally Dry  
D1 Moderate Drought  
D2 Severe Drought  
D3 Extreme Drought  
D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for detailed statements.

Author:  
Chris Ferrelle  
NOAA/NWS/DIS/NCDC



<http://droughtmonitor.unl.edu/>

EL NIÑO...CONTINUED FROM PAGE 1—>A second factor in the dry period just mentioned which may be keeping the usual effects of El Niño of below average temperatures and above average rainfall from occurring is the large area of above normal sea surface temperatures in the North Pacific Ocean, Fig. 1. This is a pattern which is more La Niña like in the North Pacific even though water temperatures in the Equatorial region of the Pacific are above normal and in a strong El Niño pattern. This is a conflicting anomaly to the effects that El Niño will have on the United States. Figure 1 shows this region of warm waters in the North Pacific circled and its relation to the strong El Niño in the Equatorial Pacific with the outlook for these areas of the Pacific Ocean.

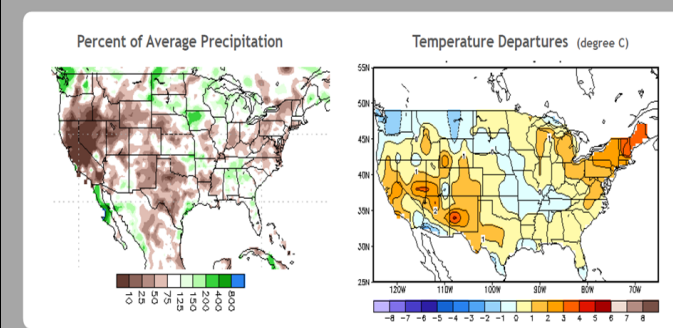
The outlook for the fall months in Figures 8 and 9 shows at least a 50% chance of above average rainfall over the southern and southwestern portions of Texas between October and December. Then between December and February, most of the state will fall under the high chance of above normal precipitation.

With the likelihood of well above average precipitation, temperatures will likely be cooler due to the clouds and rain. Current outlooks call for below average temperatures in the southwest, northwest and panhandle regions of the state between October and December, with almost all the state having at least a 40% chance of below normal temperatures between December and February.

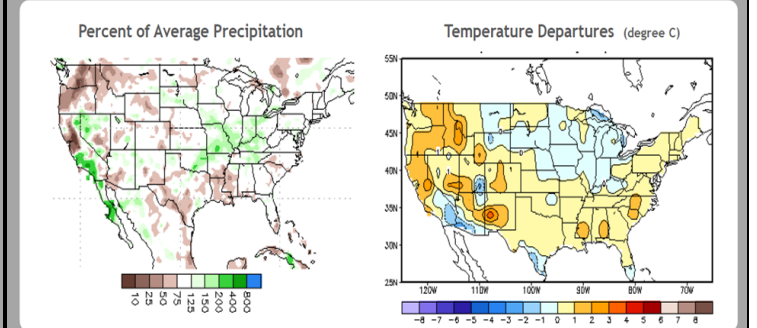
This type of pattern with a strong El Niño may have a highly variable precipitation and temperature pattern which may have typical wet and cool conditions of El Niño followed by period of very dry and warm conditions.

With a wet period of weather coming, make sure to have those CoCoRaHS rain gauges ready to record how much falls. Your data is valuable to forecasters for the purpose of issuing watches, warnings and river forecasts and to scientists that track and compare El Niño events throughout history.

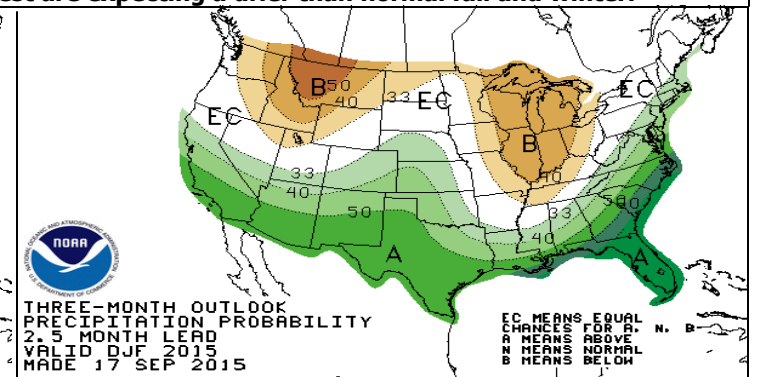
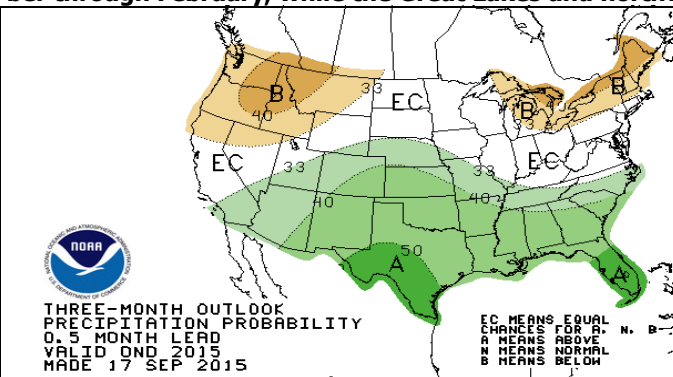
**Below...Figure 6: Temperatures and precipitation over the last 30 days ending 12 September 2015**



**Below..Figure 7: Temperatures and precipitation over the last 90 days ending 12 September 2015**



**Below...Figures 8 and 9. Outlooks calling for at least a 50% of above normal rainfall for much of Texas from October through February, while the Great Lakes and northwest are expecting a drier than normal fall and winter.**





## Heavy downpours cause flooding in Brownsville area

A combination of high moisture content in the atmosphere, outflow boundaries from earlier storms, daytime heating and the sea breeze triggered a deluge not seen in Brownsville since September of 2010.

Four to six inches of rain in a three hour time span on the afternoon of August 31st, left parts of southern Cameron County under as much as four feet of water. Areas hardest hit included the western half of Brownsville, mainly areas along and west of Paredes Line Road., and northwest along Interstate 69E to Rancho Viejo.

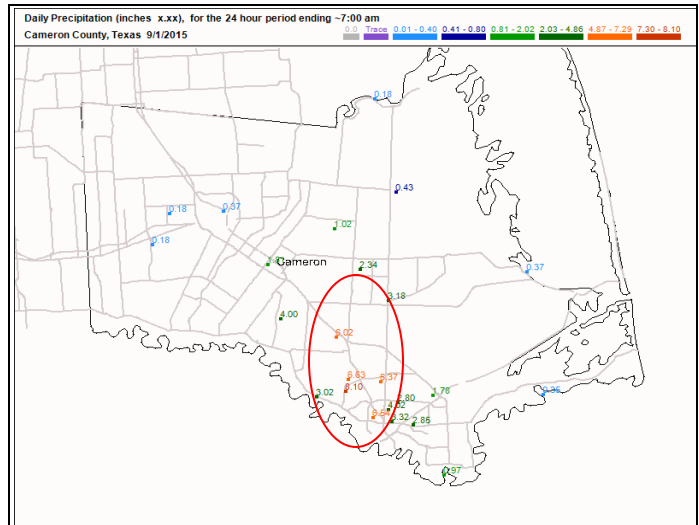
Many vehicles became stranded under water, including a school bus along the service road of I-69E at Price Road. Many homes and businesses west of the expressway also experienced some water inundation.

Flooding was most severe in the Colonia Galaxia in Brownsville's west side. As a result, the City of Brownsville, together with the American Red Cross opened a shelter to accommodate any families impacted by the flooding.

This storm slowly drifted south into downtown Brownsville and then into Matamoros, Mexico and became classic high precipitation supercell, with a possible radar indicated tornado just south of the Mexican border.

While no exact figures are available, damage is estimated to be in the millions of dollars.

This 6 inch deluge was nearly three times the normal September rainfall of about 2.5 inches. The last time the city saw such a deluge was on September 19, 2010 when 6.48 inches fell, which was part of a span of straight days of rain.



**Above: CoCoRaHS 24 hour rainfall map for Cameron County ending at 7:00 am on September 1st, 2015. Heaviest rainfall amounts occurred in west Brownsville (6.54"), Rancho Viejo (6.02") and Cameron Park (8.10"), while the official total at the NWS office in east Brownsville was only 1.61".**

**Below: Flooded streets and cars under water in western half of Brownsville on the afternoon of August 31st.**



## San Angelo/Big Country region very dry during August.

Strong high pressure kept much of west central Texas drier and warmer than normal during August.

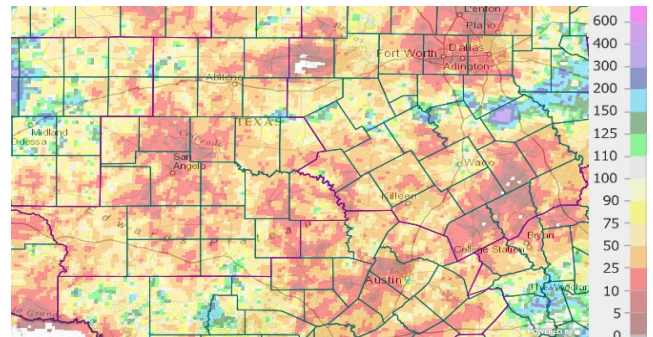
San Angelo, with an average temperature of 86.4°, tied August 1929 for 10th warmest on record. Abilene averaged 84.9°, ranking 31st warmest.

Although some scattered showers occurred during the first few days of the month, hot and dry continued in several segments throughout the remainder of the month, interspersed with intermittent showers and thunderstorms which were mostly isolated to scattered in coverage. Showers occurred in parts of the region on the—>

—>13th and 14th, with the best rains occurring on the 20th, in which some locations received 1 to 2 inches.

San Angelo finished August with 19 days over 100°, while Junction had 13 and Abilene 11 days.

The hot and dry conditions from July into August caused the vegetation to become very dry in some areas. Several grass and brush fires occurred, with some of the fires started by lightning. The largest fires included Head of the River Ranch in Tom Green County which had 5,200 acres burned and the Prickly Pair wildfire in Crockett County which burned 3,452 acres.



**Much of west central Texas recorded less than 25% of the normal August rainfall. For areas in red, total rain was less than 1/2 inch for the month of August.**

## Training Section: Types of Reports

The observer training section in this edition will focus on the many different reports the CoCoRaHS website has available for any observer to submit data to CoCoRaHS about the conditions they have observed and experienced at their station.

The following reports cover precipitation, significant weather, days without rain, and drought and are detailed below:

### Multi-Day Precipitation Accumulation Report

### Significant Weather Report

### Hail Report

### Monthly Zeros Report

### Drought Impact Report

Additional reports about atmospheric phenomenon, optics, and thunder:

**Frost Report** - a simple report about the percent coverage of frost on a surfaces.

**Optics Report** - a report about optical phenomenon with the sun such as corona, halo, and rainbows.

**Snowflake Report** - a report about the shapes of snowflakes that were falling during snow events.

**Thunder Report** – a report covering the number of thunder claps during a certain time period of the 24 hour day.

### Multi-Day Precipitation Accumulation Report

This report is useful if you are away on vacation and return to find you had rain while you were away. This report can also be useful anytime you forget to read your gauge the day before and didn't enter a daily report. Read your gauge and if you had rain from the previous 48 hours then fill out and submit the "Multi-Day Precipitation Accumulation Report". Remember to add up the amount rain in your gage, then enter the dates the report will cover and the time you emptied the gauge. Enter the rain amount and add any notes about the number of days the report covers. Submit the data.

Multi-Day Precipitation Form

If you are away on vacation or out of town this is the form for you.

Just put in the dates that you were gone and record what you found in the gauge.

There is no need to file an additional daily report.

### Significant Weather Report

This report can be submitted anytime you observe heavy rain or snow. Enter the observation date and time then enter the time duration that the report covers. Additional information can be entered if there was flooding and severe weather. Observation notes are a great way of telling the story of what happened and how an event occurred. This report goes directly to your local National Weather Office and is viewed immediately by a meteorologist.

Significant Weather Report  
(both rain and snow)

Notification:  
Use this form to report heavy rain or snow that has just fallen, or is still falling.

Significant Weather Report

Station Number : CO-LR-610  
Station Name : Fort Collins 3.5 SW  
Denotes Required Field

Observation Date : 7/27/2014  
Observation Time : 9:00 AM  
Time duration that the report covers : 20 Minutes

Rain

New Rain and Melted Snow that has fallen during the report duration, in inches to the nearest hundredth : 1.35 in  
Total Precipitation, rain and melted snow, since storm began, in inches to the nearest hundredth : 1.35 in

Snow

Depth of New Snow that has fallen during the report duration, in inches to the nearest tenth : in  
Total depth of snow and ice on ground at the time of this observation to nearest half inch : in



## Training Section: Types of Reports (cont)

### Hail Report

CoCoRaHS COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK  
"Because every drop counts"

Home | States | View Data | Maps | My Data | My Account | Admin | Logout

My Data Entry : Hail Report Form

Enter My New Reports

- Daily Precipitation
- Multi-Day Accumulation
- Hail
- Significant Weather
- Monthly Zeros
- Drought Impact Report
- Evapotranspiration

FROST Reports

- Frost
- Optics
- Snowflake
- Thunder

List/Edit My Reports

- Daily Precipitation
- Multi-Day Accumulation
- Hail
- Significant Weather
- Drought Impact Report
- Evapotranspiration

FROST Reports

- Optics
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- Thunder

Hail Report Form

Station Number : CO-LR-610  
Station Name : Fort Collins 3.5 SW

Date of Hail Storm : 6/26/2014  
Time Hail Storm Began : 1:50 PM

Report was taken at registered location?  
☒ Yes ☐ No

Size of hailstones

Smallest: 1/4" Pea Size  
Average: 1/2" Grape  
Largest: 3/4" Penny Size

Hail Lasted : 15 Minutes  
This time is accurate within : 2 min.

Hailfall was: ☒ Continuous ☐ Intermittent

Hailstones were:  
(Check all that apply)  
☒ Hard ☐ Soft ☐ Mixed (Hard & Soft) ☐ Clear Ice ☐ White Ice

Was there more rain than hail? ☐ Yes ☒ No

Hail Started:  
☒ Before rain ☐ After rain ☐ Same time as rain

Largest Hail Started:  
☐ Before smaller hail ☒ After smaller hail ☐ Same time as smaller hail

### Hail Report

If you observe hail at your station location then please submit a hail report as soon as possible. This report covers the following: size of hail, how long the hail lasted, information about the hail, damage information, hail pad information, any notes. Please correctly document the time the hail started and how long it lasted, the size of the hailstones, and type of hail. Please note any damage the hail may have caused. Enter as much information as you can and provide any notes about additional information not covered in the report form. This report goes directly to your local National Weather Office and is viewed immediately by a meteorologist.

### Monthly Zeros Report

This is a convenient report to make sure any days that you didn't record rain and forgot to enter and submit a daily report you can still record and report all of these days with this one report. Now all of those important zero days can be in the database and you have a complete month of data. Just check the boxes on the calendar days for your station in which you didn't record rainfall. Then hit submit. Please double check your reports with stations in your area to make sure this data is correct. Make sure that a submitted zero day is not submitted on days that were rain days for all other stations near your station.

### Monthly Zeros Report

CoCoRaHS COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK  
"Because every drop counts"

Home | States | View Data | Maps | My Data | My Account | Admin | Logout

My Data Entry : Monthly Zeros Form

Enter My New Reports

- Daily Precipitation
- Multi-Day Accumulation
- Hail
- Significant Weather
- Monthly Zeros
- Drought Impact Report
- Evapotranspiration

FROST Reports

- Frost
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- Thunder

List/Edit My Reports

- Daily Precipitation
- Multi-Day Accumulation
- Hail
- Significant Weather
- Drought Impact Report
- Evapotranspiration

Monthly Zeros

Station Number : CO-LR-610  
Station Name : Fort Collins 3.5 SW

May 2014

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Click a empty box and it will automatically fill in a zero (0.00") for that day.

Don't forget to hit submit.

### Drought Impact Report

CoCoRaHS COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK  
"Because every drop counts"

Home | States | View Data | Maps | My Data | My Account | Admin | Logout

My Data Entry : Drought Impact Report Form

Enter My New Reports

- Daily Precipitation
- Multi-Day Accumulation
- Hail
- Significant Weather
- Monthly Zeros
- Drought Impact Report
- Evapotranspiration

FROST Reports

- Frost
- Optics
- Snowflake
- Thunder

List/Edit My Reports

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- Drought Impact Report
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Drought Impact Report Form

Station Number : CO-LR-610  
Station Name : Fort Collins 3.5 SW

The significance of drought is tied directly to the impacts that it causes. Identifying and documenting impacts as they first appear and as they continue is essential for comprehensive drought monitoring. Please refer to the CoCoRaHS training slide show for reporting drought impacts.

Duration  
Drought is a gradual, slow-moving phenomenon. The start date is an approximation. End dates are not required.

Impact Start Date : 6/21/2014  
End Date : 6/21/2014

Condition Monitoring  
☐ Condition Monitoring Report

A Condition Monitoring Report allows a regular observer to describe normal conditions that are likely to change during drought, to create a basis for comparison. Please check Condition Monitoring Report if that's what you are submitting. If you aren't sure, please leave it unchecked. More information on categories of drought impacts and reports.

Description  
Please provide a description of how dry, normal or wet conditions are affecting you, your neighborhood, your activities, etc.

After pond for our sheep has dried up over the summer. Many trees have lost their leaves due to the lack of rain. The corn in our field has not materialized this year and this will impact the feeding of our livestock.

### Drought Impact Report

This report is very valuable to identify and document the impacts of drought as they first appear in your area. A guide to reporting drought impacts is linked from the report form and covers all the details of this very important report. Please read this guide to better understand about the importance of drought and it's impacts, and how to report "how drought is impacting you".

## Heavy rain and flooding in areas of southern Panhandle

After a wet spring, rains continued into the summer months across the southern Texas panhandle

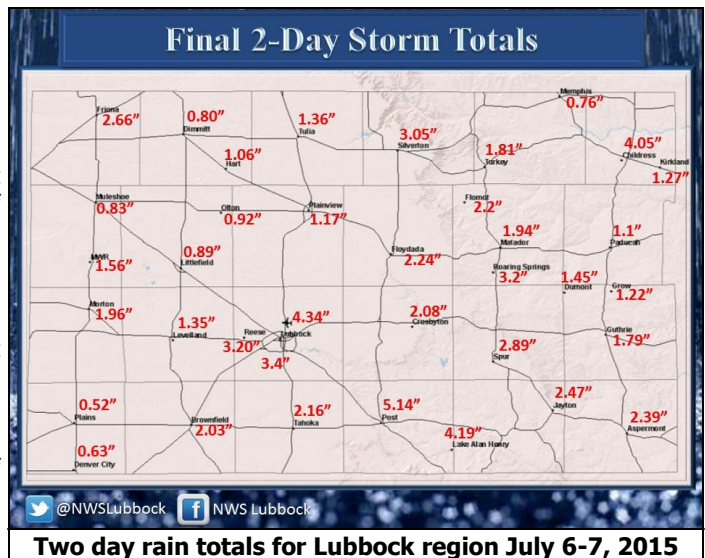
Mid-June brought another stretch of unsettled weather as a slow moving upper level storm system interacted with abundant moisture and instability. The result was several rounds of thunderstorms, with some dumping heavy rain, tennis to baseball size hail and damaging winds. Several storms developed rotation with wall clouds seen over Lubbock and Muleshoe. However, no tornadoes were reported. Winds up to 73 mph damaged homes and power lines and eve blew trucks off of Interstate 27 south of Plainview.

July 6th & 7th brought an unusually strong cold front to the South Plains region.

The front took advantage of very warm and moist air to generate widespread showers and thunderstorms. Several storms dumped 3 to 5 inches of rain, including 4.34" at Lubbock Airport and 5.14" at Post, southeast of Lubbock, which resulted in flooding. The storms also brought high winds which downed power lines and resulted in near zero visibility conditions, making travel difficult to impossible.

On July 8th and 9th, a slow moving complex of thunderstorms another 2 to 3 inches of rain in Plainview and areas to the north and northeast. Northern Hall, Briscoe and Childress Counties received 3 to 5 inches.

On August 19th, a rare strong summer cold front moved into the southern Panhandle and caused thunderstorms to erupt as it interacted with the summer heat



**Two day rain totals for Lubbock region July 6-7, 2015**

and moisture. Many storms were in Swisher and Briscoe Counties where 1 to 2 inches of rain was recorded. Childress received 1.07", which set a new daily rain record.

### June-August Rainfall

City	Total	Departure*
Lubbock	6.36"	-0.10"
Childress	10.65"	+2.10"
Plainview	8.74"	+0.99"
Paducah	7.35"	-0.19"
Memphis	8.24"	+0.30"
Tahoka	5.58"	-2.22"
Post	8.12"	-0.25"
Muleshoe	8.97"	+1.42"

\* departure based average from 1985 to 2015

Source: NWS-Lubbock



**Wall cloud and rain shaft over the western areas of Lubbock on the evening of June 12, 2015.**



**Flooding problems near 89th Street and Quaker in Lubbock at 6:45p. m. on July 6th, 2015.**

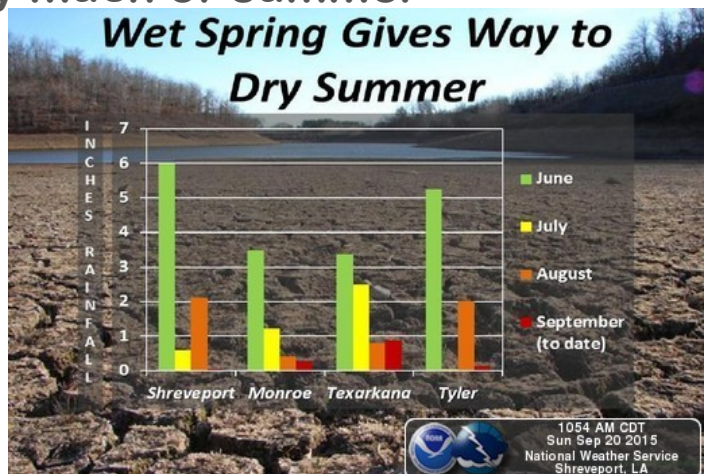
## Northeast Texas dry much of summer

Severe drought conditions continue to expand across portions of northeast Texas.

The first few weeks of August remained very dry, continuing the trend of a hot and dry July which attributed to "flash drought" conditions across much of the region. Several locations either set or ranked in the top 10 for longest number of consecutive days without measurable rainfall. Tyler went 42 days, from July 8th to August 18th, without rain, which tied for 5th longest

with 1953. Longview also went 42 days without rain, ranking 7th longest all time. Although some showers and thunderstorms affected the region on August 19th, it did little to help alleviate the ongoing drought conditions.

Due to the dry conditions, topsoil moisture remains dry with hay harvesting over until grass growth resumes. The corn crop was a complete loss across portions of east Texas, with many other vegetable crops suffering as well. Numerous burn bans remain in effect across the region.





# National Weather Service to debut “Impact-Based Warnings”

On October 1st, 2015, the National Weather Service forecast office in Corpus Christi, Brownsville and Houston will debut “Impact-Based Warnings (IBW).”

IBW are an experimental product that started in 2012 in the central region of the National Weather Service. By the end of 2015, a total of 80 NWS offices will be using the new Impact Based Warnings. The remaining NWS offices are expected to implement IBWs in 2016.

The goal of IBWs are to improve communication of the most critical information through the use of specific statements, easy to find hazard and impact information and the use of summary tags at the bottom of warnings.

As a result, partners and users will notice minor changes to Tornado and Severe Thunderstorm Warnings, and to Severe Weather Statements.

## Specific Statements:

Specific phrases will be used in Tornado Warnings for both the considerable and catastrophic tags.

*This is a particularly dangerous situation.”*

*This is a tornado emergency for locations along the path of the tornado. Take cover now. This is a particularly dangerous situation.”*

## Hazard and Impact Information

Each tornado and severe thunderstorm warning will contain individual lines that clearly state hazard and impact information.

*Hazard: Damaging Tornado*

*Source: Emergency Management Confirmed tornado*

*Impact: You are in a life threatening situation. Flying debris will be deadly to those caught without shelter. Mobile homes will be destroyed. Considerable damage to homes....businesses and vehicles is likely and complete destruction possible.*

## Tags

Tags will appear at the bottom of Tornado and Severe Thunderstorm Warnings, and in

the Severe Weather Statements that update warnings.

In a Severe Thunderstorm Warning, tags will be used to define:

- Hail size
- wind speed
- possible tornado (if necessary)

In a Tornado Warning, two types of tags can be used:

- Tornado tag (always used)
  - radar indicated
  - observed
- Damage threat tag (optional)
  - considerable damage
  - catastrophic damage

For more information about Impact-Based Warnings, log onto [www.weather.gov/impacts/](http://www.weather.gov/impacts/)

CoCoRaHS Observers: your hail and significant weather reports play a key role in the issuance of timely and accurate weather and flood warnings by the National Weather Service. Be sure to submit a report if you see significant weather in your area.

	<b>Tornado Tag</b>	
	TORNADO...RADAR INDICATED	Evidence on radar and near storm environment is supportive, but no confirmation.
	TORNADO...OBSERVED	Tornado is confirmed by spotters, law enforcement, etc.
	<b>Tornado Damage Threat Tag</b>	
	No Tag	Use most of the time, when tornado damage possible within the warning polygon. Tornado duration generally expected to be short-lived
	TORNADO DAMAGE THREAT...CONSIDERABLE	Use rarely, when there is credible evidence that a tornado, capable of producing considerable damage, is imminent or ongoing. Tornado duration generally expected to be long lived
	TORNADO DAMAGE THREAT...CATASTROPHIC	Use exceedingly rarely, when a severe threat to human life and catastrophic damage from a tornado is occurring, and will only be used when reliable sources confirm a violent tornado.. Tornado duration generally expected to be long lived
<b>Tornado Tag In Severe Thunderstorm Warnings</b>		
	TORNADO...POSSIBLE	A severe thunderstorm has some potential for producing a tornado although forecaster confidence is not high enough to issue a Tornado Warning.

The different types of Tornado Tags that can be used in the new Impact-Based Warnings (IBWs), with an example of a new IBW type Tornado warning at left. The “Hazard and Impact” statements are circled in red in the bulletin at left. IBWs will begin October 1st for NWS offices along Texas Coast.

# Tropical Storm Bill summary

## TOTAL RAINFALL FROM 1200 UTC JUN 16 UNTIL 1200 UTC JUN 18

CITY/TOWN	COUNTY	ID	RAINFALL
1.5 W GANADO	JACKSON	TX-JK-5	13.78
8 N GANADO	WHARTON	ETCT2	13.50
2 NW EL CAMPO	WHARTON	EMCT2	10.50
SEALY 0.3 NNW	AUSTIN	TX-AS-5	9.17
6 WNW WHARTON	WHARTON	GNFT2	8.04
2 W BAY CITY	MATAGORDA	BACT2	7.43
LA WARD	JACKSON	E6228	7.32
SAN FELIPE 1 WNW	AUSTIN	TX-AS-6	6.84
1 SW BELLVILLE	AUSTIN	BVCT2	6.82
8 SE NAVASOTA	GRIMES	E4261	6.73
WHARTON	WHARTON	KARM	6.26
3 SSW MONT BELVIEU	CHAMBERS	E0401	5.82
5 W EAGLE LAKE	COLORADO	ACL22	5.80
7 S WEIMAR	COLORADO	WMCT2	5.56
7 S NEW ULM	COLORADO	TX-CLR-6	5.44
MADISONVILLE	MADISON	MSVT2	5.43
4 WNW DAYTON	LIBERTY	TR968	4.63
9 W MARKHAM	MATAGORDA	MGMT2	4.25
MONTGOMERY	MONTGOMERY	MGMT2	4.25
1 ESE WEST COLUMBIA	BRAZORIA	WSCT2	4.17
1 SSE SOMERVILLE	BURLESON	SOMT2	3.65
HUNTSVILLE	WALKER	HUNT2	3.42
PEARLAND REG. AIRPORT	BRAZORIA	KLJV	3.41
9 SSW STOWELL	CHAMBERS	R474	3.33
6 SSW TODD MISSION	WALLER	D1932	3.30
15 N HOUSTON	HARRIS	KIAH	3.30
3 NE KENNARD	HOUSTON	RTCT2	3.22
13 NW LIVINGSTON	POLK	TX-PL-35	2.93
1 NNE LEAGUE CITY	GALVESTON	LGCT1	2.63
COULTER FIELD AIRPORT	BRAZOS	CFD	2.24
RICHMOND	FORT BEND	RCHJL	2.23
1.8 NNE CROCKETT	HOUSTON	TX-HST-3	2.21
1 W SUGAR LAND AIRPORT	FORT BEND	SGR	2.14
3 W SOUTH HOUSTON	HARRIS	KHOU	2.09
4 ENE CLEVELAND	LIBERTY	6R3	2.05
2 WSW ARCOLA	FORT BEND	AXH	1.78
GALVESTON	GALVESTON	GLS	1.66
4 NE CONROE	MONTGOMERY	KCXO	1.60
5 SSE COLDSRING	SAN JACINTO	CPGT2	1.38

REMARKS: RAINFALL OCCURRED NEAR CORE OF STORM BUT ALSO WITH BANDS AND TAPPING GULF MOISTURE AND FEEDING INTO BILL AS IT TRACKED NORTH.

COCORAHs STATIONS HIGHLIGHTED IN BLUE

## INLAND FLOODING BY COUNTY

WASHINGTON...FLASH FLOODING IN BRENHAM DURING EARLY MORNING HOURS OF JUNE 17TH. SEVERAL ROADS CLOSED.

GRIMES...NUMEROUS ROADS CLOSED DUE TO HIGH WATER. THIS INCLUDES FM 3090 12 MILES NORTH OF NAVASOTA AND FM 1774 NORTH OF PLANTERSVILLE.

AUSTIN...NUMEROUS ROADWAYS IMPASSABLE DUE TO HEAVY RAINFALL NEAR SEALY AND BELLVILLE.

JACKSON...NUMEROUS ROADS CLOSED DUE TO FLOODING FROM HEAVY RAINFALL INCLUDING FM 1593 WEST OF LA WARD. STATE HIGHWAY 59 WAS CLOSED FROM EDNA TO WHARTON COUNTY LINE.

WHARTON...SEVERAL ROADS CLOSED DUE TO HIGH WATER. AREA NEAR GANADO AND EL CAMPO ESPECIALLY HARD HIT. SEVERAL ROADS CLOSED.

COLORADO...NUMEROUS ROADS CLOSED FROM FLOODING THAT OCCURRED AS BILL LIFTED NORTH. THESE INCLUDE FM 2761...FM 2434 AND FM 532.

## Tornadoes and Storm Impacts by County

TORNADOES...

NO TORNADOES WERE REPORTED.

STORM IMPACTS BY COUNTY...

COUNTY	DEATHS	INJURIES	EVACUATIONS
DESCRIPTION			
GALVESTON	0	0	0

VOLUNTARY EVACUATION ORDERED FOR BOLIVAR PENINSULA. MINOR COASTAL FLOODING OCCURRED ON BOLIVAR WITH SOME DEBRIS REMOVAL REQUIRED OFF OF STATE HIGHWAY 87. SURF CAUSED BEACH EROSION ON GALVESTON BEACHES. SAND AND DEBRIS WASHED UP ON STREETS OF VARIOUS SUBDIVISIONS ON GALVESTON ISLANDS WEST END. TWO ROADS TEMPORARILY CLOSED JAMAICA BEACH. A FEW HOMES HAD MINOR DAMAGE IN DOWNSTAIRS GARAGE AREA.

BRAZORIA	0	0	0
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SURGE FLOODING IMPACTED SURFSIDE BEACHES, TREASURE ISLAND SUBDIVISION AND SAN LUIS PASS PARK. BEACH...SEASHELL AND SURF ROADS WERE CLOSED IN THE VILLAGE OF SURFSIDE BEACH. ALL BEACH ACCESS ROADS CLOSED. STORM SURGE FLOODING WAS 2 FEET DEEP IN TREASURE ISLAND SUBDIVISION. HEAVY RAIN CAUSED FLOODING OF CHOCOLATE AND HALLS BAYOUS. FOUR TREES DOWNED BY WIND.

HARRIS	0	0	0
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MINOR STORM SURGE FLOODING OBSERVED IN SHOREACRES, CLEAR LAKE SHORES AND SEABROOK, TODDVILLE ROAD AREA. SURGE FLOODING 2 FEET DEEP IN SHOREACRES AS TAYLOR BAYOU CAME OUT OF ITS BANKS. HIGH WATER FROM SURGE ENTERED PARK AREAS OF NASSAU BAY BUT NO REAL IMPACT.

MATAGORDA	0	0	0
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STRONG WINDS AND MINOR COASTAL FLOODING OCCURRED. ROAD TO BEACH FROM SERGEANT WAS FLOODED AND CLOSED. WATER ROSE AROUND HOMES IN THE CITY OF MATAGORDA BUT NO DAMAGE REPORTED.

CHAMBERS	0	0	0
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SOME LOW LYING RURAL ROADS EXPERIENCE MINOR COASTAL FLOODING BUT LITTLE IMPACT.

JACKSON	0	0	0
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SOME MINOR COASTAL FLOODING NEAR MATAGORDA BAY. SIGNIFICANT INLAND FLOODING FROM HEAVY RAINFALL FROM LOLITA TO EDNA TO GANADO WHERE OVER 13 INCHES OF RAIN FELL LOCALLY WITH THE STORM AND AFTER THE STORM LIFTED NORTH.

HOUSTON...HIGHWAY 287 AND 19S CLOSED BETWEEN CROCKETT AND LOVELADY DUE TO HIGH WATER.

WALKER...10 COUNTY ROADS AND 1 STATE HIGHWAY FLOODED BY HEAVY RAIN.



The month of August began with the same pattern as July ended with very dry conditions and hot temperatures. The Houston area had a streak of days from the 5<sup>th</sup> to the 15<sup>th</sup> with highs of 99 or greater with a reading of 106 degrees on the 11<sup>th</sup> for the highest temperature of the summer months. Most of the region had temperatures near normal for the month. A few of the counties in the central part of the region had slightly above normal temperatures. Rainfall was below normal for counties well inland from the coast while most areas had rainfall near normal. The big exception was coastal counties and areas south of IH-10 where several days of heavy rain fell for the month. The days of the 11<sup>th</sup>, 17<sup>th</sup> to the 22<sup>nd</sup>, and the 25<sup>th</sup> had very heavy rainfall in these areas. The August radar estimated rainfall map shows this pattern of heavy coastal rains.

## June-August 2015 Rainfall Totals

### Summer 2015 CoCoRaHS Houston/Galveston Region Rainfall

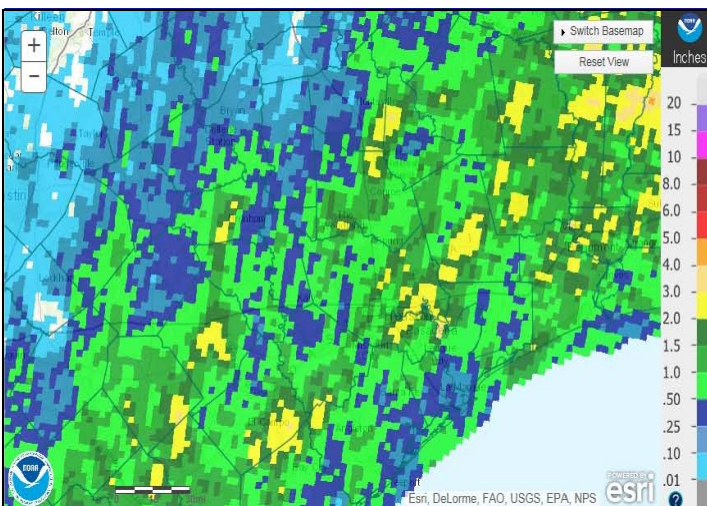
County Rainfall Average and County Station Rainfall Maximum Total in inches per month

County	June		July		August		Summer Total
	AVG.	MAX.	AVG.	MAX.	AVG.	MAX.	3-Month Rain avg.
Austin	8.34	10.98	0.86	1.64	3.78	7.29	12.98
Brazoria	5.32	6.20	1.62	3.42	7.17	10.76	14.11
Chambers *	10.24 *	10.24	2.76 *	2.76	2.05 *	2.05	15.05 *
Colorado	9.90	12.19	1.78	3.35	1.53	2.01	13.21
Fort Bend	3.49	5.84	0.81	1.11	5.21	7.58	9.51
Galveston	7.00	12.13	1.09	2.73	8.51	14.97	16.60
Harris	6.32	15.53	2.12	5.52	5.25	11.10	13.69
Jackson	14.87	18.71	0.80	1.07	2.56	2.97	18.23
Liberty	5.36	7.76	0.99	1.66	1.68	2.13	8.03
Matagorda	No data	"	No data	"	No data	"	No data
Montgomery	5.66	10.87	1.77	3.11	2.15	4.80	9.58
Polk	4.66	7.30	1.04	2.57	2.69	4.78	8.39
San Jacinto	3.20	3.99	1.28	2.27	1.12 *	1.12	5.60
Waller	9.17	11.92	0.97	1.63	4.56	7.03	14.70
Wharton	9.43	12.56	1.79	7.44	2.52	3.41	13.74
Region Totals	7.13	18.71	1.30	7.44	3.97	14.97	12.40

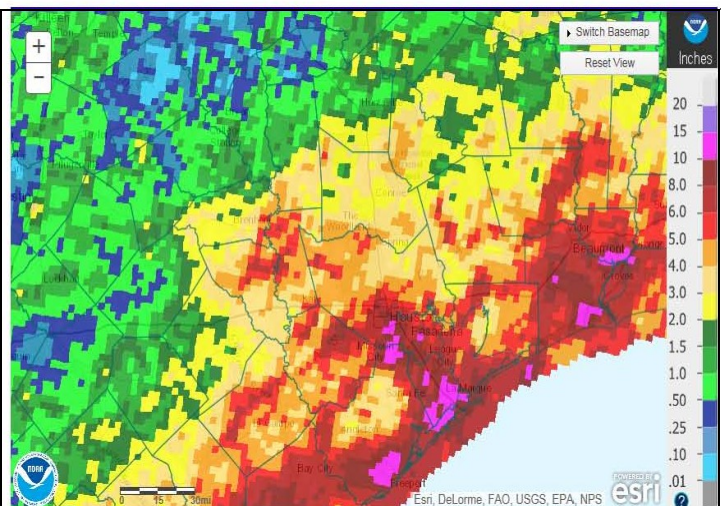
Note: \* = Only one station reported

Rainfall of several NWS first order sites in the region

	June	July	August	3-Month Rain Total
Hou. Bush	11.39	0.61	2.94	14.94
College Sta.	5.21	0.31	1.36	6.88
Galveston	2.75	0.23	6.40	9.38
Hou. Hobby	4.87	2.57	10.76	18.20
Dickinson FO	9.26	0.57	13.81	23.64
Conroe	3.61	1.44	2.27	7.32
Tomball	7.64	0.21	5.28	13.13
Sugarland	3.27	0.43	7.19	10.89
Palacios	3.09	0.43	7.77	11.29
Station avg.'s	5.68	0.76	6.42	12.86



Radar estimated rainfall for July 2015 in Houston-Galveston Area



Radar estimated rainfall for August 2015 in Houston-Galveston Area



## June-August 2015 Rainfall Totals

### WEST TEXAS/PERMIAN BASIN REGION

TX-EP-16	El Paso 6.0 N	5.18"
TX-EP-17	El Paso 3.3 ENE	5.54"
TX-EP-44	El Paso 3.8 SSW	3.92"
TX-EP-53	UTEP EHS	4.31"
TX-EP-70	El Paso 11.2 WNW	5.89"
TX-MDL-6	Midland 3.0 WSW	4.92"
TX-MDL-18	Midland 12.1 S	3.65"
TX-MDL-37	Midland 25.7 SE	5.17"
TX-EC-2	Odessa 8.3 WSW	3.64"
TX-PS-1	Marfa 1.0 NNE	6.19"

### RIO GRANDE VALLEY REGION

TX-CMR-1	Rancho Viejo 0.7 E	12.31"
TX-CMR-8	Brownsville 6.4 SE	6.02"
TX-CMR-12	Harlingen 2.6 ESE	4.87"
TX-CMR-16	Brownsville 3.5 N	11.57"
TX-CMR-21	Los Fresnos 0.3 NE	7.30"
TX-CMR-70	San Benito 0.6 SSE	6.73"
TX-CMR-90	Brownsville 1.5 WNW	12.80"
TX-CMR-97	Rio Hondo 7.9 E	4.22"
TX-HDL-19	Mission 4.3 WSW	9.33"
TX-HDL-21	McAllen 2.4 NE	9.37"
TX-HDL-32	Linn 8.4 WNW	4.31"
TX-ST-1	Rio Grande City 2.8 W	0.40"
TX-ST-2	Rio Grande City 17.7 NE	5.25"
TX-WC-5	Raymondville 2.0 SSW	0.41"
TX-BRK-3	Falfurrias 8.9 SSW	4.72"

### CENTRAL TEXAS REGION

TX-HYS-1	San Marcos 5.8 N	5.53"
TX-HYS-3	Wimberley 4.4 E	4.10"
TX-HYS-17	Dripping Springs 8.4 W	5.28"
TX-HYS-117	Kyle 7.8 ENE	4.31"
TX-HYS-131	Buda 0.7 SW	6.50"
TX-TV-1	Austin 10.0 NW (Great Hills)	7.84"
TX-TV-2	Austin 2.8 N (Allendale)	7.81"
TX-TV-14	Austin 2.9 NE (Lamar & Airport)	6.94"
TX-TV-27	Leander 1.9 WSW	6.32"
TX-TV-43	Pflugerville 2.6 N	3.28"
TX-TV-49	Wells Branch 4.2 S	6.53"
TX-TV-53	Austin 4.2 NW (Lp 360/Penneb)	6.77"
TX-TV-87	Austin 3.9 NNE	5.48"
TX-TV-218	Onion Creek 3.2 ENE	4.19"
TX-BLC-6	Blanco 5.5 E	2.51"
TX-BLC-12	Blanco 1.8 ESE	3.75"
TX-BLC-20	Johnson City 7.9 WNW	1.35"
TX-BXR-8	Hollywood Park 4.7 E	7.38"
TX-BXR-28	Leon Valley 1.6 N	9.52"
TX-BXR-95	Helotes 3.7 SSE	8.44"
TX-BXR-121	San Antonio 3.0 S	7.39"

TX-BXR-138	Leon Valley 2.8 W	6.68"
TX-CML-4	New Braunfels 2.4 SSW	7.39"
TX-CML-8	New Braunfels 7.2 NW	6.99"
TX-CML-12	Canyon Lake 2.5 W	4.49"
TX-CML-95	Bulverde 4.2 ENE	3.77"
TX-GP-64	Seguin 7.6 N	4.97"
TX-GP-91	Cibolo 0.5 NW	8.49"
TX-GP-15	Stonewall 2.3 ENE	1.90"
TX-GS-18	Fredericksburg 12.2 W	4.63"

### NORTH TEXAS REGION

TX-DA-3	University Park 3.1 WNW	7.74"
TX-DA-13	Dallas 7.2 SW	7.16"
TX-DA-39	Dallas 6.6 NE	6.34"
TX-DA-45	Duncanville 0.9 SE	2.35"
TX-DA-57	Irving 5.6 NNE	2.21"
TX-DA-63	DeSoto 2.2 ENE	3.68"
TX-DA-70	Mesquite 3.7 N	5.43"
TX-TN-39	Fort Worth 5.4 SSW	5.18"
TX-TN-55	Fort Worth 11.8 NW	5.54"
TX-TN-85	Southlake 1.7 NE	6.15"
TX-MCL-1	Waco 6.8 NW	7.43"
TX-MCL-14	Waco 1.9 SW	8.63"
TX-MCL-26	Waco 7.7 ESE	8.65"
TX-BEL-1	Temple 8.5 SE	5.61"
TX-BEL-5	Harker Heights 1.7 NW	6.42"
TX-BEL-8	Belton 3.9 N	9.05"
TX-CLL-8	Plano 2.4 WSW	4.51"
TX-CLL-11	McKinney 3.1 SW	2.72"
TX-CLL-40	Frisco 1.9 N	6.22"
TX-DN-8	Flower Mound 2.3 NE	7.22"
TX-WT-13	Wichita Falls 3.4 SSW	8.20"
TX-WT-15	Wichita Falls 7.2 WSW	8.93"

### SAN ANGELO-ABILENE REGION

TX-TG-11	San Angelo 3.8 W	6.59"
TX-TG-28	San Angelo 5.6 SSW	6.10"
TX-TY-5	Merkel 5.8 SW	6.84"
TX-TY-7	Abilene 3.3 SW	10.68"
TX-TY-9	Abilene 7.3 SSW	10.40"
TX-TY-18	Abilene 5.8 SSW	10.15"
TX-HWR-3	Big Spring 1.5 E	4.89"

### SOUTH TEXAS/COASTAL BEND REGION

TX-LS-4	Artesia Wells 1.1 W	4.02"
TX-LS-5	Cotulla 1.6 NE	5.09"
TX-WB-2	Laredo 1.8 SSE	1.13"
TX-WB-4	Las Tiendas Ranch	4.91"
TX-WB-23	Freer 29.5 WSW	0.61"
TX-WB-27	Laredo 2.0 NNE	2.20"

CONTINUED PAGE 12————>

## June-August 2015 Rainfall Totals

TX-NU-4	Corpus Christi 8.0 WNW	4.93"
TX-NU-7	Corpus Christi 9.0 SSE	4.96"
TX-NU-9	Corpus Christi 6.4 WSW	6.73"
TX-NU-12	Orange Grove 4.5 SE	6.44"
TX-VC-4	Victoria 1.3 E	10.95"
TX-VC-17	Victoria 2.1 NNW	9.12"
TX-VC-20	Victoria 9.7 ESE	18.17"
TX-JW-6	Orange Grove 3.3 NW	12.88"
TX-KL-11	Kingsville 0.6 E	5.41"
TX-SP-18	Portland 1.3 NW	5.83"
TX-BEE-10	Beeville 4.5 NW	8.63"
TX-BEE-17	Normania 0.5 NE	7.36"
<b><u>NORTHEAST TEXAS REGION</u></b>		
TX-BWE-1	DeKalb 0.1 SSW	6.51"
TX-GG-5	Longview 3.4 NE	7.46"
TX-GG-8	Longview 2.7 NW	6.02"
TX-HRS-12	Marshall 9.7 SE	5.82"

TX-SM-4	Tyler 4.1 SSW	7.01"
TX-SM-18	Tyler 3.8 WSW	7.32"
TX-AG-1	Lufkin 7.0 W	10.32"
TX-AG-3	Lufkin 3.0 SW	12.30"

### **TEXAS PANHANDLE REGION**

TX-RD-5	Amarillo 6.5 WSW	17.03"
TX-RD-14	Amarillo 4.5 SE	14.75"
TX-RD-22	Canyon 1.9 WNW	8.46"
TX-LK-6	Lubbock 6.1 SW	9.93"
TX-LK-21	Lubbock 3.1 S	8.90"
TX-LK-22	Lubbock Int'l Airport	5.85"
TX-CHD-3	Childress 0.4 WNW	11.70"
TX-DL-1	Texline 0.3 WNW	9.72"
TX-DL-3	Dalhart 8.1 W	8.22"
TX-GY-3	Pampa 3.1 N	15.36"

## Join CoCoRaHS....It's fun!

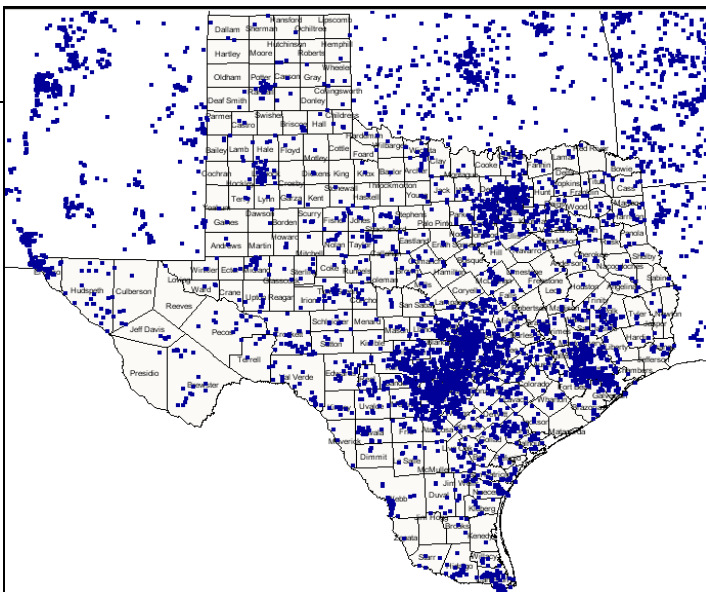
The saying "Rain doesn't fall the same on all" really proves to be true. How often have you seen it rain in your neighborhood and a few blocks away not a drop has fallen.

CoCoRaHS is now the largest provider of daily precipitation data in the United States. CoCoRaHS is also measuring precipitation in Canada, Puerto Rico and the U.S. Virgin Islands.

So when you have the chance, please tell a friend or neighbor about this grassroots effort to measure precipitation in the backyards of citizens from the Atlantic to the Pacific. It is easy to join, simply log on to [www.cocorahs.org](http://www.cocorahs.org) and click on "join" to sign up.

Once registered and set up with your rain gauge, it only takes a couple minutes a day to record and submit your precipitation and is a fun way to learn about this natural resource that falls from the sky. Your observations give the National Weather Service, climatologists, scientists, among others, an ever clearer picture of the amount of precipitation that falls in our nations backyards.

For more information go to [www.cocorahs.org](http://www.cocorahs.org)



**Active CoCoRaHS stations in Texas as of September 19, 2015**



## ***Texas CoCoRaHS Observer***

The official newsletter of Texas CoCoRaHS

Newsletter Editors: **Juan Alanis Jr.**, NOAA/National Weather Service-Corpus Christi  
[Juan.alanis@noaa.gov](mailto:Juan.alanis@noaa.gov)  
**Ronald Havran**, Harris County Flood Control District (Houston)  
[Ronald.havran@hcfcd.org](mailto:Ronald.havran@hcfcd.org)

Texas CoCoRaHS: **William (Bill) Runyon**, Texas State Coordinator  
[Texas.CoCoRaHS@austin.rr.com](mailto:Texas.CoCoRaHS@austin.rr.com)



Texas CoCoRaHS  
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@Texas\_CoCoRaHS